Carbon and Land-Use:

The Economies of Cocoa, Timber and Agriculture

THE KATOOMBA GROUP'S
Ecosystem Marketplace

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Introduction

Over the past three years, the term 'REDD' (reduced emissions from deforestation and degradation) has risen from obscure acronym to hot-button issue for policymakers, conservation groups, investors and academics across the globe, with good reason. According the Intergovernmental Panel on Climate Change (IPCC), land use change accounts for approximately 20% of global greenhouse gas emissions—more emissions than the transportation sector world-wide. Most of these emissions are the result of deforestation driven by demand for agriculture and timber. In response to rapid deforestation, stakeholders are aggressively sculpting policy and market tools to incentivize REDD or 'avoided deforestation' projects.

REDD offsets have become a hot issue in the debate over both international and emerging domestic regulated systems — both in the US and the EU — and a clear consensus has emerged around a phased approach that begins with capacity-building, moves into government financing, and culminates with direct payments for forest saved.

These direct payments, however, will not begin flowing under compliance schemes for years — possibly not before 2020. That leaves the voluntary carbon markets as not only a testing ground for the development of REDD carbon credits, but also a means of generating immediate action.

This publication is designed to introduce practitioners to the carbon markets, in particular the voluntary markets, and the current climate for reforestation, afforestation and REDD projects generating carbon credits. It is a collection of articles and one book chapter commissioned by the Ecosystem Marketplace (www.ecosystemmarketplace.com).

The Ecosystem Marketplace is a web-based, non-profit information service created to help spur the development of environmental markets worldwide. It is a leading source of information on markets and payments for ecosystem services such as water quality, carbon sequestration, and biodiversity. The organization is built on the belief that by providing reliable information on prices, regulation, science, and other market-relevant factors, markets for ecosystem services will one day become a fundamental part of our economic system, helping give value to environmental services that, for too long, have been taken for granted. The Ecosystem Marketplace is a project of the DC- based non-profit Forest Trends.

These articles were compiled to serve as context and provide background for the Ghana Katoomba conference, held in Accra, Ghana, on October 6-7, 2009. The conference is the fifteenth in a series of Katoomba conferences designed to stimulate and strengthen environmental markets around the world.

Launched in Katoomba, Australia, in 1999, the Katoomba Group is an international working group composed of leading thinkers and practitioners from academia, industry and government, all committed to enhancing the integrity of ecosystems through market solutions that are efficient, effective and equitable. The group is a sister project of the Ecosystem Marketplace and is also sponsored by Forest Trends.

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Bird's Eye View:
An Introduction to the Carbon Markets

The Big Picture: Chapter 1 of *Voluntary Carbon Markets*, 2nd edition: A Business Guide to What They Are and How They Work

by Ricardo Bayon, Amanda Hawn, and Katherine Hamilton

December 2006 | In 2005, Kerry Emanuel, a professor of atmospheric science at MIT, published a controversial paper in Nature linking global warming with the rising intensity of hurricanes. (Emanuel, 2005) The paper relied on historical records showing the intensity of Atlantic storms had nearly doubled in 30 years. What caught people's attention, however, was not this alarming statistic, but rather that it was released just three weeks before Hurricane Katrina displaced 1 million people and left an estimated 1,836 dead.

For hurricane watchers, 2005 was indeed a year for the record books. A startling number of hurricanes hit the Gulf of Mexico, causing over US$100 billion in damages. The 2004 hurricane season was a bit less horrific in terms of raw numbers, but what it lacked in quantity, it made up for in oddity. The year was marked by an event some believed to be a scientific impossibility — a hurricane in the southern Atlantic Ocean. For over 40 years, weather satellites circling the globe have seen hurricanes and cyclones in the northern Atlantic, and on both sides of the equator in the Pacific, but never in the southern Atlantic — until 2004. On 28 March, Hurricane Katrina slammed into Brazil, suggesting that recent weather patterns are starkly different from those of the 20th century.

What is going on? Are these freak occurrences or signs of something bigger?

In 2008, Kerry Emanuel again sought answers to these questions. This time, however, the team of scientists he led used a completely different approach. Instead of using historical records, they worked with Global Circulation Models that scientists around the world now use to help forecast the effects of climate change under different conditions. The models, says Emanuel, do not explain the real world pattern perfectly, but they do show one thing without a doubt: "The idea that there is no connection between hurricanes and global warming, that's not supported." (Emanuel et al, 2008).

While there is no level of data or anecdote that that will satisfy hardened skeptics, many scientists now believe, like Emanuel, that the increasing intensity of storms over the Atlantic are merely symptoms of a bigger problem: global climate change. As the Earth's average temperature grows warmer, they say, atmospheric and oceanic patterns are beginning to shift, fueling increased storms and unusual weather events.

Temperatures at the planet's surface increased by an estimated 1.4 degrees Fahrenheit (°F) (0.8 degrees Celsius (°C)) between 1900 and 2005. The past decade was the hottest on record during the last 150 years, with 2005 being the warmest year on record (NASA, 2007).

Again, skeptics argue that this is part of the natural variability in the Earth's temperature, but the majority of scientists now agree that it is more likely due to increased concentrations of heat-trapping greenhouse gases (GHGs) in the atmosphere. The U.S. National Oceanic and Atmospheric Administration (NOAA) reported that carbon dioxide (CO_2), the most common

GHG, is increasing at ever faster rates. Between 1970 and 2000, CO_2 concentrations rose at an average annual rate of 1.5 parts per million (ppm). That average has ticked upward to 2.1 ppm since 2000, and in 2007 the mean growth rate was 2.14 ppm. Atmospheric CO_2 levels are now higher than they have been for at least the last 650,000 years. (NOAA, 2008)

Box 1.1 A Look at the Science

Prior to the industrial revolution of the 18th and 19th centuries, the atmospheric concentration of carbon dioxide (CO_2) was approximately 280 parts per million (ppm). Today, the atmospheric concentration of CO_2 has risen to 387 ppm (NOAA, 2008), largely because of anthropogenic emissions from the burning of fossil fuels used in transportation, agriculture, energy generation and the production of everyday materials. The loss of natural carbon sinks (places where carbon is pulled out of the atmosphere and trapped either in geological formations or in biological organisms) — on land and in the ocean — is also contributing to increased levels of carbon dioxide in the atmosphere.

The rapid rise in concentration of CO_2 in the atmosphere concerns scientists because CO_2 is a greenhouse gas. GHGs allow sunlight to enter the atmosphere, but they keep the heat released from the Earth's surface from getting back out.

While recent trends show a gradual warming trend of the Earth's surface, some scientists fear future climate change will not be linear.

'The Earth's system', says Wallace Broecker, Newberry Professor of Earth and Environmental Sciences at Columbia University, 'has sort of proven that if it's given small nudges, it can take large leaps. By tripling the amount of carbon dioxide in the atmosphere, we are giving the system a huge nudge' (Hawn, 2004).

The 'large leaps' to which Broecker refers are better known as 'abrupt climate changes' in the world of science. Over the course of thousands of years, such changes have left geological records of themselves in ice cores and stalagmites. These records show that past temperature swings on our planet have been as large as 18°F (7.8°C) and have occurred over time scales as short as two years.

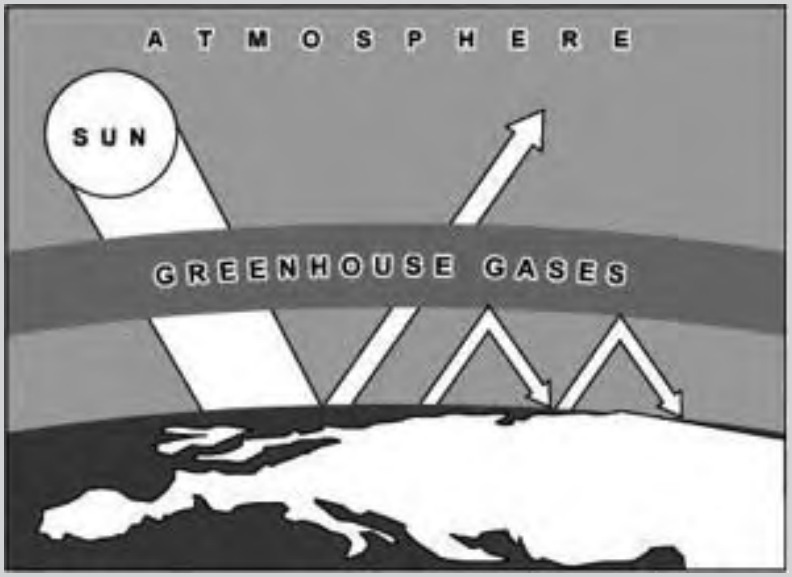
Using the analogy of a car moving along an unknown road at night, Klaus Lackner, a geophysicist at Columbia University, argues that our incomplete understanding of the natural system is no excuse for delaying action: 'We sort of vaguely see in the headlights a sharp turn. There are two possibilities.

You can say: 'I'm going to ignore that and keep going at 90 miles an hour because you cannot prove to me that the curve is not banked and therefore I might make it...or you can put on the brakes' (Hawn, 2004).

Noting that there could be an oil slick and no bank to the road, Lackner says the good news is that we have the technology to put on the brakes. He adds, however, that if we want to stabilize the amount of CO_2 in the atmosphere at double the natural level (roughly 500ppm, which still might leave us with an ice-free Arctic

Ocean), we have to start now (Hawn, 2004). The most recent report from the Intergovernmental Panel on Climate Change (IPCC) concluded that "greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century" (IPCC, 2007).

Figure 1.1 The greenhouse effect



Source: Pew Center on Global Climate Change. (2001) ' The greenhouse effect,' in Claussen, E. et al (ed) *Climate Change: Science, Strategies and Solutions*. Boston, MA: Brill Academic Publishers

Market Theory

To start towards stabilized levels of atmospheric CO_2, climate policy makers argue that we not only need to prime the research pump behind clean energy technologies and emission reduction strategies; we also must generate the market pull for them.

Enter the global carbon market. Many think markets for emissions reductions are among the most innovative and cost-effective means society has of creating a market pull for new clean energy technologies while, at the same time, putting a price on pollution and thereby providing incentives for people to emit less.

The theory is that carbon markets are able to achieve this magic because they help channel resources toward the most cost-effective means of reducing greenhouse gas emissions. At the same time, they punish (monetarily) those who emit more than an established quota, and reward (again, monetarily) those who emit less. In so doing, they encourage people to emit less and change the economics of energy technologies, making technologies that emit less carbon more competitive vis-a-vis their carbon-intensive counterparts.

There is other magic at work as well. By turning units of pollution into units of property, the system makes it possible to exchange pollution from Cape Town with pollution from Cape Cod. If business managers find reducing their company's emissions too costly, they can buy excess reductions from a facility where reductions are less expensive. The bigger the market, the theory goes, the greater the likelihood that efficiencies will be found.

By aggregating information about the value of carbon allowances, the market is sending signals to potential polluters. In a world where pollution has no price, the default decision will always be to pollute, but in a world where pollution has a financial cost, the decision is no longer easy. In today's European emissions market, for instance, emitting 1 tonne of CO_2 has in the past cost polluters anywhere from €7.02 up to €32.85. Polluters

suddenly must consider a new suite of options: do they accept the cost of added pollution, change fuel mixes or simply conserve energy?

Once markets take shape, emitters have a variety of options available to them. If they believe they can reduce emissions cheaply by changing production processes or experimenting with new technologies, they have an incentive to do so. If they believe they can change their production process, but that this will take time, emitters can purchase credits up front in the hopes that they will be able to make them back through the use of emissions reduction technologies down the line. If, on the other hand, emitters believe they will emit more in the long run, they can buy credits now (or options on credits once secondary markets develop) for use later. In short, the system enables the trading of emissions across temporal as well as geographic boundaries — a basic benefit of markets.

The market-based approach also allows other, third-party players such as speculators to enter the fray. By agreeing to take on market risks in exchange for possible paybacks, speculators assume the risks that others are either unwilling or unable to shoulder. Other interested parties also can get involved. If, for example, an environmental group wants to see emissions decrease below a regulated target, they can raise money to buy and retire emissions allowances. This drives up the cost of emissions and can force utilities to become more efficient.

It is, of course, important to note that some people dispute the net gain of this approach, and others feel that markets allow companies to 'greenwash' previously tarnished environmental reputations without changing their behaviour in important ways. 'Carbon offsets are based on fictitious carbon accounting, and can by themselves not make a company carbon neutral,' argues Larry Lohmann of The Corner House, a UK-based nongovernmental organization (NGO). 'The practice of offsetting is slowing down innovation at home and abroad and diverting attention away from the root causes of climate change' (Wright, 2006).

This debate notwithstanding, experimentation with environmental markets is now widespread. Ever since the US established the first large-scale environmental market (to regulate emissions of gases that lead to acid rain) in 1995, we have seen environmental markets emerging in everything from wetlands to woodpeckers.

Carbon Markets

The term 'carbon market' refers to the buying and selling of emissions permits (rights to pollute) or emissions reductions (offsets) that have been either distributed by a regulatory body or generated by GHG emission reductions projects, respectively. Six GHGs are generally included in 'carbon' markets: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons and perfluorocarbons.

GHG emission reductions are traded in the form of carbon credits, which represent the reduction of GHGs equal to one metric ton (tonne) of carbon dioxide (tCO_2e), the most common GHG. A group of scientists associated with the Intergovernmental Panel on Climate Change (IPCC) has determined the global warming potential (GWP) of each gas in terms of its equivalent in tonnes of carbon dioxide (tCO_2e) over the course of 100 years. For example, methane has a GWP roughly 23 times higher than CO2, so one tonne of methane equals about 23 tCO_2e. Likewise, other gases have different equivalences in terms of tCO_2e, with some of them (perfluorocarbons) worth thousands of tonnes of CO_2e.

Carbon credits can be accrued through two different types of transactions. In project-based transactions, emissions credits are the result of a specific carbon offset project. Allowance-based transactions involve the

trading of issued permits (also known as allowances) created and allocated by regulators under a cap-and-trade regime. In cap-and-trade, the regulatory authority caps the quantity of emissions that participants are permitted to emit and issues a number of tradable allowance units equal to the cap. Participants who reduce their emissions internally beyond required levels can sell unused allowances to other participants at whatever price the market will bear. Likewise, participants who exceed their required levels can purchase extra allowances from participants who outperformed their emissions targets.

Carbon markets can be separated into two major categories: the compliance (or regulatory) and voluntary markets. Because the voluntary market inherently does not operate under a universal cap, all carbon credits purchased in the voluntary market are project-based transactions (with the exception of the Chicago Climate Exchange).

Richard Sandor, a former chief economist at the Chicago Board of Trade, launched 'North America's only voluntary, legally binding rules-based greenhouse gas emission reduction and trading system' in 2003 (www.chicagoclimatex.com). He called the trading platform the Chicago Climate Exchange (CCX).

The Exchange refers to the carbon credits it trades as carbon financial instruments (CFIs, also measured in tCO_2e) and restricts trading to members who have voluntarily signed up to its mandatory reductions policy. During the pilot phase (2003–2006) members agreed to reduce greenhouse gas emissions 1 per cent a year from a baseline determined by their average emissions during 1998 to 2001 (see www.chicagoclimatex.com). The current goal (Phase II) is for members to reduce their total emissions by 6 per cent below the baseline by 2010. Hence, members who have been participating since the launch of the trading program only need to reduce an additional 2 per cent, while new members need to reduce 6 per cent during this time (Hamilton, 2006).

Like the carbon market in general, CCX trades six different types of GHGs denominated in terms of tCO_2e. Unlike most of the voluntary carbon markets, the majority of trading on CCX is allowance based, rather than project based. In other words, CCX operates as a cap-and-trade system in which members agree to cap emissions at a stated level and then trade allowances with other participants if they are either under or over

Box 1.2 The Chicago Climate Exchange (CCX)

Since its launch in late 2003, CCX has grown in membership from 19 institutions to over 350 institutions. Ford Motor, International Paper, IBM, American Electric Power, the City of Chicago, the State of New Mexico, the World Resources Institute, and Natural Capitalism Inc. are just a few of its wide range of members from the business, governmental and philanthropic sectors. CCX traded 23 million tCO_2e in 2007 for a total value of US$72 million (up from 1.45 million tCO2e in 2005 worth US$2.7 million). Total market value through the first quarter of 2008 was already at US$81 million, suggesting the market is still growing quickly year-after-year (Hamilton et al, 2008).

In 2005, CCX created the European Carbon Exchange (ECX), a wholly owned subsidiary which has since become the largest exchange trading carbon credits on the EU Emission Trading Scheme (see below). Since 2006, CCX and ECX have been owned by Climate Exchange Plc, a publicly traded company listed on the AIM of the London Stock Exchange.

their target. While CCX allows members to purchase offsets as a means of meeting emissions targets, offsets registered on the Exchange have accounted for just 10% of total verified emissions reductions (http://www.chicagoclimatex.com/docs/offsets/General_Offsets_faq.pdf).

Therefore, the majority of the credits are allowance-based credits, created by member companies internally reducing their emissions. When and where offset projects are used, CCX requires that an approved third-party organization verify that the project's emissions reductions are real and that they meet standards set by the Exchange.

