



Carbon Trading Mechanisms and Opportunities

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Climate change resulting from excessive accumulation of greenhouse gases (GHGs) in the atmosphere is one of the most significant sustainable development challenges facing the international community.

The global nature of climate change calls for a cooperative and coordinated response by all countries with the common goal - "stabilizing atmospheric concentration of greenhouse gases at a safe level that would prevent dangerous anthropogenic interference with the climate system" (UN, 1992).

The international policy on global climate protection follows "cap and trade" approach for limiting the overall emissions of carbon dioxide and other GHGs. **Carbon trading** is an outcome of this approach to control global warming. It provides economic incentives for achieving reductions in the emissions of GHGs.

Genesis of Carbon Trading

The United Nations Framework Convention on Climate Change (UNFCCC) that came into force on 21 March 1994, divides countries into two groups: Annex I Parties, the industrialized countries who have historically contributed the most to climate change, and Non-Annex I Parties, which include primarily the developing countries, like India. The Convention established the Conference of Parties (COP) as its supreme body with the responsibility to oversee the progress towards the aim of the Convention.

The stage for global carbon trading was set in December 1997 in the third session of the COP held in Kyoto (Japan), where an important milestone in the international climate change negotiations was achieved in the form of Kyoto Protocol. The Protocol is a legally binding set of obligations for 38 industrialized countries, including 11 countries in the Central and Eastern Europe, to reduce their emissions of GHGs to an average of approximately 5.2% below their 1990 levels over the commitment period 2008-2012.

The quantified emission reduction targets set for the complying countries (Annex I countries) do not have to

be reached by domestic emission reduction alone, instead the flexible mechanisms under the Protocol allow the use of less costly emission reduction potential abroad through carbon trading within the Annex I countries or with Non-Annex I countries.

The concept of international trade in GHGs had its roots in the successful sulphur dioxide trading system instituted to stop acid rain under the U.S. Clean Air Act of 1990. In 1990, the U.S. Environmental Protection Agency had set a limit on SO₂ emissions from obvious point sources and allowed those who emit less than their quota to trade excess allowances. As a result, regional acid deposition was dramatically reduced. Kyoto Protocol follows a similar approach to reduce global concentration of GHGs, as these gases are distinguished from most other pollutants through their exclusively global impact, implying it does not matter where emission reduction takes place.

Carbon Trading Systems

The carbon trading systems that are currently in vogue can be broadly categorized into two: compliance based and voluntary mechanism.

Compliance Based System: The cap set under the Kyoto Protocol on the amount of GHGs that an Annex I country can produce is allocated (or auctioned) to the carbon emitting entities in the country such as electric utilities, industrial units, etc. that is, the committed country, in turn, sets quotas on the emissions by its businesses. The quota permits are freely tradable and can be bought and sold in the form of carbon credits between businesses or in the international markets.

Carbon credits – the standard of trading in the carbon markets- are certificates awarded to countries that are successful in reducing emissions of GHGs. One carbon credit is equal to one metric ton (mt) of carbon dioxide emission. The five GHGs other than CO₂ (methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) are converted into tonnes of CO₂ equivalent (CO₂e) using their Global Warming Potential (GWP) factor.

Article 17 of the Protocol allows emission trade among countries with emission targets - permitting Annex I countries to transfer parts of their 'allowed emissions' (assigned amount units AAUs) between themselves.

Article 6, Joint Implementation (JI), allows Annex I countries to acquire emission permits through investment in GHG mitigation projects in other Annex I countries. The ensuing reductions in emission are transferred as emission reduction units (ERUs).

Article 12 brings the developing countries also within the fold of carbon trading through institution of Clean Development Mechanism (CDM). Under CDM, an Annex I party can take up a GHG reduction activity in a developing country where the cost of emission reduction is usually much lower. The ensuing carbon credits are called certified emission reduction (CERs).

