The Carbon Market and the Paper Industry Examining CDM Potential

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Commitments to reduce greenhouse gas emissions are leading to a carbon-constrained economy. A market is emerging in carbon, providing opportunities for cost-effective management of a business's carbon assets and liabilities. Emission Reduction Units (ERUs) can be generated through Joint Implementation (JI) projects in so-called Annex 1 nations (covering the former Soviet Union. Eastern Europe, and potentially Western Europe, Japan and Canada), whereas Certified Emission Reductions (CERs) can be generated through Clean Development Mechanism (CDM) projects in non-Annex 1 nations (including China, Brazil, India and many other developing world nations). Collectively these carbon 'offsets' or carbon 'credits' can help businesses and countries meet greenhouse gas emissions reduction targets within Europe and other parts of the world. To project developers in JI or CDM countries carbon credits represent an additional stream of capital and should be treated as a further element in project finance structuring. This development has tremendous impact for industries in India. The Kyoto Protocol does not prescribe any targets for India (a non -Annex 1 country) to reduce its Greenhouse Gas (GHG) emissions. There is this potential for industries in India to take advantage of this new development and gain additional income for implementing "green technologies". CDM in the India's growing market has potential to reap huge benefits, but at this stage is clouded in misinformation. This paper seeks to deconstruct the carbon market, talk about new technologies and methodologies, and highlight benefits in the paper and pulp industry.

INTRODUCTION

Climate change represents the most widespread and pressing environmental concern of our time. The detection of significant changes in the Earth's climate over the last 100 years, and the attribution of these changes to anthropogenic emissions of greenhouse gases (GHGs), has now been accepted by the vast majority of the world's scientists, and by the findings of the Intergovernmental Panel on Climate Change (IPCC). The international negotiations at Rio de Janeiro. Kyoto, and subsequently to Kyoto have brought home the political reality of an increasingly carbon constrained economy. As a result of this new reality, and in order to reduce emissions in the most economically efficient manner, emissions reduction projects in developing and transition countries are increasingly being turned to. The Kyoto Protocol, the international agreement on climate change, has established the largest environmental market in the world, the trading of 'carbon credits'. The Protocol, which established mechanisms for project-based carbon trading, has paved the way for a wide range of project types to seek substantial new sources of finance - including: renewable energy; waste gas capture; energy efficiency; the chemicals sector; fuel switching; agriculture and biomass; and land use and forestry. In this article, EcoSecurities Ltd provides an overview of the status of the new carbon market and how companies can take advantage of the funding opportunities it presents,

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The Carbon Market

The Kyoto Protocol was signed in 1997, and entered into force in 2005 following its ratification by Russia, The Protocol established for the first time binding emissions reduction targets for Industrialized countries, part of what many see as a long and evolving process of ever stricter greenhouse gas targets, In order to help mitigate the costs of meeting these targets, the Protocol established other countries struggling to meet their own targets could buy groundbreaking new 'flexible mechanisms' for carbon trading, so that emissions reductions achieved in one country, Thus the global reduction in greenhouse gases would be achieved at minimum cost. This is the world's first truly international environmental market,

and carbon the first globally traded environmental commodity, The 'carbon market' is the term given to the global trade in greenhouse gas emissions reductions - measured in tones of carbon dioxide - which has grown up in response to the trading mechanisms established by the Kyoto Protocol. These mechanisms are the Clean Development Mechanism (CDM) and Joint Implementation (JI), The CDM is based on emissions reducing projects located in developing countries, selling carbon credits to buyers in industrialised countries, whereas JI is designed to encourage emissions reduction projects in industrialised countries themselves, and predominantly operates in the 'countries in transition', The CDM is already operational, and 77 projects have been registered by the international regulatory authority (the Executive Board) since the board began approving projects since November 2004 The first project to be registered was the 'Nova Gerar landfill gas to energy project' in Brazil, structured by EcoSecurities. Although JI is not yet as well developed as the CDM, and no projects have yet received formal approval, both CDM and JI credits are being purchased and traded by European, Japanese, and Canadian Governments and companies.

What do carbon credits mean for project economics ?