Compliance Carbon Markets

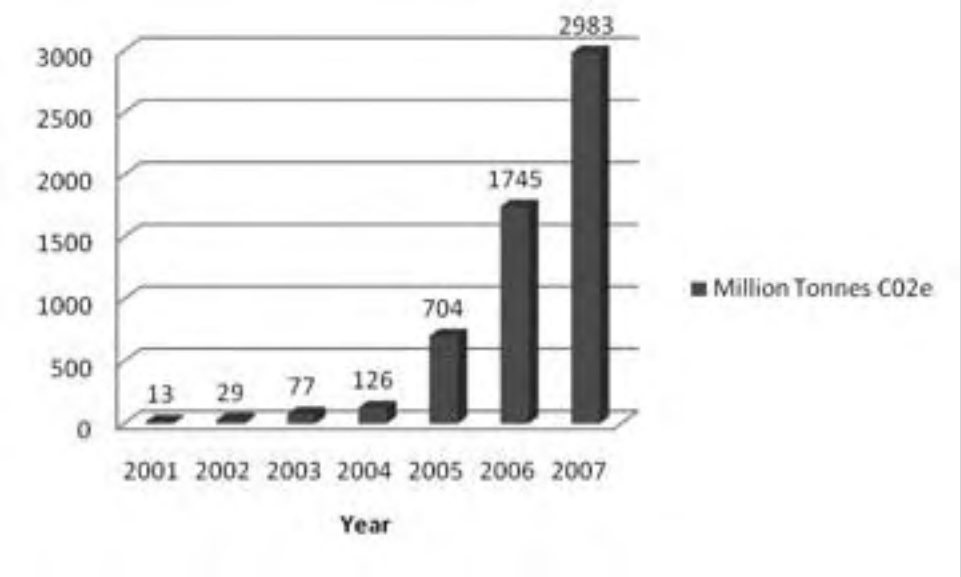
There are now a number of regulated cap-and-trade carbon markets around the world. The Kyoto Protocol underpins in one way or another most of these markets. Ratified by 182 countries, the Protocol is a legally binding treaty committing industrialized countries to reduce their collective GHGs by 5.4 per cent below 1990 levels by 2012. The Kyoto Protocol's authors created three major 'flexibility mechanisms' in order to provide the treaty's signatories with a cost-effective means of achieving their greenhouse gas emission reduction targets. These mechanisms are the basis for the regulated international compliance carbon market, and they are:

- **Emissions trading**: An allowance-based transaction system that enables countries with emissions targets to purchase carbon credits from one another in order to fulfill their Kyoto commitments.
- **Joint Implementation (JI)**: A project-based transaction system that allows developed countries to purchase carbon credits from greenhouse gas reduction projects implemented in another developed country or in a country with an economy in transition (specifically countries of the former Soviet Union). Credits from these JI projects are referred to as Emission Reduction Units (ERUs).
- **Clean Development Mechanism (CDM)**: Another project-based transaction system through which industrialized countries can accrue carbon credits by financing carbon reduction projects in developing countries. Carbon offsets originating from registered and approved CDM projects are known as Certified Emissions Reductions (CERs).

The World Bank estimates that in 2007 buyers contracted for 551 million tonnes (Mt) of CO_2e in the primary Clean Development Mechanism (CDM) market of the Kyoto Protocol. Analysts put the total value of the CDM market (primary and secondary) in 2007 at over US$12 billion. The same year, the Joint Implementation mechanism is believed to have traded only 41 Mt of carbon and have been worth around US$499 million (Capoor and Ambrosi, 2008).

To meet their Kyoto obligations, countries have established (or are establishing) national or regional emissions trading schemes to help them meet their Kyoto targets. For instance, in January 2005, the European Union launched the first phase of the EU Emission Trading Scheme (EU ETS) to help achieve its greenhouse gas emission reductions targets required by the Kyoto Protocol. The EU ETS involves all of the EU's member states and allows limited trading with the three Kyoto mechanisms described above through a linking directive. More specifically, EU members may trade allowances (known as EU emissions allowances, or EUAs) with one another, or they may buy and sell carbon credits — ERUs and CERs — generated by Joint Implementation (JI) or Clean Development Mechanism (CDM) projects.

Figure 1.2 Growth in Trading Volume, Global Carbon Market



Note: The launch of the European Union's Emission Trading Scheme in 2005 drove huge expansion in the global carbon market in 2005 (Capoor and Ambrosi, 2008; Capoor and Ambrosi, 2006; Lecocq and Capoor, 2005).

By the end of its first year of trading, the EU ETS had transacted an estimated 362 million tonnes (Mt) of carbon credits, worth approximately €7.2 billion (or US$9 billion) (Point Carbon, 2006; Capoor and Ambrosi, 2006). By 2007, the EU ETS had traded over 30 billion tonnes of carbon credits.

Outside of Europe, regulated emissions trading schemes related to the Kyoto Protocol have not developed as quickly. Japan and Canada ratified the treaty, and Japanese companies, in particular, have been active buyers of carbon credits on the CDM market, but neither country has launched a regulated emissions trading scheme of its own. The Japanese government has a government-mediated

voluntary market for carbon and is in the process of setting up a national scheme, as is New Zealand, while the Canadian government has indicated that the country is not likely to meet its Kyoto targets and has talked of scrapping plans for a national emissions trading scheme. At the same time, several Canadian provinces have opted into the Western Climate Initiative, a voluntary trading program with western US states set to begin trading in 2010.

The explosive growth of the global compliance carbon market under the Kyoto Protocol has meant that prices for carbon credits have been extremely volatile, with carbon trading anywhere from €7 to €32 a tonne (Point Carbon). Despite this volatility, carbon markets around the world have matured, and in 2008, the global carbon market was valued at a whopping US$64 billion (€47 billion),

As regulators and participants refine their approaches to allocating and trading carbon credits, new investment vehicles and emissions reduction strategies are emerging. The World Bank estimated that the total capitalization of carbon investment vehicles could top US$13 billion in 2008 (Capoor and Ambrosi, 2008).

A short section from the World Bank's State and Trends of the Carbon Market 2008 report suggests the level of sophistication to which the compliance carbon market has evolved and matured:

> *Financial institutions have entered the carbon world acquiring pioneering carbon aggregators and building a base for origination of carbon assets globally. An increasing number of carbon contracts and carbon-based derivatives are becoming available. Specialized companies and institutions have sprung up to service several aspects of the carbon value chain; some have begun to pair carbon finance with more traditional skills found in other commodity markets.*
>
> *Several dedicated funds focusing on developing and participating in greenfield projects have been launched (i.e., these funds are either partially replenished with carbon revenue streams or account with the sale of the credits to meet investor expectations of return). Large international banks have established structured origination teams to pick up principal positions in carbon-rich projects and have set up carbon trading desks, seeking arbitrage opportunities. Financial institutions offer products that reduce or transfer risk, for instance by offering delivery guarantees for carbon assets in the secondary market.*

Echoing the World Bank's analyses over the years, Annie Petsonk, international counsel for Environmental Defense's Global and Regional Air Program, says she is particularly pleased with some of the innovations triggered by the CDM. Petsonk says people, inspired by the active market in Europe, are now pouring money into new clean technologies in the hopes of capitalizing on a perceived first-mover advantage. Indeed, the European experience with carbon trading suggests that large-scale environmental markets are not only feasible, but also are capable of changing the way businesses relate to environmental issues (Kenny, 2006). Challenges remain, however, and the first half of 2008 has seen a growing spread between EU allowances and CERs from the CDM, driven largely by uncertainty over the future of the CDM market in a post-2012 international climate change agreement (Capoor and Ambrosi 2008).

Movement in the US

The United States did not ratify the Kyoto Protocol, and the federal government does not currently regulate carbon dioxide (CO_2) or any other GHGs regulated under Kyoto as climate change-related pollutants. Having ratified the Montreal Protocol, the US does regulate ozone depleting GHGs, such as Chlorofluorocarbons (CFCs), which are being phased out entirely on the international scale.

To compensate for the lack of national CO_2 regulation, several states have initiated their own regulations alone or in conjunction with others. Legislation is quickly evolving at the national and multi-state levels as more states step up to the plate on climate legislation and members of Congress announce new legislative proposals on a monthly basis. As of March 2008, legislators in the 110th US Congress introduced more than 195 bills, resolutions, and amendments addressing climate change (Pew Center on Global Climate Change, 2008). Currently, GHG emissions markets exist or may soon exist under a handful of regimes, profiled below.

In 1997, Oregon enacted the Oregon Standard, the first regulation of CO_2 in the United States. The Oregon Standard requires that new power plants built in Oregon reduce their CO_2 emissions to a level 17% below those of the most efficient combined cycle plant, either through direct reduction or offsets. Plants may propose specific offset projects or pay mitigation funds to The Climate Trust, a non-profit created by law to implement projects that avoid, sequester, or displace CO_2 emissions (The Climate Trust, 2008).

On the East Coast, ten states (Connecticut, Delaware, Maryland, Massachusetts, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) have developed the Regional Greenhouse Gas Initiative (RGGI), a regional strategy to reduce CO_2 emissions utilizing a cap-and-trade system. Although RGGI will not officially launch until January 2009, the first auction of emission permits is set for September 2008 and brokers report that forward transactions are already taking place on this market. Member states anticipate auctioning close to 100% of their annually allocated allowances, which represent approximately 171 $MtCO_2e$ per year. The emissions cap will initially apply to power plants in member states that use fossil fuels to generate over half their electricity and have energy production capacities above 25 MW. The cap‘s applicability is much broader for power plants that commenced operations after 2004, and includes power plants with fossil fuels constituting over 5% of their annual total heat input (RGGI, 2007). The program may be extended to include other GHGs, as well as offsets from projects and project-based transactions. Member states have agreed to allocate the revenues of at least 25% of allowances to consumer benefit programs. States maintain autonomy over allocating the remaining 75% of allowances (RGGI, 2007).

RGGI has a sliding scale that permits the use of flexible mechanism credits based on market prices: the lower the price of emissions reduction credits, the more restrictive the use of those credits. If the average price of credits across the United States remains under $7/short tCO_2e (as opposed to a metric tonne), the scheme only allows participants to cover up to 3.3% of their emissions using credits from emissions reduction projects, which must be located within the United States. If the average price in the US goes above $7/short tCO_2e, offsets can be used for up to 5% of emissions, and if prices rise above $10/ short tCO_2e, participants can use offsets for 10% of their emissions. Under this last scenario, offsets may be used from US-based projects as well as from the EU ETS and the Kyoto Protocol‘s CDM (RGGI, 2007).

California‘s Global Warming Solutions Act (AB 32) is the first US state-wide program to cap all GHG emissions from major industries and to include penalties for non-compliance. Under the Act, California‘s State Air Resources Board (CARB) is required to create, monitor, and enforce a GHG emissions reporting and reduction program. The California Market Advisory Committee (MAC) was created in December 2006 to provide recommendations on the implementation of the Act. In the implementation of AB 32, Governor Schwarzenegger authorized CARB to establish market-based compliance mechanisms to achieve reduction goals. The MAC‘s current recommendations include: the eventual incorporation of all GHG-emitting sectors of the economy into the cap-and-trade system; a first-seller approach whereby responsibility is assigned to the utility that initially sells electricity into the state; an allocation design that combines free and auctioned pollution permits, with the amount being auctioned increasing over time, and the promotion of linkages with other emerging cap-and-trade systems (CalEPA, 2007).

wwwThe Western Climate Initiative (WCI) includes California and five other states (New Mexico, Oregon, Washington, Arizona, and Utah) as well as three Canadian provinces (British Columbia, Manitoba, and Quebec). It was formed in February 2007, and member states have committed to a 15% GHG emissions reduction goal below a 2005 baseline by 2020. In mid-2008, the WCI released its Draft Design Recommendations and Draft Essential Requirements for Reporting, and plans to launch a cap-and-trade

program in 2012. WCI intends to begin mandatory measuring and monitoring of emissions in 2010 for all regulated entities, and reporting of emissions in early 2011.

A third regional cap-and-trade program is also in the making: the Midwestern Regional GHG Reduction Program (MRP). This program consists of the following members: Iowa, Illinois, Kansas, Minnesota, Wisconsin, Michigan, and Manitoba (Canada). The Midwestern Greenhouse Gas Accord was signed in November 2007, and aims to incorporate an approximate emissions target of 16% below 2005 levels. The program is scheduled to start in 2012 and will incorporate a regional cap-and-trade system covering most sectors of the economy. The scheme aims to cover approximately 1,107MtCO_2e per year by 2012 and is slightly larger than the WCI (Hamilton et al, 2008).

Australia's Pioneers

While Europe's compliance carbon market clearly leads the world in terms of sophistication and scale, it is worth noting that the state of New South Wales (NSW) in Australia launched the NSW Greenhouse Gas Abatement Scheme on January 1, 2003, two years before the first trade ever took place on the EU ETS.

The New South Wales (NSW) Greenhouse Gas Abatement Scheme (GGAS) is a mandatory, state-level cap-and-trade program designed to reduce greenhouse gas emissions associated with the production and use of electricity, and to develop and encourage activities to offset the production of greenhouse gases. Legislators set the target at 8.65 tonnes of carbon dioxide equivalent per capita in 2003, decreasing by about 3 per cent each year through 2007, when it became and will remain at 7.27 tonnes (http://www.greenhousegas.nsw.gov.au). It requires individual electricity retailers and certain other parties who buy or sell electricity in NSW to meet mandatory benchmarks based on the size of their shares of the electricity market.

If a regulated emitter exceeds its target, it has the choice of either paying a penalty of AU $11.50 (about US$9) per tCO_2e or purchasing New South Wales Greenhouse Abatement Certificates (NGACs), which are generated by emissions abatement projects carried out within the state. NGACs can be generated by approved providers with projects that lead to low emissions electricity generation, improved energy efficiency, biological CO_2 sequestration, or reduced onsite emissions not directly related to electricity consumption. The initiative does not accept credits, such as CERs or ERUs, from outside of the state. The NSW GGAS traded some 25 million certificates in 2007 for a total market value of US$224 (€164 million) (Hamilton et al, 2008).

According to the World Bank, outside of the Kyoto markets, the NSW GGAS is the world's largest, regulated cap-and-trade GHG market, with about 25.41MtCO_2e traded in 2007 and an estimated value of US$224.10 million (Capoor and Ambrosi, 2008). After years of holding out, Australia ratified the Kyoto Protocol in 2007, soon after the inauguration of new Prime

Minster Kevin Rudd. According to the current government, a national emissions trading scheme will be launched in Australia no later than 2010 (Capoor and Ambrosi, 2008).

Unfortunately, the emission reductions driven by current state and regional schemes in Australia and the US are tiny compared to those mandated by the Kyoto Protocol, and the emission reductions driven by the Kyoto Protocol are tiny compared to those scientists deem necessary. Throw in other non-market-based reduction strategies around the world and Mark Kenber, head of policy strategy at The Climate Group in London, says, 'The policies that we see around the world are nowhere near what the science suggests we need.'

Thin End of the Wedge

Guy Brasseur, head of the Hamburg-based Max Planck Institute for Meteorology,echoed Kenber's comments when he told the European Parliament in November of 2005, 'Kyoto won't be enough.'

'Emissions,' said Brasseur, 'will need to fall by 80 or 90 per cent, rather than five or 10 per cent, to have an effect on the models. In terms of a response, Kyoto is only a start' (Kenny, 2006).

In the absence of a much larger global effort to reduce greenhouse gas emissions, models suggest the amount of carbon dioxide trapped in the atmosphere will double within the next 50 years and quadruple by the turn of the century. According to Professor Steve Pacala, head of Princeton University's Carbon Mitigation Initiative, that would 'bring out the monsters behind the door' — melting the Greenland ice cap, washing away coastal cities, spreading famine, and intermixing hurricanes with prolonged droughts (Kenny, 2006).

While scientists cannot say how many gigatonnes of carbon dioxide emitted into the atmosphere will produce how many degrees of warming, they do agree that roughly seven billion tons — seven gigatonnes — of carbon dioxide emissions must be prevented from entering the atmosphere during the next 50 years in order to stabilize the concentration of carbon dioxide in the atmosphere at 500ppm. Pacala slices a metaphorical emissions pie into seven wedges in order to demonstrate how the world might achieve a seven-gigatonne cut (Pacala and Socolow, 2004). With each wedge representing one gigatonne of carbon dioxide emissions, Western Europe's emissions comprise about one seventh of the pie. In other words, if the ETS meets its current targets and then extends them for the next four decades, it would remove only one wedge of the pie (Kenny, 2006).

The current carbon market, it seems, represents only the very thin end of the wedge when it comes to combating climate change. Fortunately, however, wedges sometimes work like levers. Recognizing the need for increased action, some institutions and individuals have undertaken voluntary commitments to minimize (or even neutralize) their contribution to climate change by offsetting their emissions through investments in projects that either remove an equivalent amount of carbon dioxide from the atmosphere, or prevent it from being emitted in the first place. Hundreds of companies — ranging from Google to General Electric — have now incorporated the idea of carbon offsetting into corporate sustainability plans, spawning voluntary markets worth an estimated $331 million in 2007 (Hamilton et al, 2008).

Much like the credits traded in a regulated cap-and-trade scheme, voluntary offset projects generate credits equal to the removal or avoided emission of one tonne of carbon dioxide. Institutions voluntarily purchasing credits either have set caps on themselves, such as a 10 per cent reduction below 1990 levels, or have decided to offset some or all of the emissions related to their activities. Institutions claiming to have offset their greenhouse gas emissions must retire credits purchased. As in a compliance market, carbon credits in a voluntary market ideally allow actors to reduce emissions at least cost.

Voluntary Carbon Markets

Voluntary carbon markets are nothing new; in fact, they pre-date all regulated carbon markets. The world's first carbon offset deal was brokered in 1989 (long before the Kyoto Protocol was signed, let alone ratified), when AES Corp., an American electricity company, invested in an agro-forestry project in Guatemala (Hawn, 2005).

Since trees use and store carbon as they grow (an example of carbon sequestration), AES reasoned it could offset the GHGs it emitted during electricity production by paying farmers in Guatemala to plant 50 million pine and eucalyptus trees on their land (Hawn, 2005). AES, like other companies since, hoped to reduce its 'carbon footprint' for philanthropic and marketing reasons, not because it was forced to do so by legislation or global treaty. The deal thus was voluntary, marking the beginning of a voluntary carbon market that remains as controversial and interesting today as it was in 1989.

Unlike the regulated markets, the voluntary markets do not rely on legally mandated reductions to generate demand. As a result, they sometimes suffer from fragmentation and a lack of widely available impartial information. The fragmented and opaque nature of the voluntary markets can, in large part, be attributed to the fact that they are composed of deals that are negotiated on a case-by-case basis, and that many of these deals neither require the carbon credits to undergo a uniform certification or verification process nor register them with any central body. As a result, there are as many types of carbon transactions on the voluntary markets as there are buyers and sellers; a variety of businesses and non-profits based on different models sell a range of products, certified to a wide array of standards.

The lack of uniformity, transparency and registration in the voluntary markets has won them a great deal of criticism from some environmentalists who claim that they are a game of smoke and mirrors rather than an engine of actual environmental progress. Many buyers also say they are wary of the voluntary carbon markets because transactions often carry real risks of non-delivery. Some companies buying carbon credits also fear that they will be criticized by non-governmental organizations (NGOs) if the carbon they are buying isn't seen to meet the highest possible standards.

Of concern to environmentalists and buyers, alike, is the fact that the voluntary carbon markets' lack of regulation may mean they cannot reach the scale necessary to impact the problem. Because they lack a regulatory driver, demand for credits can be fickle. The sudden explosion of the Kyoto-driven carbon markets in 2005 shows the difference that regulation can make. Clearly, regulation is key to driving large-scale demand. 'The voluntary credit market could grow by an order of magnitude or two orders of magnitude and it's still not going to impact the problem,' explains Mark Trexler, Director of EcoSecurities Global Consulting Services (Trexler, 2006).

