Chapter 14
Carbon Credit Currency for the Future

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Abstract Carbon credits have the potential to be the next great currency. It might be almost mandatory to have carbon credits one day and there seems to be no alternative world currency that escapes local political intervention that we can all trust. Carbon credits are going to hold the same value wherever you are because CO_2 has a global impact. The world carbon market grew by 37% in Q1 2009 compared to the previous quarter, reaching 1,927 Mt. This was 128% higher than the first quarter in 2008. By the end of 2009, the carbon market is expected to be $121 billion. The carbon market is forecasted to touch $408 billion by 2012 and $2.1 trillion by 2020. This paper reviews the carbon market in terms of volume and value, market classification, and the future of the carbon market beyond 2012.

Keywords Carbon credit · Carbon market · Market classification

Introduction

The dramatic imagery of global warming frightens people. Melting glaciers, freak storms, and stranded polar bears (the mascots of climate change) show how quickly and drastically greenhouse gas (GHG) emissions are changing our planet. Such graphic examples, combined with the rising price of energy, drive people to want to reduce consumption and lower their personal share of global emissions. But behind the emotional front of climate change lies a developing framework of economic solutions to the problem. Two major market-based options exist, and politicians around the world have largely settled on carbon trading over its rival, carbon tax, as the chosen method to regulate GHG emissions.

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Global warming is the increase in the average temperature of the earth's near-surface air and oceans since the mid-twentieth century and its projected continuation. Global warming is caused by many things. The causes are split into two groups, man-made and natural causes. Natural causes are causes created by nature. One natural cause is the release of methane gas from arctic tundra and wetlands. Methane is a greenhouse gas. A greenhouse gas is a gas that traps heat in the earth's atmosphere. Another natural cause is that the earth goes through a cycle of climate change. This climate change usually lasts about 40,000 years. Man-made causes probably do the most damage. Pollution is one of the biggest man-made problems. Burning fossil fuels is one thing that causes pollution.

Fossil fuels are fuels made of organic matter such as coal or oil. When fossil fuels are burned, they give off a greenhouse gas called CO_2. Mining coal and oil also allows methane to escape. How does it escape? Methane is naturally in the ground. When coal or oil is mined, you have to dig up the earth a little. When you dig up the fossil fuels you dig up the methane as well. Another major man-made cause of global warming is population. More people mean more food, and more methods of transportation. That means more methane because there will be more burning of fossil fuels, and more agriculture. Because more food is needed, we have to raise food. Animals such as cows are a source of food which means more manure and methane. Another problem with the increasing population is transportation. More people mean more cars and more cars mean more pollution. Also, many people have more than one car.

Since CO_2 contributes to global warming, the increase in population makes the problem worse because we breathe out CO_2. Moreover, the trees that convert our CO_2 to oxygen are being destroyed because we are using the land that we cut the trees down from as property for our homes and buildings. Hence, we are not replacing the trees (an important part of our ecosystem), which means we are constantly taking advantage of our natural resources and giving nothing back in return.

Regulatory Mechanism: Kyoto Protocol

The concept of carbon credits came into existence as a result of increasing awareness of the need for controlling emissions. It was formalized in the Kyoto Protocol, an international agreement between 169 countries. The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro, Brazil, from 3 to 14 June 1992. The treaty is intended to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

The Kyoto Protocol establishes legally binding commitments for the reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride), and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by "Annex I" (industrialized) nations, as well as general commitments for all member countries. Under Kyoto, industrialized countries agreed to reduce their collective GHG emissions by 5.2% compared to the year 1990. National limitations range from 8% reductions for the European Union and some others to 7% for the United States, 6% for Japan, and 0% for Russia. The treaty permitted GHG emission increases of 8% for Australia and 10% for Iceland.

