A Review Paper on Carbon Trading

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ABSTRACT:

Carbon dioxide (CO_2) emissions in our atmosphere have been increasing steadily due to the burning of fossil fuels such as coal, gas and oil, etc. CO_2 being a Greenhouse Gas (GHG) has contributed to global warming resulting in the melting of polar ice caps and glaciers leading to a rise in the sea levels and finally culminating in the submerging of coastal and low-level areas all around the world. Thus, with the intention of controlling global warming and the rising CO_2 emissions, the Kyoto Protocol was set up in 2005 to compel the developed countries to lower their greenhouse gas (GHG) emissions thus giving rise to the concept of carbon credits, devised to reduce global carbon emission levels.

However, the first phase of the sole international agreement to cut GHG emissions came to an end in 2012. The Kyoto Protocol has not been qualified as an absolute success seeing that it has not produced any demonstrable reduction in emission levels, and global temperatures are still rising at an alarming rate. A miscarriage of the treaty can also be sensed through the demeanor of countries like Canada, which pulled back from the treaty in 2011; Japan and Russia, who would not commit themselves beyond 2012 while the United States remains aloof.

This study reviews the climate change regime and explores the concept of carbon credits, how carbon trading is occurring presently and also identifies some key issues concerning the same. The reasons for the unsatisfactory results of the Kyoto Protocol and prospects in mitigating climate change have also been discussed here.

JEL: Q01, Q54, Q58

Keywords: carbon credits, carbon trading, clean development mechanism, emissions reduction, greenhouse gases, joint implementation, Kyoto Protocol

1. INTRODUCTION:

One of the main aspects of climate change is global warming which is engendered by an agglomeration of greenhouse gases in the atmosphere through either natural or anthropogenic sources. The evolution of the climate change issue initially took place in the scientific arena. The growth of scientific knowledge was significant in building up the public and political interest in climate change mitigation. Until 1988, the climate change issue had been dominated essentially by nongovernmental actors and environmentally oriented scientists. In 1988, however, climate change emerged as an intergovernmental issue. The year 1988 also saw the formation of Intergovernmental Panel on Climate Change (IPCC) by World Meteorological Organization (WMO) and United Nations Environment Program (UNEP). The main function of IPCC was to develop assessments on all facets of climate change and its ramifications, with the intention to devise practical response strategies based on accessible scientific data.

At the 1992 Rio Conference, there was a major international consensus for the urgent need to combat and mitigate the climate change arising from increased GHG emissions. The upshot was the first international legally binding agreement – the United Nations Framework Convention on Climate Change (UNFCCC) aimed at curbing GHG emissions. The Convention came into force on March 21, 1994, after its ratification by fifty states. The prime aim of UNFCCC was to attain stabilization of atmospheric concentrations of GHGs at levels that would not allow dangerous interferences with the climate system and hence to meet this objective, the idea of Kyoto Protocol came into being.

2. THE KYOTO PROTOCOL:

Kyoto Protocol was introduced in 1997 for the sole purpose of reducing GHG emissions. It was an international agreement under the aegis of the UNFCCC. Since the Annex 1 countries (industrialized countries) are majorly responsible for the high levels of GHG emissions in the present atmosphere; the Protocol placed a heavier burden of cutting down on the GHG emissions on the developed nations in the form of mandatory targets. The binding targets ranged from -8 to +10 percent of the countries' individual 1990 emissions levels. The objective of these targets was to bring down overall emissions of GHGs by at least 5 percent below 1990 levels during the first commitment period of the Protocol (2008-12) and was in line with the principle of “common but differentiated responsibilities”. Commitments under the Protocol varied from nation to nation**.** New Zealand, Russia, and Ukraine were to stabilize their emissions while Norway could increase emissions by up to 1 percent and Australia by up to 8 percent. However the European Union (EU) while meeting its overall 8 percent target distributed differing rates to its member states. For instance, a 28 percent reduction by Luxembourg, 21 per cent cuts by Denmark and Germany, a

25 and 27 percent increase by Greece and Portugal, respectively. Though the Non-Annex 1 countries (developing and transition economies) did not have any compulsory emission reduction targets under the Kyoto Protocol, they were expected to ratify the Protocol to host emission reduction projects under flexible mechanisms like the Clean Development Mechanism (CDM).

After the ratification of the Kyoto Protocol by Russia in 2004, it entered into being on February 16, 2005, and obligated all developed nations that had ratified it to meet their emission reduction commitments. A total of 141 nations had ratified the Protocol when it entered into force. With Australia joining in 2007 (although it subsequently withdrew its support for the Protocol), US was only major industrialized country that had not ratified Kyoto. The United States had resolutely insisted that a meaningful participation of the role of developing countries was an essential prerequisite for achieving the prescribed goals of the Protocol and its subsequent approval by the U.S. Senate. Since the U.S. demands were not acceded to in the Kyoto Protocol, it resulted in non-ratification of the treaty by the U.S.

The Kyoto Protocol offered the following three market-based mechanisms to the countries which are a part of the protocol, to enable the countries to meet their binding emission targets in a cost-effective way:

- Clean development mechanism (CDM)
- Joint implementation (JI)
- Emissions trading– "the carbon market."

The first two are project-based transactions while the last one is an allowance based transaction.

2.1 CLEAN DEVELOPMENT MECHANISM:

The Clean Development Mechanism (CDM) was created by Article 12 of the Kyoto Protocol. It means an emission reduction project between a developed country on one hand and a developing country on the other. The developing country acts as the project host while the developed country provides funds and technology to the host country in lieu of Certified Emission Reductions (CER) credits.

The CDM is a supposed to be a win-win situation for both parties through the achievement of two broad goals. First, it promotes cost-effectiveness as the Annex 1 country finances low-cost emission reduction projects in developing countries instead of making relatively costlier domestic emission reductions. Second, the CDM encourages sustainable development in Non-Annex 1 or developing economies thus leading them on a path towards less pollution, with developed countries paying for these emission reductions.

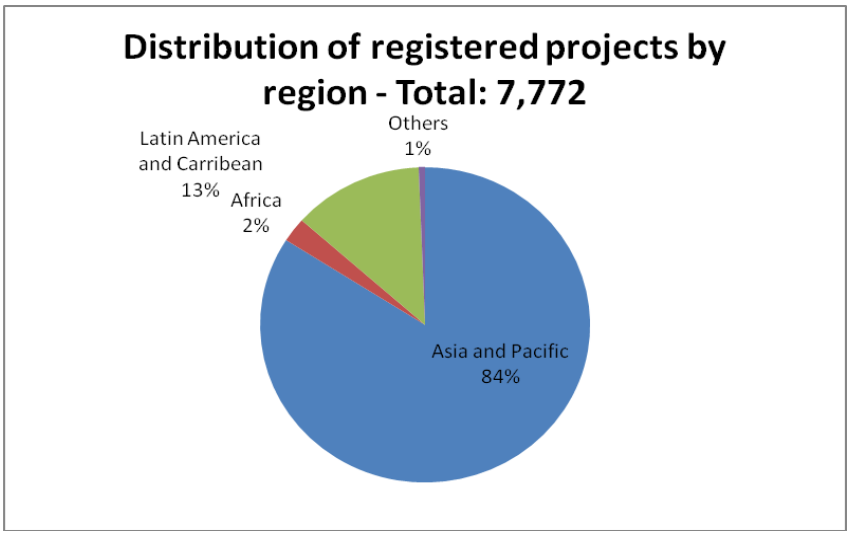
The power to decide whether or not to approve a CDM project lies with the CDM Executive Board (EB). The approval of a project depends on the estimates given by the Designated Operational Entity (DOE) that the project actually does result in long-term emission reductions. Once a project is registered and implemented, the EB issues CERs and each CER is equivalent to the reduction of one metric tonne of CO_2. After ten years of its operation, the CDM has become a cost-effective policy tool for mitigating GHG (IGES, 2011). It has created a global GHG offset market in a very short time, and its success lies in its flexibility to adapt to the prevailing circumstances (World Bank, 2012).

