Chapter-1

Introduction to the Study

1.1 Introduction:

Industrialization plays a pivotal role in human existence. The economy of India is currently the world's third largest in terms of real GDP (PPP) after the USA and the People's Republic of China. According to the World Bank India overtook China to become the fastest-growing major economy in the world as of 2015. (Source: https://en.wikipedia.org/wiki/India_as_an_emerging_superpower). Industrialization affects the environment in diverse ways. This study focuses on the extent of pollution and harmful impact on the environment of India\(^1\).

It has also been vividly discussed and policy measures outlined to be undertaken by different large and small industries and government to maintain healthy environment along with the spirit of creating environmental consciousness and awareness about Kyoto agreement\(^2\). Governments in most countries are coming up with the policy of _polluters pay_, thereby increasing cost to such organization. Global warming is the increase in the average temperature of earth's surface due to increasing concentration of CO\(_2\) in the atmosphere. Increasing greenhouse gas emission in the atmosphere is leading to global warming. Change in land, converting forests to urban centers (deforestation), has altered the climate system. Variation in solar output (from the sun) and CO\(_2\) emitted by volcanic eruption has also led to increase in CO\(_2\) concentration in the atmosphere outcome.\(^3\)

UNFCCC has taken various steps towards drafting and implementation of the Kyoto Protocol Kyoto. To fight climate change, Kyoto Protocol was formed under the UNFCCC with an objective to reduce carbon emission globally. Three mechanisms were adopted to reduce emissions initiative 1) Clean Development Mechanism (CDM) 2) Joint Implementation and 3) International Emission Trading to tackle the problem of global warming. United Nations Framework Convention on Climate Change (UNFCCC or FCCC)

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\(^1\) Dr. Dewaram A. Nagdeve, _Environment and Health in India_, Asian Context at Bangkok, Thailand 10-13 June 2002.

\(^2\) India and Climate Change (2009), Ministry of Environment and Forest, Government of India

- an international environmental treaty - was formed at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro. India is the largest developer of Clean Development Mechanism projects and provider of CER after China.

Clean Development Mechanism Authority Trading Players, Indian carbon market Projects under CDM. India is the second largest provider of Clean Development Mechanism projects. So that industrialist should convert the threat (Global Warming) in to opportunities through showing there excellence by managing & coping with toxic environment.

The industrialization defines the process by which manufacturing industries develop from a primarily agrarian society. Industrialization includes the scientific methods and mechanization to solve scrape generated by a factory system for the growth of the economy, and management of the labor force both geographically and socially. Urbanization is encouraged to develop and change the whole of civil society. Industrialization affects the environment in diverse ways. Increasing trend of environmental pollution is the burning problem nowadays. Hence, requires making an intensive study on the facet of impact due to industrialization on the environment.

According to Vedas the nature is controlled by a supreme power that can never be ruled by human, and if interrupted by human chaotically, it shows itself in various forms of natural disasters. In Vedas to prevent the environment, there exists rules and restrictions in Indian culture, e.g. not to cut Banyan tree, Pipal tree and not to pollute river.

This study focuses on efforts to provide sufficient frameworks for environmental safety and health aspects with respect to industrial growth. The objective of the study is to find the awareness level, challenges and opportunities for carbon trading among the cooperative sugar industrialists from western Maharashtra.

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5 Maria DA Graca Canto Moniz, India's carbon Governance: The Clean Development Mechanism, Future of Food: Journal on Food, Agriculture and Society, Vol.1,Nr.1Summer 2013,pp.5-14.
Worldwide Emissions Trading is where parties that have surpassed their emanation lessening responsibilities under the Kyoto Protocol may offer overabundance (Doled out Sum Units, AAUs, or "recompenses" for short). Different gatherings may meet their own particular discharges diminished by obtaining these Assigned Amount Units or balance credits from creating nations. The system has brought about a few national and local exchanging plans, including the European Union Emission Trading Scheme (EU ETS).

In January 2008 the European Union GHG Emission Trading Scheme (EU ETS) began operation as the biggest multi-nation, multi-division GHG exchanging framework around the world. As of recently, it is the world's most developed discharges exchanging framework.

The EU ETS is executed as a top and exchange framework. A total breaking point (top) on the measure of a contamination that can be produced is set up. The top is used to calculate the emanation stipends which can be (exchanged) among establishments required to hold various recompenses comparable to their outflows. Establishments which produce not as much as their individual top permits can offer their surplus discharge recompenses and the other way around. In this way, the purchaser is paying a charge for dirtying, while the vender is being compensated for having lessened emission. In addition, emission are decreased where it costs modest. The top is brought down after some time, pointing towards the national outflows lessening target. The EU ETS depends on the Emission Trading (Directive 2003/87/EC), which went into drive in October 2003, and is executed at an establishment level.

This implies exactly 11,500 substantial producers of carbon dioxide inside the EU must screen and report their CO₂ outflows every year and are obliged to surrender various

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9 UNFCC The Kyoto Protocol Mechanism, International Emission Trading Clean Development Mechanism Joint Implementation
12 www.carbondioxideemissions
emanation remittances (EUAs) and CERs/ERUs equivalent to the aggregate discharges from their establishment during the former timetable year by 30 April at the most recent. Establishments as of now secured by the ETS are by and large in charge of near portion of the EU's discharges of CO₂ and 40% of its aggregate ozone depleting substance emission.

13Since in 2008, the EU ETS not just applies to the 27 EU Member States, yet in addition to the next three individuals from the European Economic Area (EEA) Iceland, Liechtenstein and Norway. In July 2008, the EU ETS Directive was changed to bring the flight segment into the framework from 2012 onwards. So as to wind up clearer the position of EU-ETS in the worldwide carbon Market, a general graph is given underneath.

1.2 India: A Country Study:

1.2.1 Industrial Profile and contribution to India's GDP:

There are various sectors that contribute to India's GDP14. Some of the major sectors are Automobile Industry, Steel Industry, Real Estate Industry, Tourism Industry, Energy Sector, Textile Industry, Airlines Industry, Medical Industry, Biotechnology Industry, Electronics and Hardware and the power industry. Besides these industries, there are several other sectors that are important contributors to the GDP of India.

1. GDP: $1.209 trillion (2008 Estimate)
2. GDP growth: 6.7% (2009)
3. GDP per capita: $1016
5. Unemployment: 6.8% (2008 Estimate)

The fertilizer industry of India makes more than a 20% contribution to the GDP15. Another sector that seems very promising for the future is biotechnology. This sector is very young, but it is growing at a very fast pace and will undoubtedly become one of the leading sectors contributing to the GDP in the near future. Currently this sector generates $
The real estate sector has witnessed a huge boom of late and has made significant contributions to the GDP of India. The real estate sector is one industry that has made significant contribution to the country's GDP. Due to the enormous demand in the retail and other sectors of the economy, more demands are being created for real estate. The automobile industry is another sector that makes good contribution to the Indian economy. Due to the changed lifestyle of the consumer the demand for vehicles is increasing at a huge pace. Industry accounts for 28% of the GDP and employs 14% of the total workforce. However, about one-third of the industrial labor force is engaged in simple household manufacturing only. In absolute terms, India is 16th in the world in terms of nominal factory output. Economic reforms brought foreign competition, led to privatization of certain public sector industries, opened up sectors hitherto reserved for the public sector and led to an expansion in the production of fast-moving consumer goods. Post-liberalization, the Indian private sector, which was usually run by oligopolies of old family firms and required political connections to prosper was faced with foreign competition, including the threat of cheaper Chinese imports. It has since handled the change by squeezing costs, revamping management, focusing on designing new products and relying on low labor costs and technology. The growth in the IT sector is attributed to increased specialization, and an availability of a large pool of low cost, but highly skilled, educated and fluent English-speaking workers, on the supply side, matched on the demand side by an increased demand from foreign consumers interested in India's service exports, or those looking to outsource their operations. The share of India's IT industry to the country's GDP increased from 4.8% in 2005-06 to 7% in 2008. In 2009, seven Indian firms were listed among the top 15 technology outsourcing companies in the world. In March 2009, annual revenues from outsourcing operations in India amounted to US$60 billion and this is expected to increase to US$225 billion by 2020. Organized retail such as supermarkets accounts for 24% of the market as of 2008. Regulations prevent most

foreign investment in retailing. Moreover, over thirty regulations such as "signboard licenses" and "anti-hoarding measures" may have to be complied before a store can open doors. There are taxes for moving goods to states, from states, and even within states. Tourism in India is relatively undeveloped, but growing at double digits. Some hospitals woo medical tourism.