Kyoto includes defined "flexible mechanisms" such as Emissions Trading, the Clean Development Mechanism and Joint Implementation to allow Annex I economies to meet their greenhouse gas (GHG) emission limitations by purchasing GHG emission reductions credits from elsewhere, through financial exchanges, projects that reduce emissions in Annex II economies, from other Annex I countries, or from Annex I countries with excess allowances. The Intergovernmental Panel on Climate Change (IPCC) has predicted an average global rise in temperature of 1.4°C (2.5°F) to 5.8°C (10.4°F) between 1990 and 2100. Proponents also note that Kyoto is a first step to meeting the UNFCCC; it will be modified until the objective is met, as required by UNFCCC. The treaty was negotiated in Kyoto, Japan in December 1997, opened for signature on 16 Mar 1998, and closed on 15 Mar 1999. The agreement came into force on 16 Feb 2005 following ratification by Russia on 18 Nov 2004. As of 14 Jan 2009, a total of 183 countries and 1 regional economic integration organization have ratified the agreement (representing over 63.7% of emissions from Annex I countries).

Carbon Market

Carbon markets are primarily aimed at dealing with the problem of increasing concentrations of greenhouse gases in the atmosphere due to human activities. Carbon markets can also be attributed to technological and industry development, as well as a new area for employment growth. Carbon markets are seen by policy makers and economists as the most efficient policy measure available for reducing greenhouse emissions. Carbon markets operate through the use of tradable certificates, much like a stock exchange, with each certificate (credit) symbolizing a unit of exchange such as a megawatt hour of renewable energy or tonnes of carbon dioxide (Fig. 14.1).

The carbon market was valued at $1 billion in 2004 and reached $11 billion during 2005, with $8 billion from EUETS and $3 billion from primary CDM projects. The market reached $31 billion in 2006 and $64 billion in 2007, with $50 billion from EUETS, $7 billion from the primary CDM market, $5 billion from the secondary CDM market, and $2 billion from other markets. The market reached $120 billion in 2008, which is 120 times more than the 2004 figure of $1 billion.

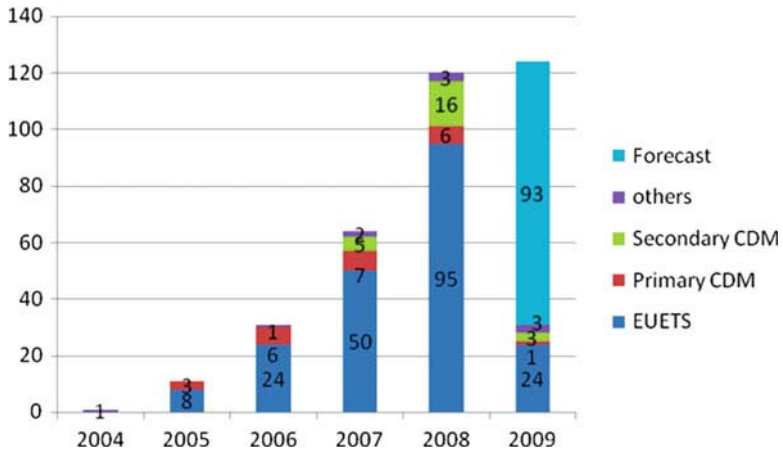

Fig. 14.1 Carbon market size 2004–09(billion $)
Source: New Carbon Finance

Introduction to Carbon Credits

Carbon credits are a key component of national and international emissions trading schemes. They provide a way to reduce greenhouse effect emissions on an industrial scale by capping total annual emissions and letting the market assign a monetary value to any shortfall through trading. Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. Credits can be used to finance carbon reduction schemes between trading partners and around the world.

There are also many companies that sell carbon credits to commercial and individual customers who are interested in lowering their carbon footprint on a voluntary basis. These carbon offsetters purchase the credits from an investment fund or a carbon development company that has aggregated the credits from individual projects. The quality of the credits is based in part on the validation process and sophistication of the fund or development company that acted as the sponsor to the carbon project. This is reflected in their price; voluntary units typically have less value than the units sold through the rigorously validated Clean Development Mechanism. Emissions trading involves the exchange of emissions certificates.

Operators of large energy production plants or energy-intensive industrial companies are assigned a predetermined number of emissions certificates by their governments. These initial certificates are free, and authorize the companies to emit a specific amount of CO_2. If a company exceeds its allowance it must buy in additional certificates. When a company reduces its emissions, it can sell its excess certificates for profit. Companies face penalties when they do not acquire enough certificates to balance out the CO_2 they have emitted.