With the carbon market now maturing, for any given project investment in developing countries or countries in transition, there are now two possible revenue streams: traditional cash flows (e.g. electricity sales) and the environmental value of the investment (e.g. carbon credits). Providing that projects fulfill the eligibility requirements as set out in the CDM and JI guidelines, projects may access large new revenue streams. The amount of carbon credits generated depends entirely on the type and size of projects. What CDM revenue means is that many proposed projects could go from being marginally economically viable or not economically worthwhile to becoming worthwhile with the additional revenue from CDM. For some sectors, CDM/JI provides very large revenues where no conventional revenue streams exist, a classic example being landfills, where very few operators currently use or flare landfill gas without the additional incentive provided by CDM or JI.

Eligibility for CDM projects

To examine this development from a micro point of view, this has evolved into a market where carbon reductions can be traded along a decided price between the buyer and the seller. Over the last one and a half years, there have been a signlficant number of projects registered with the United Nations Framework Convention on Climate change that have started issuing credits.

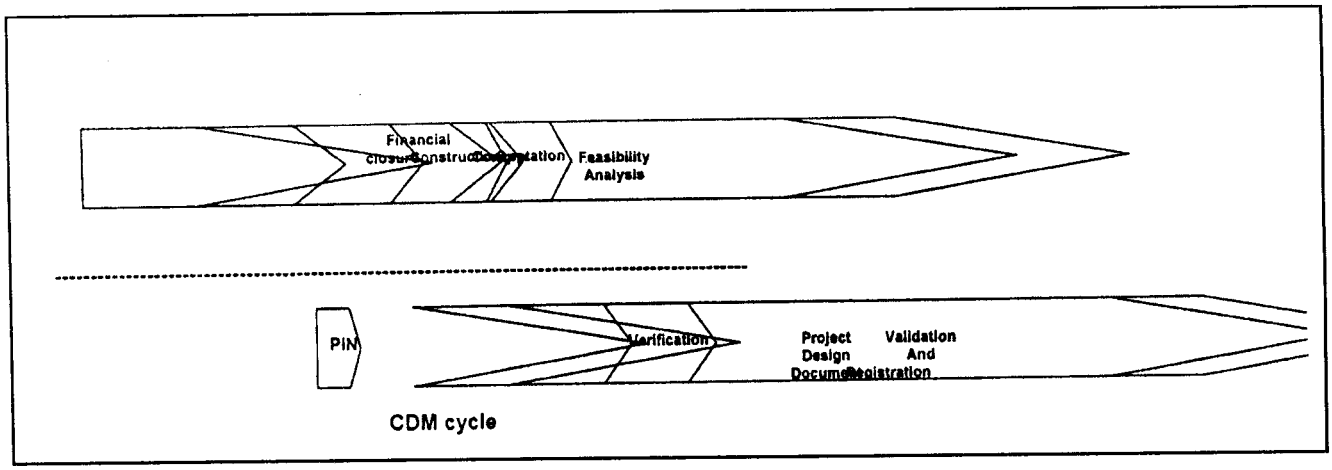
First CDM project The 'Brazil NovaGerar Landfill Gas to Energy' project was the first formal CDM project registered with the CDM Executive Board. NovaGerar was developed by EcoSecurities in partnership with a local landfill operating company in Brazil, and validated by DNV. The project consists of the use of landfill gas to generate electricity. It is expected that the project will reduce 670,000 tCO_2e per year.

For a project to be eligible of carbon credits, it must fulfill certain criteria:

- The project must create a reduction of any Green House Gases mentioned in the Kyoto Protocol.

Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O); Hydro fluorocarbons (HFCs); Per fluorocarbons (PFCs); Sulphur hexafluoride (SF_6)

- It must be Additional (the project should have progressed even without revenue generation from carbon credits)
- Contribute to sustainable development objectives of the nation
- Project type: The Kyoto Protocol



Project development cycle CDM cycle

and the CDM EB do not explicitly mention project categories that are eligible under the CDM. However, nuclear energy projects and LULUCF projects other than afforestation and reforestation are not eligible under the first commitment period.

- Non diversion of Overseas Development Aid: Public funding sources for the project itself are allowed, as long as it is clearly stated that the CERs generated by the project are not considered as a compensation to public funding.