Despite the shortcomings of the voluntary markets, many feel they are fast-evolving arenas with some distinct and important advantages over the regulated carbon markets. For example, while the wide range of products emerging from the voluntary markets can be confusing to potential buyers, these products can also be highly innovative and flexible. Numerous suppliers say they benefit from this flexibility and the lower transaction costs associated with it.

For example, getting a carbon offset project approved by the CDM Executive Board under the Kyoto Protocol costs up to US$350,000 (Kollmuss et al, 2008). By the time the United Nations CDM Executive Board finally registers a typical small-scale CDM project (essentially creating the CER that can be sold on the CDM markets), the United Nations Development Programme (UNDP) calculates that the project's total up-front costs will account for 14–22 per cent of the net present value of its revenue from carbon credits (Krolik, 2006). For many projects, coming up with the start-up capital to register a project for the compliance carbon market is prohibitively difficult. The voluntary carbon markets, on the other hand, don't have these sorts of transaction costs. They can avoid 'bottlenecks' in the CDM methodology approval process and obtain carbon financing for methodologies that aren't currently 'approved' by the CDM Executive Board.

For example, the Nature Conservancy is working towards obtaining carbon financing for forest protection projects (which in Kyoto parlance is referred to as 'avoided deforestation'), a concept not currently approved to produce carbon credits under the CDM process.

The innovation, flexibility and lower transaction costs of the voluntary carbon markets can benefit buyers as well as suppliers. When an organization purchases carbon offsets to meet a public relations or branding need, creativity, speed, cost-effectiveness and the ability to support specific types of projects (e.g. those that also benefit local communities or biodiversity) can often be clear and valuable benefits.

Having weighed such pros and cons, many non-profit organizations are supportive of the voluntary carbon markets because they provide individuals — not just corporations and large organizations — with a means of participating in the fight against climate change in a way that the compliance markets do not. In particular, some environmentalists view the voluntary carbon markets as an important tool for educating the public about climate change and their potential role in addressing the problem. Some sellers and buyers of carbon credits prefer the voluntary carbon markets precisely because they do not depend on regulation.

In 2007, a range of articles in the mainstream press highlighted various issues related to offset quality in the voluntary carbon markets. In response, suppliers embraced a range of tools for producing high quality credits and proving their legitimacy, notably standards and registries, which are discussed in more detail in Chapter 2. As the international political community struggles to implement an effective climate change framework, these infrastructural developments, coupled with the tremendous growth in the voluntary carbon market over the last several years, indicate that the voluntary carbon markets collectively have the potential to become an active driver of change today — not ten years from now.

A More Formal Affair

Be they fans or critics, experts agree that the voluntary carbon markets are in a critical period. Spurred by the success of the regulated carbon markets, the voluntary markets are formalizing, as investors who cut their teeth on the regulated markets look for other places to put their money, and as buyers and sellers consolidate around a few guiding practices and business models from which conclusions can be drawn about market direction and opportunities.

Table 1.1 Voluntary carbon markets size

Year	Voluntary Markets' Volume (millions tonnes/yr)
Pre 2002	38
2002	10
2003	5
2004	11
2005	11
2006	25
2007	65
2008 (est.)	148

Source: Ecosystem Marketplace/New Carbon Finance, 2008

Although nobody has exact numbers on the size of the global voluntary carbon markets, most think they have grown rapidly in the last two years. In their State of the Voluntary Carbon Markets 2008 report, Ecosystem Marketplace and New Carbon Finance were able to track the transaction volumes presented in Table 1.1 (below), though the actual number of transactions is certain to be significantly greater.

Table 1.2 Standards in the Voluntary Carbon Markets

Standard	Description	Env. & Social Benefits	Reporting/ Registration	Includes LULUCF Method'y?	Geographical Reach	Start Date	Projects/ Credits Verified
Gold Standard for VERs	Certification for offset projects & carbon credits	Yes	VER registry in development	RE & EE projects	International	1st validated 2006, 1st verified 2007	10 VER projects verified
The VCS	Certification for offset projects & carbon credits	No	Use Bank of New York; other registry TBD	Yes, Methodologies TBD	International	Expected mid-2007	Unknown
Green-e Climate	Certification program for offset sellers	No	Registry Incorporated	Accepts other standards with LULUCF	Aimed at N.A., International possibilities	Expected mid-2007	3 companies
CCB Standards	Certification program for offset projects	Yes	Projects on Website	Only LULUCF	International	1st project certified in 2007	9 projects
CCX	Internal system for CCX offset projects & CCX carbon credits	No	Registry Incorporated w/ trading platform	Yes	International	2003	28Mt CFI's registered.
Plan Vivo	Guidelines for offset projects	Yes	No	Community based agro forestry	International	2000	3 projects
Greenhouse Friendly	Certification program for offset sellers & carbon neutral products	No	No	Yes	Australia	2001	4,373,877 registered (259,202 in 2007)
CCAR	A Registry Protocol	No	Reporting protocols used as standards	Yes, first protocol	Forestry- California; Livestock- US	1st protocol in 2005	2 projects
VER+	Certification program for offset projects carbon neutral products	No	TÜV SÜV Blue Registry	Includes a JI or CDM meth's	International	Expected launch mid-2007	706,107 VERs registered
ISO 14064	Certification program for emissions reporting offset projects, carbon credits	No	No	Yes	International	Methodology Released in 2006	Unknown
VOS	Certification for offset projects & carbon credits	No	TBD	Follow CDM or JI meth's	International	TBD	Unknown
Social Carbon	Certification for offset projects & carbon credits	No	Creating its own registry system	Reforestation & Avoided deforestation	South America & Portugal	1st Methodology applied in 2002	10 projects representing 350,000 tonnes
DEFRA	Proposed consumer code for offsetting & accounting	No	Does not include a registry	If CDM/ JI approved	UK	TBD	Unknown

While maturing quickly, the voluntary markets remain small, transacting roughly 2% of the volume of the Kyoto markets. Despite the comparatively small scale of the voluntary carbon markets, some investors believe they are poised for explosive growth, and many companies see real business opportunities associated with the creation of carbon-neutral products for retail consumption. If these predictions are to be borne out, most market players think it will be necessary to formalize and streamline the voluntary markets, making them more accessible and gaining the confidence of large institutional buyers in Australia, Europe, Asia and North America.

At present there are several related and unrelated efforts underway to make the voluntary carbon markets more 'investor-friendly' by creating registries, documenting the size of the markets, and standardizing the credits being sold. In the past several years, the standards and registry infrastructure has matured rapidly. For instance, the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) jointly issued the Greenhouse Gas Protocol for Project Accounting (WBCSD/ WRI GHG Protocol) in December 2005. In March of 2006, the International Organisation for Standardisation (ISO) followed up with the ISO 14064 standards for greenhouse gas accounting and verification. Several other standards have become major sources of certification in the last couple of years, including VER+, the Voluntary Carbon Standard, and the Gold Standard (see Table 1.2).

Building on the establishment of standards, a new feature of the voluntary carbon market infrastructure is sprouting up across the globe: carbon credit registries. These registries are designed to track credit transactions and ownership as well as reduce the risk that a single credit can be sold to more than one buyer. When dealing with a commodity as intangible as a carbon credit, such registries are crucial, but they have not been prevalent in the voluntary markets until recently. Several new registries were launched during the first four months of 2008 alone, including the New Zealand-based registry and exchange TZ1 which was acquired by financial information provider Markit in June of 2009 and rechristened the Markit Environmental Registry, the California Climate Action Registry's Climate Action Reserve, and The Gold Standard's Registry for VERs (the latter two set up by market infrastructure provider APX).

Whatever one's take on the long term prospects of the voluntary carbon markets, it seems clear that in the short term, the markets are evolving quickly, creating new economic and environmental opportunities for investors, businesses, non-profits and individuals. It is therefore important to understand how these markets operate. In the next chapter, then, we will turn our attention to addressing a basic but all-important question: how do the voluntary carbon markets really work?

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This version of Chapter 1 has been slightly modified from the version appearing in the upcoming second edition of the book Voluntary Carbon Markets: An International Guide to What They are and How They Work (scheduled for publication by Earthscan in spring 2009)

Fortifying the Foundation: State of the Voluntary Carbon Markets 2009 Executive Summary

By Katherine Hamilton, Milo Sjardin, Thomas Marcello, and Gordon Xu

Executive Summary

This report was created to answer fundamental questions about the voluntary carbon markets such as transaction volumes, credit prices, project types, locations, and the motivations of buyers in this market. Over the past several years, these markets have not only become an opportunity for citizen consumer action, but also an alternative source of carbon finance and an incubator for carbon market innovation. As the voluntary carbon markets have rapidly gained traction, the answers, to these questions have become increasingly important to investors, policymakers, and environmentalists alike. For example, since the last edition of this report, we have seen various U.S. climate bills make reference to voluntary carbon offset standards, the Japanese government launch a voluntary carbon-offsetting scheme, and the U.K. government issue an official definition of "carbon neutral."

Proving the legitimacy of carbon offset projects remains a major issue in the marketplace, leading to a so-called "flight to quality." Last year saw further establishment and greater functionality of voluntary offset standards; the emergence of new registries; the forging of new partnerships between infrastructure providers; the formation of coalitions to encourage self-regulation; and increased market transparency. At the same time, existing and potential voluntary market consumers became more sophisticated as literature and education around offset quality increased. All of this points to a further maturation of the market in 2008. However, at the same time, the voluntary carbon markets, like any other commodity market, were not immune to the over-arching forces of the economy and regulatory developments.

Below we outline the aggregated results of our survey of the State of the Voluntary Carbon Markets in 2008. For the analysis of the "over-the-counter" (OTC) side of the voluntary carbon markets, we obtained data from over 182 suppliers from 28 different countries involving all stages of the supply chain: developers, aggregators, brokers, and retailers. This report is based on the information collected from these suppliers. Hence, numbers throughout this report may not contain every single OTC transaction in the marketplace and should be considered conservative. Alternatively, all data on the Chicago Climate Exchange (CCX) was obtained directly from the exchange and hence presents a greater degree of completeness.

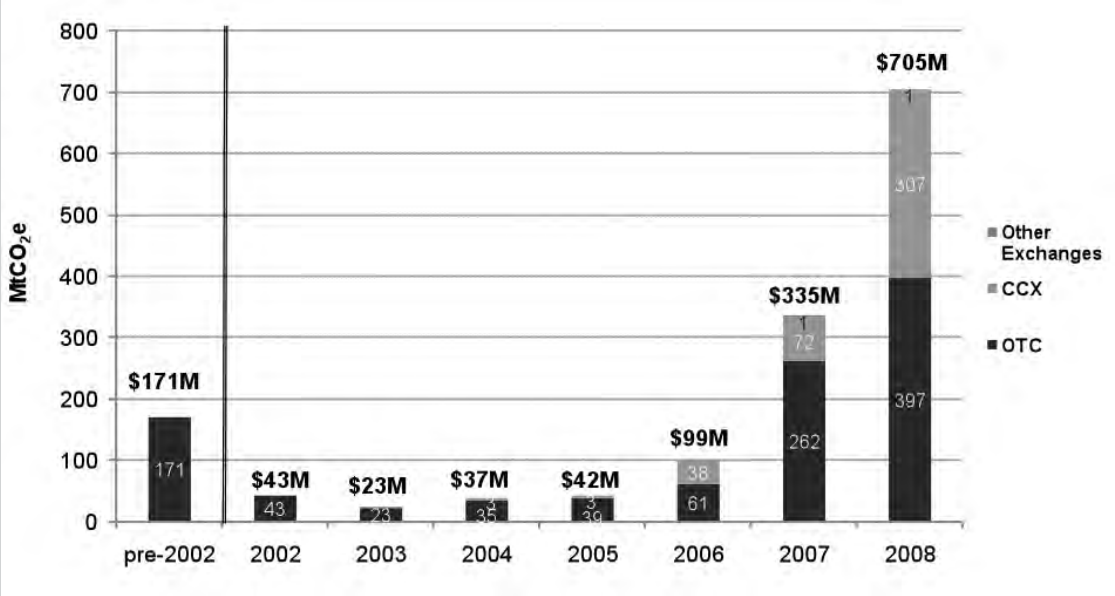
Voluntary Carbon Markets Nearly Doubled in 2008, Reaching 123.4 $MtCO_2e$

We tracked 123.4 million metric tonnes of carbon dioxide equivalent ($MtCO_2e$) transacted in the global voluntary carbon markets in 2008, a near doubling of 2007 transaction volume (87% growth). Of the two main components that comprise the voluntary carbon markets — the CCX and the OTC — the CCX was responsible for the larger share of the market, trading 69.2$MtCO_2e$ (56%) versus 54.0MtCO2e (44%) in the OTC market[1]. Not only was 2008 the first year that the CCX overtook the OTC market in terms of tracked

1 Note that the remaining 0.2 $MtC0_2e$ was traded on other exchanges besides the CCX.

volume, it also overtook the OTC market in terms of growth. CCX trades tripled in 2008 (202%), whereas the OTC market grew by 26% — a clear break from the trend in 2007, when the OTC market tripled, while the CCX only doubled.

Historic Values for the Voluntary Carbon Markets



Source: Ecosystem Marketplace, New Carbon Finance

Where numbers do not add up in this and other tables, values reflect rounded numbers.
Note: Values for years prior to 2006 were derived by using transacted volumes and an average price equal to the 2006 average: $4.1/tCO2e. As the average prices prior to 2006 are not known, this is merely an estimate. Volume for 2007 based on 118 data points.

The strong growth of the CCX in 2008 is attributed to strong trading activity in the first two quarters of the year on the back of introduced climate change legislation in the United States. During the second half of 2008, neither the CCX nor the OTC market was immune to the global recession. Both experienced slower activity in the second half of 2008, as companies turned their attention away from environmental impacts and cut discretionary spending.

Of the 54.0MtCO2e transacted in the OTC market, we were able to confirm that only 12.4MtCO_2e were retired. Retirement is critical in the voluntary markets because it represents the impact of the market from an environmental perspective. Our retirement numbers are particularly conservative given the challenge of confirming the data. However, according to this estimate 23% of the total OTC traded volume was used to directly offset emissions in 2008, and a credit passed hands (also known as the “churn rate”) an average of 4.4 times.

Transaction Volumes and Values, Global Carbon Market, 2007 and 2008

Markets	Volume ($MtCO_2e$)		Value (US$million)	
	2007	2008	2007	2008
Voluntary OTC Market	43.1	54	262.9	396.7
CCX	22.9	69.2	72.4	306.7
Total Voluntary Markets	**66**	**123.4**	**335.3**	**704.8**
EU ETS	2,061	2,982	50,097	94,971.7
Primary CDM	551	400.3	7,426	6,118.2
Secondary CDM	240	622.4	5,451	15,584.5
Joint Implementation	41	20	499	294
Kyoto (AAU)	0	16	0	177.1
New South Wales	25	30.6	224	151.9
RGGI	-	71.5	-	253.5
Alberta's SGER[(a)]	1.5	3.3	13.7	31.3
Total Regulated Markets	**2,919.5**	**4,146.1**	**63,046**	**117,582.2**
Total Global Market	**2,985.5**	**4,269.5**	**64,046**	**118,287**

Source: Ecosystem Marketplace, New Carbon Finance, World Bank

Notes: (a) Assume a CA$10 price for Alberta offsets and Emission Performance Credits based on interviews with market participants. (b) 2008 JI & RGGI numbers in this chart were updated after initial release of this publication. (c) 2008 JI volume and value information provided by the World Bank.

Voluntary Credit Prices Increased a Further 20%, Resulting in a Total Market Value of US$705 million

We estimate that the voluntary carbon markets were valued at US$705 million[2] in 2008, more than twice their value in 2007 ($335 million). While OTC market traded a smaller share of the transaction volume than the CCX, most of this value increase was driven by OTC credits, as they traded at a price premium of 66% in 2008 over CCX credits. The average price of a voluntary carbon credit transacted on the OTC market was $7.34/$tCO_2e$ in 2008, up 22% from $6.10/$tCO_2e$ in 2007 and up 79% from $4.10/$tCO_2e$ in 2006. This compares to an average price of $4.43/$tCO_2e$ on the CCX. The OTC market transacted an estimated $396.7 million (56% of the total market), whereas the CCX market transacted an estimated $306.7 million (44%).

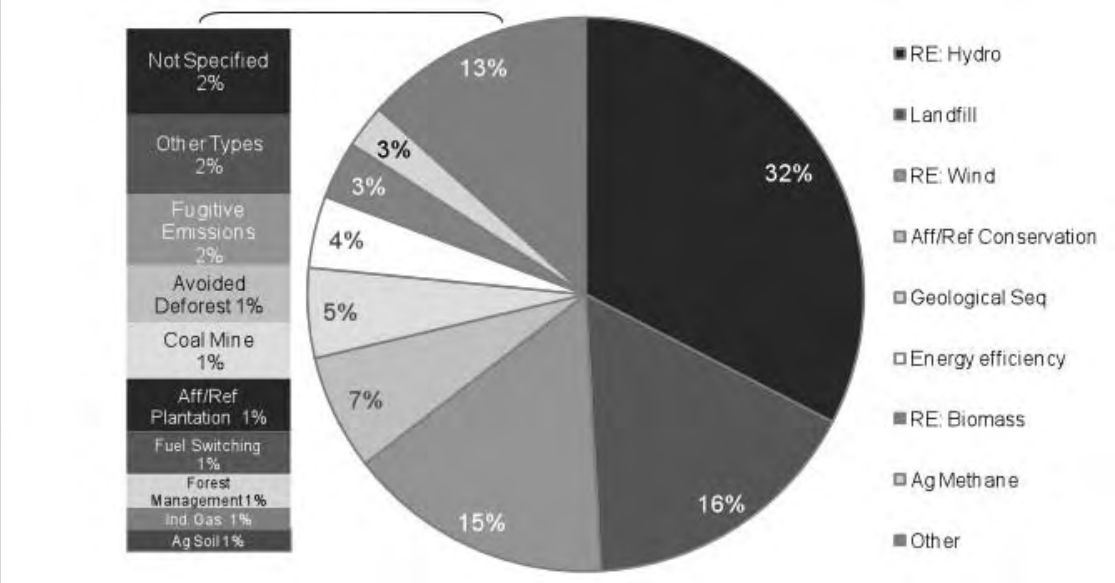
Similar to last year, credit prices increased along the market's value chain, reflecting the transaction costs associated with credits passing into new hands and the general decline of transaction volume along the value chain. We found that prices increased from an average of $5.1/$tCO_2e$ for project developers to $5.4/$tCO_2e$ at the wholesale level to $8.9/$tCO_2e$ at the retail level.