In addition to the emissions certificates allocated by the state, companies can also make use of other "flexible mechanisms". If they invest in emissions reduction

projects in other countries, for example, they receive additional emissions allowances, which are the equivalent of emissions certificates. These can also be traded. The use of these market mechanisms ensures that the reductions in emissions are made where the costs of reduction are lowest. Thus, for all companies involved, emission trading makes both ecological and economic sense.

Need for Carbon Credits

Carbon credits came into existence as a result of increasing awareness of the need for pollution control. It took its formal form after the international agreement between 141 countries popularly known as the Kyoto Protocol. Carbon credits are certificates awarded to countries that are successful in reducing the emissions that cause global warming. The Kyoto Protocol aims to reduce greenhouse gas emissions by 5.2% below 1990 levels by 2012. Major contributors of greenhouse gas emissions are cement, steel textiles, and fertilizer manufactures.

The Kyoto Protocol provides for three mechanisms that enable developed countries with quantified emission limitation and reduction commitments to acquire greenhouse gas reduction credits. These mechanisms are:

Clean Development Mechanism

The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission reduction or emission limitation commitment under the Kyoto Protocol (Annex I) to implement an emission reduction project in developing countries. Developed countries can implement projects that reduce emissions or remove carbon from the atmosphere in other developing countries in lieu of CERs (Certified Emission Reductions). These CERs can be used to meet the emission targets. The Protocol stresses that such projects are to assist the developing countries host parties in achieving sustainable development. Furthermore, the Protocol prevents developed countries from using CERs generated out of nuclear facilities to meet the targets. Table 14.1 shows decline in volume during 2008 in comparison to 2007, related to the primary CDM market, with a threefold rise in value and volume in the secondary CDM market during 2008 over 2007 figure.

Joint Implementation

The mechanism known as Joint Implementation' (JI), defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex I) to earn emission reduction units (ERUs)

Table 14.1 Market classification

Markets	Volume ($MtCO_2e$)		Value (US$ million)	
	2007	2008	2007	2008
Voluntary OTC	43.1	54.0	262.9	396.7
CCX	22.9	69.2	72.4	306.7
Other exchanges	0.0	0.2	0.0	1.3
Total – voluntary Markets	66.0	123.4	335.3	704.8
EU ETS	2,061.0	2,982.0	50,097.0	94,971.7
Primary CDM	551.0	400.3	7,426.0	6,118.2
Secondary CDM	240.0	622.4	5,451.0	15,584.5
Joint Implementation	41.0	8.0	499.0	2,339.8
Kyoto (AAU)	0.0	16.0	0.0	177.1
New South Wales	25.0	30.6	224.0	151.9
RGGI	–	27.4	–	108.9
Alberta's SGER	1.5	3.3	13.7	31.3
Total – regulated markets	2,919.5	4,090.0	63,710.7	119,483.4
Total – global markets	2,985.5	4,213.5	64046.0	120,188.2

Source: Ecosystem Marketplace, New Carbon Finance

from an emission reduction or emission removal project in another Annex I Party, each equivalent to one tonne of CO_2, which can be counted towards meeting its Kyoto target.

Developed countries can implement projects that reduce emissions or remove carbon from the atmosphere in other developed countries in lieu of ERUs. These ERUs can be used to meet the emission reduction targets. JI projects must have the approval of all Parties involved and must lead to emission reductions or removals that are additional to any that would have occurred without the project. ERUs can only be issued from 2008 onwards, although JI projects can be started from 2000 onwards. Joint Implementation offers Parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer.

Emissions Trading

Emissions trading (ET), as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare – emissions permitted them but not "used" – to sell this excess capacity to countries that are over their targets. It is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. It is sometimes called "cap and trade". A central authority (usually a government or international body) sets a limit or cap on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of allowances (or credits), which represent the right to emit a specific amount. The total amount of allowances and credits cannot exceed the

cap, limiting total emissions to that level. Companies that need to increase their emission allowance must buy credits from those who pollute less. The transfer of allowances is referred to as a trade. In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions by more than was needed.