Despite this, there are many limitations of the Clean Development Mechanism. One major problem is that of additionality i.e. to analyze and come to the conclusion that the approved projects are actually reducing GHG emissions only due to CDM related funding and not otherwise. Also, the CDM registration process is slow and costly, which may discourage project applications. Furthermore, in the absence of any curbs to sell credits, the developing countries may be reluctant to commit themselves to future emission reduction programme. Finally, the Annex 1 countries having procured a large number of CERs from CDM projects may also slow down the investment in reducing their domestic GHG emissions.

Most CDM Projects have been concentrated in Asia and Pacific, with an 84 percent share of project numbers. Africa and the Middle East have been poorly represented so far accounting for only about 2 percent share in the registered CDM projects. Since the approval of the first registered project in 2004, the number of registered CDM projects has risen steadily reaching a peak in 2012. Although in the subsequent years, there has been a considerable fall in the CDM project registration (Figure 2). About 180 projects were registered in 2014. In total, 7,828 Projects and Programmes of Activities (PoAs) were registered under the CDM in 108 countries by the end of 2014. Approximately 1,066 further projects (including 114 PoAs) were undergoing validation.

The CDM has seen an upward trend in the number of PoAs. By the end of 2014, there were 266 registered PoAs in 73 countries. PoA allows the aggregation of smaller and individually unviable component projects across a sector, country or region under a single administrative patronage resulting in the generation of large-scale emission reductions. This attribute of PoAs has helped in expanding the reach of the CDM to poorly represented regions (UNFCCC, 2014).

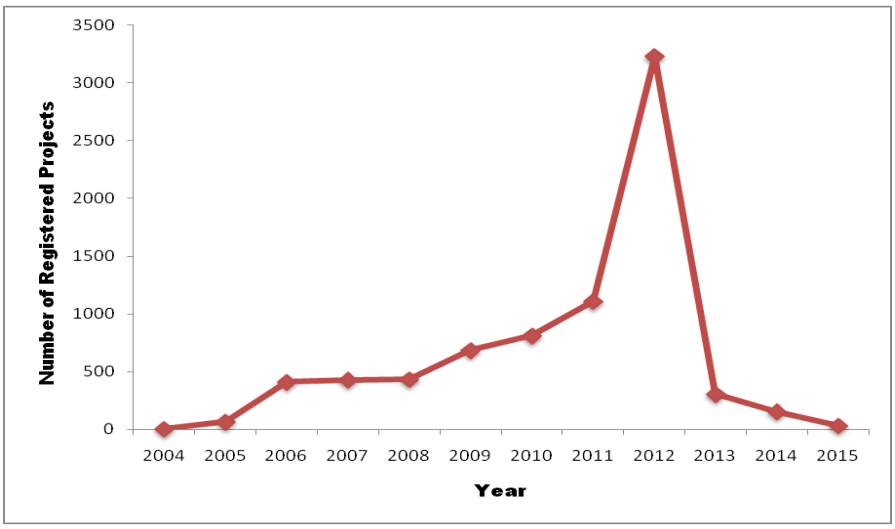
Figure 1



Source: Author's own estimation based on data from UNFCCC, 2014

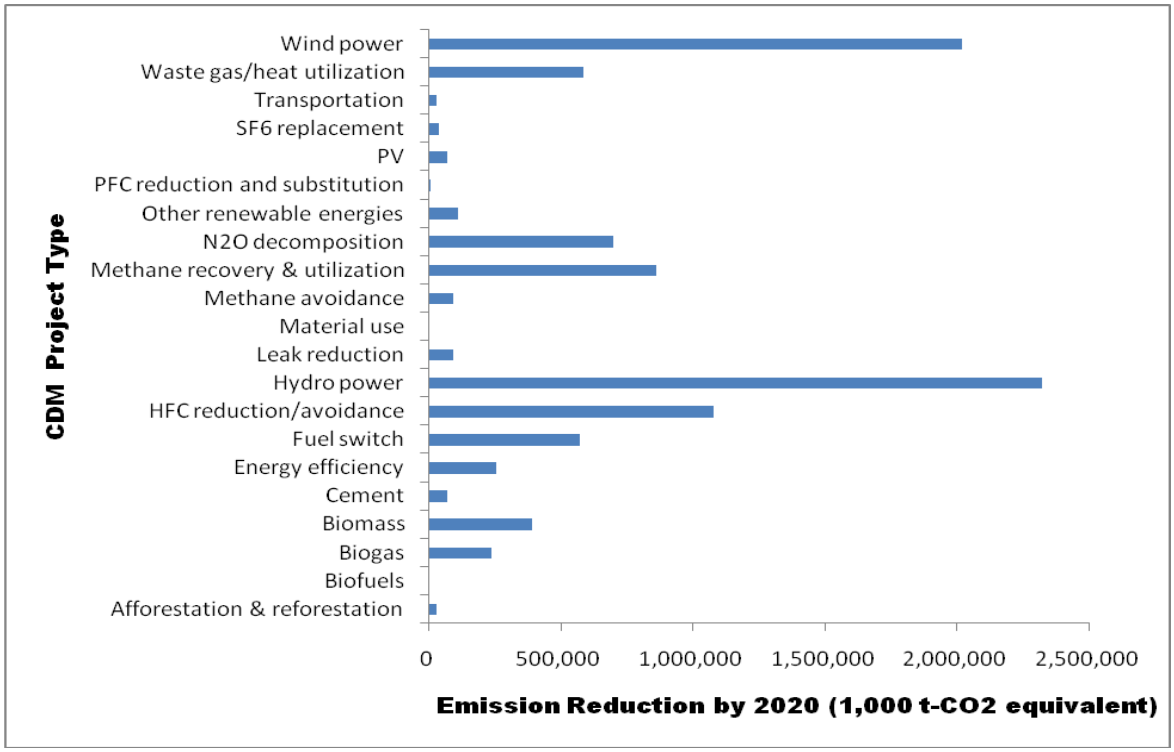
Figure 3 shows the estimated reductions in CO_2 emissions (1,000 tonne equivalent) by the different types of registered CDM projects. Though HFC and N_2O reduction projects are relatively inconsequential in terms of project numbers, they still overshadow the provision of CERs. Hydropower followed by wind power projects are the two main contributors to reductions in CO_2 emissions. Project activities in the afforestation and transportation do not seem to contribute much towards emissions reductions though it is still a larger contributor than bio-fuel projects.