The European Union (EU) accepted the Kyoto cap collectively as a group, implementing the commitments through the EU Emissions Trading Scheme (EU ETS). Each EU nation has been allocated carbon emissions targets according to the National Allocation Plan (NAP). The NAP sets an emission cap on 'installations' above a certain size in 6 industrial sectors, fixing the maximum allowable GHG emission from them. These EU allowances (EUAs) are traded amongst the EU nations and capped installations.

Voluntary Trading: Carbon credits also stem from voluntary carbon abatement projects outside the realm of the Kyoto Protocol. The two main segments of the voluntary carbon trading are: (a) membership-based cap-and-trade system under the aegis of the Chicago Climate Exchange (CCX), the New South Wales Greenhouse Gas Abatement Scheme (NSW GGAS) and UK Emission Trading Scheme (UK ETS) (b) Over-the-Counter (OTC) offset market.

The CCX defines itself as the world's first and North America's only voluntary, legally-binding, rules-based GHG emission reduction and trading system. Members who join the CCX do so voluntarily, but once they have committed to participate, the cap is binding. Instruments used for compliance with CCX commitments are called Carbon Finance Instruments (CFI). Trading opened in December 2003. Recently, India has also announced carbon trading exchange in Multi Commodity Exchange (MCX) in alliance with the CCX.

The NSW GGAS is an Australian mandatory state-level program to reduce GHG emissions associated with the production and use of electricity. If a regulated emitter exceeds its target, it has the choice of either paying a

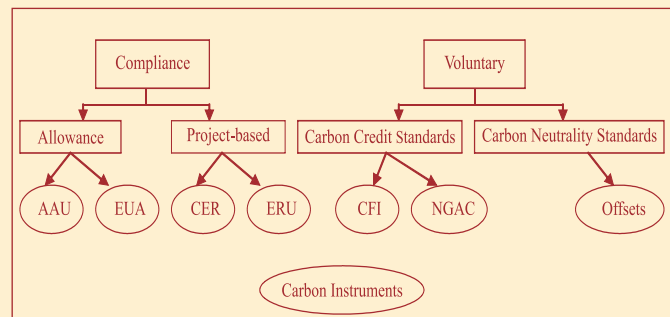
penalty or purchasing New South Wales Greenhouse Abatement Certificates (NGACs), which are generated by emissions abatement projects carried out within the state.

UK ETS participation is on a voluntary basis and combines incentives, penalties and flexibility. The installations earmarked under Kyoto Protocol joined EUETS after 2007 and the UKETS now remains open for climate change agreement participants to trade through the voluntary market to meet their targets.

Other than the cap and trade mechanism, trading also takes place in carbon offsets. A carbon offset negates or 'neutralises' a ton of CO₂e emitted in one place by avoiding the release of a ton of CO₂e elsewhere or absorbing/sequestering a ton of CO₂e that would have otherwise remained in the atmosphere. Carbon offsets are created through various types of projects, such as renewable energy, energy efficiency, destruction of various industrial gases, and carbon sequestration underground or in soils and forests. Although offset credits also exist on the CCX, but a wide range of such transactions that do not operate via a formal exchange constitute voluntary Over-the-Counter (OTC) offset trading.

The certified and traded carbon instruments under various systems discussed above are summarised in Figure 1.

Fig. 1: Carbon Trading Systems



Global Carbon Markets

The regulations on carbon emissions have spawned an emerging carbon market that was worth US\$ 31.24 billion in 2006 and more than doubled to US\$64 billion in 2007 (Capoor and Ambrosi, 2008). EUETS is the leader in global carbon market with 78% share.

The second most important compliance-driven carbon market is that of primary and secondary carbon credits (CERs) from CDM project activities with combined share of 20 per cent. The secondary market for guaranteed CERs grew exponentially in 2007 to an estimated 240 mtCO₂e, worth about US\$5.5 billion.