The European emissions trading market rise in terms of value during 2008 reached the figure of US$94,971.7 million; the 2007 figure was US$50,097 million.

Market Structure

Allowance-Based Markets

The European Union Greenhouse Gas Emission Trading System (EU ETS) is the major market for greenhouse gas (GHG) emission allowances, and is the engine, perhaps even the laboratory, of the global carbon market. Its major achievement is that it helps discover the price of emitting GHGs in Europe. Several exchanges transparently disclose prices at which allowances change hands: for example, the EU emission allowance (EUA) for December 2008 delivery has traded in the €20–25 price band since May 2007. This price signal also encourages project developers to reduce emissions globally through climate-friendly CDM Projects in developing countries and JI projects in Annex I countries that generate carbon credits for sale into the EU ETS.

EU ETS

The EU ETS continued to dominate the global carbon market in 2008, both in transaction volume as well as monetary value. The European emission trading market rise in terms of value during 2008 reached US$94,971.7 million; the 2007 figure was US$50,097 million.

New South Wales

With the election of the Australian Labor Party with Kevin Rudd as Prime Minister, the year 2007 ended with a landmark decision by Australia to ratify the Kyoto Protocol. According to recent projections, Australia is on track to meet its Kyoto target (+8% above 1990 levels). The expected outcomes of the new Rudd Labor Government measures (in particular the 20% Renewable Energy Target by 2020) are also expected to help bridge the Kyoto gap.

Chicago Climate Exchange

Members of the Chicago Climate Exchange (CCX) made voluntary but firm commitments to reduce GHG emissions 6% below a baseline period of 1998–2001 by 2010. 2007 closed with record-breaking transacted volumes on CCX of 23 $MtCO_2e$ representing slightly more than a doubling of volumes over 2006. This 2007 volume represented a value of US$72 million or €53 million (nearly twice the value recorded in 2006). By the end of March 2008, volumes transacted since the beginning of the year almost equalled 2007 volumes with 19.7 $MtCO_2e$ traded, while market value had already surpassed that of 2007 by some 12% at US$81 million (€54 million). Moreover, CCX also pursued an expansion strategy to other schemes and other regions. In August 2007, CCX started listing futures on CER contracts, followed in September 2007 by futures on EUA contracts and, in December 2007, listing CER options.

Project-Based Markets

CDM basically accounts for most of the project-based market activity (at 87% of volumes and 91% of value transacted). JI and the voluntary market as a whole each experienced a doubling of transacted volumes and a tripling of transacted values. The dynamic of the project-based market changed in early 2008, as buyers became more cautious in response to a combination of mounting delivery and issuance challenges; higher perceived credit risks had the generally bearish sentiment in the financial markets, as well as continuing uncertainty about the role of and demand for CDM and JI in the post-2012 climate regime. These market trends, as well as the limits to demand from the EU ETS, have the potential to leave behind, in particular, projects in poorer countries which have only just begun to take advantage of the carbon compliance market. Many of these sellers have begun to look increasingly toward voluntary and pre-compliance markets for buyers.

Market Classifications

There are two types of markets where trading of carbon credits takes place.

European Climate Exchange

The European Climate Exchange (ECX) is a leading market place where trading of carbon dioxide (CO_2) emissions takes place in Europe and internationally. ECX currently trade two types of carbon credits:

1. EU Allowances (EUAs) – They are the climate credit which are used in the European Union Emission Trading Scheme (EU ETS). EU allowances are issued by the EU member states into Member State Registry accounts. In January 2005 the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) commenced operation as the largest multi-country, multisector greenhouse gas emission trading scheme worldwide.
2. Certified Emissions Reduction (CERs) – Certified emission reductions are the climate credit issued by the Clean Development Mechanism (CDM) Executive Board for emission reductions achieved by CDM projects and verified under the rules of Kyoto Protocol. CERs are either long term (lCER) or temporary (tCER), depending on the likely duration of their benefit. Both types of CER can be purchased from the primary market (purchased from original party that makes the reduction) or secondary market (resold from a marketplace).