1.2.2 Volume and Trend of Urbanization in India:

\(^{18}\)India shares most characteristic features of urbanization in the developing countries. This process of urbanization in India reflects a gradual increasing trend of urbanization. India is at acceleration stage of the process of urbanization.

**Table 1.1 Numbers of Million Plus Cities in India**

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\(^{18}\)Pranati Datta, Urbanization in India, Population Studies Unit Indian Statistical Institute
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<tr>
<td></td>
<td>City</td>
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<td>Population</td>
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(Source: Census Report 2011)

1.2.3 Infrastructure Development in India:

Infrastructure sector is a key driver for the Indian economy\(^{19}\). The part is exceptionally in charge of driving India's general advancement and appreciates extreme focus from Government for starting approaches that would guarantee time-bound making of world class infrastructure in the country. Infrastructure sector includes control, spans, dams, streets and urban foundation advancement. In 2016, India jumped 19 points in World Bank's Logistics Performance Index (LPI) 2016, to rank 35\(^{th}\) among 160 nations.

1.2.3.1 Market Size:

Foreign Direct Investment (FDI) received in Construction Development sector (townships, housing, built up infrastructure and construction development projects) from April 2000 to March 2017 stood at US$ 24.3 billion, according to the Department of Industrial Policy and Promotion (DIPP)\(^{20}\).

1.2.3.2 Investment:

India is witnessing significant interest from international investors in the infrastructure space\(^{21}\). Some key investments in the sector are listed below.

1. The infrastructure sector in India witnessed 33 deals in FY 2016-17 involving US$ 3.49 billion as against US$ 2.98 billion raised across 31 deals in FY 2015-16, with the majority of deals led by the power, roads and renewable sectors, as per investment bank Equirus Capital.

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\(^{19}\) K. Narinder Jetli and Vishal Sethi – —Infrastructure Development in India – Post Liberalisation Initiatives and Challenges – New Century Publications, New Delhi

\(^{20}\) Infrastructure Sector In India, India Brand Equity Foundation, As per a report released by the Indian Construction Equipment Manufacturers’ Association (ICEMA), - As per Indian Credit Rating Agency (ICRA)

\(^{21}\) Infrastructure Sector In India, India Brand Equity Foundation, As per a report released by the Indian Construction Equipment Manufacturers’ Association (ICEMA), - As per Indian Credit Rating Agency (ICRA)
2. Meinhardt Group, an engineering company based in Singapore, plans to establish its position in India as it targets the next wave of India's urban development to meet the country’s development needs.

3. Infrastructure Leasing and Financial Services Ltd (IL&FS) and global private equity (PE) firm Lone Star plan to jointly invest US$ 550 million in stressed infrastructure projects in India.

1.2.3.3 Government Initiative:

The Road Transport & Highways Ministry has invested around T3.17 trillion (US$ 47.7 billion), while the Shipping Ministry has invested around T80,000 crores (US$ 12.0 billion) in the past two and a half years for building world class highways and shipping infrastructure in the country\(^{22}\). The Government of India is expected to invest highly in the infrastructure sector, mainly highways, renewable energy and urban transport, prior to the general elections in 2019. \(^{23}\) A total of 6,604 km out of the 15,000 km of target set for national highways in 2016-17 has been constructed by the end of February 2017, according to the Minister of State for Road, Transport & Highways and Government of India.

1.2.3.4 Indian microeconomics:

This made easy which will uncover some interesting not to known facts about Indian microeconomics which too. Indian economy is what it is today. The tables given specifically unveil the facts from 1999 to 2013.

\(^{22}\) Infrastructure Sector In India, India Brand Equity Foundation , As per a report released by the Indian Construction Equipment Manufacturers' Association (ICEMA), - As per Indian Credit Rating Agency (ICRA)

\(^{23}\) Press Information Bureau Government of India Ministry of Road Transport & Highways
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<td>9.48</td>
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<td>48.1</td>
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1.3 Effect of Global Warming on India - Negative Phase of Industrialization

Lakshadweep, comprising tiny low-lying islands are at risk of being inundated by sea level rises associated with global warming\textsuperscript{24}. The effects of global warming on the Indian subcontinent vary from the submergence of low-lying islands and coastal lands to the melting of glaciers in the Indian Himalayas, threatening the volumetric flow rate of many of the most important rivers of India and South Asia.

1.3.1 Greenhouse gases in India: Elevated carbon dioxide emissions from industries, factories, vehicles etc. have contributed to the greenhouse effect, causing warmer weather that lasted long after the atmospheric shroud of dust and aerosols had cleared\textsuperscript{25}. Further climatic changes 20 million years ago, long after India had crashed into the Laurasian landmass, were severe enough to cause the extinction of many endemic Indian forms. The formation of the Himalayas resulted in blockage of frigid Central Asian air, preventing it from reaching India. This made its climate significantly warmer and more tropical in character than it would otherwise have been.

**Figure 1.1 Sources of Emission of Greenhouse Gases (year 2015)**

![Sources of Emission of Greenhouse Gases](http://www.mospi.gov.in/sites/default/files/publication_reports/climateChangeStat2015.pdf)

Total Emission in year 2454968 (kt) in 2015 i.e. 6.81% in the total emission contribution in the world.

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\textsuperscript{24} Anupama Mahato, Climate Change and It’s Impact on Agriculture, International Journal of Scientific and Research Publications, Volume 4, Issue 4, April 2014, ISSN 2250-3153, pp. 1-6

\textsuperscript{25} Subodh Sharma, Sumana Bhattacharya and Amit Garg, _A Green House Gas Emission from India: A Perspective_ Special Section: Climate Change and India, VOL. 90, NO. 3, 10 FEBRUARY 2006
1.3.2 Effects of global warming on India: Several effects of global warming, including steady sea level rise, increased cyclonic activity, and changes in ambient temperature and precipitation patterns, have affected or are projected to affect India\textsuperscript{26}. Ongoing sea level rises have submerged several low-lying islands in the Sundarbans, displacing thousands of people. Temperature rises on the Tibetan Plateau, which are causing Himalayan glaciers to retreat.

1.3.2.1 Environmental: Increased landslides and flooding are projected to have an impact upon states such as Assam\textsuperscript{27}. Ecological disasters, such as a 1998 coral bleaching event that killed off more than 70\% of corals in the reef ecosystems off Lakshadweep and the Andamans, and was brought on by Elevated Ocean temperatures tied to global warming, are also projected to become increasingly common. The first among the countries to be affected by severe climate change is Bangladesh. Its sea level, temperature and evaporation are increasing, and the changes in precipitation and cross boundary river flows are already beginning to cause drainage congestion. There is a reduction in fresh water availability, disturbance of morphologic processes and a higher intensity of flooding and other such disasters. Bangladesh only contributes 0.1\% of the world’s emissions yet it has 2.4\% of the world’s population. In contrast, the United States makes up about 5 percent of the world's population, yet they produce approximately 25 percent of the pollution that causes global warming.