2 All monetary values in this report are in US$ unless otherwise specified.

Asia and North America Remained Dominant as Credit Sources

Sources of voluntary offsets on both the CCX and the OTC market are extremely diverse in both project type and location. With regard to OTC project type, renewable energy credits dominated this year, increasing their market share from 27% in 2007 to 51%, mostly from hydropower (32%), wind energy (15%) and biomass energy (3%). The dominance of this project type comes from its general appeal to voluntary buyers and particularly high credit production from a number of Turkish VER projects and Asian pre-registered CDM projects. Landfill gas capture was the second most popular category, capturing 16% of the market (up from 5% in 2007), mostly resulting from a shift towards pre-compliance motives in the U.S. carbon market. In contrast, energy efficiency, fuel switching, and coal mine methane all declined in popularity.

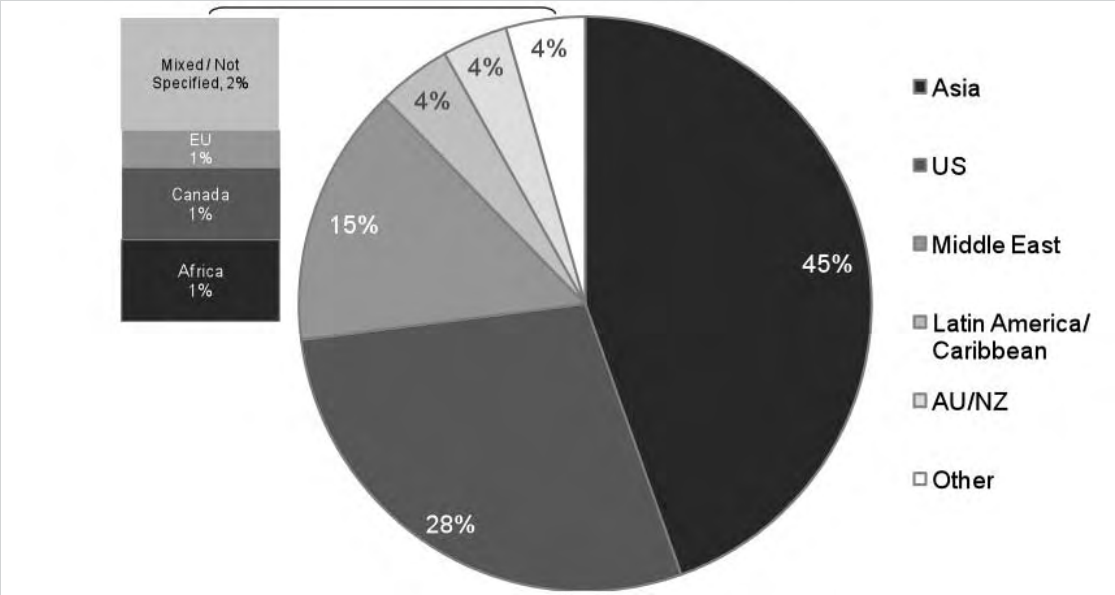
Transaction Volume by Project Type, OTC 2008



Source: Ecosystem Marketplace, New Carbon Finance

Consistent with its prominence in the CDM market and in line with 2007, Asia was the most popular project location, sourcing 45% of transacted credits in the OTC market. The largest single country supplying credits was the United States, which was the credit source for 28% of OTC transactions. The Middle East also emerged as a key source of credits, supplying 15% of OTC transaction volume in 2008 as a result of a few large projects in Turkey, which we've included in the Middle East for the purpose of this report. Credits from the EU, Canada, Australia and New Zealand declined significantly on the back of concerns about double-counting emissions reductions as offsets in the voluntary markets and emissions reductions under Kyoto compliance schemes.

Transaction Volume by Project Location, OTC 2008



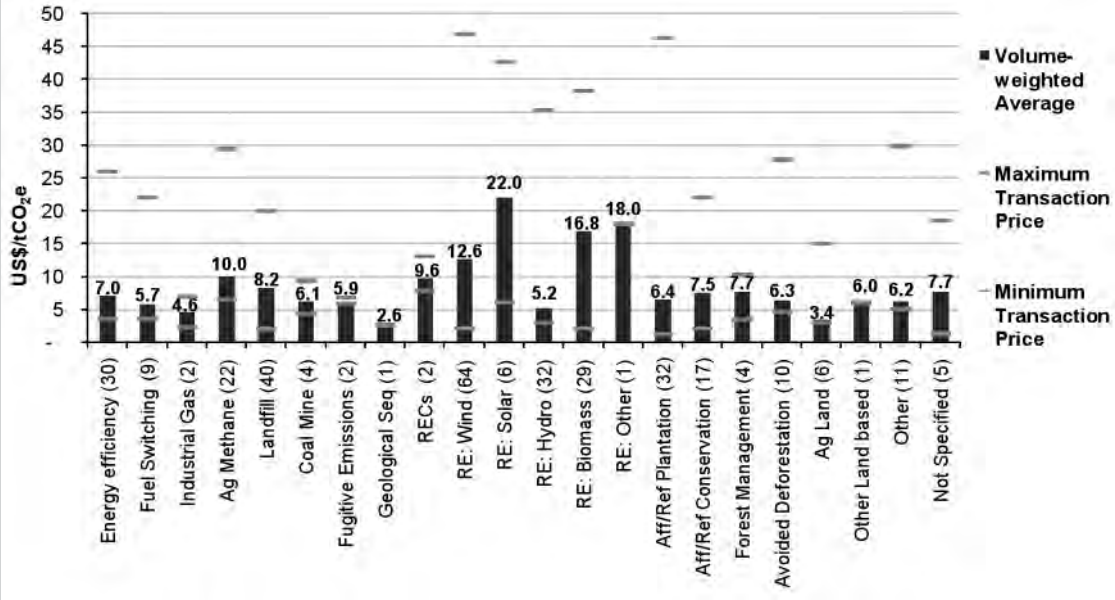
Source: Ecosystem Marketplace, New Carbon Finance

Credit Prices Ranged between $1.20/tCO$_2$e and $46.90/tCO$_2$e

OTC credit prices in 2008 covered a wide range ($1.20 to $46.90/tCO$_2$e), but not quite as wide a range as the year before ($1.80 to $300/tCO$_2$e). Project types claiming the highest average prices in 2008 were renewable energy projects, of which solar ($21.98/tCO$_2$e), geothermal (RE: other, $18.00/tCO$_2$e), and biomass energy ($16.84/tCO$_2$e) claimed the highest spots. At the low end of the range were geological sequestration ($2.58/tCO$_2$e), agricultural soil sequestration ($3.35/tCO$_2$e), and industrial gas credits ($4.57/tCO$_2$e).

This year we also collected price data according to the country of project location. Though it was difficult to discern any strong regional trends, on average, credits from New Zealand, South Africa, Malaysia, and Australia fetched a premium over other countries, earning $19.20, $15.40, $14.40, and $13.30/tCO$_2$e respectively.

Credit Price Ranges and Averages by Project Type, OTC 2008



Source: Ecosystem Marketplace, New Carbon Finance

Note: Numbers within parentheses indicate number of observations.

CCX Projects Expanded their Geographical Horizons

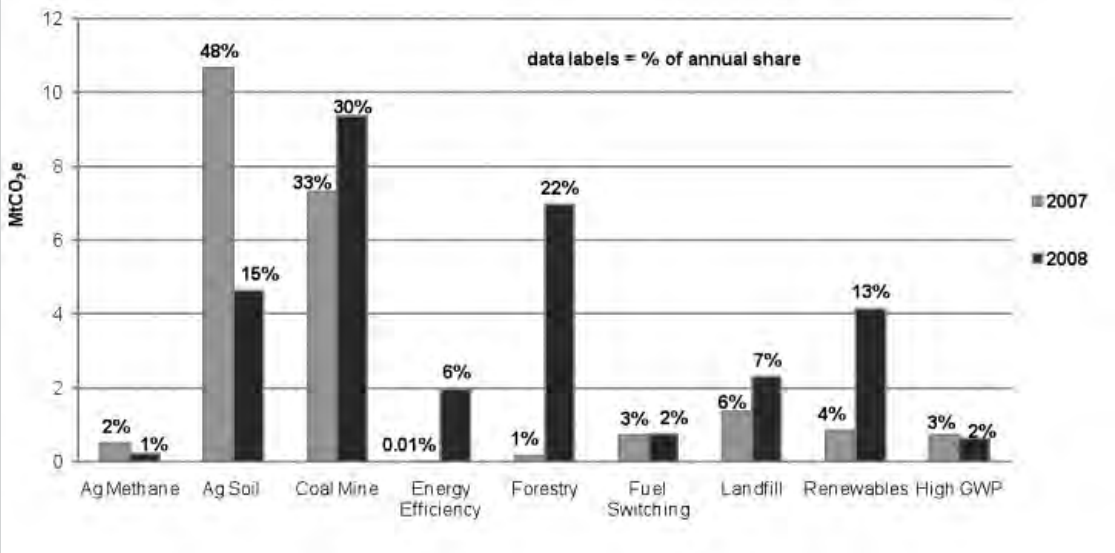
This year we also obtained registration information on offset credits listed on the CCX Registry. While this information cannot be directly compared with our OTC data, as registered credits are not necessarily transacted, it does shed light on project type and location trends on the CCX. For instance, newly-registered CCX offsets generated from forestry and renewable energy projects took a tremendous jump in 2008 (21 and 9 percentage points up, respectively), whereas the new registration of offsets from agricultural soil projects declined (down 33 percentage points).

In terms of project location, the major trend seen on the CCX was the increased number of credits from Asia and Latin America. This year, these two regions were responsible for 19% and 21% of total registered credits, up from a 4% share each in 2007. In contrast, North American countries (Canada and the U.S.) supplied only 60% in 2008, down from 79% in 2007.

The Voluntary Carbon Standard Solidified its Leadership Position, Capturing 48% of Credits Verified to a Third-Party Standard

If the relevance of third-party verification to the voluntary carbon markets was ever in doubt in 2007, it was solidified in 2008. No less than 96% of credits were third-party verified in 2008, up 9 percentage points from 2007.

Chicago Climate Exchange (CCX) Registered Project Types, 2007 and 2008

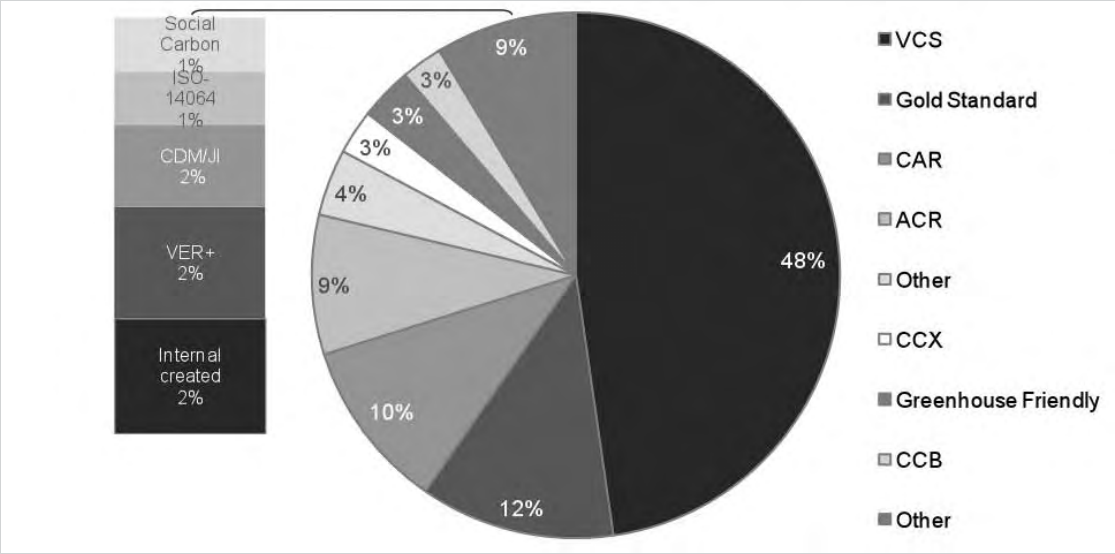


Source: Chicago Climate Exchange

Last year also saw further consolidation amongst the many standards in the market. Of the 17 identified standards, the most utilized OTC standard by transaction volume was the Voluntary Carbon Standard (48%), followed by the Gold Standard (12%), the Climate Action Reserve Protocols (10%), and the American Carbon Registry Standard (9%). Defying the small interest indicated by last year's respondents, both CAR and the ACR increased in transaction volume on the back of higher pre-compliance activity in the U.S.

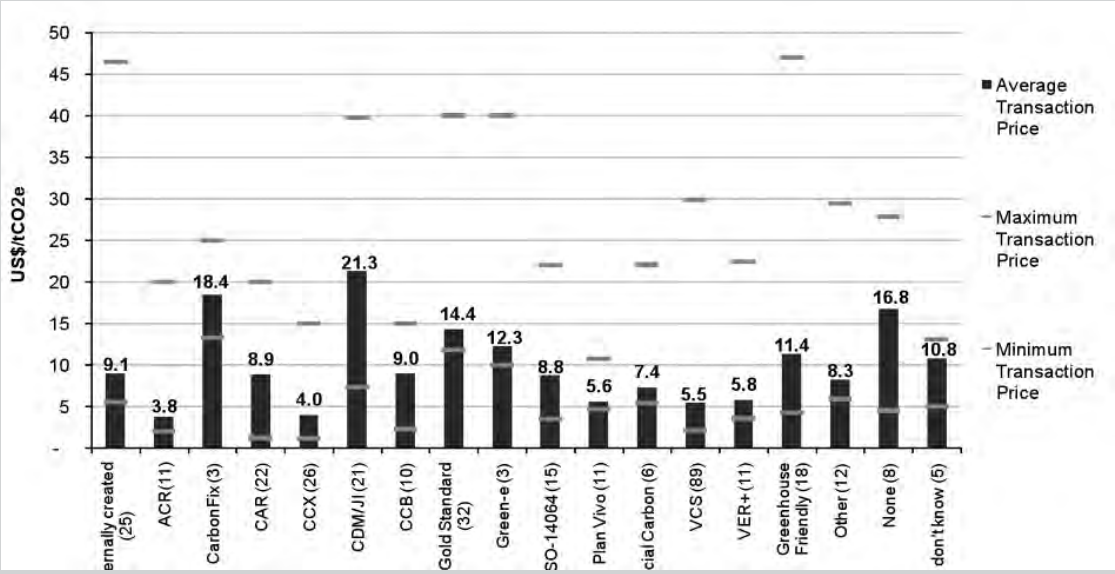
Losing most OTC market share in 2008 were the CDM/JI, VER+, and the Voluntary Offset Standard (VOS). CDM/JI credits were the second most popular credit type on the OTC voluntary markets in 2007 (16%), but they dropped to only 2% of the market in 2008. VER+ was another popular standard in 2007 that lost substantial market share in 2008 (from 9% to 2%).

Standard Utilization, OTC 2008



Source: Ecosystem Marketplace, New Carbon Finance.

Credit Prices and Price Ranges by Standard, OTC 2008



Source: Ecosystem Marketplace, New Carbon Finance.

Note: Numbers within parentheses indicate number of data points.

Large Numbers of Standards Fetched Above-Average Prices

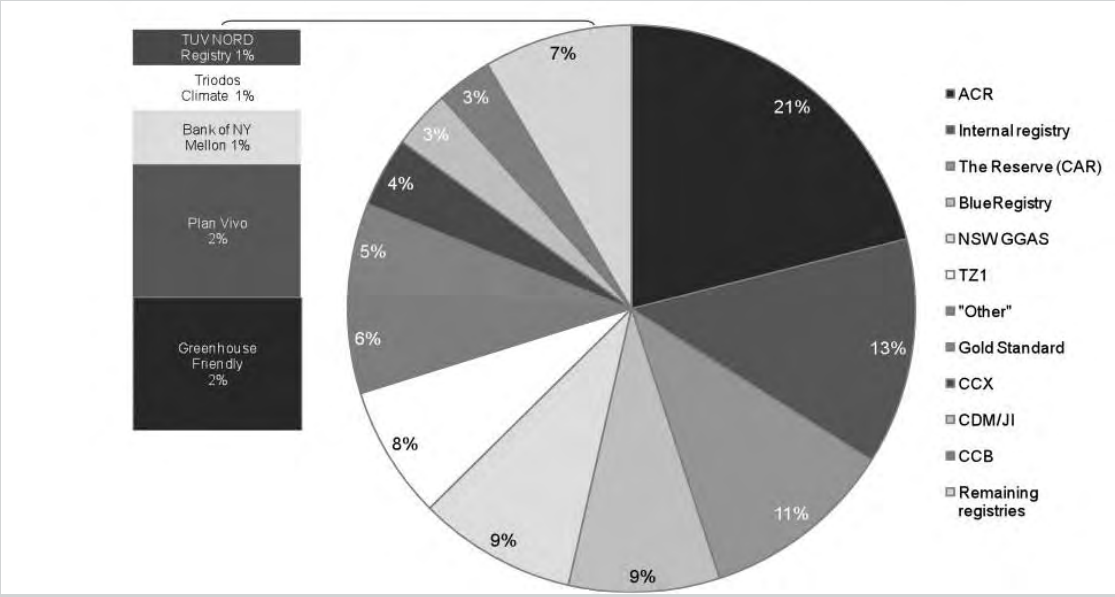
Similar to project type, the verification standard utilized is a major determinant of transaction prices. Although their volumes dropped significantly, CDM/JI credits maintained their price premium, averaging of $21.31/tCO$_2$e. Above-average premiums (>$7.34/tCO$_2$e) were also paid for CarbonFix, Gold Standard, Green-e, GHG Friendly, CCB Standards, Climate Action Reserve, ISO, Social Carbon and even internally created standards.

The CCX and the ACR were at the bottom of the OTC credit price spectrum at average transaction prices of less than $4.00/tCO$_2$e. This average discount is related to the low carbon prices on the CCX itself and inexpensive reductions achieved via geological sequestration, the most popular ACR project type in 2008.

While Gaining Attention, Registry Usage Still Limited in 2008

A newer infrastructure element of the voluntary OTC market, but one that is receiving increasing attention, is the third-party credit-accounting registry. In 2008, at least 29% of voluntary transactions were tracked in a third-party registry. Despite the increase in third-party credit verification and consolidation of standards, this 29% represents a small reduction from the 31% of transaction volume tracked in third-party registries in 2007. We attribute this decline to the lack of a dedicated VCS registry, by far the most popular standard in the market last year. However, it should be noted that of the credits eligible for registration — issued offsets in which emissions reductions have already occurred — 64% were transacted via a third-party registry. Therefore we anticipate registry usage to increase substantially going forward.

Credit Prices and Price Ranges by Standard, OTC 2008



Source: Ecosystem Marketplace, New Carbon Finance.