What Are Futures?

Futures contracts are exchange traded derivatives. A futures contract is a standardized contract to buy or sell. A futures contract gives the holder the right and the obligation to buy or sell a certain underlying instrument at a certain date in the future, at a pre-set price. In the case of ICE ECX EUA Futures Contracts, the underlying units of trading are EU allowances (EUAs) of carbon dioxide (CO_2). One ICE ECX EUA Futures Contract ("lot") represents 1,000 EU allowances. EUA contracts differ from our CER contracts in that the underlying commodity that is delivered is different. Our CER products ensure delivery of Certified Emission Reduction (CERs) units which are credits generated from greenhouse gas emission projects which fall under the Clean Development Mechanism (CDM) of the Kyoto Protocol. Both parties of a "futures contract" must exercise the contract (buy or sell) on the settlement date. To exit the commitment, the holder of a futures position has to sell his long position or buy back his short position, effectively closing out the futures position and its contract obligations. ECX EUA Futures Contracts allow users to lock-in prices for delivery of carbon emission allowances (EUAs) at set dates in the future, with guaranteed delivery provided by the clearing house ICE Clear Europe.

The Role of Markets

Futures and options markets are derivative markets (though certainly not the only types of derivative products), which means that they exist in relation to spot markets, which are the underlying primary markets in which actual physical commodities are bought and sold. Because futures and options contracts allow for the delivery of the underlying commodity upon expiration, there is a strong tendency for spot, futures and option prices to move in the same direction and react to the same economic factors.

Where Do They Develop?

Derivatives markets tend to develop in large, competitive spot markets that have volatile prices. In the case of the EU ETS, however, the forward and futures markets have developed faster than the spot market. Approximately 95% of the total volumes in the European carbon market are seen in derivative trades (forwards, futures and options) with the remaining in spot trades. This can partly be explained by the initial delay of national registries and final allocations in many of the EU Member States which prevented the execution of instant delivery for spot contracts. Another reason may be that in such a new and volatile market, derivative instruments are crucial tools to optimize the value of your emissions portfolio.

What Does Trading Derivatives Involve?

Derivatives involve the trading of obligations (futures) and rights (options) based on an underlying product, without necessarily directly transferring that underlying product. The most familiar derivative instruments are exchange-traded futures and options based on an underlying product. On the European Climate Exchange, the underlying units of trading are the EU allowances (EUAs) which are granted to companies under the EU Emissions Trading Scheme (EU ETS).

ECX Derivatives

The ECX CFI Futures and Options Contracts provide an example of standardized terms of trade. The standardized nature of futures and options markets makes them inexpensive and reliable to use for those with a commercial interest in the EU ETS. Because futures and options contracts attract industrials, utilities, and financials of various nature, futures and options of a commodity often develop into a deep and liquid market. Market depth and liquidity means trades can be executed quickly without displacing prices. In sum, derivatives are traded either on exchanges (where trading is public, multilateral and closely regulated by governments and the exchanges themselves), or between two or more parties in over-the-counter markets (where trading is non-public and largely outside government regulation).

Twofold Role of Derivatives

Derivative markets have two central roles: risk transfer and price discovery. For market participants, the primary purposes of derivatives markets are:

To transfer the risk of adverse changes in commodity prices from those who wish to reduce risk to those willing to accept it. Commercial firms (that produce or use

the commodity) shift part of the risk of price change to proprietary traders, who willingly assume that risk for the opportunity to earn a profit on their venture capital.

The revelation of price information that reflects a multitude of market opinions. These are the views of the various traders involved in the markets. Because futures and option markets funnel large quantities of bids and offers that result in publicly disseminated transaction prices, futures and options markets often become the primary source of price discovery for the related commodities.

Derivatives and the EU ETS

Derivative markets play an important role in the EU ETS. By allowing market participants to reduce exposure to price risk, buyers and sellers can better plan their businesses. By revealing the market's summary of the value of the underlying product, derivative markets inform those with a major stake in those commodities and financial instruments. The availability of these markets has provided the means to allow greater risk to be absorbed, thus facilitating growth and efficiency in each of the associated industries. Market users have improved predictability of future business conditions, which allows for expansion of lending and commodity production and facilitates borrowing for business growth. These results can lead to reductions in prices and interest rates paid by consumers.