Figure 2



Source: Author's own estimation based on data from IGES, 2014

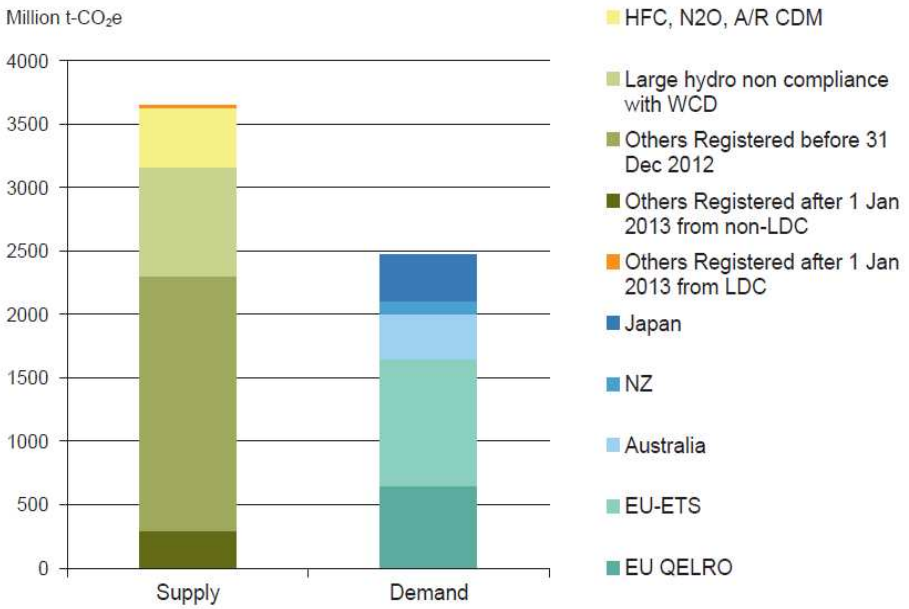
Figure 3



Source: Author's own estimation based on data from IGES, 2014

Between 2005 and 2011, the number of CER issuances increased drastically, and 56 percent of the total issued CERs were from Chinese projects (IGES, 2011a). The clean development mechanism has played an important role in supplying carbon credits for Annex I Parties during the first commitment period (CP1). Since the first certified emission reductions (CERs) were issued on 20 October 2005, the total CERs issued had reached around 1.1 billion tCO_2 by the end of December 2012 (IGES, 2012). However, the demand and price for carbon offsets have declined due to economic recession (financial crisis of 2007-08 and European sovereign debt crisis of 2011) and limitation on quantity, type and origin of CERs by some buyers. All these factors contributed to the fall in the prices for CERs as compared to several years ago. For instance, the price for CERs plunged from over €13 in early 2011 to less than €o.5 in 2013. A study by Warnecke et. al (2015) demonstrates that the major barrier faced today by registered CDM projects is the low price of CERs while difficulties associated with the costs and uncertainty of CDM procedures are also very significant barriers.

Figure 4



Source: IGES (2013a)

Figure 4 represents the imbalance between CER supply and demand during the 2013-2020 period. It can be clearly seen that there is an excess of supply of CERs over demand. The CDM pipeline is predicted to have the potential to issue about 6,600 MtCO2e between now and 2020, should the demand exist (World Bank, 2015). The supply-demand imbalance is therefore not expected to vary much, thus, hardly any significant price recovery is anticipated.

Warnecke et. al (2015) addresses the question that despite the drop in CER prices, why are the CDM projects still in regular operation? They find an interesting answer to it- a majority of operational projects are either locked into an irreversible investment decision and cannot cease to operate, or in doing so would not achieve cost savings; or they expect to receive support from alternative sources, unlinked to CER revenues, or to convert their project for compliance with other programmes. They also find that very few projects continue with their CDM operations on account of any benefits afforded by the mechanism itself. Only 2–3 percent of registered CDM projects continue due to sufficient CER revenues, while between 11 per cent and 23 per cent of projects continue operations due to non-financial benefits afforded by the mechanism. These figures call for the need to build on a reformed, improved and evolved CDM. The CDM Executive Board is currently working on continual improvements in the mechanism with a specific focus on programmes of activities allowing a large number of project activities covering wide areas which sometimes cross the national boundaries. The EB also endeavors to formulate standardized benchmarks, which may reduce the evaluation and assessment cost of the impact of GHG emission

reduction projects. All these measures will help countries move over directly towards more efficient and less carbon-intensive technologies. It may also lead to the alignment of regulations thereby reducing the time and cost involved in making use of the mechanism. It is believed that the CDM mechanism is not only suitable in the present scenario but also has potential for future realization (UNFCCC, 2014).

2.2 JOINT IMPLEMENTATION:

Article 6 of the Kyoto Protocol defines Joint Implementation (JI) as a mechanism under which an Annex 1 country can earn Emission Reduction Units (ERUs) from an emission-reduction project in another Annex 1 country (host party), instead of reducing emissions in their country. JI also aims to promote cost-effectiveness since the countries now have the option to invest in GHG reductions in another Annex 1 country where reductions are relatively cheaper, and, in turn, use the earned credits (ERUs) to meet their commitment goal. Just like CDM, the main feature of a JI project is that it should comply with additionality factor of emission reductions.[1]

Under the present framework, JI is divided into two "tracks": track1 and track 2. When the host party fulfills all the obligations regarding the eligibility requirements to transfer and/or acquire ERUs, it is qualified to verify its emission reductions from the JI project as being additional to what would have happened otherwise. This verification enables the host party to issue the appropriate quantity of ERUs. This procedure is known as the "Track 1" procedure. On the other hand, if a host Party does not meet the eligibility requirements, it will have to employ the verification procedure under the Joint Implementation Supervisory Committee (JISC) to verify the additionality of its emission reductions. Under this procedure, also referred to as the "Track 2" procedure an independent entity ascribed by the JISC determines whether the appropriate prerequisites have been met before it can allow the host Party to issue and transfer ERUs.

[1] United Nations Framework Convention on Climate Change (UNFCCC). *Recommendations on Options for Building on the Approach Embodied in Joint Implementation*. Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, Durban, 2011.

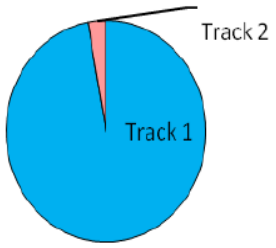
Table 1: JI host countries, number of registered projects and their ERU issuance

Country	Registered projects	Million ERUs issued
Ukraine	278	503.3
Russia	98	266.2
Poland	38	20.1
Germany	25	13.6
Romania	18	9.2
France	20	8.6
Bulgaria	25	8.4
Lithuania	18	8.3
Hungary	12	7.4
Czech Republic	85	4.4
New Zealand	8	2.5
Sweden	2	1.3
Finland	3	1.0
Estonia	12	1.1
Spain	3	0.9
Belgium	2	0.4
Latvia	1	0.0
Total	**648**	**856.7**

Source: ji.unfccc.int.