1.3.2.2 Economic: The Indira Gandhi Institute of Development Research has reported that, if the predictions relating to global warming made by the Intergovernmental Panel on Climate Change come to fruition\textsuperscript{28}, climate-related factors could cause India's GDP to decline by up to 9\%. Contributing to this would be shifting growing seasons for major crops such as rice, production of which could fall by 40\%. Around seven million people are projected to be displaced due to, among other factors, submersion of parts of Mumbai and Chennai, if global temperatures were to rise by a mere 2 °C (3.6 °F) Villagers in India's North Easter state of Meghalaya are also concerned that rising sea levels will submerge neighboring low-lying Bangladesh, resulting in an influx of refugees into Meghalaya which has few resources to handle such a situation. If severe climate changes occur, Bangladesh will lose land along the

\textsuperscript{26}Intergovernmental Panel on Climate Change
\textsuperscript{27}Maximilian Auffhammer & V. Ramanathan & Jeffrey R. Vincent, _Climate change, the monsoon, and rice yield in India_, DOI 10.1007/s10584-011-0208-4, Climatic Change, Springer Science+Business Media B.V. 2011
\textsuperscript{28}Dr. Tapati Basu, Green Journalism: Environment And Media
coast line. The economy has grown 5-6% over the past few years despite inefficient state-owned enterprises, delays in exploiting natural gas resources insufficient power supplies, and slow implementation of economic reforms. However, Bangladesh remains a poor, overpopulated, and inefficiently governed nation. If no further steps are taken to improve the current conditions global warming will affect the economy severely worsening the present issues further.

1.3.2.3 Social: Climate Change in India will have a disproportionate impact on the more than 400 million that make up India's poor. This is because so many depend on natural resources for their food, shelter and income. More than 56% of people in India work in agriculture, while many others earn their living in coastal areas.

Indian journalist, Praful Bidwai, argues that the Indian Government's climate policy does not address the interests of the majority of these peoples for whom climate change will mean hunger, food insecurity, and destruction of livelihoods but is instead focused on maximizing Indian elite's freedom to consume by maintaining high emissions-intensive GDP growth. Past climate change Thick haze and smoke along the Ganges River in northern India. However, such shifts are not new: for example, earlier in the current Holocene epoch (4,800–6,300 years ago), parts of what is now the thar Desert were wet enough to support perennial lakes, researchers have proposed that this was due to much higher winter precipitation, which coincided with stronger monsoons. Similarly, Kashmir, which once had a warm subtropical climate, shifted to a substantially colder temperate climate 2.6–3.7 mya. It was then repeatedly subjected to extended cold spells starting 1 million years ago.

1.3.2.4 Atmospheric Pollution: Thick haze and smoke, originating from burning biomass in northwestern India and air pollution from large industrial cities in northern India, often concentrate inside the Ganges Basin. Prevailing waterlines carry aerosols along the southern margins of the steep-faced Tibetan Plateau to eastern India and the Bay of Bengal. Dust and black carbon, which are blown towards higher altitudes by winds at the southern faces of the Himalayas, can absorb shortwave radiation and heat the air over the Tibetan Plateau. The net atmospheric heating due to aerosol absorption causes the air to warm and convect upwards,

29Navroz Dubash, Handbook of Climate Change and India, ISBN 9781849713580, Earthscan, New York, pp.219-221
30National Intelligence Council, India: The Impact of Climate Change to 2030 A Commission Research Report,
increasing the concentration of moisture in the mid-troposphere and providing positive feedback that stimulates further heating of aerosols.

### Table 1.3: CO₂ Emissions by Different Sectors in India -2007

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<tr>
<th>Sr. No.</th>
<th>Sources of Emission</th>
<th>Percentage of CO₂ Emission -2007 (in million tons)</th>
<th>Percentage of CO₂ Emission (in %)</th>
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<td>Electricity</td>
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<td>2</td>
<td>Transport</td>
<td>142.04</td>
<td>7.5</td>
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<td>3</td>
<td>Residential</td>
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<td>Other Energy</td>
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<td>5</td>
<td>Cement</td>
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<td>6</td>
<td>Iron &amp; Steel</td>
<td>117.32</td>
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<td>7</td>
<td>Other Industry</td>
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<td>8.7</td>
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<td>Agriculture</td>
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<td>9</td>
<td>Waste</td>
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<td><strong>Total</strong></td>
<td></td>
<td><strong>1904.73</strong></td>
<td><strong>100</strong></td>
</tr>
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</table>


**1.3.3 Awareness on Climate Change**: Tribal people in India's remote northeast plan to honor former U.S. Vice President Al Gore with an award for promoting awareness on climate change that they say will have a devastating impact on their homeland. Meghalaya -- meaning 'Abode of the Clouds' in Hindi -- is home to the towns of Cherrapunji and Mawsynram, which are credited with being the wettest places in the world due to their high rainfall. But scientists state that global climate change is causing these areas to experience an increasingly sparse and erratic rainfall pattern and a lengthened dry season, affecting the livelihoods of thousands of villagers who cultivate paddy and maize. Some areas are also facing water shortages. People are becoming aware of ills of global warming. Taking initiative on their own people from Sangamner, Maharashtra (near Shirdi) has started a campaign of planting trees known as Dandakaranya- the Green Movement. It was started by visionary & ace freedom fighter Late

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Shri. Bhausaheb Thorat in the year 2005 till date, they have sowed more than 12 million seeds & half a million of plants.

1.4 World of carbon Market and India

According to the Department of Energy's (DOE) Energy Information Administration (EIA), after China and the United States, among major polluters only India is expected to have significant growth of emissions over the next 20 years. According to the Energy Information Administration, after China and the United States, among major polluters only India is expected to have carbon Dioxide Emissions by Country, 1990-2030, indicated in following graph.

Figure 1.2 World carbon Dioxide Emission by Country, 1990-2030

(Source: https://rainforests.mongabay.com/09-carbon_emissions.htm)

1.5 Contribution to Global Warming – carbon Trading by India

1.5.1 What is carbon Market?

All emission units mentioned in this report ultimately owe their existence to the Kyoto Protocol of 1997\(^3\). This Protocol is, in effect, an action plan to bring about greenhouse Gas (GHG) reductions as proposed by the United Nations Framework Convention on Climate Change (UNFCCC), itself signed by most countries in 1994. Under the UNFCCC, a group of countries (basically the OECD plus the ex-Soviet Union countries) are known as Annex

\(^3\)Ric har d G. New ell, William A. Pize r, a nd Dani el Raimi, carbon Markets: Past, Present, and Future, Discussion Paper, December 2012, RFF DP 12-51
countries. These countries agreed to limit their own GHG emissions to a percentage of previous output levels. A subset of the Annex 1 countries that ratified Kyoto agreed to reduce their GHG emissions relative to 1990 levels on aggregate by 5.2%, averaged over the first commitment period (2008-2012). The EU, signing the treaty as a single body, has made a commitment to make an overall 8% reduction on 1990 emissions. The burden for achieving the EU target is divided unequally between EU member states under the 'Burden Sharing Agreement'. Countries with such commitments must meet their targets primarily through national GHG reduction measures. However, as additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, thereby creating what is now known as the 'carbon market'.

1.5.2 The Kyoto Protocol:

The Kyoto Protocol treaty was negotiated in December 1997 at the city of Kyoto, Japan and came into force February 16th, 2005.\textsuperscript{34}\textsuperscript{35} The Kyoto Protocol is a legally binding agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions from six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland.\textsuperscript{1} Greenhouse gas emissions a new commodity. Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or —assigned amounts,— over the 2008-2012 commitment periods.\textsuperscript{36} The allowed emissions are divided into —assigned amount unitsl (AAUs). 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

\textsuperscript{36}UNFCC The Kyoto Protocol Mechanism, International Emission Trading Clean Development Mechanism Joint Implementation
this excess capacity to countries that are over their targets. Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity. This is known as the "carbon market."