Chicago Climate Exchange

Chicago Climate Exchange (CCX) is the world's first and North America's only active voluntary, legally binding integrated trading system to reduce emissions of all six greenhouse gases (GHGs), with offset projects worldwide. CCX employs independent verification and has been trading GHG emission reductions since 2003. CCX Members that cannot reduce their own emissions can purchase credits from those who make extra emission cuts or from verified offset projects.

Trading on the Exchange

Members of the Exchange earn Carbon Financial Instrument (CFI) contracts for any reductions that they are able to achieve below their defined reduction amount. CFI contracts represent 100 metric tonnes of carbon dioxide and all transactions are completed through the electronic trading system. In addition to companies receiving CFI contracts for their reductions, members may also obtain contracts by completing an approved offset project and having it verified by a third party. For this exchange there is no trading floor, as with all other commodities exchanges, because all of the trading is done electronically.

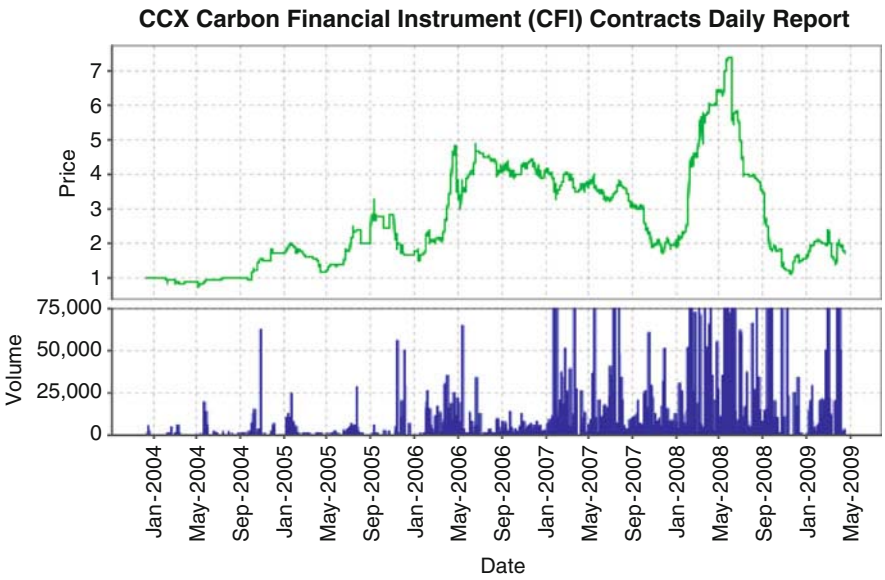

Fig. 14.2 CCX Carbon Financial Instrument (CFI) Contracts Daily Report (Jan 2004–May 2009) *Source*: http://www.chicagoclimatex.com/market/data/summary.jsf

Figure 14.2 shows trading done on CCX from Jan 2004 till May 2009, both in terms of price as well as volume. As can be seen from the graph, there were ups and downs in the price, as well as volume; however, in May 2008 and June 2008, the price of CCX Carbon Financial Instruments was at its peak at $7.40 metric tonnes of CO_2. After that, there was a fall in the price until Dec 2008. In Jan 2009, the price showed a further rise till Mar 2009, and in Apr 2009, there was again a fall in the price. Volumes also fluctuated from Jan 2004 till May 2009.

Future of the Carbon Market

Voluntary Market: Gaining Momentum

Some of the more optimistic estimates for the size of the voluntary market by 2010 are as high as 400 $MtCO_2e$. Earlier this year, US analysts estimated that US demand alone for offsets under the voluntary market could almost double annually from today to 250 $MtCO_2e$ by 2011. Consider, for example, that per capita, every American emits 20 tCO_2e annually.[1] More than 100 million Americans have one or more credit cards. If it were possible to reach 1% of American credit card holders a year every year for the next 5 years, one could imagine a customer base addition

[1]Based on 137 survey respondents.