Table 1 gives an account of JI projects in different countries and the ERU's issued (in millions) from those projects. Two economies in transition (EIT's) i.e. Ukraine and Russia have been leading in hosting of JI projects. The Czech Republic has also registered 85 projects followed by Poland registering 38 projects. The ERU issuance has been the highest in these countries as well. As of August 2014, a total of 648 projects had been registered under JI mechanism amounting to the issuance of over 856 million ERU's in the process. The next table breaks down the ERU's and registered projects by JI track. Despite the fact that Track 2 was operational before Track 1, almost 90 percent of JI projects have been registered, and 97 percent of ERUs have been issued under Track 1. Many projects that were initiated under Track 2 switched to Track 1 once it became operational. Ten countries – Poland, Belgium, Czech Republic, Estonia, Finland, France, Germany, Hungary, Latvia and New Zealand – have hosted only Track 1 projects. There could be several reasons for the preference for Track 1. Until 2011 there were no fees for Track 1 projects while Track 2 projects had to pay 0.10 USD per tonne of CO2e of annual reductions for the first 15,000 tonnes and 0.20 USD per tonne exceeding this number. The one-time fee of 20,000 USD to the UNFCCC for registering a Track 1 project that was introduced in 2011 was still considerably less than Track 2 fees (Kollmuss et. al, 2015). Several interviewed JI experts highlighted that many of the early projects did not apply under Track 2 because the administrative burden was considered too great. They also mentioned that Track 1 procedures were perceived to be less stringent because they did not require supervision by the JISC.

Table 2: ERUs and registered projects by JI track

Track	Number of registered projects	Share of registered projects	Total million ERUs issued	Share of ERUs issued	ERUs issued per track
Track 1	597	92%	832	97%	
Track 2	51	8%	25	3%	
Total	**648**		**857**		

Source: http://ji.unfccc.int.

There has been a substantial recent growth in the quantity of projects under JI. There has also been a steady increase in the number of ERUs issued under both tracks. For instance, ERUs totaled over 94 million in the first eight months of 2011 and 31 million in 2010, compared to 6 million in 2009 and 120,000 in 2008. Table 2 depicts the distribution of ERUs between track 1 and track 2 for the Kyoto Protocol period (2008-2012).

The first host country approval for a JI project was given in 2000, to a Polish project. The first ERUs were issued in 2008. As shown in Figure 5, issuance of credits grew exponentially in the first few years before plateauing in 2013. Prices dropped from more than EUR 12 in 2010 to less than EUR 0.10 in early 2013, and have remained at well below EUR 0.50. This precipitous drop occurred because the supply of ERUs from JI and Certified Emission Reductions (CERs) from the CDM exceeded demand. The demand was limited due to various factors, including a cap on the use of ERUs and CERs in the EU Emissions Trading System (EU ETS), and less demand from EU governments for mitigation commitments in non-ETS sectors due to the economic slowdown. On the other hand, the supply of ERUs was much larger than expected, in particular when ERU issuance accelerated strongly in 2012.

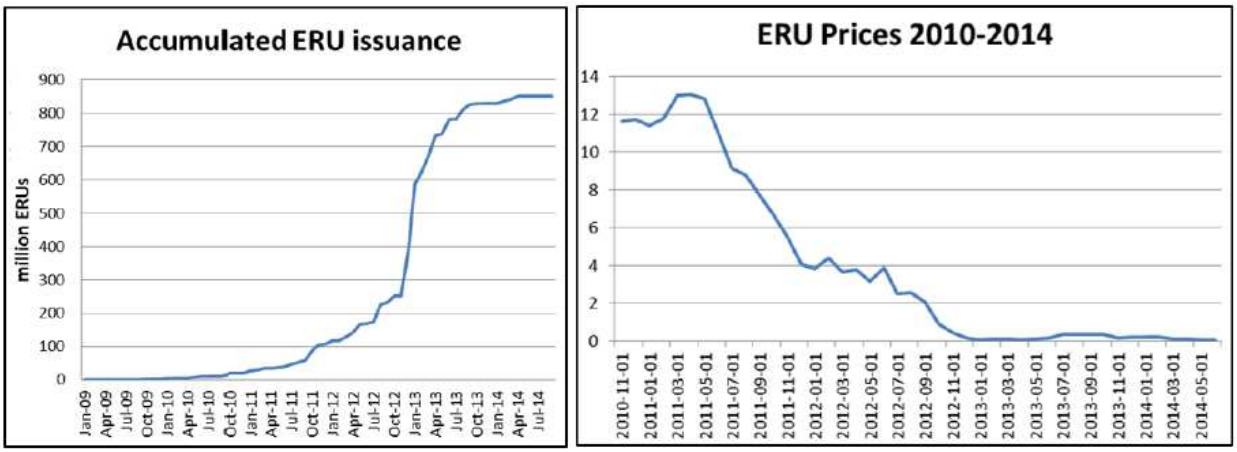
Table 3

Total emission reduction units issued under joint implementation, 2008–2012

	Track 1	*Track 2*	*Total*
2008	120 000	–	120 000
2009	4 670 641	1 324 448	5 995 089
2010	28 033 010	2 921 570	30 954 580
2011	86 702 918	6 818 250	93 521 168
2012	129 067 095	7 543 613	136 610 708
Total	**248 593 664**	**18 607 881**	**267 201 545**

Source: UNFCCC Secretariat.

Figure 5



Source: Kollmuss et. al (2015)

JI has generated 872 million ERUs as of March 2015 (Kollmuss et. al, 2015). To safeguard the environmental integrity, the Kyoto Protocol requires that reduction in emissions from JI projects should be in addition to what would have occurred otherwise. Of the six largest project types assessed in more detail, only identify one project type i.e. N_2O abatement from nitric acid production – had an overall high environmental integrity. Also, many JI projects use unrealistic assumptions which grossly overestimate the actual emission reductions. The environmental integrity of JI projects not only depends on the project type but also on the host country, when and under which track the projects were registered. The environmental integrity of JI projects has been lower in countries with significant AAU surpluses. Projects registered in 2012 have on average lower integrity than projects registered earlier. As the first commitment period came to a close, some host countries with significant surplus – in particular, Ukraine and Russia – retroactively registered many projects for which additionality is not plausible. Thus, the

overall low environmental integrity of JI has significantly undermined efforts to mitigate climate change. Kollmuss et. al (2015) find that about three-quarters of ERUs did not represent plausibly additional emissions reductions, and about 95 percent of total ERUs issued were from countries with a significant AAU surplus. This implies even with JI mechanism in place; the actual global GHG emissions were higher than they were expected to be. So the lesson learnt from all this is that there is a dire need to design the crediting mechanisms carefully so that the progress made in the process of mitigation of climate change is not neutralized and/or affected in a contrary manner.

2.3 EMISSIONS TRADING:

The third mechanism in the Kyoto Protocol is the tradable permit system which has led to the concept of carbon credits. When firms shift to cleaner technologies of production, they cut down their GHG emissions. As a result, the concerned entity gets a carbon emission certificate which they can sell immediately or through a futures market, just like any other commodity. The industrialized countries have binding emission reduction targets imposed on them and hence find it economical to purchase these certificates rather than adopting cleaner techniques of production.

Under the tradeable permit system, a regulatory agency imposes a limit or cap on the amount of a pollutant. Based on this limit, permits (Assigned Amount Units or AAUs) which represent the right to pollute a specific amount are then issued to the enterprises. The entities can buy and/or sell their respective allowances depending upon their emission reduction requirements. This transfer of allowances is referred to as trade in which one emission permit is seen to be equivalent to one metric ton of CO_2 emissions. The permit system provides a cost-effective solution to the climate change problem in the sense that those who find it cheaper to reduce emissions will do so while those who cannot prefer to purchase carbon offsets, thus, in turn, achieving the desired pollution reduction at the lowest possible cost to the society.