As of the publication of this report, there are at least 18 third party registries serving the voluntary carbon markets. In 2008, the most popular third-party registries in terms of OTC transaction volume tracked were the American Carbon Registry (21%), followed by the Climate Action Reserve (11%), the New South Wales Greenhouse Gas Abatement Scheme Registry (9%) and the BlueRegistry (9%). An additional 13% of OTC transactions were tracked in internal registries. The popularity of suppliers' internal registries is attributed to the unavailability of a VCS registry. In 2008, as VCS was the standard chosen for nearly half of OTC transaction volumes last year. The dominance of the ACR may be in part related to reporting bias, as the ACR was one of only a handful of registries active in 2008 and supplied its own transaction (as opposed to just issuance) data.

With respect to our 2007 results, most of the registry usage follows the market's trends with regard to third-party standards. Notable changes from last year include the rise of the American Carbon Registry (which took 21% of the 2008 market vs. only 5% of the 2007 market), the Climate Action Reserve (11% in 2008 vs. 2% in 2007), and the NSW GGAS Registry (9% in 2008 vs. 2% in 2007). The CDM/JI registry and CCX Registries each experienced significant declines in market share between 2007 and 2008.

Although Investment Has Become an Important Motive, CSR and PR Remain the Dominant Driving Forces in the Market

Private companies continue to dominate the buy-side of the voluntary market (66% of volume), with purchasing for investment/resale now the largest overall motivation (35%) instead of retirement (29%). This suggests a higher contribution from intermediaries in the market. Voluntary purchasing by both NGOs and individuals has significantly decreased in 2008 to a mere 1% and 2% respectively, which could represent a reduced interest in voluntary offsetting on the back of negative media publicity as well the onset of the global economic recession in 2008.

Despite the increased importance of investment, however, sellers continue to perceive that Corporate Social Responsibility (CSR) and public relations/branding are the two main driving forces for voluntary offset purchases. This means that, although many analysts perceive pre-compliance buying as a rising force in the market, our survey results indicate that it remains secondary to the pure voluntary market.

This year's results also confirm that a compliance market does not eliminate the voluntary carbon market, with European buyers purchasing over half (53%) of sold volumes, up from 47% in 2007. Given the non-existence of a large U.S. compliance market, the United States was responsible for both the greatest demand (39%) as well as supply of credits (28%) of any single country.

Market Participants Expect Continued Growth with Volumes Reaching almost 350MtCO_2e in 2015

On average, suppliers projected an average annual growth of 15% per year from 2009 through 2020 with volumes for the global voluntary markets anticipated to increase to 257MtCO_2e in 2012 and 476MtCO_2e in 2020. Participants expected the 2009 markets to grow by 21%, which is low relative to the historic average of 95% (2003-2008), but still a good growth rate in the midst of a recession.

When asked about standards they plan to use in 2009, more suppliers (52% of survey respondents) intend to use the Voluntary Carbon Standard (VCS) than any other standard. In 2007, suppliers also reported the

VCS as their most-preferred standard for use in 2008, which proved to be correct, as the standard took 48% of the OTC market last year. About 34% of suppliers indicated they will utilize the CDM in 2009, 32% the Gold Standard, 28% the Climate Action Reserve, and 27% the Community, Climate & Biodiversity (CCB) Standards. Note that individual organizations may use multiple standards; so percentages do not add up to 100%.

The most popular choices for future registry use in 2009 were the Climate Action Reserve, the Gold Standard registry, APX, Markit, and the CDM/JI registry. The popularity of CAR, Gold Standard, VCS, and CDM/JI is consistent with these standards' intended future utilization. The popularity of Markit and APX is consistent with a strong interest in the VCS, since these infrastructure providers both serve the VCS as well as several other standards.

Seeing the Forests for the Trees:
Land Use Change in the Carbon Markets

Speaking for the Trees: Voluntary Markets Help Expand the Reach of Climate Efforts

by David Biello

Four years can be an eternity in a burgeoning industry, and environmental finance is certainly one of those. But it's fascinating to see what changes and what remains the same. This 2005 article from Ecosystem Marketplace offers a snapshot of the voluntary carbon markets four years ago — and introduces companies that were leaders then and still are today, as well as concepts that appear to be with us forever.

14 September 2005 | In 1997, a small company began planting single trees for individual consumers to help combat climate change. The offering was small, the science was incomplete, and awareness was limited. Nevertheless, the company had a vision for the future, a future filled with new forests offsetting the greenhouse gas (GHG) emissions of individuals and corporations around the world.

The trees — by consuming carbon dioxide (CO_2) during photosynthesis and their growing cycle — would counterbalance the daily CO_2 that came from driving to work, burning coal to produce power, or flying to meetings. Planting the trees would not be that expensive and it would offer a cost-effective opportunity to reduce emissions deemed absolutely necessary to life in the 21st century.

With a clear nod to the future they envisioned, the company called itself, simply, Future Forests. On 14 September 2005, Future Forests changed its name to The CarbonNeutral Company.

In many respects, the company's evolution — from its launch as Future Forests in 1997 to its new name change to CarbonNeutral — parallels that of the voluntary carbon market since the turn of the century.

"For the last three to four years, we've been offering an end-to-end carbon management service," says Jonathan Shopley, CEO. "As we've grown in that sector we've found that our name has become something of a misnomer."

The Voluntary Market

Many things have changed since Future Forests got its start. The Kyoto Protocol came into effect in February of this year after Russia ratified it. With it came fledgling markets for offsets under the terms of

the Clean Development Mechanism (CDM) and Joint-Implementation (JI) protocol. And the European Union developed and implemented a nearly continent-wide cap-and-trade program for CO_2. A true — and active —

compliance market was born, where allowances in the EU Emissions Trading Scheme (EU ETS) cost as much as EU$29 per metric ton.

But there are few trees in sight. The multilateral overseers of the CDM and JI have not yet seen fit to approve any of the methodologies explaining how new trees absorb CO2 and keep it out of the atmosphere. And the EU ETS seemingly rejects the idea of forestry projects, preferring to focus on reductions from industry and electricity production.

With such compliance markets quickly ramping up, voluntary efforts — like Future Forests — might have taken a back seat. Instead, the voluntary market has broadened the reach of mandatory efforts. In fact, according to a study from the Hamburg Institute of International Economics, the voluntary market alone accounted for 9 million metric tons of CO_2-equivalent in 2004 — offsets that would not have happened otherwise. “If these offsets are truly additional, then the voluntary market is additional to the regulatory market,” says John Niles, manager of the Climate Community and Biodiversity Alliance (CCBA), a standard-setting coalition of corporations and environmental groups. “If they are additional, then it should be encouraged. It’s more carbon staying out of the atmosphere.”

While the CarbonNeutral Company says it no longer focuses on planting single trees for crusading citizens, it has expanded its business by helping corporations assess their emissions and make their own reductions through project portfolios that may or may not include offsets (from tree-planting or otherwise). The company also helps corporations wield their newfound carbon neutrality to best effect in marketing, sales, and public relations.

“If you’re out there offering offsets as a sole solution, there is a temptation to suggest that people are buying offsets as a means of avoiding deep, hard decisions about their operations,” says Shopley. “We’ve never seen offsets as an alternative to [other changes], but rather [we see them] as an integral part of a carbon neutral program.”

European Climate

Many European consumers understand climate change. From wind farms in Denmark to car taxes based on carbon emissions in the UK, national efforts are in place that put climate change in the public spotlight again and again. European consumers also want to do something about it in their own lives. “The CDM continues to be for countries and large corporations to get involved in. It’s not accessible to the individual consumer,” explains Tom Morton, director of Oxford-based offset provider Climate Care. “People like the idea of offsetting their emissions and so they come to people like us to do that.”

And the number of people doing that seems to be growing by leaps and bounds. “We’ve seen a sevenfold increase in our Internet sales this year,” Morton says, noting that his company has already sold roughly 100,000 metric tons of CO2 this year — double last year’s total already. “The Internet is becoming one of our biggest clients.”

Spurred on by this growing awareness, more and more Europeans are offsetting the emissions from their air trave — a major source of GHG emissions that go directly into a sensitive portion of the atmosphere — through programs like Dutch-based Business for Climate’s COOL Flying or Switzerland-based myclimate tickets.

And, where consumers lead, it is hard for companies not to follow. Recent innovative efforts range from credit cards that allow you to earn carbon offsets rather than air miles, to gasoline whose carbon emissions have been offset, to climate neutral fruit drinks. “They offset the emissions of the transport of the exotic fruit to Switzerland and the making of the plastic bottle,” explains Corinne Moser, a founding member of Zurich-based offset provider myclimate.

With this much consumer and corporate interest, Europe has a multitude of companies looking to provide offsets in a variety of ways and at various prices view a list of companies. “The three factors in price are: offset class, the overall volume, and where [in the world] you go to purchase,” says Ingo Puhl, managing director at German offset provider and carbon consultant 500ppm.

Trees vs. Tech

In the early days, trees were the most popular offset class. “One reason people want forests is because it is tangible,” explains Denis Slieker, director of Netherlands-based offset provider Business for Climate. “It also has an emotional aspect. It not only helps the climate, it’s also nature, a home for animals and community development.”

But as the offset market has grown, so has criticism of efforts simply to plant trees or avoid cutting down existing forests. Environmental groups and others have said that such projects do little to reduce overall pollution, are scientifically unreliable (an argument seemingly born out by recent studies), and lack the necessary permanence. Even though much of the language of the Kyoto Protocol and other market-based efforts covered exactly how such forestry projects could be done, these concerns — plus the complexity they engendered — effectively eliminated forestry from mandatory markets.

But in the voluntary market, such forests could flourish, thanks to the intuitive appeal of trees and the host of other benefits they bring with them. “Most people want to see that they’re own relatively small purchase has made some difference,” says Richard Tipper, director of the Edinburgh Centre for Carbon Management (ECCM) and its Plan Vivo system. “We’ve identified that as consumer additionality.”

Under the terms of Plan Vivo system, small farmers in Mexico, Mozambique and Uganda are able to get extra money from ECCM and its buyers in exchange for planting trees on part of their land or not clearing forest stands that are already there. “The idea was to see if we could use the carbon market to develop a long-term income stream that would be contingent on actual progress but would also give farmers the ability to plan exactly what they wanted,” Tipper explains.

While the cost was higher — $13 per ton of carbon — the technical specificity and long-term monitoring of Plan Vivo as well as its community development benefits — $8 out of the $13 price goes directly to farmers — made it an attractive option, despite the apparent drawbacks of forestry. As a result, since 1997, ECCM has sold 250,000 metric tons of CO_2 reductions from its project in Chiapas, Mexico.

“I would hope that things like the Plan Vivo system provide a framework for dialogue between buyers and sellers. What type of legal agreement do you want with the farmers? Do you want something that you can legally enforce?” Tipper says. “Our buyers said ‘No. We just want to make sure that our money is being put to good use.’”

Global Expansion

Trees are also popular in other parts of the world, outside the direct realm of the Kyoto Protocol and Europe's mandatory market. Australia, which explicitly repudiated Kyoto in 2002, has Greenfleet, a nonprofit offset program. For AU$40, a buyer offsets car travel CO_2 emissions for one year (based on estimates of 4.3 metric tons for an "average" vehicle) through the planting (and growing) of "17 trees."

"We have planted over 2 million trees in excess of 250 sites up and down the seaboard of eastern Australia," says Sara Gipton, Greenfleet's business manager. "Trees are planted on land made available by the owner under a 'carbon agreement' which ensures the security of the trees as long as that landholder holds that land."

It's an effort to cut back on Australia's transportation emissions — not unlike BP's climate friendly fuels — as well as an effort to restore cleared land and prevent further degradation of the soil. And it's not only nonprofits like Greenfleet getting in on the act.

Sydney-based New Forests Pty Limited — an independent offshoot of the Hancock Natural Resources Group — plans to help institutional investors derive new income from their forestry holdings through carbon. "They can outperform by selling carbon credits or undertaking the leasing of lands," says David Brand, managing director of the new company. "Down the road, we'll offer new forest ecological projects, not just carbon but biodiversity and water benefits."

And the nation that is the largest emitter of CO_2 in the world seems to have a particular fondness for forests. The US pushed for forestry projects — and market-based mechanisms — to be included in the Kyoto Protocol under the Clinton administration and a host of individual companies and organizations with US headquarters — like The Nature Conservancy and Conservation International — continue to push forestry projects despite the US withdrawal from Kyoto in 2001.

For example, PowerTree (and its predecessor UtiliTree) is a joint effort of several US power companies — among the largest sources of CO2 in the world — to plant trees in the lower Mississippi valley. "There was a loss of millions of acres of bottomland hardwood forests down there since the mid-20th century," explains John Kinsman, director of air quality programs at power industry group the Edison Electric Institute (EEI).

Twenty-five power companies banded together, pooled $3 million, and planted more than 3,600 acres worth of trees to provide new animal habitat and carbon offsets. "We're picking ecologically significant locations," Kinsman says. "We expect there will be some carbon credits to come out of this."

How many exactly depends on future regulation and the hardiness of the trees. But it is a model that many US electric utilities endorse. "PowerTree is a very good model from the standpoint of offering a way off-system to reduce CO_2. Plus, it helps the science of CO_2 uptake, " says Melissa McHenry, a spokeswoman for the largest CO_2 emitter in the US, American Electric Power (AEP). "We've invested about $25 million in terrestrial sequestration."

And, while individual consumers in the US have been slow to catch on to offset possibilities, forestry projects can be attractive to providers for the same reasons as anywhere else in the globe. "There's a strong need for reforestation of degraded areas," says Erica Graetz, program and operations manager for The Climate Trust, an Oregon-based fund that provides offsets to the power sector and individuals. "There's a lot of co-benefits to using carbon money to fund reforestation as far as air, biodiversity and water quality goes."

"But there's a lot of risk associated with it," she continues.

Impermanence

That risk comes from all the threats to a natural forest: fire, insects, logging. But it also comes from the nature of the projects themselves. Trees only absorb carbon slowly over the course of decades and they do nothing to address the root of the climate change problem: the burning of fossil fuels. As a result, offset providers in Europe are moving away from such projects. "Planting trees, to us, is quite a dangerous thing. You cannot guarantee that the trees will still be there in 40 years if there's a forest fire or a logging," myclimate's Moser says. "We focus on [energy efficiency and renewable energy] projects because we need to contribute to a sustainable energy future."

That means that even companies that once had forest in their name, like The CarbonNeutral Company, are moving away from such projects. "Last year, the split between forestry and technology-based projects was about 50–50," says Bill Sneyd, operations director for the Company. "We reckon that within about two years it will be 80% to 20% technology to forestry."

Part of this is driven by the demands of clients. For example, international bank HSBC recently committed to becoming carbon neutral and is looking to purchase roughly 17000 metric tons of CO2 per year. But none of those tons can come from a forestry-related project.

And in the US, the voluntary carbon market is rapidly becoming conflated with the market for renewable energy credits (RECs) — allowances that are created by wind, solar, biomass, and other renewable generation in various states. Two major consumer efforts — TerraPass, a business school project turned business that aims to offset vehicle emissions, and Carbonfund.org, a nonprofit that has partnered with advocacy group and environmental marketer Working Assets to fund offset projects — source almost half of their offsets from RECs.

Plus, several REC providers — such as the Bonneville Environmental Foundation (BEF) or Native Energy — market their product via carbon offsets. "We call them green tags and we consider the green part to be the fact that renewable power generation causes the CO_2 emissions reduction or offset," says Patrick Nye, BEF's director of sales. "It's basically just a way of explaining that buying X amount of green power cuts Y amount of carbon."

"In order to do RECs you have to put it in terms the customer understands," says Tom Arnold, chief environmental officer at TerraPass. "So it's put in terms of [sport-utility vehicles] taken off the road."

Crediting Consumers

Putting it in terms the customer understands is exactly why trees became popular in the first place. And given forestry's potential to promote sustainable development in impoverished parts of the world, many — including the head of the World Bank's carbon finance group, Odin Knudsen — would like to see forestry remain part of the voluntary as well as mandatory markets.

"The Kyoto Protocol is a train wreck for forestry," says CCBA's Niles. "It is a fossil fuel treaty and a plantation treaty. It does not address the core of the problem from a forestry perspective."

"So the voluntary market is very important. It is going to establish whether forestry can be a carbon credit. And that's going to be important to the post-2012 discussion," he continues. "You're never going to get the US involved without voluntary credits."

As a result of this belief, CCBA has developed a standard — backed by prominent non-governmental organizations and companies — to establish standards for good forestry project design and good monitoring. And the offset providers themselves have undertaken measures to ensure the integrity of the market, from the independent scientific review panel employed by myclimate in Switzerland to project auditing under the terms of the World Resources Institute's GHG Protocol on the Chicago Climate Exchange (CCX) in the US.

Given the rapidly expanding opportunity, a growing number of companies — including the verifiers and validators of the CDM world — and organizations are also stepping up with offers to certify the validity of voluntary reductions. For example, the Oregon-based Climate Neutral Network offers its Climate Cool certification to everything from products that are tied to supply chain GHG reductions to offset projects themselves. And the San Francisco-based Center for Resource Solutions is working to certify TerraPass's reductions in an effort to develop certification models like its Green-e standard for RECs for the future. "At this point in the industry, credibility is everything," avers Eric Carlson, president of offset provider Carbonfund.org.

If the credibility of offsets developed for the voluntary market continues to grow, market expansion may well be on the horizon. "In terms of overall market potential, we are tapping less than 1%," says 500ppm's Puhl. "There is a lot of benefit in terms of cooperation among offset providers."

Huge market growth may, in the end, justify both forestry and technology based offsets. "The pendulum is currently swinging away from forestry. People seem more comfortable with technology," says The CarbonNeutral Company's Shopley. "Once people understand that there are complex issues related to technology offsets that we haven't really grappled with yet..."

"I'm reasonably sanguine that forestry sequestration will be there."

David Biello is the US Editor for Environmental Finance magazine and a freelance writer based in Brooklyn.

This article was first published on the Ecosystem Marketplace on September 14, 2005.

Climate Change and Forestry: a REDD Primer

Climate Change and Forestry: a REDD Primer

by Erin Myers

One of the most contentious issues in the debate over how to tackle climate change is the role of REDD (Reducing Emissions from Deforestation and Forest Degradation) in market-based mitigation strategies. The Ecosystem Marketplace summarizes the key issues.

19 May 2008 | In 2007, more than 50,000 fires raged through the Brazilian Amazon, reducing what were once lush rainforests to charred plains stretching to the horizon. Meanwhile, on the other side of the world, fires on the island of Borneo consumed millions of hectares of old-growth forests.