- Other environmental benefits: The project should not result in significant negative environmental impacts.

The process of registration and documentation involves various steps. The CDM registration process should begin at the stage that the project reaches financial closure. The entire process of writing a PDD, to validation by the host country and a third party validator, and finally certification by the COM Executive Body takes on an average 6-8 months.

Opportunities in the Paper & Pulp Industry

Paper production is an energy intensive process requiring mechanical and thermal energy to transform raw materials into finished. products. The sector is therefore a significant global user of fossil fuels and electricity. A significant amount of biomass wastes (in solid and sludge or liquid forms) is also produced and requires disposal. Consequently, the industry is a large emitter of Greenhouse gases (GHG) in many parts of the world.

Table 1

List of Applicable Methodologies for the Paper and Pulp Industry

Methodology Number	Name	Explanation
	Large Scale Methodologies Capacity>15 MW	
ACM 002	Renewable electricity from captive power	This methodology is applicable only to plants that purchase electricity from grid or intends to export to grid, which is generated from renewable sources.
ACM 006	Electricity generation from biomass residues	This methodology is applicable to grid-connected and biomass residue fired electricity generation project activities, including cogeneration plants.
AM 0008	Fuel switch from coke or petroleum fuel to Natural Gas	This methodology is applicable to a project activity, which is to switch the industrial fuel currently used in some element processes1 of a facility to natural gas from coal and/or petroleum fuels that would otherwise continue to be used during the crediting period.
AMO018	Steam optimization system	
	Small Scale Methodologies	These are small scale methodologies that are approved for projects that are of capacity <15 MW
AMS I. A -	Electricity for the user (like a fuel switch)	This category comprises renewable energy generation units that supply individual households or users with a small amount of electricity. Upgrading of existing equipment is not allowed. These units include technologies such as solar power, hydropower, wind power, and other technologies that produce electricity all of

The emissions associated with pulp and paper materials differ based on a number of factors:

- The pulping process (mechanical of chemical).
- The type of paper produced.
- The type of fuel used for onsite electricity generation.
- The energy efficiency of the mill.

For a project to be eligible for carbon credits, it must fall into the limits of certain "methodologies" approved by the UNFCCC. Table 1 demonstrates which can be applied to the paper and pulp industry:

On average the production of 1 Adt (Air dry tonne) of paper results in 0.67 tCO_2 (Source CEPI). The Paper & Pulp industry emits approximately 218 $mtCO_2e$ annually (Annual global paper production is estimated at 325m tonnes pa).

The paper industry is possibly the only large-scale industrial sector that is capable of realising a low carbon, energy self-sustaining, and trajectory. Such a path could be realized whilst avoiding major changes to its primary production process. The adoption of a more effective organization of its existing biomass supply, improved energy efficiency and more sustainable waste management practices in the industry could yield many hundreds of millions of Euros annually to the industry through carbon trading mechanisms.

Case studies

Case1: Irani Biomass Electricity Generation Project, Brazil

South America, 2002

Cellulose Irani is a Brazilian pulp and paper manufacturing company, located in the 'Campina da Alegria' district (Santa Catarina State, Brazil), with

		which is used on-site by the user, such as solar home systems, and wind battery chargers. The renewable generating units may be new or replace existing fossil fuel fired generation. The capacity of these renewable energy generators shall not exceed 15 MW.
AMS I.B -	Mechanical energy	This category comprises renewable energy generation units that supply individual households or users with a small amount of mechanical energy.
AMS I.C -	Thermal energy	This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Biomass-based co-generating systems that produce heat and electricity for use on-site are included in this category.
AMS I. D -	renewable electricity generation	This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.
AMS III. B	Fossil fuel switch	
AMS III. D	Methane recovery	This project category comprises methane recovery from coalmines, agro-industries, landfills, Wastewater treatment facilities and other sources. Measures shall both reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually. CO2 emissions from combustion of non-biogenic methane shall be accounted for in the project activity.
AMS III.E	Methane avoidance	This project category comprises measures that avoid the production of methane from biomass or other organic matter that would have otherwise been left to decay as a result of anthropogenic activity. Due to the project activity, decay is prevented through controlled combustion and less methane is produced and emitted to the atmosphere.
AMS-II.D	Energy Efficiency and fuel switching measures for industrialized facilities	This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.11 Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial processes (such as steel furnaces, paper drying, tobacco curing, etc.
ACM 0013, ACM 0022	Avoidance or methane production through biomass decay through controlled production	This project category comprises measures that avoid the production of methane or capture and destroy the methane- from biomass or other organic matter that would have otherwise been treated in an anaerobic process