One of the largest emissions trading programme is the European Union Emission Trading Scheme (EU ETS). It started in 2005 with the first phase (2005-2007) being referred to as the trial phase. The second phase coincided with the Kyoto Protocol (2008-12), and the third phase started from 2013 and will go on till 2020. More than 12,000 energy-intensive facilities across the 27 EU Member countries, including sectors like production and processing of iron and steel, minerals (glass, cement and ceramic), pulp and paper and energy production have been encompassed by EU ETS. The trading program so far does not include CO_2 emissions from the chemical industries, household and small emitters and the transportation sector (except aviation), which accounts for around 25 percent of the EU's total GHG emissions.

EU ETS started its first phase from January 1, 2005, to December 31, 2007. Each Member State defined the number of permits to be allotted in the National Allocation Plan (NAP). Since there was no steadfast historical emissions data, phase one emission limits were proposed in a hypothetical manner. Phase I of EU ETS saw a large proportion of allowances in all countries being grandfathered. This move was deeply castigated as it was ineffective about auctioning, led to the creation of windfall profits and did not provide any incentive for new and environment-friendly innovations. Thus, the European Union proposed various modifications including the abrogation of NAPs from 2013 besides auctioning of a greater share of carbon permits.

Grandfathering of permits means that the government could give away the permits to specific groups on the basis of past usage or historical emissions data, or to politically favored groups. Auctioning of permits is seen as a much better approach as it provides permits to those who need them the most. In an auction, the government, rather than the energy companies gets the scarcity rents. The revenues generated from these auctions can be used to mitigate the impact of other distortionary taxes, thereby providing an efficiency benefit (Crampton and Kerr, 2002). In Phase I, many firms which were encompassed by EU ETS, enjoyed a considerable boost in their profits due to grandfathering of permits (Betz and Sato, 2006). Also, the 2005 verified official emissions data showed that the volume of allowances allocated was far greater than real emissions by around 100 million (Kettner et al., 2007). The oversupply of allowances led to sharp price decreases thus proving strenuous for long-term investment risk (Betz and Sato, 2006). It was found that verified CO_2 emissions were about 4 percent lower than the number of allowances distributed in 2005 which led to a fall the permit prices under €10/tonne in 2006. This surplus of allowances perpetuated through 2006 resulting in a trading price of €1.2 per tonne in March 2007 which further declined to €0.10 in September 2007. Nevertheless, the vital role of phase I of EU ETS was that it established a price for carbon and put in place the vital infrastructure for analyzing, documenting and authenticating actual emissions from the encompassed sectors.

The next phase of EU ETS (2008-12) was built on the experience gained by EU in Phase I. The three non-EU members: Liechtenstein, Iceland and Norway – joined the EU ETS at the initiation of the second phase. About 10 percent of the allowances were now auctioned off. Several problems like permit allocation (use of auctions), new entrant reserves, etc. that cropped up during Phase one lingered on as Phase II was implemented by the ETS [4]. The “Linking Directive” of the EU allowed the companies to purchase CDM and JI credits (except for those from nuclear facilities and agricultural and forestry activities) thus broadening the spectrum of cost-effective options for emission mitigation available to businesses. The EU ETS propelled the demand for these carbon credits, thus boosting the international carbon market as well as clean energy investment in transition economies and least developed countries.

It was postulated that inclusion of aviation emissions from 2012 in the EU ETS would raise the demand for allowances by about 10 to 12 million tonnes of CO_2 per year in the second phase. But the problem was that the United States and other countries like China, India and Russia were in disagreement with this. They altercated that the jurisdiction to regulate flights when they were not in European skies did not lie with the EU. This resulted in the Commission making a recommendation to stall the application of the EU ETS to flights into and out of Europe during 2012 which was later on accepted by the European Parliament and Council.

It is a little difficult to judge the success of Phase one of EU ETS in terms of emissions reductions. Nevertheless, the chief objective of this phase was to make sure that the EU was in compliance with Kyoto. Based on the projected growth in emissions, the countries formulated baselines for emission mitigation. But there baselines were inhabited by data and forecasting uncertainties. While the collection and authentication of data in the first phase was itself quite challenging, there were also issues related to unpredictability of economic or sector-based growth rates. All these problems translated in permit allocations in 2005-2007 surpassing actual 2005 emissions. This led the European Commission to restrict the total quantity of emission permits by about 6.5 percent relative to the level in 2005. Nonetheless, the 2008 economic recession dampened emissions, thus further lowering the demand for allowances. This resulted in the creation of a large surplus of unused permits which in turn depressed carbon prices over the whole of the second trading period. Phase II carbon price rose above €20/tCO_2 in the first half of 2008 to €22/tCO_2 in the second half of 2008, subsequently falling to €13/tCO_2 in the first half of 2009.

The third phase of EU ETS (2013-2020) aims to actualize a curtailment of 20 per cent of GHG emissions by 2020 relative to 1990 levels. Table 4 presents the prospective EU-wide ETS cap for the consequent phase of the program. These values are subject to the European Commission broadening ETS coverage to include other sectors as well as non-CO_2 greenhouse gases.[2] Before associating with the EU, Croatia joined the ETS on 1 January 2013 raising the total number of countries in the EU ETS to 31.

For Phase III, the EU has planned to eradicate the problems observed during Phase I and II while at the same time working on making it more efficient. The critical change that EU has made in Phase III is the elimination of National Allocation Plans (NAPs). NAPs have been replaced with EU-wide rules concerning availability, allocation and auction of allowances. In Phase III, auctioning would be the default allocation mechanism.

[2] Committee on Climate Change (CCC). *Chapter 4: Carbon markets and carbon prices. Building a low-carbon economy – The UK's contribution to tackling climate change*, 2008.

Table 4: Proposed Annual ETS Cap Figures for Phase 3

Year	Billion metric tons of CO_2e
Annual limit for Kyoto compliance period (2008-2012)	2.083
2013	1.974
2014	1.937
2015	1.901
2016	1.865
2017	1.829
2018	1.792
2019	1.756
2020	1.720

Source: European Commission

Until now auctioning has remained less favorable as an allocation mechanism due to the political difficulties in implementing it. But now, a Directive proposed by the EC to alter the structure of the EU ETS for Phase III states that '*Auctioning should ... be the basic principle for allocation, as it is the simplest, and generally considered to be the most efficient economic system*'. This would do away with windfall gains and provide a level playing field to new entrants and fast growing economies as subsisting installations [4]. Another major change will be the provision of free allowances to the new entrants into the system on the basis of fairness and equity. This can be achieved via the New Entrants Reserve which has kept aside 300 million allowances to finance innovative renewable and clean energy technologies. From 2013, the ETS radius will be expanded to incorporate CO_2 emissions from petrochemicals, ammonia and aluminium along with N_2O emissions from the nitric, adipic and glyocalic acid production and fluorocarbons from the aluminium sector. It is hoped that these changes in the EU ETS Phase III will help to achieve desired emission reductions and thus cooperate in mitigation of climate change.