Table 14.2 Historic volume growth in the voluntary carbon markets ($MtCO_2$)

Year	OTC	CCX	Other exchange
Pre-2002	42	–	–
2002	10	–	–
2003	05	–	–
2004	09	02	–
2005	10	01	–
2006	10	15	–
2007	43	23	0.1
2008	54	69	0.2

Source: Ecosystem Marketplace, New Carbon Finance

Table 14.3 Historic value growth in the voluntary carbon markets (million USD)

Year	OTC	CCX	Other exchange
Pre-2002	171	–	–
2002	43	–	–
2003	23	–	–
2004	35	02	–
2005	39	03	–
2006	61	38	–
2007	262	72	01
2008	393	307	01

Source: Ecosystem Marketplace, New Carbon Finance

of one million customers a year. Assuming each customer offsets his or her own per capita share, this gives a potential demand of five million customers offsetting 50 million tonnes annually by 2012. Double that rate of market penetration and one could see demand for 100 million tonnes annually (Tables 14.2 and 14.3).

The growth of the voluntary markets is a welcome indicator of the appetite that ordinary individuals and companies across the world need to take personal responsibility for the problem of climate change. Governments also need to participate in the effort to spur innovation towards a low-carbon future by taking various steps to reduce their emissions.

Beyond the Carbon Market

There is a tendency to believe that carbon markets will save the world from global warming, but it would be wise not to assume that markets will provide a painless, magical way to lessen climate change.

- First, the market does not set the level of the cap, policy makers do. It can only be a tool to help achieve that target
- Second, policy makers need to set targets and support mechanisms that meet two massive challenges. They have the responsibility of taking into account the risks

of climate change, especially on the poorest, as well as the opportunity of expanding clean development choices to meet the basic needs and aspirations of billions worldwide, many without access to electricity or clean water

- Third, the integrity of a market rests on the clarity and simplicity of its rules, the transparency of information and on institutions that guard against fraud and manipulation
- Fourth, it is not fair to expect "cap and trade" or emissions trading to work in all sectors globally. Clearly, housing and transport are sectors that do not lend themselves easily to an elegant emissions cap and trade approach
- Fifth, a solution to the urgent problem of climate change will require sustained effort from all of us. Policy has a role, in the same way that individual action by each of us does. It will also require applying market-based principles to the likely need for society, especially its most vulnerable members, to adapt to climate change

Is There a Post-2012 Market?

Preliminary findings from IETA's recent Market Sentiment Survey indicate that more than 90% of respondents believe that the GHG market is an established instrument that will continue post-2012. In addition, more than 65% of those surveyed anticipated that a global market will be established in the next 10 years.

The recent EU announcement regarding its climate and energy policy for 2012–2020 and beyond appears to have been taken seriously by the business community. Developments in the EU, USA, Canada, and Australia have helped kick off a modest post-2012 market in abatement domestically; however there is much ambiguity about the extent to which CDM and JI will play a role in compliance (Table 14.4).

Since there is still some uncertainty at play about details of each of these post-2012 regimes, there is some risk that origination of new carbon projects tapers off. This should not imply, however, a weakening of prices for CERs and ERUs in the short run, as there still is some strong residual demand before 2012 to be met. Furthermore, if the emerging North American regimes encourage early action and

Table 14.4 Transactions in world carbon market regions to 2020 (million US$)

	2009	2012	2020
Europe	101,577	216,315	980,723
North America	972	116,425	860,716
Australia	154	19,863	50,974
Kyoto	15,619	48,335	194,758
Other (voluntary Japan)	384	55,646	28,527
Carbon market total	118,706	408,249	2,115,698

Source: New Carbon Finance

banking of CERs, this could stimulate further demand. The uncertainty about demand post-2012 may justify a lower price – given the uncertain compliance value of the credits that may be generated.

Conclusion

If the carbon market is to play a significant role in helping to achieve the deeper reductions from current emission paths required over the next 20 years, decision makers will need to consider how best to broaden and deepen the reach of the market. Experience to date and our understanding of the nature and limitations of emissions trading and project-based mechanisms suggest that several key issues will need to be addressed.