Drenched by more than 75 inches of rain annually, neither the Amazon nor Borneo have ecosystems that are naturally adapted to fire. Instead, these fires were set with the express purpose of clearing the forest — to open the land for soy production and cattle farming in the Amazon and for palm oil plantations in Borneo. While fires consumed these forests harboring some of the world's most diverse ecosystems, they released the carbon that had been stored in the trees' woody matter for as much as 1000 years.

Land-use change, such as the conversion of Amazonian forests to industrial mono-crop agriculture, accounts for approximately 20% of global greenhouse gas emissions — more than the emissions from the transportation sector worldwide. The majority of these land-use change emissions come from deforestation in developing countries, where forests are being cleared for agriculture and timber. Currently, the international climate change community is considering how to create incentives for reducing emissions from deforestation and forest degradation — or "REDD".

Forests and Carbon Emissions

Forests play an integral role in mitigating climate change. Not only are they one of the most important carbon sinks, storing more carbon than both the atmosphere and the world's oil reserves, they also constantly remove carbon from the atmosphere through photosynthesis, which converts atmospheric carbon to organic matter.

But while forests are working diligently to clean up the carbon we have emitted through burning fossil fuels, deforestation is pumping carbon right back into the atmosphere.

The Drivers of Deforestation

Deforestation in developing countries is frequently driven by agriculture, logging, and road expansion. Rising prices for soy, palm oil, and beef make it increasingly profitable for landowners in developing countries to clear forests and convert the land to agriculture. Often, burning is the cheapest and easiest way to clear the land.

Contrary to popular belief, when logging occurs, only a fraction of the wood that is cleared ends up as dimensional lumber and eventually in housing and other structures. The majority of the forest vegetation ends up as waste, and thus the majority of the carbon from the forest ends up in the atmosphere.

And it's getting worse as policies that expand road infrastructure provide access for loggers, farmers and homesteaders to the previously inaccessible forest interior.

Deforestation Highest in Indonesia and Brazil

Deforestation is not evenly distributed around the world. In fact, Indonesia and Brazil account for 50% of the world's deforestation emissions. Because of these deforestation emissions, Indonesia and Brazil are ranked third and fourth among the top greenhouse gas (GHG) emitting countries. If Indonesia and Brazil were able to abate their deforestation, their ranking would fall to 15th and eighth, respectively.

The irony is that we normally associate high GHG emissions with development and increasing GDP, but the activities that drive deforestation generally have low economic returns. Thus, Indonesia and Brazil are among the top GHG emitters, but their emissions are from low-return activities.

Low-Cost Emission Reductions

Analyses examining the cost of REDD activities indicate that abating deforestation is one of the most cost-effective ways to reduce emissions. In their conservative calculations, the Intergovernmental Panel on Climate Change (IPCC) estimates that approximately 25% of deforestation emissions can be abated at a cost of less than $20 per metric ton of carbon dioxide (tCO_2).

By comparison, the market price for carbon on the European Union Emissions Trading Scheme (EU ETS) was $35/$tCO_2$ in the first quarter of 2008. It is important to note that the IPCC's cost estimates are based on the opportunity cost of probable land uses and don't include transaction costs such as monitoring, enforcement, and capacity building.

The Role of REDD

Given the magnitude of deforestation emissions and the low cost of abating those emissions, REDD is poised to play a very important role in the global strategy to abate GHG emissions.

"We cannot solve the climate problem if we do not include forests," said Stuart Eizenstat in testimony before the House Select Committee on Energy Independence and Global Warming. A former Under Secretary of State in the Clinton Administration, Eizenstat now advocates the need to include market-based incentives for REDD activities in any future climate-change policy.

In addition to the benefits from reducing emissions, REDD activities can protect the biodiversity and important ecosystem services provided by tropical rainforests. Although Eizenstat and others see REDD as an opportunity to collaborate with developing countries to shore up a huge source of emissions at relatively low cost, there are no incentives to pursue REDD in any of the market-based mechanisms of the Kyoto Protocol.

Banishing REDD from Kyoto

In 1997, the Kyoto Protocol laid out target emission reductions and the different mechanisms by which countries could achieve those targets. In order to achieve target emissions levels, countries had two options:

either take actions to reduce their own domestic emissions, or pay someone else to reduce their emissions and thus *offset* the country's domestic emissions with reductions somewhere else.

The Kyoto Protocol established the rules and financing structures surrounding different types of offset mechanisms. At that time, the Parties to the Protocol *excluded REDD* from the offset mechanism because of uncertainties about the magnitude of deforestation emissions and the ability to monitor deforestation.

The Kyoto Protocol does recognize credits from *reforestation* and *afforestation* — the first being when you replant forests that have recently been chopped down or otherwise destroyed, and the second being when you plant forests that have either been gone for quite some time or never existed. Both can be used to generate offsets under the Kyoto Protocol's Clean Development Mechanism (CDM), but only if they meet a narrow definition of success.

Because of their exclusion from regulatory markets, REDD credits have been limited to the voluntary market, where a handful of projects are generating credits. These credits are sold at a fraction of the regulatory market price to buyers concerned about reducing their carbon footprint for reasons other than compliance with the law, as documented in State of the Voluntary Carbon Markets 2008, published by the **Ecosystem Marketplace** and **New Carbon Finance**.

Bali: REDD Rising?

The outlook for REDD changed at the 2005 Conference of the Parties in Montreal. Costa Rica and Papua New Guinea, on behalf of the Coalition for Rainforest Nations, proposed to give developing countries access to the carbon market through credits generated from REDD activities. In response, the United Nations Framework Convention on Climate Change (UNFCCC) launched a two-year initiative to examine the potential of REDD. Those two years culminated at the 13th UNFCCC Conference of the Parties (COP 13) in Bali.

Officially, the Bali decision was quite modest. The Bali Action Plan formally listed REDD among other mitigation activities as a potential means to achieve emissions targets and encouraged voluntary action on REDD. The decision of whether and how REDD will fit into the international climate mitigation strategy was put off until COP 15 in 2009 in Copenhagen.

And yet, Bali was a turning point for REDD.

"Bali put REDD on the broader COP agenda," explains Tracy Johns, Policy Advisor and Research Associate at Woods Hole Research Center. "Bali legitimized REDD as a tool for the UNFCCC's broader strategy to mitigate climate change, and put it on the same track and timeframe as the post-2012 discussion."

The Bali decision sent a signal that the international climate change framework will take on the problem of emissions from deforestation, but the financing mechanism is far from decided.

Still, the Bali decision encourages capacity building and the development of pilot projects. By ameliorating some of the uncertainty about the future of REDD, the Bali decision encourages developing countries and project developers to begin investing in REDD activities.

Three Shades of REDD

Broadly speaking, you can break all REDD activities into three categories: *project-based, policy-based, and sectoral.*

Project-based REDD activities would generate credits based on the maintenance of carbon stocks in a localized area.

Many of the current REDD projects focus on forest conservation that creates reserves and parks to protect threatened forests. These place-based REDD projects preserve the carbon stocks on a parcel of land that otherwise would be deforested.

Policy-based REDD activities would generate credits by reforming land use policies in a manner that would lead to reduced deforestation.

Emissions from deforestation can be reduced by land use policies. Agricultural subsidies, for example, often create incentives to deforest, and transportation networks provide access to clear forests and remove timber. Reforming land use policy could lead to significant reductions in forestry emissions, just as reforms in energy policy are expected to reduce emissions rates in the electricity sector.

Sectoral REDD activities would generate market-based credits by reducing net deforestation rates over an entire country.

A country or province could take on an emissions cap in the forestry sector in which they would commit to a target emissions rate from forestry. For some developing countries, actively pursuing emissions targets in the forestry sector might be the most appealing and powerful way for them to participate in the global effort to mitigate climate change. Eizenstat points out that the voluntary participation in sectoral targets in the forestry sector could create "a model for other developing countries to take targets in other sectors, such as electric power or transportation."

These three shades of REDD — project, policy, and sectoral targets — capture the different scales at which REDD activities could be implemented, and each have their own set of strengths and weaknesses.

An Argument for Every Shade

Project-based REDD activities could be modeled after the forestry CDM, and there are a number of project developers ready to begin investing in REDD projects. However, the CDM model has its strengths and weaknesses.

Because REDD projects would be geographically-bound, they would be easier to implement than sectoral or policy-based activities. There are, however, also a number of technical challenge that must be overcome — such as minimizing and accounting for "leakage", which is what happens when preventing deforestation in one place encourages it somewhere else. This is dealt with in more detail under the heading *Technical Issues*.

Further, emissions from deforestation account for 20% of global carbon emissions, and there is concern that there would never be enough REDD projects to have a meaningful impact on the large magnitude of emissions from deforestation.

In contrast to project-based activities, policies and sectoral caps that reduce emissions from deforestation may be better matched to the scale of the problem. Consequently, they would also require more coordination, and some countries don't have a sufficiently strong central government or the proper governance institutions to monitor and enforce these programs.

In reality, countries currently have very different capacities on the ground to implement REDD activities. A climate change policy could allow a spectrum of REDD activities, creating incentives for countries to take actions at the most appropriate scale for them. All three shades of REDD face a number of technical and policy-design challenges that must be addressed to ensure an environmentally robust REDD mechanism. These challenges differ with each shade of REDD. For example, projects that maintain carbon stocks on a hectare of land would require different accounting mechanisms than sectoral caps that reduce emissions rates over a country's entire forests.

Potholes on the Road to Copenhagen

Although uncertainties still linger, the technical sub-committee that focused on REDD for the two years leading up to Bali concluded not only that the magnitude of deforestation emissions was significant — approximately 20% of global emissions — but that sufficiently cost-effective methodologies exist for measuring forest carbon and monitoring deforestation.

Support of the measurement and monitoring methodologies was a significant first step in overcoming the technical challenges that face the implementation of REDD policies, but there are a number of additional hurdles (technical and political) that lie on the road from Bali to Copenhagen.

Technical Issues

Leakage means that preventing deforestation in one place might actually encourage deforestation somewhere else. It could, for example, take the form of the actual deforestation agents shifting their equipment and labor to a nearby patch of forest. But it can also be less direct. If REDD activities force up the market price of timber, livestock, and crops, they could drive deforestation somewhere else.

Unless all global forests are included in a REDD policy, leakage cannot be eliminated; however, it can be minimized through careful project design. Further, leakage can be accounted for by requiring that a percentage of a project's REDD credits be held in reserve and not be sold (the so-called "buffer" approach). In this manner, the reserve account would offset or neutralize the leakage that was assumed to have taken place.

Concerns over permanence are rooted in the idea that emission reductions are potentially reversible due to forests' vulnerability to fires, pest outbreaks, changes in management, and other natural and anthropogenic disturbances. However, the scale at which REDD activities are implemented affects the risk of impermanence. For example, as you move to policy- and sectoral-scale activities, credits would be generated based on net deforestation rates over some political jurisdiction.

As a result, you are not bound to maintaining forest carbon in any one specific location, and increases in deforestation in one place can be offset with reducing deforestation somewhere else. As you move to scale, there is greater flexibility in how land is managed, and there is greater impermanence in any specific site.

Too Much of a Good Thing?

Because REDD credits are expected to be relatively inexpensive, there is concern that a mechanism that incentivizes REDD activities will flood the regulatory market with cheap credits, deflating the price of carbon and shifting attention away from low-carbon technologies such as carbon capture and storage.

The realistic extent of this concern depends on the extent to which REDD projects can be implemented and begin generating credits. While the potential for REDD credits is high, it's not clear how much of this potential could be realized in a timely fashion. In reality, because many countries need to develop on-the-ground capacity before they can begin generating REDD credits, fears of a deluge may be over-stated.

Even so, the decision about whether to include REDD credits in a cap-and-trade program cannot be separated from the negotiations about future emissions targets. More aggressive emissions reductions targets would neutralize any effects on the price of carbon.

Policy Design Issues

Even more challenging are the policy design issues that will decide the extent to which a REDD instrument will interact with the over-arching climate change mitigation strategy.

In 2005, the Coalition for Rainforest Nations proposed creating market based incentives for REDD activities — arguing that because market prices for agricultural goods drive deforestation in many countries, then international prices for carbon would drive forest conservation if REDD is allowed into a global carbon-trading scheme. This, they said, would offset the incentive to chop down forests for agriculture, while enhancing economic development.

Some countries, however, oppose linking REDD activities to the compliance carbon market and favor creating a fund where REDD activities would be financially rewarded. Proponents of the fund approach argue that linking REDD credits to the carbon market will delay the transition of developed countries to low-carbon technologies and will restrict developing countries in their ability to reform land use policies.

Additionality and Baselines

As if leakage and permanence aren't difficult enough issues to wrestle with, how do you prove that a REDD regime actually saves a forest that is in danger of being chopped down?

The typical answer is "baselines", which are the yardstick by which countries measure whether they have successfully reduced deforestation or not. There is confidence in the ability to establish historic deforestation rates based on existing remote sensing imagery, but many regions and countries argue that historic rates don't indicate the current risk of deforestation.

For example, some countries currently experiencing political instability have a low rate of deforestation because the domestic turmoil suppresses access to forests and markets. They argue that deforestation pressure will increase if the domestic situation subsides, and that the historic baseline thus underestimates the real pressure on the forests.

And what about countries that have already taken action to prevent deforestation? Some argue that countries with low rates of deforestation should be rewarded to avoid creating a perverse incentive for these countries to increase deforestation in order to then qualify for REDD incentives. However, in order to maintain the environmental integrity of a REDD policy, credits can only be generated by additional reductions in emissions from deforestation, and these countries would have to be rewarded through other means.

Co-Benefits and Sustainable Development

REDD activities are often touted because of the added benefits that come with preventing deforestation, such as preserving ecosystems and encouraging sustainable development.

"Investors express a preference for and will pay a premium for projects that demonstrate social and environmental benefits in addition to robust climate benefits," observes Joanna Durbin, Director of the Climate, Community & Biodiversity Alliance (CCBA) that developed a design standard for climate change mitigation projects to ensure the projects are designed to support sustainable development and biodiversity in addition to their carbon benefits.

Although the Bali agreement recognizes that "reducing emissions from deforestation and forest degradation can promote co-benefits," Durbin and others are concerned that if REDD-generated credits move into a compliance market, the incentives for multiple benefits will be lost.

REDD policies promise to face all of the governance and equity challenges that have marked the international climate policy negotiations. The long-term success of REDD activities on the ground relies on ensuring that the priorities of forest-dependent communities are met and the benefits from REDD activities reach the communities bearing the burden of forest stewardship.

The Bali agreement recognizes the importance of forest-dependent communities, stating: "The needs of local and indigenous communities should be addressed when action is taken to reduce emissions from deforestation and forest degradation in developing countries." However, critics argue that local and indigenous communities currently don't have a voice at the negotiations table, and thus their needs are not being heard.

Two-Year Sprint

There is much work to be done. In December, 2009, the Parties will meet in Copenhagen to negotiate new target emission levels. Further, the parties will decide the mechanisms by which countries can meet those targets, including whether REDD will be incentivized through market-based incentives, or if REDD activities will be accomplished through a fund that rewards countries for measurable, reportable and verifiable reductions in emissions from forestry.

Though much ink will be spilled over the next 2 years addressing the technical and policy challenges facing REDD, the role that REDD will ultimately play in achieving global emissions targets depends on the on-the-ground capacity to implement REDD activities. "Readiness for REDD", a term often used for the technical and institutional capacity to implement REDD activities, varies tremendously from country to country and province to province. In an effort to build capacity for REDD a handful of new initiatives have been launched to improve readiness among key developing countries.

Priming the Pump

At COP-13 in Bali, the World Bank launched the Forest Carbon Partnership Facility (FCPF), a $250 million fund focusing exclusively on REDD. In its first stage, the FCPF will help about 20 developing countries to build capacity to implement REDD activities. These capacity-building activities could include helping to assess national forest carbon stocks and sources of forest emissions, define past and future emission rates, calculate opportunity costs of REDD activities, and design REDD strategies. Australia launched a similar fund called the Global Initiatives on Forests and Climate (GIFC) that will focus on Southeast Asia and the Pacific.

The challenges facing the incorporation of REDD into mainstream climate change policies are not trivial. However, the potential rewards from getting it right stretch beyond the emission reductions themselves and include the sustainable development of forest-dependent communities and the conservation of some of the world's richest forest ecosystems.

With the World Bank's Forest Carbon Partnership Facility (FCPF), the Australian government's Global Initiative on Forests and Carbon (GIFC) and other funds catalyzing REDD activities on the ground, and the clock already ticking on the UNFCCC's countdown to a decision at Copenhagen, the next two years offer a unique opportunity to shape how the world's forests can join the fight to mitigate climate change.

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Methodologies Tame Forest Carbon Jungle

by Michael J. Coren

As forests convert carbon dioxide in the air to carbon stored in woods, leaves and roots, a range of organizations are, in turn, working to convert forests into carbon offsets. The 'exchange rate' of this conversion is determined by specific standards' methodologies — technical, but critical, tools shaping the rules of the game.

18 August 2009 | Richard Wineberg is rhapsodizing about trees. His firm, Terra Firma Carbon, owns several hundred acres of timberland in Indiana and North Carolina in hopes of managing it as a healthy forest. Browsing the bookshelf in his Chicago office, crammed with classics on silviculture, Wineberg describes teaching himself forestry over the last few decades.

"It's more art than science," he says. "Forestry comes from looking over your woods very carefully. You can see the forces at work in the woods when you look at it."

Yet Wineberg's world is getting a hefty dose of science — and rules. **Forest carbon methodologies** — sets of guidelines governing how projects are designed, managed and monitored — are emerging to catalyze demand for offsets generated by growing trees and crops.

From reforestation and afforestation (A/R) to reduced emissions from deforestation and degradation (REDD), more land-use methodologies have been submitted to voluntary standards in the last twelve months than were approved under the Kyoto Protocol's Clean Development Mechanism (CDM) since the CDM Executive Board was formed in 2003, based on a review of standards' websites. At least nine have been approved under the CDM since 2005, but more than a dozen are taking shape under voluntary standards such as the Voluntary Carbon Standard, Climate Action Reserve (CAR — formerly CCAR, the California Climate Action Registry) and others vying to become the standard for a new generation of voluntary carbon projects.

Wineberg, 57, plans to be an early adapter. After decades preaching and practicing sustainable forest management, he's negotiating his first avoided deforestation project in Brazil. While optimistic that he can apply the new methodologies, he's concerned forest management will not conform to rigid protocols.

"There's no simple answer to anything in forestry," says Wineberg who seems as likely to consult a walk in the woods as a yield table for decisions about forestry. "Every piece of land is different. You don't want to make the perfect the enemy of the good in this business."