Apart from the EU ETS, many other countries and regions have started their own emissions trading systems like the Swiss Emissions Trading System, which started in 2008 with a five-year voluntary phase. The system subsequently became mandatory from 2013, and this is known as the mandatory phase (2013-2020). About 11 percent of the country's emissions are covered under this system, and the target is to have a GHG reduction of at least 20 percent below 1990 levels by 2020. Other regional trading programmes include Kazakhstan ETS, Tokyo Cap and Trade program and New Zealand ETS. The most recent one is the Korean Emissions Trading System. 1 January 2015 saw the launch of the national ETS of the Republic of Korea (KETS). This is the first nationwide operational Cap-and-Trade program in Asia. With a cap of 573 MtCO2e in 2015, it is the second-largest ETS worldwide after the EU ETS. The economy of South Korea has seen a very rapid growth over the past two decades with it emerging as the OECD's prominent emitter of GHGs. The trading periods of KETS are- Phase I: Three years (2015–

2017), Phase II: Three years (2018–2020) and Phase III: Five years (2021–2025). Being a Non-Annex I country under the Kyoto Protocol, there were no legally-binding obligations on Korea to decrease its emissions. By means of the Korean Emissions Trading System, it plans to scale down its GHG emissions by 30 per cent against business-as-usual (BAU) scenario by 2020. Apart from these, some ETS programmes are in consideration in many different regions of the world. For example; Russia, Turkey and Ukraine in Europe and Central Asia; Washington, Manitoba and Ontario in North America; Rio de Janeiro, Brazil, Chile, Sao Paulo, Mexico in Latin America and the Carribean and China (emissions trading system is scheduled to begin from 2016), Japan, Thailand, Vietnam in Asia.

3. TRENDS IN THE CARBON MARKET:

Carbon market cannot be defined by a sole commodity, contract type or a single set of demanders and suppliers. Carbon market actually comprises of varied transactions through which quantities of carbon emission reductions are traded. The amplifying need for countries to mitigate climate change has resulted in a multi-million dollar international market for sale and purchase of GHG emissions. Carbon trading having a worth of $30 billion took place in 2006. With the recession of 2008 and other economic crunches, the uneasiness in the carbon markets increased. The incessant surplus of permits in the EU ETS resulted in the sharp decline of carbon prices in 2009. It was projected that the carbon price in EU ETS would reach €56/tCO_2 in 2020, against an average market price for the first half of 2008 of €24/tCO_2. But it fell to €8/tCO_2, averaging €22/tCO_2 in the later half of 2008 and €13/tCO_2 in the first half of 2009 (UNEP, 2010).

Even after a fall in the carbon prices, the value of the global carbon market scaled up in 2011 and was governed primarily by a vigorous hike in the volume of transactions. According to a World Bank (2012) report, the market grew by 11 percent to US$176 billion with the volume of transactions reaching a peak of 10.3 billion tonnes of carbon dioxide equivalent (CO_2e). In 2011, the EU allowance transactions reached US$147.8 billion in comparison to US$133.6 billion in 2010. Around 7.9 billion EUAs (European Union Allowances) were traded in the market in 2011, compared to 6.8 billion EUAs in 2010. The hike in volumes was slightly outweighed by a 4 per cent reduction in prices. Also in 2011, the aggregate transaction value in the EU ETS rose 11 percent year on year to US$171.0 billion because the trading volume of EUAs, CERs, and ERUs rose steeply (World Bank, 2012).

An interesting thing to note is that this growth materialized despite the substantial dip in annual average prices for all three types of carbon credits. A report by World Bank terms this growth as fraudulent as a substantial proportion of the increased volume of trade was associated with a value added tax (VAT)

"carousel" fraud. The World Bank report stipulated in this scam, the EUAs were rapidly sold from one country to another. By shuffling large volumes of EUAs from one country to another, the traders hoped to secure free short-term financing from the time lag in making VAT payments. It was reported that this was a major element in the 450 per cent increment in the EU ETS "spot trades" in 2009 relative to 2008.[3] This upward trend in carbon market remained until May 2011 but then reversed due to worsening of the Greek debt crises and was further compounded by other factors like the attrition of EU emissions during the economic slump of 2008-2009, with a subsequent feeble industrial recovery. Thus, together these factors clearly indicated that the oversupply of EUAs seen in first and second Phases of the EU Scheme would plausibly continue for some more years.

At present, besides the EU ETS other national and sub-national systems are evolving or already operating in countries like Canada, China, Japan, South Korea, Kazakhstan, Switzerland, New Zealand and the United States.[4] The emergence of new cap and trade schemes has played a consequential role in the aggrandizement of the world carbon market. World Bank has enumerated that the worth of global carbon permits expanded to $34 billion in 2014, with the main contributors being South Korea, California and Quebec. The aggregate value of two North American markets, Western Climate Initiative (WCI) and the Regional Greenhouse Gas Initiative (RGGI), was about €3.2 billion. The scope of carbon markets in terms of global emissions has increased from 4 percent in 2005 to 12 percent at present. In 2014, the value of the global carbon market grew by 15 per cent to €45 billion due to higher prices in EU ETS but in terms of trading activity, the traded volume deflated by 17 percent to 7.7 billion (Gt) [5]. Furthermore, China's seven pilot schemes launched in 2013 (Tianjin, Shanghai, Beijing and Shenzhen - or a province - Guangdong, Hubei and Chongqing) showed a six-fold jump in market volume to 23 million tonnes (Mt). It is estimated that China's seven markets will continue to thrive, potentially doubling in 2015 with an expected value of €146 million.[6] A national ETS is also under consideration by the Chinese government by 2016, which after implementation, might as well supplement the existing carbon market.

Another facet of the world carbon market comprises of the voluntary carbon market. The voluntary market provides a valuable platform to those who are voluntarily interested in cutting down their carbon footprint with the help of carbon offsets. The absence of stringent regulations associated with carbon emissions in some countries and the anticipation of the threat of future legislations on GHG emissions also triggers some pre-compliance actions. Many activities come under the purview of voluntary carbon offsetting such as conserving an endangered rainforest, restoring mangroves, consigning clean-burning

[3] https://www.tni.org/en/article/carbon-market-growth-mainly-fraudulent-world-bank-report-shows
[4] http://ec.europa.eu/clima/policies/ets/linking/index_en.htm
[5] http://newsroom.unfccc.int/financial-flows/global-carbon-market-grew-15-in-2014/
[6] http://www.commodities-now.com/reports/environmental-markets/18014-global-carbon-market-to-reach-record-volumes-by-2017.html

cooking stoves in poorer economies, instating renewable energy systems and cultivating low-carbon rice production. In 2011 and 2012, wind projects were dominant because of their relative cost-effectiveness compared to other project types. But now avoided deforestation (REDD) offsets, which traded an everlasting high of 25 million tonnes in 2014 have outstripped them[7]. After following diverse procedures and standards for monitoring and verification of carbon reductions, voluntary carbon offsets are issued. These evaluation standards are generally less stringent than, say, the Clean Development Mechanism (CDM) which gives rise to both an advantage and a disadvantage. On one side, weaker standards diminish bureaucracy and reduce project costs. But on the flip side, less stringent standards could act as a green signal for those projects that are actually not so beneficial. The voluntary carbon markets expanded from $43 million in 2002 to $705 million in 2008, finally reaching $572 million in 2011 (Newell et. al, 2013). In 2014, there was an increase in the volume of carbon offsets purchased by 13.6 percent as compared to 2013 though the prices of carbon offsets continued to fall. But these price decreases seen in the voluntary market are small relative to that in the CDM market.