- Countries need to consider how to better engage developing countries in the carbon market in a way that supports the transfer of low-carbon technology and investments in sustainable energy and other sectors.
- The uncertain cost of emissions abatement presents a barrier to both broader participation and deeper reductions. Options to manage cost uncertainty without compromising long-term emission reduction goals.
- Domestic policies such as domestic emissions trading systems or crediting mechanisms are needed to enhance the participation of the private sector in the international carbon market. These domestic systems or schemes also determine the extent of coverage of the carbon market and the number of sources that face a common price signal.
- In order for the carbon market to impact investment decisions, there must be some assurance that there will be a value for emission reductions beyond 2012. Since the value of the commodity traded in the international carbon market is entirely based on policies adopted by governments, the market requires a clear signal on the longevity of the limitation and reduction targets by policy makers.

The EU's decision to continue the EU ETS beyond 2012 shows there is little certainty about the path that international climate change policies will take. Countries may want to consider whether and how an early signal might be provided.

Glossary

AAU	Assigned Amount Units
AB 32	Assembly Bill 32: California's Global Warming Act
ACG	Asia Carbon Group
ACR	American Carbon Registry
ACX	Australian Climate Exchange
ACX	Asia Carbon Exchange

AES	AES Corporation
BoNY	Bank of New York Mellon
CAR	Climate Action Reserve (also known as The Reserve)
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CCB	Climate, Community, and Biodiversity Standards
CCBA	Climate, Community, and Biodiversity Alliance
CCFE	Chicago Climate Futures Exchange
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFC	Chlorofluorocarbon
CFI	Carbon Financial Instrument (unit of exchange on CCX)
CFS	Carbon Fix Standard
CFTC	Commodities Futures Trading Commission
CO_2	Carbon dioxide
CPRS	Carbon Pollution Reduction Scheme (Australia)
CRT	Climate Reserve Tonne
ECCM	Edinburgh Centre for Carbon Management
ECIS	European Carbon Investor Services
ECX	European Climate Exchange
EPA	US Environmental Protection Agency
EPA CL	US Environmental Protection Agency Climate Leaders
ERT	Environmental Resources Trust
ETS	Emissions Trading Scheme
EUA	European Union Allowance
EU ETS	European Union Emission Trading Scheme
ERU	Emission Reduction Unit
FINRA	Financial Industry Regulatory Authority
FTC	US Federal Trade Commission
GE	General Electric
GF	Greenhouse Friendly
GHG	Greenhouse Gas
GS	Gold Standard
GWP	Global warming potential
HFC	Hydrofluorocarbon
IIED	International Institute for Environment and Development
ISO	International Standards Organization
JI	Joint Implementation
KWh	Kilowatt-hour
LULUCF	Land Use, Land Use Change and Forestry
MAC	California Market Advisory Committee
MGGRA	Midwestern GHG Reduction Accord
$MtCO_2e$	Millions of tonnes of carbon dioxide equivalent

MW	Megawatt
MWh	Megawatt-hour
NGAC	New South Wales Greenhouse Abatement Certificate
NGO	Non-governmental Organization
NOx	Nitrogen oxides
N2O	Nitrous oxide
NREL	US National Renewable Energy Laboratory
NSW GGAS	New South Wales Greenhouse Gas Abatement Scheme
OTC	Over-the-Counter (market)
RE	Renewable energy
REC	Renewable Energy Credit
REDD	Reducing Emissions from Deforestation and Degradation
RGGI	Regional Greenhouse Gas Initiative
SGER	Specified Gas Emitters Regulation
SO2	Sulfur dioxide
tCO_2e	Tonne of carbon dioxide equivalent
TREC	Tradable renewable energy credit
XXX	The Reserve Climate Action Reserve
UNFCCC	United National Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Units
VER	Verified (or Voluntary) Emission Reduction
VERR	Verified Emission Reductions-Removals
VOS	Voluntary Offset Standard
WBCSD	World Business Council for Sustainable Development
WCI	Western Climate Initiative
WRI	World Resources Institute
WWF	World Wildlife Fund

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