The ERU transactions under JI have doubled in volume and tripled in value terms in 2007 as compared to 2006, but their share in total carbon markets is still less than 1 per cent. Similarly, 2007 closed with record-breaking transacted volumes on CCX of 23 mtCO₂e (US\$72 million), representing slightly more than doubling of volumes (and value) over 2006, albeit this and other voluntary markets account for negligible proportion of global carbon trade.

Like the usual stock exchange, carbon credits have spot, futures and option trades. Futures contracts account for the major part of volume and value of transactions while option and spot trades together represent less than 5% share of the activity.

Buyers: On the demand side, the project based compliance markets (primary CDM and JI) are dominated by European countries (Table 1). The most active buyers are large European companies with installations in several countries, project developers and aggregators as well as financial institutions with an eye on the buoyant secondary markets. Japan is also an important player in the carbon compliance market.

Table 1: Location of Customers in Carbon Markets: 2007
(% of transaction volume)

Countries	Primary CDM/JI Buyers	Countries	OTC
UK	59	EU	47
Italy	4	USA	34
Spain	4	Canada	3
Austria	2	Australia & New Zealand	8
Baltic States*	12	Asia/Latin America/Africa	<1
Rest of Europe	6	Others	8
Japan	11		
Others	2		

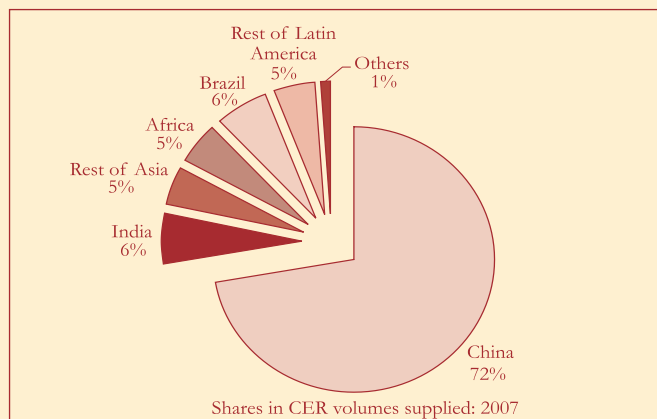
* Finland, Sweden, Norway, Germany, Denmark and Iceland
Source: Capoor and Ambrosi (2008); Hamilton et al. (2008)

The EU also has the highest share in the voluntary OTC offset markets, followed by US, Australia/New Zealand. The demand from Asia, the Middle East, Latin America, and Africa was virtually negligible (Hamilton et al., 2008).

Suppliers: China has been the world leader in CDM supply (Figure 2). The buyers' preference for China is guided by several factors such as large average volume of CERs per project, economies of scale in origination and its favourable investment climate. India hosts about 27% of CDM projects but has only 6% share in volumes entering the carbon markets. Brazil also has a share equal to that of India, followed by emergence of Africa.

Asia, as in the CDM markets, also takes the lead in OTC market holding the largest share of credits (39% in 2007)

Fig.2: CER suppliers



Source: Capoor and Ambrosi (2008)

transacted by any single region in carbon offsets. North America at 27% had the second-highest origination of Verified Emission Reduction (VER) credits. Besides these two major regions, the other credit supply originates from EU and Russia (13%), New Zealand and Australia (7%), Latin America (7%) and Africa (2%).

Carbon Prices

There is a great deal of price differentiation across carbon instruments and contracts. The prices of maximum traded futures EUA found a solid underpinning above €20 in the last four months of 2007 and rose further to about €29 in July 2008 (Carbon Positive, 2007; ECX, 2008)

However, for developing countries like India that enter the carbon markets as suppliers of CERs, the scenario is somewhat less lucrative. The vast majority of primary forward CERs were transacted in the range of €8-13 in 2007 and early-2008, with an average contracted price of about €10 (Capoor and Ambrosi, 2008). Spot contracts of the issued CERs are transacted at €16-17. The projects demonstrating strong sustainability attributes and community benefits (such as those certified under the Gold Standard) could easily fetch a €1.0-1.5 premium for Gold Standard CERs.