1.5.2.1 Other Trading Units in the carbon Market:

More than actual emissions units can be traded and sold under the Kyoto Protocol’s emissions trading scheme. The other units which may be transferred under the scheme, each equal to one tonne of CO₂. A removal unit (RMU) on the basis of land use, land-use change and forestry (LULUCF) activities such as reforestation. An emission reduction unit (ERU) generated by a joint implementation project. A certified emission reduction (CER) generated from a clean development mechanism project activity. Transfers and acquisitions of these units are tracked and recorded through the registry systems under the Kyoto Protocol. An international transaction log ensures secure transfer of emission reduction units between countries. Relationship to domestic and regional emissions trading schemes. Emissions trading schemes may be established as climate policy instruments at the national level and the regional level. Under such schemes, governments set emissions obligations to be reached by the participating entities. As we know greenhouse gas (GHG) emission is increasing day by day in developed as well as in developing countries. According to the provision of the Kyoto Protocol in February 2005, developed nations have to reduce their GHG emissions by an average of 5.2% below their 1990 levels by 2012. So they (developed countries) thought that plantations are one of the best solutions to curbing damage from GHG emissions. But the expenditure for that in developed countries is high. So companies there can fund plantations in countries like India, where the costs are low and in turn take credit for the carbon absorbed by the trees.

1.5.2.2 Kyoto Infrastructure:

As the number of units and their location has to be tracked to determine if countries have met their obligations, the Kyoto protocol mandates that each Annex B country (195 countries signed the Paris Agreement) create and maintain a registry for the holding of Kyoto units and

38 United Nations Climate Change, Clean Development Mechanism.
provide a mechanism for their transfer (both domestically and internationally). Assigned Amount Units, RMUs and ERUs are issued by the national registry in each country. CERs are issued by the UNFCCC-operated Clean Development Mechanism registry once the emission reductions from a project have been independently verified. Once issued, units can be freely transferred between accounts on the registry. A country can decide whether to hold all the units in its own name, or transfer units to companies with high emissions levels. Transfers can also be made to accounts on a foreign registry (subject to each country maintaining a commitment period reserve). Therefore, a national registry can hold Assigned Amount Units, RMUs, ERUs that it has itself issued, plus Assigned Amount Units, RMUs and ERUs issued by other countries, as well as CERs issued by the Clean Development Mechanism registry. International transfers are verified by another Kyoto mechanism, the International Transactions Log (ITL), administered by the UNFCCC. The ITL verifies transactions proposed by registries to ensure they are consistent with rules agreed under the Kyoto Protocol. Once approved, registries complete the transaction. In the event that a transaction is rejected, the ITL sends a code indicating which ITL check has been failed and the registry terminates the transaction. At the end of the commitment period (2012), the actual emissions of each Annex B country over the period will be compared with the holding of all the units in the registry. If a country does not have enough units to cover its emissions, it has to make good the shortfall plus an additional 30% of the shortfall. Some trading of Assigned Amount Units between nations has taken place in the past. Some of this trade is controversial, especially the purchase of Assigned Amount Units from the old Eastern Block. The baseline for Kyoto was 1990, which was just at the point that these inefficient economies started to collapse. This meant that current emissions for this region are well below 1990 levels. These excess units are known as 'hot air'. In an effort to improve the situation, the Green Investment Scheme (GIS) was developed, obligating participating countries who sell such excess units to reinvest the proceeds in green projects.

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1.5.2.3 How Kyoto Units are Created / Issued:

1. **Kyoto Allocation of Assigned Amount Units**: The amount of AAUs allocated to a country is dependent on its emissions target for the period 2008 to 2012, based on the 1990 baseline\(^41\). At the start of the period each country was allocated all of its units for the five-year period – i.e. it received (tones emitted in 1990) * (100 - reduction percentage)*\(^54\). These units are created in the national registry for that country, and the government of the country could then decide whether to manage the holdings themselves, or issue them to major energy consuming businesses to encourage emissions reductions at source.

2. **RMU’s**: RMUs are issued into the national registry of the country that hosts the project that results in net removal of carbon from the atmosphere (by creating or enhancing a carbon sink). The commitment period reserve is a requirement under the Kyoto Protocol that requires each Party to maintain a reserve of ERUs, CERs, Assigned Amount Units and/or RMUs in its national registry at least equal to 90% of the Party's assigned amount (KP Emissions Trading)\(^42\). Not all countries are subject to a reduction on 1990 levels. Australia, which did not initially ratify Kyoto, negotiated an 8% increase.

3. **ERU from JI’s**: ERUs differ from other units, in that they can only be created if another unit type is cancelled. \(^43\)ERUs result from projects in one Annex B country sponsored by another. These units can be used by the sponsor to add to its holdings in its own country. The conversion of Assigned Amount Units or RMUs to ERUs prevents double counting. The units are issued in the host country's national registry.

4. **CER from Clean Development Mechanism (CDM)**: The CDM process is one of the major planks of Kyoto. As mentioned, it encourages emission projects in less developed countries, where the environmental benefit may be produced at a lower cost than could be done in a developed country. As GHGs know no national boundaries, saving carbon emissions in India, for example, has the identical impact of saving carbon emissions in Germany\(^44\). A key imperative of Clean Development Mechanism schemes is additional.

Additionally is the requirement that the greenhouse gas emissions after implementation of a Clean Development Mechanism project activity are lower than those that would have occurred in the most plausible alternative scenario to the implementation of the Clean Development Mechanism project activity. An example would be the building of a wind farm instead of a thermal power station. The UNFCCC operates a comprehensive approval process to determine which projects are eligible as well as a verification process to ensure the emission reductions have actually taken place. Each year, once the verification has taken place, the resulting CERs are issued on the Clean Development Mechanism registry in the name of the project developer. These units can then be sold to Annex B countries, industrial users or traders. Once transferred, they can exist in the holding accounts in national registries.

1.5.3 Carbon Trading Mechanisms:

Countries with commitments under the Kyoto Protocol to limit or reduce greenhouse gas emissions must meet their targets primarily through national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, thereby creating what is now known as the —carbon market. Following are the carbon Trading Mechanisms.

1. Emission Trading
2. The Clean Development Mechanism (CDM)
3. Joint Implementation (JI)

The above mentioned carbon trading mechanisms are discussed in detail in the following section.

1.5.3.1 Emission Trading:

Countries with commitments under the Kyoto Protocol have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or 'assigned amounts', over the 2008-2012 commitment periods. Allowed emissions are divided into assigned amount units (Assigned Amount Units – each AAU representing one tonne of CO₂eq) and issued to each country at the level of its emissions target (i.e. a country will get fewer Assigned Amount Units than would cover the existing, business as usual, emissions levels). Emissions trading allows countries that have unused emission allowance units allowances allocated to them but not 'used' – to sell this

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excess capacity to countries that are over their targets. Greenhouse gas is the name for the group of six gases (including CO\textsubscript{2}) which have an impact on global warming. CO\textsubscript{2e} is the unit of measurement used to compare the relative climate impact of the different GHGs. The CO\textsubscript{2e} quantity of any greenhouse gas is the amount of carbon dioxide that would produce the equivalent global warming impact. Annex 1 countries can achieve their targets by allocating their reduced annual allowances to major operators within their borders. Operators who have reduced their emissions below their level of allocation can sell this excess to operators who exceed their allocations. This type of trading scheme is known as ‘Cap and Trade’.

1.5.3.2 The Clean Development Mechanism (CDM):

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 B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one ton of CO\textsubscript{2}, which can be counted towards meeting Kyoto targets. The mechanism is seen by many as a trailblazer. It is the first global, environmental investment and credit scheme of its kind, providing standardized emissions offset instrument, CERs. The Clean Development Mechanism (CDM), allows a country with an emission reduction commitment to implement an emission-reduction project in developing countries, where the cost of reducing emissions may be cheaper than at home. Such projects can earn saleable Certified Emission Reduction (CER) credits, each equivalent to one tons of CO\textsubscript{2}, which can be counted towards meeting Kyoto targets. In this way countries (and operators within a country) can purchase CERs to meet their obligations if they face a shortfall.