Nonetheless, despite all these efforts, the challenge of climate change and global warming continues to be formidable and the quest for longstanding solutions persists as it is being projected that global emissions could go up to 56 Gigatonnes CO_2e by 2020 even if the best efforts of all countries affiliated with the emissions reduction are taken into account (UNEP, 2010).

4. CARBON TRADING IN INDIA:

Per capita CO_2 emissions in India are predicted to rise from 1.1 tonne in 2001 to 3–5 tonnes in 2030 (Ministry of Environment and Forest, GOI). Since the carbon market was established in 2001, it has been an interesting realm for Indian entrepreneurs. The year 2008 saw the launch of the National Action Plan on Climate Change (NAPCC) by India (Planning Commission, 2011). It contends for a gradual replacement of non-renewable fossil fuels with more abundant renewable resources available in India. This transition from an overt inclination towards imported conventional fuels which also puts a burden on the exchequer is a gradual move towards a growth which is more sustainable and may reap dividends in terms of more habitable climate for our large populace. The Action plan is constituted by the following eight missions which would be responsible to meet the broad goals of adaptation and mitigation: the national mission for enhanced energy efficiency, national mission on sustainable habitat, national solar mission, national water mission, national mission for sustaining the Himalayan ecosystem, national mission for a green India, national mission for sustainable agriculture, and national mission on strategic knowledge for climate change. Each mission is to be monitored by the respective ministries. They will

[7] http://forest-trends.org/releases/p/ahead_of_the_curve_state_of_the_voluntary_carbon_markets_2015

assess, formulate and execute each project in a time bound manner. These reports would also be submitted to the Prime Minister's Council on Climate Change which will be periodically scrutinized besides noting the headway of individual missions. 27 States and 5 Union Territories prepared State Action Plan on Climate Change (SAPCC) in compliance with the goals of NAPCC in July 2015. A final review of all these missions is set to happen in 2017. Renewable Energy Certificate (REC) schemes and the Perform Achieve and Trade (PAT) are two market-based approaches introduced to deal with the issue of increasing carbon emissions in India.

Like CERs, AAUs and ERUs, Renewable Energy Certificate (REC) can be traded on the open market as a commodity. RECs are certificates issued to entities which generate electricity using a renewable resource. Since this type of energy production is relatively costlier than the conventional methods, the RECs gives an incentive to the producer of electricity by providing him a supplementary compensation. The REC Scheme was introduced in March 2011, for providing a foundation to the country's Renewable Purchase Obligations (RPOs) targets under the NAPCC.[8] It was required under RPOs that 5 per cent share of the countrywide electricity should be procured from renewable sources of energy in 2010, increasing at 1 per cent per year for ten years. RECs can be distinguished from carbon credits in many ways. While the market of REC lies within a country, the conception of carbon credits occurs through mechanisms like CDM, JI, etc. While one carbon credit is equivalent to one tonne of CO_2 emission reduction, 1 REC actually equals 1 Megawatt hour (MWh) of production of electricity. Thus, those projects which involve substitution of coal for natural gas will acquire carbon credits but would be unqualified for RECs, which must come from a generation of electricity from renewable sources. But they are similar in the sense that both are plausible sources for funding the development of renewable energy based electricity generation resources. RECs trading in India commenced on March 30, 2011, with 427 non-solar RECs being traded on the first day itself. RECs on the Indian Energy Exchange (IEX) traded at a price of Rs 3900 and in the next month, the price fell to fixed (minimum) level of Rs 1,500. On the Power Exchange of India Limited (PXIL), after the first 274 non-solar RECs changed hands at Rs 2,225 compared to IEX's Rs 3,900, trade slackened[9]. In recent years as well, the trading of these certificates has remained sluggish due to a slack in demand. There was a backlog of 1.22 crore unsold RECs as of April 2015. In 2014-15, the number of available certificates was much greater (96 lakh) than the number of RECs traded (30.6 lakh). The total number of RECs traded comprised of 1.6 lakh solar certificates and 82 lakh non-solar ones.[10]

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[8] Central Electricity Regulatory Commission Regulations. *Terms and Conditions for Recognition and Issuance of Renewable Energy Certificate for Renewable Energy Generation*. India, 2010

[9] http://carboncreditcapital.com/dev/wp-content/uploads/resources/InFocus8.pdf

[10] http://timesofindia.indiatimes.com/home/environment/developmental-issues/Over-1-crore-renewable-energy-certificates-unsold-at-IEX/articleshow/46812047.cms

April 2012 saw the inception of Perform Achieve and Trade (PAT). The first phase of the scheme (2012-2015) covered eight sectors and 478 facilities and assigned objectives for specific energy consumption reduction to designated consumers (DCs) that together account for 25 percent of national GDP and around 45 percent of its commercial energy use.[11] If DCs perform better than the target, they procure energy savings credits, which they can either trade with other facilities or save for future periods. The average target for specific energy consumption reduction is 4.8 per cent. This is estimated to save 6.6 million tonnes of oil equivalents during the first compliance period 2012-2015. The certificates are issued ex-post and based on actual reductions. Stringency and sector coverage of the scheme is set to increase in the next phases.[12]

Over the past few years, the development of CDM projects has helped India surface as a world leader in the reduction of GHG emissions. The major supplier of carbon credits in India were CDM projects based on renewable energy like wind power, biomass generation and hydropower and other energy efficiency measures in sectors such as cement, petrochemicals and power generation. Global trading in carbon credits trading was estimated at $5 billion in 2011, with India contributing around $1 billion (Birla et. al, 2012). India stands with the second largest portfolio of carbon contracts with a market share of 12 percent, behind China having a 61 percent market share (Cormier, 2007). Also with more than 1,200 registered projects with UNFCCC until 31 December 2012, India has delivered about 13 percent of the total issued CERs from more than 450 projects. The National CDM Authority (NCDMA) had approbated about 2,800 projects by May 2013. The registered CDM projects and NCDMA approved projects from India exhibit an investment of more than INR 1.6 trillion and INR 5.5 trillion respectively (GIZ, 2014).

There is a looming oversupply in the CER market, and it is expected to persist till 2020. The prime demander of credits i.e. EU has recently restrained the usage of CERs from CDM projects from India registered after 31 December 2012 in order to meet their compliance requirements. The supply of CERs is projected at 4,214 million over the period 2013 – 2020 indicating a surplus of 2 billion tCO2e during 2013 – 2020. The 2008 economic recession amounted to a reduction in price of CERs. Though there was a slight recovery of prices in 2009 because of the perception that the output of power plants and manufacturing units will see a rise but in 2011 prices started falling again due to superabundance of permits (partly caused by the rush to sell CERs generated by industrial gas projects) and decrease in demand because of slow economic growth (GIZ, 2014). It is expected that CER prices will remain repressed unless their demand is rekindled. This will have important repercussions for the CDM potential

[11] Bureau of energy efficiency. *Roadmap for India in energy efficiency* report prepared by Sengupta, A., and Kumar, S., The Atlantic Energy Efficiency Policy Briefs. 2011.