The prices of carbon credits from project activities other than CDM are even lower. For instance, in 2007, the ERUs were traded at an average price of €8.9, while the volume weighted price of credits transacted in the OTC market was only €4.5 (\$6.1/tCO₂e). On the CCX, the weighted average price was nearly half the OTC figure. In the voluntary markets, forestry projects, in particular those involving afforestation/reforestation, have been some of the highest priced project types. Methane and renewable energy projects also continue to be valued highly. The lowest-priced credits originate from industrial gas projects and geological sequestration.

Economic Implications of Carbon Trading

Trade in emission permits derives from the principle of sustainable development encompassing the goals of cost efficiency, attaining set emission target and distributional equity in allocating emission permits. The scale of possible efficiency gains is reflected in several economic models, such as, cost saving estimate of 20-90% through global emission trade given by the Stanford Energy Modelling Forum.

In developing countries, the system attracts the much desired private sector investment in energy saving technologies which will have far reaching benefits for these nations with poor energy infrastructure. The system offers commercial opportunities for industrial enterprises, financial institutions, investors, etc. as a new source of earning.

Although the critics argue that emissions trading does little to mitigate global warming, places disproportionate emphasis on individual lifestyles and carbon footprints, distracting attention from the wider, systemic changes and collective political action that needs to be taken to tackle climate change problem, yet the financial attractiveness of the system will be the driving force in its further evolution.

Carbon Trading Opportunities for Indian Agriculture Sector

The sectoral composition of CDM activities in India is heavily skewed towards non-renewable energy projects, followed by energy efficiency projects in industrial units (Figure 3). The National GHG Inventory attributes 28% of the national emissions to agricultural and allied activities (NATCOM, 2004), yet systematic efforts to tap commercial opportunities from carbon trading from the sector are singularly lacking. The projects aimed at reducing methane

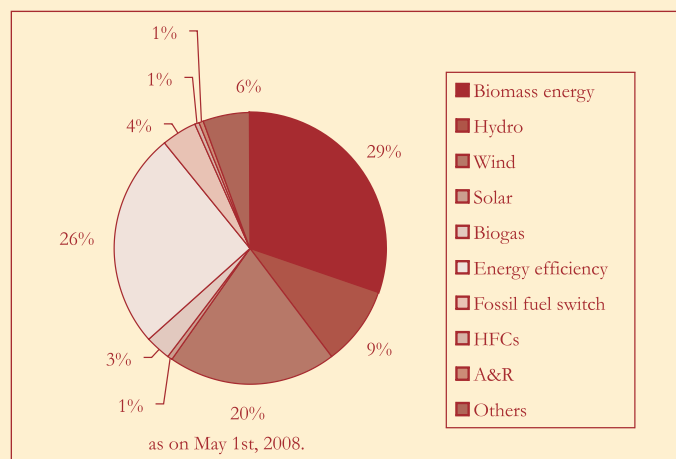
emissions from enteric fermentation in farm animals and paddy fields, carbon sequestration in soil and improving energy efficiency in agriculture can be formulated to serve the dual purpose of generating carbon credits with improving output and input productivity. The immense potential of the agriculture sector to generate carbon credits can be gauged from the fact that just a 10% annual reduction in enteric methane emissions from dairy animals would create 18 million carbon credits.

Due to small and scattered nature of land and livestock holdings in India, agriculture sector is considered to be a difficult one for designing and executing project activities in accordance with the norms set for monitoring and verification of carbon credits. The first phase of the compliance based carbon trading under Kyoto Protocol is set to expire in 2012. However, there is general consensus that global carbon trading system in one form or the other will be a fixture in the world economy for decades. The challenge to the project developers, researchers and policymakers, therefore, lies in harnessing the untapped potential of the agriculture sector and linking the farmers effectively to the booming carbon markets.

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Fig. 3: Sectoral Composition of CDM Projects in India



Source: Fenhann (2008)

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