A Clean Development Mechanism project activity might involve, for example, a landfill methane capture project, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The idea is that the mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction targets. The mechanism stimulates

\footnote{United Nations Climate Change, Clean Development Mechanism,}
\footnote{Lucila Nathali PINTO CIEZA, Facing New Challenges: Environmental Policies and the Implementation of Solutions in Peru.}
sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

**Types of Projects in Clean Development Mechanism**

1. Renewable energy
2. Switching to alternate fuels
3. Energy efficiency
4. Waste management
5. Industrial process
6. Agriculture
7. Carbon sequestration in forests

**Registration of Clean Development Mechanism (CDM) Projects:** It has to undergo through a project cycle involving four stages such as: (1) Project Development (2) Validation and Registration (3) Project Monitoring (4) Verification, Certification and Issuance of CERs.

A Clean Development Mechanism project must provide emission reductions that are additional to what would otherwise have occurred. The projects must qualify through a rigorous and public registration and issuance process. Approval is given by the Designated National Authorities. Public funding for Clean Development Mechanism project activities must not result in the diversion of official development assistance. The mechanism is overseen by the Clean Development Mechanism Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol. Operational since the beginning of 2006, the mechanism has already registered more than 1,650 projects and is anticipated to produce CERs amounting to more than 2.9 billion tons of CO$_2$ equivalent in the first commitment period of the Kyoto Protocol, 2008–2012.

**The main new features of the proposed registry are as follows:**

1. All functions related to the EU ETS will be carried out on the Union Registry. Thus all transfers as a result of trading activity will be processed by the Union Registry.
2. The Union Registry will operate a single, central infrastructure on behalf of the national registries, which will still be responsible for opening accounts. Thus, an institution could have multiple accounts in the Union Registry depending on the number of national registries in which it has opened accounts. The services provided will, however, be

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49Book of Clean Development Mechanism, ISBN 875503866,
identical across all the accounts, as they will be provided centrally by the Union Registry.

3. National registries will remain responsible for functions required under the Kyoto Protocol, such as managing the surrender of units. Units will therefore be returned to national registries when needed for this process to be carried out.

4. Regulated exchanges and trading venues will be able to open a trading platform holding account.

5. Account holders will be able to nominate that their account is accessible through a trading platform.

6. The arrangements for technical connectivity to the Union Registry are still under discussion. Electronic Interface (REI) from the beginning. Although there will be a single secure web portal, users may still require separate passwords to access accounts opened through different national registries.

7. Security arrangements will allow for more sophisticated authorization controls over transfers.

8. There will be specific facilities to back out of transfers clearly made in error.

9. The registry system operator will be required to —take all reasonable steps‖ to make the system available 24 hours a day, 7 days a week.

1.5.3.3 Joint Implementation:

The Joint Implementation mechanism (JI)\(^50\) allows a country with an emission reduction commitment to earn Emission Reduction Units (ERUs) from an emission reduction or emission removal project in another Annex B country, each equivalent to one tons of CO\(_2\), which can be counted towards meeting its Kyoto target. The idea behind JI is that it offers countries a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host country benefits from foreign investment and technology transfer. These projects are similar to Clean Development Mechanism projects but the creation of units is different. ERUs come about by the conversion of Assigned Amount Units (or RMUs – see below) into ERUs. The latter can then be sold to meet a Kyoto reduction target. They do not add to the overall supply of units in the market.

Other Method Removal Units:

In addition to the above mentioned market mechanisms, there is a fourth unit which can be created and traded under the Protocol. These are removal units (RMUs) and are given for net removals of carbon by sinks from activities in the Land Use, Land Use Change and Forestry sector (LULUCF).

1.5.4 Participants in the carbon Market:

A. **Installation:** The primary participants in the market are 12,000 or so installations covered under the EU ETS, who receive allocations of EUAs in each phase of the scheme.\(^{51}\) These installations need to annually match their actual measured emissions with their holdings of EUAs (or other acceptable units). If they are successful in reducing emissions below their EUA allocation, they can sell the surplus. If they are short, they need to purchase EUAs, or other units such as CERs.

B. **Clean Development Mechanism Project Developer:** Project developers provide the finance for CDM projects.\(^{52}\) They receive the actual CERs created from these projects once the emission reductions have been verified. However, it is possible to sell Primary CERs to organizations belongs to host country that wish to buy the CERs.

C. **Brokers:** Brokers exist to facilitate trading in financial assets. In the emissions space, specialist brokers have emerged, and established brokers in other assets have moved into the emissions space. Some brokers specialize in the CER market, sourcing CERs (pre- or post-issuance) directly from Clean Development Mechanism schemes for their customers, others operate exclusively in the secondary market.

D. **Traders:** Like any financial asset, emission units vary in price over time and provide another vehicle for traders to profit from. Traders are an essential component of the secondary market.

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\(^{51}\) European Roundtable on Climate Change and Sustainable Transition, 2017 State of the EU ETS Report, ERCST, Wegener Center, Nomisma Energia, I4CE & ICTSD


E. **Voluntary off Setters:** There are many opportunities for companies and individuals to offset their own emissions by buying emission units. Such units are often sourced from voluntary schemes but there is nothing preventing such buyers from purchasing EUAs, CERs or other Kyoto units. For example, the Easy Jet offsetting scheme, whereby passengers can purchase offsets at the time of booking a flight, meets the offset by buying CERs from a small hydro project in Ecuador. These schemes only account for a small proportion of the overall market.

1.5.5 **How and Where Emission are Traded?**

1.5.5.1 **Primary Market:** Increasingly, allowances and credits first become tradable through an auction process. National governments have evolved this method of allocating a proportion of the allowances that are distributed to installations. It not only raises revenue but also helps to ensure that the allowances maintain a market value which provides an incentive for installations to reduce emissions. The auction method is also used to sell CER credits released by Clean Development Mechanism projects. The objective is for the project developer to maximize the revenue from a block of CERs, avoiding the potential market impact on the price if they were sold into the secondary market. Auctions are operated as a service by some of the organizations running secondary markets, such as EEX, BlueNext and Climex. The UK government Debt Management Office organizes the auction of EUAs to obligated emitters, using its long experience of auctioning government bonds. Direct participants in the auction are banks who act on behalf of the compliance buyers. Phase 3 of the EU ETS will rationalize the auction process across all EU countries and will require governments to increase the percentage of allowances which are distributed through auctioning.

1.5.5.2 **Types of Secondary Trading**

A. **Private Contract:** Like any asset, it is possible to exchange units for cash with another party by private contract. In this way installations that have an excess of EUAs as a result of being successful in their emission reduction efforts can transfer them directly to another party in exchange for cash. Units can be transferred directly between holdings accounts in the national registries or from a holding account on one national registry to a

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holding account on another national registry. The cash and the asset transactions are not
directly linked, so the parties have to agree on the timing of the two exchanges (units
and cash). This creates a counterparty risk which will be commented on later in this
report.

B. **OTC Market:** Much trading of spot and futures contracts takes place in the OTC
markets. Brokers bring together buyers and sellers, and offer either spot contracts or
forward contracts, covering EUAs and Primary and Secondary CERs.

C. **Exchange Market:** Exchange Markets provide an open and transparent marketplace for
emissions units. The various markets offer spot, futures and options contracts.

**Forms in Which Units are traded:**

A. **Spot:** Spot trading is trading for immediate delivery. The buyer and seller agree a price
for an amount of EUAs or Secondary CERs and settlement takes place within two or
three days. Transfer of cash and units takes place independently due to most registries
not having facilities to allow for delivery versus payment (DVP), with the exception of
the French registry.