[12] http://clifit.org/files/strategies_and_policies/application/pdf/policy+analysis_handout_india_2015-06-04.pdf

(in India and globally as well) as CER revenues tend to raise the financial returns to the project and/or assuage barriers to implementation of a CDM project. The curtailment of investment barriers purports that project activities that were unviable under the current policy, regulatory and institutional framework would most likely become feasible (conditional on the CER price) and might as well be implemented thus resulting in an increase in the potential of CDM. It is also notable that if the present level of CER price prevails (around €0.5) and there exist no regulatory constraints, it creates a very unfavourable situation in which it would be almost impossible to support the advancement of any mitigation process under the CDM.

Cormier (2007) states that the Indian government needs to address market failures and prepare a blueprint in order to utilize fully the enormous potential of the carbon market. India should also work to build the capacity of its PSUs in order to attain carbon finance. Currently, most of the Indian projects are guided by Small and Medium-sized Enterprises (SMEs) and are thus at a disadvantage because such projects generate a limited number of carbon credits. So a buyer who needs a large volume of carbon credits can easily purchase it from a single project in China, while in India, the same quantity of carbon credits would require the buyer to purchase it from ten or more projects. Hence, the private sector needs to come into play here by clubbing together small projects so as to bring about greater market access.

The diverse sectors of the Indian economy offer the huge unexplored potential for emission reduction. The evolution and expansion of the Indian carbon market will principally depend on the cognizance that markets can help in attaining a low carbon economy and the ensuing formulation of government strategies to make the most out of the available opportunities.

5. KYOTO PROTOCOL: SUCCESS OR FAILURE

At this platform, it seems evident to discuss what was intended with this treaty and what actually has happened. The Kyoto Protocol was a ten-year agreement to cut GHG emissions which transpired from the United Nations Earth Summit held in Brazil in 1992. There exist both pros and cons of Kyoto. It offered a market-based solution and flexible mechanisms towards the problem of global warming and helped to establish in place a robust and fool proof system to ascertain the factual position of GHG emissions at the ground level. On the contrary, countries like U.S., China and India did not face any commitments through the protocol, and there was also a potential to withdraw from the treaty (for example Canada pulled out in 2011). Besides, Russia, Bulgaria and Ukraine are now facing a problem of “hot air” (AAUs) i.e. excess carbon credits. This is because the fall of the Soviet Union in December 1991 led to the massive deindustrialization of many former Soviet countries leaving much of the carbon credits in these

economies unused. It was found that CO_2 emissions in Russia and Ukraine fell about 34 and 59 percent respectively in 2010 as compared to their levels in the base year. Thus, the carbon credits offered to Russia as an incentive to sign the treaty were in huge surplus. These extra credits are expected to crash the whole carbon market if the countries are allowed to carry over their left over credits into the second commitment period as the supply of these credits would even surpass the demand by the whole of European Union. Conversely, if the banking of permits is prohibited to stop the market from crashing, it would be unfair to the countries which have actually worked hard to reduce their emissions and earned the carbon credits in the process in the first commitment period so as to use them in the second period.

The first phase of Kyoto Protocol was deemed limited in meeting up to its expectations. Many countries saw a hike in their emissions after the introduction of the Kyoto Protocol. Some of the reasons for its failure could be that the Protocol was finalized halfway through its ten-year life, i.e., although it was introduced in 1992, it wasn't finalized till 1997. This reduced the time available to achieve the desired goal of emission reduction. Also, there were no binding targets for the developing nations in the protocol thus augmenting their tendency to increase their emissions and making it more strenuous to reduce them in the future. Due to rapid industrialization in certain developing economies, global emissions rose by around 50 per cent since 1990. This growth in CO_2 emissions concentrated around not so rich countries which had either not signed up to Kyoto or did not take any action even after signing up. For instance, China's emissions went up about 286.6 per cent from 2.5m metric tonnes to 9.7m metric tonnes. U.S.A., on the other hand, the major emitter, refused to ratify the Kyoto Protocol even after signing it. Canada, also a developed country, after signing the Protocol retracted out of its commitment and finally pulled out in 2011. Even the developing countries did not abide by the Protocol instead blaming developed nations for not providing enough funds to aide them in cutting their emissions. The final nail in the coffin was put in 2009, when in a UN-convened climate summit in Copenhagen, Kyoto was thoroughly discredited and derided as a failure in containing global emissions.

But despite all the imperfections of the Protocol, it has seen success in the form of reduced GHG emissions in the European Union. The EU has reduced its emissions by around 5 per cent.[13] Over the past few years, the major contributors to global emissions have been fast-growing developing countries like China, which were not a party to the Kyoto Protocol. The prime achievement of this treaty has been to bring awareness to the fact that there is a dire need to scale down our GHG emissions and secure the environment for future generation. It has also helped to establish firmly a carbon trading system that has in fact proved to be an influential tool in providing a model for emission cuts. Even though the Protocol did not deliver on the expected lines, nevertheless it proved to be a valuable starting point by creating a

[13] Chavez, Michael. "The Kyoto Protocol: Accomplishments and Failures". (2009)

conducive atmosphere for participating countries to work together in conserving our environment. It has exhibited the seriousness of many countries about plaguing environmental issues while urging others to become less selfish and focus on the issue of utmost importance i.e. the protection of Mother Earth.

6. CONCLUSION

The climate change problem has exacerbated over the past few decades and, therefore, requires a prompt and focused approach to deal with it. In 1997, the international framework to acknowledge the issue of climate change entered a new stage when the Kyoto Protocol was brought to light. It resulted in the development of three market mechanisms, namely, clean development mechanism (CDM), joint implementation (JI), and international emission trading (IET). This helped increase the level of ambition in developed countries while enhancing mitigation actions in a broad segment of the economy in developing countries. The European Union (EU) has rendered a critical assistance in the form of EU ETS in mitigating climate change. Apart from EU ETS, countries such as China, New Zealand and South Korea, have started to develop and experiment with their market instruments (e.g. domestic emission trading and voluntary emission reduction schemes) in order to complement the existing UNFCCC-based mechanisms and stimulate further actions to support domestic policy objectives.

The carbon market is nowadays seen to be among the fastest growing markets wherein the European Union Emissions Trading Scheme (EU ETS) has played a major role in pushing it up to this level. It has already surpassed $100 billion worth and is expected to pan out to $1 trillion within a decade. As more countries intend to initiate the regulation of their emissions by putting a cap on them, the demand for carbon credits may eventually soar, in turn leading to an escalation in the price of carbon credits.

Though most parties to the Protocol have secured a cut in their emissions, still the world CO_2 levels have escaladed. A considerable portion of this increment has been ascribed to large developing countries that were not a part of the treaty. The world's first and third largest emitters are China and India respectively while the U.S. has descended to the second position. The Doha Amendment was adopted by the Conference of the Parties (COP) on 8 December 2012 in Doha, Qatar establishing the second phase or second commitment period of the Kyoto Protocol, which began on 1 January 2013 and will go on until 31 December 2020. As of November 2015, 53 countries have ratified the Protocol. Despite the fact that the participating countries of the Protocol have shown a sense of cooperation and also pledged to negotiate binding emission reduction targets, many hurdles still prevail with the global emission levels being situated at their record high. These problems should be looked upon as an indicator that there is still a long way to go along the path of mitigating global warming and climate change hoping that the Kyoto Protocol's next commitment period will be even more widely accepted and successful.

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