Forest Carbon Methodologies

For now, business remains uncertain. The majority of forest carbon credit transactions have taken place in the voluntary carbon markets. As the primary source of demand for forest-related sequestration credits (and the only one for REDD), voluntary markets have an historical affinity for charismatic projects like A/R — still the single largest category of biological carbon sequestration projects.

The market for voluntary offsets is expanding at an unprecedented rate: global voluntary markets more than tripled between 2006 and 2007 reaching a value of $331 million in 2007, according the 2008 State of the Voluntary Carbon Markets report. Yet the relative number of forest carbon credits that were traded last year declined from the year before. Representing 36% of over-the-counter transactions in 2006, forestry credits, dropped to 18% of such trades in 2007, although transaction volumes remained the same. Why? The reason may in part be due to skittishness about evolving rules of the game and long-term demand.

That may soon change. The pending US climate bill, known informally as Waxman-Markey, currently includes land based offsets. New Zealand and Australia are considering them, and even the EU has softened its stance on REDD. The worry, it seems, is that the credits must be real and fungible with the rest of the carbon market to win global acceptance.

At the same time, new project methodologies are arriving to guide the conversion of stored carbon to credits.

Standards such as the US Regional Greenhouse Gas Initiative (RGGI), the Environmental Protection Agency's Climate Leaders, CAR, Chicago Climate Exchange (CCX), the Government of Alberta, American Carbon Registry, the Voluntary Carbon Standard, and CarbonFix, among others, have published forest-carbon methodologies (also called protocols), with revisions on the way. The number of projects is on the rise as well. Although the CDM has only registered 6 forestry projects out of 1,750 registered projects — mostly reforestation — at least 52 projects are registered or in the pipeline in the voluntary markets according to the Forest Carbon Portal.

The world, it seems, is finally awakening to Wineberg's vision of managing forests for ecosystem services, especially the carbon in its biomass — so long as it can be measured, monitored and verified. When the UNFCC convenes its next Conference of Parties in Copenhagen this December, REDD and other forms of terrestrial carbon credits will be a central element of the international climate agenda. Negotiators are set on curbing some of the 18% of the world's greenhouse gasses (GHG) emitted by land use change and tropical deforestation each year. It is almost certain that whatever mechanism emerges, in some way it will rely on rigorous, science-based carbon methodologies to finance forest carbon credits.

What's so great about methodologies?

Methodologies, like roadmaps, give project developers specific routes to achieve creditable emission reductions. Some are tied to specific scenarios such as reforestation of species in the tropical pasturelands. Almost all of them share measures to ensure the environmental integrity of emission reductions through the use of baselines, additionality, permanence, monitoring, verification and transparent accounting. These principles guide rules articulated in the methodologies' detailed equations and procedures.

Yet methodologies do more than serve as technical blueprints. They underlie trust in markets for forest carbon offsets, says Derik Broekhoff, policy director at CAR, which is busy developing its own GHG reduction project protocols in the United States, including forestry.

"They're important primarily because anytime you're talking about carbon offsets, an intangible commodity, it's really hard for buyers to know what they're getting if you don't have a methodology," says Broekhoff.

Standards organizations like CAR ensure the quality of their credits, but methodologies theoretically guarantee the level of standardization so buyers and sellers know they are exchanging a real asset: additional, verifiable, and permanent GHG offsets. Without this, buyers would be forced to research the quality of every credit, and poor quality projects would blend in with credible one.

This rigor comes at a price.

A major complaint voiced by project developers is a tendency to favor perfectionism over practicality. Even authors of the methodologies agree. In the early days of the CDM, says Lucio Pedroni of Carbon Decisions, who has co-authored CDM-approved methodologies for AR projects, "a lot of effort was spent to capture minimal changes in carbon stocks, just to give the impression that we are perfect in a world that is never perfect." This led to methodologies where, as CDM rules dictate, almost every carbon source was considered — from gasoline use to fence posts.

"Projects have to be perfect beyond what is needed for a credible market," he argues. While this was feasible in industrial projects, this approach simply doesn't work in forestry.

To simplify the methodologies, Pedroni has joined a recent effort to draft 'modular methodologies' for REDD under the VCS. If validated, the modules will represent a new approach: simplified, modular methodologies that can be rearranged or modified if projects differ slightly from one another. In the past, forest carbon methodologies (costing upwards of $100,000 to create) were so specific that applied to only a handful of potential projects, and developers were unable to restrict and license the use of their methodologies to recoup their investment. This hardly provided incentives for ongoing innovation.

By contrast, the REDD modules are split into the essential components of a viable forest carbon project — baseline, additionality, measuring and monitoring and other categories — that can be amended without revalidating the entire methodology.

"In the end," claims Pedroni, "simpler methodologies are better for the climate. It's better to have 1200 projects and ten that are not additional, than to have two that are perfectly additional."

Financing the Future

Paying for these methodologies is still a challenge. While firms are poised to pour millions into the promise of the new market, large investors have traditionally steered away from forestry offset projects (only two of the 50 projects publically listed by EcoSecurities are in the sector). Yet a recent study by EcoSecurities found that forestry offsets purchased in the last ten years are comparable to volumes transacted in 2008 alone, and that projected demand is igniting a global search for credible projects, as well as close scrutiny of the potential of methodologies.

Eron Bloomgarden, president of environmental markets at Equator, a firm investing in timberlands and environmental assets, says the market has taken a wait-and-see approach to investing in forest carbon credits.

"The goal posts are still moving with many of the forest protocols," he says. "It's important these protocols need to be rigorous, yes, but they need to be workable and flexible to incentivize action."

Bloomgarden's reading of CAR's recently-revised protocols highlights issues like permanence, which could extend monitoring liability for up to 100 years, as promising but potentially problematic.

"Overall, they're pretty good protocols," he says. "But I'm not sure how workable they are for large volumes of credits. The practicality of the protocols remains to be seen. The jury is still out."

There will soon be no lack of choices. Various protocols address the same major issues, but in different ways, and offer project-specific frameworks. The CDM, for example, which approved its first A/R additionality and baseline methodology in 2005, now lists nine forest carbon methodologies and 13 'tools,' or guidelines for specific project tasks, as well as two 'consolidated methodologies' combining all of it into a streamlined package.

Of the voluntary standards, RGGI has approved carbon sequestration through afforestation activities following its own "Model Rule". The EPA's Climate Leaders Program released its A/R methodology in 2008; the CCX has a "rulebook" governing afforestation, long-lived wood products, and sustainably managed forests; and the Voluntary Carbon Standard has at least one methodology approved, as well as eight undergoing validation, not to mention acceptance of CAR and CDM methodologies making it one of the most comprehensive sets of methodologies available.

Picking a Winner

So, how to choose? Voluntary market developers will find their choice of methodologies dictated by standards that certify certain activities. The CDM is limited to A/R in developing countries, while the VCS credits four categories — Afforestation, Reforestation and Revegetation (ARR), Agricultural Land Management (ALM), Improved Forest Management (IFM) and REDD — under its land-use methodologies. After clearing the eligibility hurdle, methodologies (and the standards that certify them) must be marketable. A 2008 survey of project developers found that public credibility and the permanence of CO2 storage were most important issues for forest carbon project, followed by the practicality of carbon accounting and transparency.

Which methodologies, and standard, will win out is not clear. Competition and market demand are driving the latest round of innovation, and project proponents are advancing new methodologies around the world. A few innovative ideas are taking root: more default values are being considered to streamline accounting; permanence measures like risk discounting and buffer pools are replacing unpopular temporary credits used by the CDM; performance standards that set a target for an industrial process are gaining favor under standards like the VCS; and the modular approach to methodologies promises to make modifications easier and less expensive. There's even momentum toward crediting based on sectoral benchmarks or performance (CDM and VCS) under UNFCCC negotiations.

What works depends on their performance over the next few years and decades.

"We still have a lot to learn," says Alexia Kelly in the World Resources Institute's (WRI) Climate and Energy Program who is following the development of the US climate bill's treatment of offsets. "In my mind, that's the one thing that is missing: 20 years of project data to know the actual emission reductions that will occur [from methodologies]. That's what we really need to really judge the effectiveness of a given protocol. We're still groping in the dark."

In the meantime, the voluntary market continues to push innovation as international negotiators advocate for methodologies to ensure the integrity of their crediting scheme. But Pedroni, who has seen this process before at the CDM, warns against sacrificing needs of the market for the comfort of strict but unworkable methodologies. Entering the UN climate negotiations in Copenhagen this December, the world has yet to make decisions about the tradeoff between certainty and pragmatism.

“What’s the right balance?” he asks. “We have not found that yet.”

Wanted: Forest Carbon Projects for ForestCarbonPortal.com

by Steve Zwick

Forestry advocates believe that halting the destruction of tropical rainforests is one of the easiest and most effective ways to slow global warming, and that's led to a surge in development of projects designed to capture carbon in leaves, stalks, and bogs, but no centralized information hub for keeping track of all the activity — until now. Introducing: ForestCarbonPortal.com.

23 January 2009 | When Eveline Trines founded Treeness Consult in 2002, she was able to keep a running inventory in her head of all of the projects in the world that were offsetting industrial greenhouse gas emissions by capturing carbon in trees.

"Today, there's no way," she says. "You've got one initiative tumbling over the other, and the information stream is quite intimidating."

And it's bound to get more so as forest carbon projects evolve from ugly duckling to golden goose in the eyes of many project developers. The result is a torrent of information relevant to forest carbon, but no way to access the right resources.

To help meet the challenge, Ecosystem Marketplace recently launched the first phase of ForestCarbonPortal.com, an online information clearinghouse for the terrestrial carbon markets. Although still under construction, the site is active and can be viewed here.

SpeciesBanking.com for Trees

Like SpeciesBanking.com, ForestCarbonPortal.com is a satellite website to EcosystemMarkeplace.com and includes daily news posts, Ecosystem Marketplace articles, a calendar of events, and a "tool box" of the latest intro guides, curriculums, methodologies, software measurement tools and more.

In addition to news updates and a library of resources, the Portal also includes a first-of-its-kind Forest Carbon Inventory, which tracks terrestrial carbon markets. The Inventory also maps projects selling land-based carbon credits across the globe, and makes it possible for users to search for project sites by region, as well as by a variety of criteria such as project type, standard, registry, and credit prices.

Calling all Project Developers

The site only lists projects that have sold credits or have a publicly-available project design document (PDD), and all are described in consistent 'nutrition labels' listing a range of criteria.

Forest Carbon Associate Maria Bendana has researched 250 projects so far, but only 30 have been posted — largely because verifying the information is a tedious process that begins with simple web searches and cold-calling, but ultimately involves analyzing project documentation. That tedium, she says, represents the true value to end users: because they won't have to go through it themselves.

Potential Users See Promise, Challenges

Potential end users generally agree.

"I haven't seen anything as complete and sophisticated as this," says Trenes. "The need is definitely there — because the whole REDD (Reduced Emissions from Deforestation and Degradation) issue is so big at the moment, and it's very difficult to cross oceans every time you think there might be an interesting project out there."

One thing the Inventory does not include is projects that have not yet been developed. Katherine Hamilton, Managing Director at Ecosystem Marketplace explains that "the goal is currently to ensure information provided is accurate and to establish a dynamic list of active projects... so the site does not currently include pipeline projects. Instead we're encouraging project developers to let us know if their project is not listed and to keep information updated."

Joachim Sell, Head of Forestry and Biofuels for First Climate Group, is one voice asking for more. He says he'd like to see a sub-portal with more early-stage projects, even if they don't have the degree of transparency necessary.

Room for Early-Stage Projects?

Sell says that his company looks for both issued credits and early-stage projects that want to sell carbon credits on a forward basis and then use the forward contract to attract further investments or as collateral to borrow money for further development.

"A main issue for the development of carbon forestry projects will be the availability of advance payments at risk, i.e. before the project is registered," he says. "A platform with early stage projects could help to bring players together able to commit advanced payments that help to kick-start projects."

Bendana, meanwhile, is asking project developers interested in getting their projects on the site to contact her — and trying to figure out how she'll keep up with the paperwork if she gets what she's asking for.

"I hope they will face that problem," says Trenes. "It would mean a lot of projects are coming their way."

If you would like to see your project showcased on the Forest Carbon Inventory map, or if your project is already on display and you have any corrections or additions, please contact Maria Bendana: mbendana@forest-trends.org.

III Stories from Africa

Ghana Readies for REDD and More

by Steve Zwick and Alice Kenny

Any country that wants to earn carbon credits by reducing emissions from deforestation and forest degradation (REDD) has to first draft a Readiness Preparation Proposal (R-PP), which lays out the country's goals and establishes a map for achieving them. In the process of drafting Ghana's R-PP, stakeholders from industry, civil society, and government are coming to recognize their common dependence on nature.

NOTE: This article has been taken from a longer story of the same name that has appeared on www.ecosystemmarketpkace.com. For the full story, please visit the website.

September 2009 | When Robert Bamfo first contacted Alex Dadzie last year about the Ghanaian government's plan to earn carbon credits for reducing greenhouse gas emissions from deforestation and forest degradation (REDD), Dadzie was far from enthused.

"At first, we didn't understand the whole concept," says Dadzie, who is Vice President of the Ghana Timber Association. "We thought we were going to be restrained from doing our usual extraction."

Loggers weren't the only ones leery of earning money for not chopping down trees. Kwabena Nketiah is Program Director of environmental non-governmental organization (NGO) TBI-Ghana, and had devoted his life to making sure communities shared in the largesse of the nation's forests. Introducing new forest activities — and new income streams — could, he feared, make it possible for vested interests to ratchet up their piece of the forestry pie at the expense of poor communities.

But Nketiah and Dadzie listened to Bamfo, who heads the Forestry Commission's Climate Change Unit, and today they are two of 21 people charged with hammering out a REDD strategy for Ghana as members of the country' REDD Steering Committee. That means drafting a Readiness Preparation Proposal (R-PP) and also informing the team that is negotiating on Ghana's behalf in the current round of climate-change talks.

Building Consensus

Bamfo began pulling the committee together last year, and now it's comprised of four representatives from civil society (including local communities and tribal authorities), two from the timber industry, two academic researchers, one development partner and 12 government officials. Participants have gradually come to agree on procedures for reaching consensus, as well as to appreciate more clearly their common interest in preserving the country's resources.

"It was made known to us that the main focus was on conservation and carbon storage," Dadzie recalls. "We came to see this REDD could come with a price — and also a reward."

Building consensus among competing REDD stakeholders in Ghana has not been easy — and it is far from complete. A lot of money is at stake: approximately $2.2 billion, the estimated value of carbon stored in Ghanaian forests and shade trees.

Who Steers the Committee?

The Ghanaian government first began to investigate the country's REDD potential in earnest just over two years ago, when Bamfo — a botanist and wood technologist by training — was put in charge of a technical committee charged with analyzing the science of REDD. The committee, however, quickly realized that the technical aspects of implementing a REDD strategy meant nothing without an understanding of the specific values that Ghana could earn from its forests, most of which are already being used for logging or cocoa plantations. That left Ghana little room to earn income from the purest form of REDD, which applies only to standing native forests — and forced them to take a closer look at all the options on the table.

"They saw that the state we are at now needs no permanent technical committee, because the technicalities involved are diverse and will also vary with time," says Nketiah. "So they restructured, and now we have one governing committee that can constitute ad hoc technical committees as necessary."

Every government agency with an interest in forests was given a seat on the steering committee, and the cocoa sector was represented through the Cocoa Board, a division of the Ministry of Finance.

It was Bamfo's job to bring in the views of front-line stakeholders like civil society and the private sector — a job that both Dadzie and Nketiah say he's done well — but not as well as they'd like. Initially, there were just two representatives from civil society (TBI-Ghana and Civic Response), but two more were added in May — one to represent the National Forest Forum and another to represent the Community Resource Management Areas (CREMAs), which are designated areas that allow communities greater rights to the natural resources on their land.

On the industry side, the Ghana Timber Association and the Ghana Timber Millers Organization are the two representatives.

Building Buy-In

All three men say REDD will only work if the benefits extend to all participants and the buy-in comes from all quarters — and that has led to a growing consensus in favor of REDDplus — which is REDD plus sustainable logging, conservation, and enhancement of carbon stocks — all issues that are still being defined.

Within government, Dadzie wants to see buy-in at the highest levels — which he says has not yet happened.

"For REDD to be effective, the Forestry Commission's top hierarchy has to buy into the whole concept, and I am not seeing that right now," he says. "In the steering committee, they have the forestry representative, but not the executive director or the operations director, who are the main supervisory units of the forestry sector. They need to be on the steering committee for it to work."

Bamfo says that's happening now.

"In light of the growing importance of climate change mitigation issues to the forestry sector, the Forestry Commission set up a committee to examine and make recommendations for the mainstreaming and

integration of climate change and REDDplus activities within the commission," he says. "This committee is to also ensure education and training on climate change and REDDplus issues to a wider group of Forestry Commission staff to create a critical mass of expertise in those issues in the Commission."

He also says the higher-ups are more committed than people perceive, but agrees that awareness has to be spread both upward — higher within his own commission — and outward — to agencies that manage water and other natural resources if the project is to succeed.

Many of these agencies are already represented on the steering committee. The Fisheries Commission, for example, is represented through the Ministry of Food and Agriculture. Bamfo has been using REDD readiness to lay the groundwork for a complete suite of payments for ecosystem services (PES), which he believes will draw agencies that are currently only tangential to the REDD debate into broader discussions aimed at preserving all of the interconnecting ecosystems on which Ghana depends.

"Since REDDplus includes co-benefits such as biodiversity conservation, watershed functions, ecotourism, poverty reduction through benefit sharing, and so on, I proposed to the executive management of the Forestry Commission the need to carry out economic studies to provide quantitative information on the value of potential environmental services in the high forest zone to facilitate the development of a pilot PES scheme in Ghana," he says. "A long as the REDDplus scope covers co-benefits, discussion will include PES with examples such as aquaculture being considered as options for PES."

Who gets the credits?

Since the mid-1990s, Ghana's official position on forests has been clear:

"In Ghana they say that the forest is for the people," says Bamfo. "We need to make sure that what Ghana is earning from REDD will actually get to the communities."

But this is a trickier goal than it first appears. The state owns all "naturally occurring" trees, and gives logging companies rights over their harvest. If trees are being conserved rather than harvested, who gets the money?

The issue of tenure for cocoa farmers raises a whole other suite of issues to be dealt with (see "Carbon Payments and Ghana's Cocoa Sector" for details).

The Benefits of Participation

The next three months will be critical ones for the development of Ghana's REDD potential — with the committee working to complete its proposal in time for the December Copenhagen meeting, and at the same time making sure they don't move too quickly and leave some segments of society exposed.