B. **Forwards:** Forward contracts are offered by many brokers, in EUAs, Primary CERs and
Secondary CERs. These contracts allow buyers and sellers to lock in a price for a
delivery sometime in the future. Most of these contracts carry counterparty risk as they
are not cleared. There is an active market in Primary CERs. Primary CERs are CERs
that do not yet exist but will be issued to the Project Developer in the underlying Clean
Development Mechanism project. These are effectively forward contracts on CERs that
are expected to be issued. There is, of course, a risk that the number of CERs issued will
be less than expected, or that none will be issued. For this reason, Primary CERs trade at
a discount to Secondary CERs that is, CERs already verified and issued, the level of
discount being proportional to the project risk.

C. **Future:** Cleared futures contracts on EUAs and CERs are offered by the major
emissions contract exchanges. The great majority of futures contracts are for December
delivery, allowing installations to lock in a price for any units they may need to buy to
meet their obligations or to profit from any excess units they may hold. There is an active secondary market in such units, supported by speculators. Contracts are cleared through a recognized clearing house, protecting participants from the failure of counterparty. Daily futures, which expire and settle on the day after trade date, are offered by some exchanges as a surrogate spot contract. They have the side effect of being classed as derivatives and, for instance in the UK, being regulated by the Financial Service Authority (FSA).

D. **Options:** Options are offered by a couple of regulated exchanges, notably on ECX/ICE. These are European style options on futures contracts. On expiration the option holder has the right to buy (in the case of a call) or sell (in the case of a put) a December expiring futures contract. Options have been offered for a while but growth in volume has been more recent. Exchange options contracts are cleared.

1.5.6 Major Exchange Market:

There are six significant operators of exchanges offering trading in EU-ETS eligible units.

1. **Blue Next:** Blue Next is a joint venture between the NYSE Euronext global exchange group and Caisse des Depots et Consignations (CDC) a unique French public institution with a high credit rating and a remit to encourage sustainable development. Only Nord Pool offers clearing for forwards. Nord Pool offers quarterly expiries but the majority of the volume is in the December contracts.

2. **Climax:** Climax is a private venture jointly owned by Rabobank and TenneT, the operator of the Dutch electricity grid. It has a contractual relationship with APX-ENDEX, operators of electricity and gas markets in the Netherlands, Belgium and the UK.

3. **European Climate Exchange (ECX/ICX):** ECX was established by the Chicago Climate Exchange, one of the earliest entrants into emissions trading. The market is operated in partnership with Intercontinental Exchange (ICE) Europe. ICE provides the exchange trading platform, clearing house, market regulation and business development.

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56 European Commission, Climate Change, The EU Emission Trading System
functions for contracts devised by ECX. At the time of writing ICE is in the process of concluding the purchase of ECX and its parent group.

4. **European Energy Exchange:** EEX is the German-based electricity and gas exchange. Its major shareholders are Eurex, the German/Swiss derivatives exchange and Landes bank Baden - Württemberg, the remainder being owned by market participants.

5. **The Green Exchange:** The Green Exchange is a venture recently launched by the CME Group, the US operator of the largest futures exchange in the world. It aims to focus the trading in environmental instruments which is currently conducted by the NYMEX division of the group into an exchange with its own regulatory license in the USA and regulatory permissions to also operate in Europe, with its European base in London.

6. **Nord Pool:** Nord Pool is the Nordic Electricity exchange owned by NASDAQ OMX, the global exchange operator. Each exchange offers a different mix of contract types and trading methodology.

**1.5.7 India Sets Target on carbon Emission**

The Copenhagen Accord to prevent dangerous anthropogenic interference with the climatic system recognizes the scientific view that the increase in global temperature should be below 2 degree Celsius, in a context of sustainable development, to combat climate change. Given that the most countries have agreed to keep the political declaration in mind while negotiating a climate deal, there is an acceptance that a limit has been set on the total global carbon emission. An equitable sharing of this carbon space in a manner that allows developing countries to pursue their growth agenda has become imperative. Without equity in burden sharing, the likelihood of a global deal on climate is unlikely.

India committed to reduce the intensity of its carbon emissions by 20 to 25 percent by 2020 from 2005 levels, meeting a deadline for developing countries to set voluntary carbon-curbing actions. India has consistently maintained that per-capita emission principle is the basis for an equitable burden sharing. Prime Minister Manmohan Singh made an international commitment that India’s per capita emission would never exceed that of the developed countries. At present, India’s per-capita emission is at 1.2 to 1.4 MT. The per-capita emission approach does present some problems. It helps countries

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57 Subash Dhar, Priyadarshi Ramprasad Shukla and Minal Pathak, India’s INDC for Transport and 2°C Stabilization Target, ISBN N 978-88-95608-47-1. ISSN 2283-9216, Published by The Italian Association of Chemical Engineer.

58 Energy and Climate Change, International Energy Agency,
leverage on their large populations, as is the case with India and China, Government of India has shown an approach to set up all the institutional setups (like Designated National Authority DNA) to facilitate maximum participation of Indian industries to get the benefits of Clean Development Mechanism.

1.5.8 Some Project Clean Development Mechanism Projects in India: Clean Development Mechanism projects registered at the Clean Development Mechanism executive board are 506 in number, 1,492 Clean Development Mechanism projects are at or after the validation stage. 1,592 Clean Development Mechanism projects have been approved by India. Any Clean Development Mechanism project before getting started it is necessary to undergo the Clean Development Mechanism project cycle as mentioned above. Presently India has the largest number of projects. Energy Infratech Private Limited (EIPL) is getting involved in to these projects to get the benefit of Clean Development Mechanism. The list of Indian companies who are getting benefits of clean development mechanism seems to be endless, the latest addition being the Raigarh-based Jindal Steel and Power Limited (JSPL). Tata power too got its first Clean Development Mechanism project registered just recently.

The Delhi Metro Rail Corporation (DMCR): It has become the first railway project in the world to earn carbon credit. Under this project, DMRC will earn Certified Emission Reductions (CERs). The entire project was carried out with the support of Japan carbon Finance which provided almost $95,000.

Grasim Industry: It is one of the major producers of cement in India. By the year 2006, the company began earning ₹17 cr through carbon credits. By March 2007, over 1000 companies had registered for Clean Development Mechanism projects across the globe.

1.6 Sugar Industry in Western Maharashtra and carbon Trading:

1.6.1 Introduction: Indian sugar industry is one of the main drivers of the country's rural economy supporting its agricultural growth. It supports over 50 million farmers and their families, along with workers and entrepreneurs of almost 500 mills, apart from a host of wholesalers and distributors spread across the country. The Indian sugar industry also occupies a significant place in the global sugar industry being the second largest producer of the commodity in the world. The sugar industry is a green industry and is largely self-sufficient in energy needs through utilisation of bagasse for generating electricity and steam. In fact, the sugar industry generates surplus exportable energy through cogeneration and contributes to reducing the energy deficit India is currently facing.
Table 1.4 Cooperative Sugar Industries in Western Maharashtra

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Location</th>
<th>Co-operative Sugar Industries (In No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pune</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Kolhapur</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>Sangli</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Satara</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Solapur</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

(Source: http://www.vsisugar.com/india/statistics/maharashtra_statistics.htm#)

1.6.2 Opportunities for cooperative Sugar Industries in carbon Trading:

1. By 2017, there is a total exportable power potential of approximately 9700 MW. This can fulfill almost 6 per cent of the additional power requirement of 128 GW by 2017. The sector can also generate 48 million carbon credits through cogeneration, say industry sources.

2. Presently, bagasse-based exportable power is 847 MW, but this could increase to approximately 9700 MW by 2017. The bagasse-based cogeneration is currently less than 0.6 per cent of the installed capacity, but can fulfill 6 per cent of the additional future requirement.