years of experience in the manufacturing of a diversified range of paper products for both domestic and export markets. Currently, wood used in the paper manufacturing process comes from Irani's own 16,800 ha of plantation forests. The project activity consisted of the construction and operation of a 9.43 MW biomass generation Plant that will generate part of the electricity required by the Cellulose Irani plant in the paper manufacturing process. The project activity is a renewable energy project, which consists of the construction and operation of a 9.43 MW biomass generation plant that will generate electricity required by Cellulose Irani in the paper manufacturing process.

The project activity involved displacing more carbon intensive electricity from the grid with electricity generated by GHG neutral biomass (wood chips and wood residue). The project also involved methane avoidance from biomass not being landfilled. In the absence of the project the wood residue, which will be used in the thermoelectric plant will continue to be landfilled.

Case 2: Nobrecel SA, 2004, Brazil

The NOBRECEL Biomass energy project involved the installation of a new boiler, using biomass as fuel, for steam generation, displacing boilers, which use fuel oil as fuel. Working as carbon advisors for Nobrecel, a pulp and paper producer company, EcoSecurities structured the CERs generated by the 6MW co-generation unit located in Sao Paulo State (South-East Brazil).

Seeking Competitive Advantage

Although paper market prices are slowly improving (see table 2) the industry is still plagued by structural global overcapacity, Therefore, margins are still under pressure and companies are seeking ways to reduce costs and improve revenue, Carbon trading is a valuable tool that can assist

Table 2

Paper Transaction Prices

5 per ton unless otherwise stated

Grade	Jun-04	Yr/Yr	High		Low	
	Price	%Chg.	Price	Date	Price	Date
Linerboard	430	15%	530	Sep-95	290	Apr-97
Bleached Board (SBS)	900	3%	960	Sep-95	660	Apr-94
Coated Unbleached (CUK)	820	5%	745	Aug-95	620	Aug-94
Coated Recycled (CCNB)	670	3%	705	Sep-95	500	Mar-99
Uncoated Freesheet	660	5%	1050	Oct-95	685	Feb-97
Uncoated Groundwood	730	3%	980	Oct-95	695	Sep-99
Newsprint	550	9%	745	Feb-96	495	Jan-97
Coated Freesheet	750	8%	1245	Nov-95	870	Oct-96
Coated Groundwood	840	1%	1390	Nov-95	900	Oct-96

*Per metric ton, * Per thousand square feet

Source CSFB estimates Industry sources, Random Lengths, and Miller-Freemen.

in cost reduction and revenue improvement activities.

One example of the impact carbon trading can make is the example presented here of a 'fuel switch CDM project' where a boiler providing steam into the papermaking process is retrofitted to allow utilisation of bark wastes (or to increase the proportion of such material in the fuel mix) instead of coal. Such a retrofit reduces GHG emissions in two ways, First, it reduces emissions that would arise from the burning of coal. Second, it 'avoids' emissions of methane that would occur were the bark biomass to be disposed of in a landfill.

A project EcoSecurities is currently supporting in Eastern Europe will generate some 350kt CO_2e pa as a result of the 20MW wood waste to electricity project being implemented. This could generate value in the order of 1.0-1.5m pa.

CONCLUSION

Performance of the industry has been constrained due to high cost of production caused by inadequate availability and power cost and high cost of raw materials, concentration of mills in one particular area. Several policy measures have been initiated in recent years to remove the bottlenecks of availability of raw materials and infrastructure development. The industry is a priority sector for foreign collaboration and foreign equity participation upto 100% receives automatic approval by Reserve Bank of India Several fiscal incentives have also been provided to the paper industry, particularly to those mills which are based on non-conventional raw material.

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