3. There is a significant untapped cogen potential. This can help to partially bridge the energy gap that India faces. There is a certain sense of dichotomy built into the industry which needs to be looked at. And continues to play a key role in the economy, it is expected to face some significant challenges.

4. There is lack of alignment between sugarcane and sugar prices. As a result, it leads to cane payment arrears. The arrears typically result in the eventual need for government support packages, while the pronounced cyclicity destabilizes the sector revenues, claim sugar industry sources.

5. The average sugarcane yields have also, at best, stagnated and the average recovery is amongst the lowest in comparison with key sugar producing nations. Large sugar inventory exposure and sugar price volatility also results in high sugar price risk for the sector. In the past ten years, on an average basis, even the large listed sugar firms have struggled to generate return on invested capital (ROIC) over and above their cost of
capital. This is primarily due to high mandated fixed cane prices and volatile sugar prices\textsuperscript{59}.

1.6.3 Model of Sugar Industries Entered in to carbon Trading:
The below are the few model Sugar industries who have registered for Clean Development Mechanism projects and dealing in carbon trading and started earning additional profit.

1. The bagasse-based cogeneration undertaken in the co-operative sugar sector in Maharashtra, located at Shri Pandurang Sahakari Sakhar Karkhana Limited, Shreepur, Dist-Solapur. Project is Financial Additionality. Economically non-viable project becomes viable as a direct result of Clean Development Mechanism revenues. CER (Certified Emissions Reduction) revenue acts as a financial buffer that can alleviate the impact of financial risks\textsuperscript{60}. The analysis of project IRR without inclusion of CER revenue is 6.8% while 13.6% when CER revenue is included. Project contributes to the sustainability of the factory and thus fosters further economic growth and development in the surrounding area. The crediting period for this project is of 10 years as- 05th May 2006 to 04th May 2016. The project was commissioned on 02nd July 2006\textsuperscript{61}.

2. Gangakhed Sugar and Energy Ltd. Santacruz(East), Mumbai started Power plant and the Distillery plant situated at Gangakhed is under the validation process for the registration under Clean Development Mechanism (CDM)\textsuperscript{62}.

3. KCP SUGARS Ramakrishna Buildings", Post Box No. 727, No. 239, (Old No. 183), Anna Salai, Chennai - 600006. The Company had installed two bagasse-based Incidental Cogeneration Projects at its Sugar Complex at Vuyyuru and Lakshmipuram with a capacity of 15 MW and 5 MW respectively in the year 2005. These project activities had been registered with United Nations Framework Convention on Climate Change (UNFCCC) as a Clean Development Mechanism Project Activity Ref: No. 1472 for Vuyyuru on 11.09.2008 and 1571 for Lakshmipuram on 13.06.2008. The carbon Emission Reduction achieved in these projects prior to registration, viz, Verified Emission Reduction (VER) have been voluntarily verified and bankers with APX VCS Registry,

\textsuperscript{59}https://home.kpmg.com/au/en/home/industries/power-utilities.html
\textsuperscript{60}http://cdm.unfccc.int/Projects/DB/BVQI1142341690.23
\textsuperscript{61}http://pandurangssugar.com/pages/Clean-Development-Mechanism.php
\textsuperscript{62}http://www.gangakhedicpp.com/?link=crbnrct
USA. The process of verification of carbon Emission Reduction achieved post-registration is under progress. Both these plants are estimated to reduce carbon emission to the extent of 20,000 MT per season\(^\text{63}\).

4. Balrampur Chini Mills Ltd (BCML), promoted by the Saraogi family of Uttar Pradesh, has four sugar plants with a total capacity of 29,000 tonnes per day and two cogeneration plants of a total capacity of 39.5 MW. The cogen plants supply more than 21 crore units of electricity to the Uttar Pradesh grid-IFC-Netherlands carbon Facility (INCaF), an organisation set up by the Washington-based lending agency, IFC, and the Government of Netherlands, is in talks with Balrampur Chini Mills Ltd for buying carbon credits worth Rs 45 crore. The value of the CERs purchased is expected to be around 8 million euro (about Rs 45 crore). The money will be paid in installments, on the annual delivery of CERs to the Clean Development Mechanism registry account of the Netherlands.\(^\text{64}\)

5. Being a very technology driven company Rana Sugar Ltd., Chandigarh has taken advantage of the latest technology in order to produce power from Bagasse, a by-product of sugar. RSL has an installed capacity to produce 120.8 mw of power. The power produced is used for in house consumption with excess power being sold to the state electricity board. These projects are in accordance with the United Nations Framework Convention on Climate Change (UNFCCC). Projects registered under UNFCCC are eligible to earn carbon credits. Rana Sugars has sold INR 1.49 lakh carbon credits granted by the United Nations Framework Convention on climate change (UNFCCC) for the period 2003-2008. The company has sold the carbon credits for approximately INR 11 crore\(^\text{65}\).

Cogeneration is the main vector for obtaining carbon credits in the sugar energy industry. Within the Clean Development Mechanism, approximately 500,000 tons of CO2 carbon credit equivalents (CERs) are generated per year by Brazilian mills through cogeneration. This figure is bound to triple if all projects in the validation process are approved. Thus, the sugarcane industry is one of the main industries in Brazil that uses the Clean Development Mechanism as a financial tool for investments in low carbon technologies\(^\text{66}\).

\(^{63}\)http://www.kcpsugar.com/carbon-credits.html
\(^{64}\)http://www.thehindubusinessline.com/2004/09/30/stories/2004093001490200.htm
\(^{65}\)http://ranagroup.com/rsl/contact_us.htm
1.6.4 Challenges to cooperative Sugar Industries in Western Maharashtra:

The Indian sugar industry is at the cross roads today, where it can leverage opportunities created by global shifts in sugar trade as well as the emergence of sugarcane as a source of renewable energy, through ethanol and cogeneration. While some of these opportunities have been well-researched in the past, there was a need to assess the potential for India and to develop a comprehensive and actionable roadmap that would enable the Indian industry to take its rightful place as a food and energy producer for one of the world's leading economies. The Sugar industry in Maharashtra is the perfect example of a sweet dream turned ours. It has been the back bone of Maharashtra agriculture sector. They contribute 95 percent of the total sugar produced in the state, making private sector's presence almost in significant in the state. But now days it face some problems:

1. Informational and technical barriers
2. Cropping pattern management and cane cultivate
3. Increasing cost of Sugar production
4. Low recovery rate
5. Price determination of cane
6. Fall in the price of sugar
7. Mismanagement
8. Government policies
9. Challenges of private industry
10. Lack of By-products

Carbon Trading Challenges:

Among the Clean Development Mechanism’s main difficulties, one can highlight: (a) proving additionally and defining the baseline, (b) elaborating new projects and methods, (c) approval and monitoring procedures and (d) carbon market volatility.

a. **Additionally and baseline**: Additionally means that the reduction in emissions brought about by the Clean Development Mechanism must be additional with respect to what would have occurred had such initiatives not taken place (baseline). Since the baseline can change, innovative industries maybe adversely affected for —taking the lead,— given that their initiatives would no longer be additional. Furthermore, countries with advanced environmental legislation could also be affected. Initiatives regulated by national legislation are not deemed additional. Such problems partially explain why Brazil, a relatively low carbon intensity economy with advanced environmental legislation, ranks behind China and India in the number of Clean Development Mechanism projects.

b. **Elaboration of new projects and methodologies**: The elaborations of new Clean Development Mechanism methodologies and of so-called Project Concept Documents (PCD) are costly, complicated and time-consuming processes. In practice, this renders small scale projects unfeasible, mainly if there is no previously approved methodology. Furthermore, in several projects there are difficulties in determining credit ownership, given that it is difficult to set project limits (where a project begins and where it ends). For example, in a possible project for use of biofuel, who should receive the credits: the producer, consumer, or distributor?

c. **Approval and monitoring procedures**: Bureaucracy problems with such procedures generate high costs and uncertainties about the time period and about success in obtaining credits. Clean Development Mechanism principles set forth that carbon credits must be needed to render project financially feasible. The problem is that, given the mentioned difficulties, the revenues associated with potential carbon credits can seldom be taken into consideration in a project’s financial planning.

d. **Volatility of carbon markets**: Finally, carbon markets are highly volatile, making financial planning difficult. There is also a lack of liquidity of credits generated by Clean Development Mechanism projects. The main objective of the regulated trade-in carbonic to bring about reductions at lower marginal costs, in other words, wherever additional reductions are more cost efficient. However, most
regulated markets (particularly the European market), limit trading in credits resulting from Clean Development Mechanism projects, depreciating their price.

It is difficult to imagine, at least in the short term, that any agreement will be reached to minimize such difficulties. However, one must point out that the Clean Development Mechanism, notwithstanding its importance, is not the only mechanism that can benefit innovative projects and industries that promote low emission technologies. There are others.

One such project is the voluntary market. It follows the same logic as the Clean Development Mechanism, however, to a certain extent, simplifies some of its complexities. Since there are no clearly defined rules by any regulating agent, as in the case of the Clean Development Mechanism, it is the buyer who determines the requirements and asserts emission reduction compliance. However, the credibility of the achieved reductions directly impacts the market’s acceptance and the price of the generated credits. Thus, transparent processes, widely accepted methodologies and verifications by third parties are extremely important. Some initiatives seldom contemplated by the Clean Development Mechanism, such as forest projects, so rare in the regulated market, can more easily be accepted in the voluntary market.

Furthermore, the existence of environmentally responsible projects and initiatives, which promote clean technologies and emission reductions, has been well accepted by financial markets and can significantly impact a company’s share prices. In the case of non-listed companies and groups, private equity funds too have increasingly become interested in companies with robust initiatives in this area. Hence, these are important and promising examples of financial opportunities, still little exploited, in innovative areas such as the sugar-energy industry.

1.7 Need for the Study

Sugar industry is the major agro-based instrumental in bringing about major socioeconomic changes in rural areas. Sugar industry is the second largest agro based industry in India after textile. The contribution of sugar industry to Indian economy is enormous. Maharashtra is one of the major sugar producing states in India. Maharashtra produces 31.78

\[\text{http://sugarcane.org/resource-library/copy_of_unica-materials/The%20sugar-energy%20industry%20and%20the%20challenges%20of%20the%20carbon%20market.pdf}\]
percent of the total sugar in India. The following statistics about sugar industry brings out its significance in India.

1. Millions of sugarcane farmers, a large number of agricultural labors and skilled and semi-skilled workers earn livelihood from sugar industry.

2. The cultivation of sugarcane employs 4.5 crore farmers which is the phase of sugar production.

3. The sugar industry in India is a focal point for socio-economic development in the rural areas by mobilizing resources, generating employment opportunities and ancillary activities.

4. Most of the sugar factories established school, colleges, medical centers and hospitals for their population.

5. Some sugar factories diversify into by-products based industries and invest in distilleries, organic chemical plants, papers and broad factories and co-generation plants. This again generates new employment opportunities and waste material such as molasses and bagasses which are the pollutants can be effectively utilized by the sugar factories. The above statistics shows the importance of sugar industries in Indian economy. However, total sugar industries are plagued with various problems.

Sugar industry is the only industry which can produce multiple by-products such as ethanol, country liquor, co-generation, filter cake, paper, distillery products, etc. Hence, sugar industries can diversify into by-products based industry to generate additional income which would help them to enhance their financial position.

Global warming is the burning issue across globe. Increasing greenhouse gas emission in the atmosphere is leading to global warming. The country’s economy is based on industrial development but the global warming insisting to reduce the pollution among nations. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. This Kyoto protocol becomes the threat to industrialist for the reduction of GHG gases emission level. At other side few industries reducing the GHG gases pollution through Clean Development Mechanism technology and earning through carbon credits in addition to existed profit.
The participation in carbon trading by cooperative sugar industries in Western Maharashtra leads to achieve triple win formula (WIN WIN WIN) that mean the cooperative sugar companies will gain additional profit, the government generate foreign earning and society benefited by reduction in carbon pollution. Accordingly the researcher undertook this study to find opportunities and challenges for cooperative sugar industries to deal in carbon market.

1.8 Statement of the Problem

Indian sugar industry is a critical industry, as on one hand it services the domestic market, the largest in the world and on the other hand, it supports 50 million farmers and their families. It is the second largest agro based industry in India.

Sugar industry is basically periodic in nature and functions only for 120 to 200 days in a year, (early November to April). A suggestively large volume of wastes are generated during the manufacturing of sugar and contains a high amount of contamination freight particularly in terms of suspended solid, organic matter, and press mud, bagasse and air pollutants. Therefore, an effort has been made to present an summary of waste management in sugar industry in India. The by-products available from wastage in sugar mills are bagasse, furnace ash and molasses and filter mud. All the by-products are used for transformation into value added products. It will diminish the pollution to great degree. In the early period of the industry elimination of these products could be capable by burning the bagasse in boiler furnace, using filter cake in the fields but the disposal of molasses posed problems and as such these were considered as undesirable industrial wastes creating environmental disturbance. Many factories had to encounter difficulties in disposing of the surplus bagasse. In the past few decades however, thanks to the sustained efforts of research workers and technologists considerable progress has been achieved in the proper use of these by-products for manufacture of number of items of industrial significance. Particularly in the last two decades profitable utilization of the byproducts of sugar manufacture assumed great importance in view of vast potential they offer in the manufacture of various useful products like paper, ethanol etc. besides the generation of electricity.
Emerging businesses like fuel ethanol and structural changes globally including the removal of EU subsidies have provided new horizons for the sector. The sector today has transformational opportunities that would enable it not only to continue to service the domestic markets but also emerge as a significant carbon credit and power producer and support an ethanol blending programme of E10 and beyond. In order to solve these problems the sugar industries in Maharashtra have to undertake various measures to improve their production efficiency and enhance financial performance. It was noticed that the sugar factories in Maharashtra had been facing problems, a few them are enumerated below.

1. Cropping pattern management and cane cultivation
2. Increasing cost of Sugar production
3. Low recovery rate
4. Price determination of cane
5. Fall in the price of sugar
6. Lack of Technical efficiency
7. Mismanagement
8. Government policies
9. Challenges of private industry
10. Lack of By-products
11. Sugar Cane Cutter Migrants

According to Kyoto Protocol: held in Japan the carbon is now tracked and traded like any other commodity. This is known as the "carbon market.— adopted in Kyoto, Japan, on 11 December 1997. The first commitment period started in 2008 and ended in 2012 and second commitment period from January 2013 to December 2020.

As well as the recent Paris Agreement has been held in December 2015 in which 195 countries signed an agreement —Hold the increase in the global average temperature to well below 2 degrees. Limit the temperature increase to 1.5°C.and reduce the GHG Emission. The problem is about 'polluters pays' principle is the commonly accepted by 195 countries that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. India committed to reduce the intensity of its carbon emissions by 20 to 25
percent by 2030 from 2005 levels, meeting a deadline for developing countries to set voluntary carbon-curbing actions.

By considering the above problems it was necessary to do detail study for raising financial position of sugar industries. Hence the researcher has selected the research topic entitled —carbon Trading Opportunities And Challenges with Special Reference to Sugar Industries in Western Maharashtra,—for the purpose of study.

1.9 Objectives of the Study:

1. To study existing level of market in carbon trading for cooperative sugar industries in western Maharashtra.

2. To find out the opportunities and challenges for adopting modern technology to capture carbon market by cooperative sugar industries in western Maharashtra.

3. To find out the solution for bridging the gap between industrialist and government regarding pollution control. (Win-Win-Win approach)

4. To study global contribution to earn foreign currency by carbon trading.