Members say they are progressing — but, encouragingly, not so much by ironing out differences as in discovering commonalities.

"Until we were invited to the table and given the feeling the whole process involved us, we were against the whole issue," Dadzie said. Government, industry and civic organizations, he added, were pushing their own agendas. "But now, because we are part of the committee looking into this, we seem to have a common understanding and mutually-agreed approach to the whole concept."

Carbon Payments and Ghana's Cocoa Sector

by Emilie Filou and Alice Kenny

Cocoa is one of Ghana's most important exports, but current farming techniques wreak havoc on both soil and surrounding forests. This is not only unsustainable for cocoa, but also contributes to global warming and biodiversity loss. Can payments for ecosystem services help reverse this trend?

September 2009 | Can carbon save cocoa? That, some say, is the million-dollar question — or, more accurately, the $2.2 billion question, since industry insiders estimate that's the value of carbon stored in Ghana's cocoa landscapes.

That value could play an important role in ensuring the long-term survival of the nation's cocoa industry, which faces long-term existential threats as depletion of soil fertility and water supplies and various diseases threaten cocoa fields worldwide. Already Brazil, once the second-leading cocoa producer in the world, has seen its cash cow fall victim to a massive fungal disease. Now, instead of making money from cocoa, Brazil pays to import it.

Meanwhile Ghana — which is second only to Côte d'Ivoire in world cocoa production — experienced a dramatic decline in cocoa yield per acre farmed, spurring farmers to abandon the livelihood that supported their families for generations. That decline has been in remission for three years, thanks largely to the current high price of cocoa — which has also halted the flight from the land — but long-term challenges remain.

Two-thirds of Ghana's stored carbon lies in its high-forest region and the country has already lost most of this, seeing it shrink from 8.2 million hectares in 1900 to less than 1.2 million hectares today.

The Cocoa Conundrum and the Sun Curse

Cocoa has always been rough on land. Under the best of circumstances, the cacao trees from which cocoa is harvested suck nutrients out of the soil at rates that require massive infusions of chemical fertilizers — which only 3% of cocoa famers use — and also require heavy doses insecticides — which are also not in wide use.

Traditional cocoa farming techniques recommend leaving much of the standing forest intact, because traditional strains of cacao tree grow best in filtered sunlight. Over time, hybrid varieties have improved yields — beginning with hybrids that can be harvested twice per year instead of once. Newer plantations, however, are shifting to even newer hybrid trees that are more tolerant of direct sunlight. This makes it possible for farmers to chop down larger shade trees and plant more cacao trees — an apparent improvement over traditional farming because it, like earlier hybrids, offers higher yields.

Unfortunately, sun-free or low-shade systems suck even more nutrients out of the soil than do the already ravenous multi-harvest varieties; they also encourage some pests and — most importantly for the world at

large — rob the planet of both carbon-sequestering trees and of valuable habitat for various species of rare animal and plant by encouraging the destruction of natural shade trees that store carbon and provide shelter.

As a result, these newer plantations are often abandoned within two decades and replaced with newly-deforested land, says Michael Richards, a natural resources economist with Forest Trends (publisher of Ecosystem Marketplace). Cocoa farmers then extend their cocoa farm or move into another forested area, bringing deforestation with them and releasing more carbon into the atmosphere.

Most Ghanaian farmers still use the shaded variety of cacao tree, but the hybrids are taking hold — especially in the Western part of the country — and the global atmosphere is paying the price.

Long-term, farmers are paying a price as well.

Soil fertility has shrunk noticeably; the newer hybrid-cocoa trees' lifespan is growing shorter; and farmers are struggling to survive. Climate change and unsustainable farming techniques have decreased the amount of land supporting cocoa crops by 40% in the past four decades alone, reports the Ghanaian Nature Conservation Research Center, the leading conservation NGO in West Africa — although that amount has been increasing in recent years as cocoa prices rise.

Some experts believe that if nothing is done, Ghana's cocoa sector could go the way of Brazil's.

"The world is focusing on whether Kraft is going to buy Cadbury and how much it'll pay for it, but it may not be a great long-term investment if we run out of cocoa in 30 years," says John Mason, executive director of the Nature Conservation Research Centre (NCRC).

Scores of environmental non-governmental organizations (NGOs) have called for a moratorium on new sun-cocoa plantations and a return to shade-cocoa. Many believe that carbon offsets for projects that reduce greenhouse gas emissions from deforestation and forest degradation (REDD) can make it worthwhile for farmers to return to shade-growing, but Michael Packer, managing director of ArborCarb Ltd, says simply reviving the shaded growth method will not be enough.

"Traditional cocoa is problematic, too, in the way it has been produced," he says. "After all, that led to the deforestation that exhausted soil, which lead to the requirement for hybrids."

The solution, he adds, is to manage cocoa plantations differently.

"We need to work with ecosystems to manage soil nutrient content, biodiversity and associated ecosystem services — including carbon sequestration and disease control," he says.

Pioneering Cocoa Carbon

This sparked a push to create the first-ever cocoa-carbon initiative. Its petri dish is Ghana, home to one of the world's highest deforestation rates. Cacao farming is a leading cause of that deforestation — together with logging.

Forest Trends, NCRC, and the Katoomba Group, an international network promoting ecosystem service markets, are spearheading a three-part carbon-offset pilot project under the **Forest Trends Incubator** program, which has already initiated community-based projects across Latin America.

If the program overcomes funding and logistical hurdles, it could start as early as mid 2010, insiders say.

Most cocoa farmers are share croppers, but many also live on gifted land or land they have purchased. Regardless of the ownership structure, the project plans to measure whether farm owners who preserve or enhance the carbon-storing forest canopy of their farms can compensate for their decreased cocoa production with the sale of carbon-offset credits — and how this compensation can be spread among land-owners who lease their land to share-croppers and land-owners who farm their own land.

This could answer the $2.2 billion question — if policymakers can navigate several complex hurdles. Chief among them is land tenure.

The Tenure Quandary

The Katoomba Group recently invited key participants from a range of stakeholder groups — including various government departments — to a REDD Opportunities Scoping Exercise that identified tree tenure as a major constraint for REDD.

Tree tenure laws in Ghana, for example, discourage farmers from keeping trees — especially timber trees — because the state owns all naturally-occurring trees, while planted trees belong to the person who plants them. Farmers, therefore, are only permitted to fell timber trees for household use, but not for income. Only timber groups with government concessions can fell trees for money — leaving cocoa farmers no economic or financial interest in preserving trees growing on the land they either own or work.

Adding to the complexity: many cocoa farms are located within the 'off-reserve' areas of timber concession zones. This means that a logger with a concession can harvest the farm's trees — although the logger does have to let the farmer know he's harvesting them, and technically has to compensate the farmer for the felled timber trees and any damage to cacao trees from machinery. Unfortunately, there are no standards of compensation, and disputes are quite common.

To avoid the hassle — and the risk of damage — cocoa farmers often select non-timber shade trees in preference to timber shade trees. They have also been known to destroy timber saplings and even ring-bark mature timber trees, and those who keep the trees often sell them clandestinely to chainsaw operators who cause minimum damage to cocoa.

The Katoomba Scoping Exercise concluded that the best chance for sustainable shade-tree cocoa farming, as well as other tree-based systems, would be the extension of what are known as Community Resource Management Areas (CREMAs), in which communities can hold greater rights to the natural resources on their land, including trees.

NCRC is working with a few pilot CREMAs, but there are currently only a handful in the country, and it is not really government policy to promote them. However, it is hoped that this could change as part of a national REDD program.

Sustaining the Economy and the Ecology

With the livelihood of cocoa farmers and corporations threatened, significant efforts have been launched to resuscitate the industry. A public-private partnership named the Sustainable Tree Crops Program (STCP) kicked off in 2000 to introduce sustainable innovations such as integrated pest management and reduced chemical use to enhance cocoa productivity.

Farmers graduating from the program's "farmer field school" have seen their incomes improve by 15-50 percent, says Bill Guyton, president of the World Cocoa Foundation that supports the partnership and represents nearly 70 chocolate companies worldwide.

So far, however, only a small percentage of cocoa farmers participate in field school. Using carbon credits to augment farmer income and industry sustainability is a possibility Guyton says he is anxious to explore.

Preliminary research by the University of Reading in the UK suggests that traditional, shaded-cocoa farms store over twice as much carbon as shade-free farms. Farmers could be persuaded to increase their tree canopy and decrease their cocoa yield if carbon trading makes it worth their while.

Credits could be generated through four types of transactions activities under the REDD banner or as afforestation/reforestation projects under the Kyoto Protocol's Clean Development Mechanism — or in the voluntary carbon market.

Compensation for Limitation

REDD-wise, cocoa growers could be compensated for not encroaching on forest reserves or deforesting to extend their plantations. On farms, they could get credits for maintaining shade cover and not promoting full-sun exposure.

As for reforestation, farmers would be rewarded for reverting from a full-sun system to shaded cocoa to planting trees and encouraging regeneration.

They could also get credits for rehabilitating abandoned plantations and not letting them turn into low-productivity agricultural land or bush, which have low carbon-storage capacity.

"It is a potential win-win situation for everyone," says Richards. "It promotes biodiversity and environmental sustainability, would ensure supply sustainability for the big cocoa buyers, and it could improve the livelihoods of thousands of small farmers."

Potential vs. Practice

Potential is one thing. Practice is another.

"We're all convinced that this area has real potential," says Ken Norris, a researcher from the University of Reading and lead scientist for the pilot projects. "The problem is there are a whole lot of practical issues to overcome to make it work."

For instance, because verification of carbon offsets is expensive, CO2 contracts typically apply to land sizes ranging from 3,000-5,000 hectares. But the average cocoa farm in Ghana is only 2-3 hectares. Each contract, then, would require approximately 2,000 farmers to federate.

And carbon rights are not established in law yet — although many are going on the assumption that they will follow the timber rights outlined above: namely, meaning that standing trees will fall under the jurisdiction of the Forestry Commission, while planted trees — and their largesse — will be owned by whoever plants them.

"This is a major organizational democracy initiative about benefit sharing," says Mason. "We're trying to work out the best way of doing it, perhaps through existing community groups or organizations."

Money

And, of course, there is the issue of funding. Norris estimated the project cost at US $5.5 million, and believes potential funding organizations will wait until after funding issues are resolved at the year-end Copenhagen Climate Conference before they decide how much they will contribute.

Cocoa carbon credits are not expected to flow for at least another two or three years — yet Mason says he is optimistic; he already has potential buyers.

"The cocoa industry is prepared to buy our credits as soon as we're able to bring them to market," he says, adding that he's been working with the cocoa industry over the last three years — and his message is sinking in.

"It's gone from ignorance and skepticism to the realization that a major shortage of cocoa beans is looming."

But he says he is concerned about what's been done to mitigate the crisis so far.

"All the big manufacturers are competing against each other when this is a time for a major concerted effort."

The Ghana Cocoa-Carbon Initiative and pilot projects under the Forest Trends/NCRC/Katoomba Incubator could answer these concerns. The initiative already raised $1.5 million from international donors such as the Rockefeller Foundation and NGOs such as the Rainforest Alliance.

Winning Industry Support

Mason also asked the cocoa industry to chip in. He recently presented the initiative at the launch of a new not-for-profit organization called Source Trust. Set up by Armajaro, a leading cocoa supplier whose clients include Cadbury, Nestlé, and Kraft's amongst others, Source Trust certifies and promotes sustainable cocoa-farming practices in local communities.

It already raised $1 million to pay for education and water projects that promote sustainable farming, as well as bed nets that reduce malaria. Chocolate manufacturers pay Armajaro a premium of $30 per ton in exchange for a traceable and sustainable cocoa supply.

"As an industry, our interest is to ensure that farmers have good yields over the long-term, not just in the next couple of years," says Nicko Debenham, head of traceability and sustainability at Armajaro and a spokesperson for Source Trust.

Encouraging farmers to leave 40% shade cover on their farm would serve that purpose. Debenham says Source Trust will assess its stakeholders' interest in providing the $4 million Mason requested for the cocoa-carbon initiative. The carbon pilot project could also piggyback on Source Trust's certification program as the administrative platform for carbon payments.

Cocoa Carbon Projects

Once funded, the project plans to learn more about carbon sequestration in varied landscapes, Norris says. Three pilot sites will be chosen, one in western, one in central and one in eastern Ghana. Two of the Incubator's projects will be dedicated to carbon and cocoa.

Their objective is threefold. They will undertake detailed scientific work to build a robust case for future contracts between farmers and carbon credit buyers. They will establish methodologies and structures to take the credits to market. And they will federate farmers into groups or cooperatives that will work under a single contract to spread the impact of transaction costs.

Outside the Box

It will take years before cocoa-industry stakeholders can answer the $2.2 billion question. But the final answer could transform not only the cocoa industry and carbon trading but farming as we know it.

"Instead of thinking about producing food to the detriment of the environment," Norris says, "we could produce food to preserve the environment."

The Biochar Debate

by Avril David

Land-use practices — including forestry and agriculture — are responsible for nearly 40% of all greenhouse gas emissions, which is why accounting for land use, land-use change, and forestry (LULUCF) is a key point of contention in climate-change talks leading up to December's Conference of the Parties in Copenhagen, Denmark. Ecosystem Marketplace summarizes the latest findings.

17 July 2009 | Thousands of years ago, South Americans of the Amazon Basin began using charred animal waste and wood to make what the Portuguese called "terra preta" (black earth). The terra preta soil they created has remained fertile for thousands of years, producing agricultural yields far better than neighboring soils without this charred material.

Today, similar "biochar" is being applied by innovative farmers and gardeners around the world. Biochar is produced by a process known as pyrolysis, whereby organic material is heated in a closed container without oxygen to the point where it begins to decompose chemically. It is similar to the way charcoal is produced for cooking fuel, except that biochar is produced at lower temperatures — around 400 to 550 degrees Celsius, resulting in a highly porous char that retains more of the structure and mineral content of the raw material.

Biochar retains water, and within a few years soil minerals react with it, creating an ideal habitat for soil micro organisms that help make nutrients available to plants. Furthermore, biochar is 60 to 70 percent carbon, and because it resists further decomposition in the soil, that carbon does not get released to the atmosphere for hundreds and possibly thousands of years.

Thus, organic waste — ranging from forest residues to manure — can increase crop yields and act as natural carbon sink by sequestering CO2 and storing it in the soil. A World Watch report on Mitigating Climate Change through Food and Land Use estimates that if "biochar additions were applied on just 10 percent of the world's cropland (160 million hectares), the method could store 29 billion tons of carbon dioxide equivalent, offsetting nearly all the emissions from fossil fuel burning". According to the report, "initial analyses suggest that planting vegetation for biochar on idle and degraded lands could be quite economical and is thus a promising option for carbon offset payments".

The Science

Left undisturbed or protected, soil serves as a vital carbon sink for the Earth. This function often breaks down, however, when soil is disturbed. Then, it can quickly change from carbon sink to major source of CO2 emissions.

Burying biochar in the soil can improve its carbon sequestration potential more quickly than conservation tilling and grass-planting do.

"The overall natural (carbon) cycle is carbon-neutral," writes the Illinois Sustainable Technology Center. "In contrast, pyrolysis can lock up this atmospheric carbon as biochar for long periods (e.g., centurial or even millennial time scales)", which essentially has a carbon-negative effect.

In terms of added agricultural and environmental benefits, the International Biochar Initiative states that,"char-amended soils have shown 50–80 percent reductions in nitrous oxide emissions and reduced runoff of phosphorus into surface waters and leaching of nitrogen into groundwater. As a soil amendment, biochar significantly increases the efficiency of and reduces the need for traditional chemical fertilizers, while greatly enhancing crop yields." In addition, the process used to make biochar (pyrolysis) has useful by-products such as gases and oils that can be used for heating or to power engines.

Issues and Concerns

During recent climate negotiations in Bonn, Germany, participants of a side event on biochar noted uncertainty around biochar's ability to sequester carbon, the possibility that biochar might stimulate soil microbes that turn soil carbon into carbon dioxide, and the potential albedo (or reflective) effect of laying charcoal near the soil surface.

Participants also noted that biochar could have multiple unintended social and eco-side effects, for instance, biochar production could lead to the development of biochar plantations that take the place of forests.

Furthermore, as according to the Guardian's George Monbiot, "In some cases charcoal in the soil improves plant growth, in others it suppresses it…in some cases charcoal stimulates bacterial growth, causing carbon emissions from soils to rise." Not to mention the fact that some byproducts of pyrolysis can be toxic to plants, and can also be a source of harmful emissions if the gases emitted are not properly managed.

Biochar in the Congo

The Congo Basin Forest Fund is an initiative by the British and Norwegian governments, aimed at protecting the unique tropical rain forests of Central Africa and their biodiversity and ecosystem services. The fund recently awarded funding to Belgium's Biochar Fund and its Congolese partner ADAPEL to implement its biochar concept in 10 villages in the Equateur Province of the Democratic Republic of Congo. The Biochar Fund says the scheme will help address lack of access to clean, renewable energy among poor rural communities while simultaneously cutting emissions from deforestation and forest degradation.

Despite these concerns, the prospective benefits of biochar are intriguing. Some researchers have suggested that even a slash-and-char system of agriculture would be preferable to slash-and-burn practices that remain the norm in many tropical areas. In addition to sequestering a portion of the carbon, the agricultural benefit of biochar can last decades, as opposed to the one or two years of subsistence yields that forest plots generate when slashed and burned. Charring could therefore reduce the pressure to convert additional forests to cropland.

Pilot Projects

While biochar certainly has potential as a climate change mitigation tool, continued research is needed to ensure that it is in fact viable in various soil types and that the potential adverse effects do not outweigh its benefits. To that end, biochar pilot projects are currently underway in multiple countries.

For instance, at the University of Tarapacá in Chile, researchers are conducting a comprehensive pilot program that utilizes a lab-based pyrolysis unit that produces biochar. The researchers plan to study both availability and applicability of local feedstocks for biochar and will evaluate which feedstocks are the most efficient in producing biochar. After the initial phase, the project will be scaled up to increasingly larger farms with larger units and feedstocks. While the University of Tarapaca' s project will likely yield some important findings for the further development and use of biochar as a carbon sequestration and soil enhancement tool, other biochar projects are focusing on the substance's ability to supplement existing conservation efforts.

In Cameroon, a project sponsored by Belgium's Biochar Fund plans to use biochar as a "buffer" to protect pristine rainforests threatened by slash-and-burn farming and increasing populations. The biochar could enable farmers to produce greater yields on existing agricultural lands rather than using the rainforest as a source for new land.

Residents of the Amazon are increasingly aware that their actions can contribute to climate change. Some would be surprised to know that their ancestors may have devised a means to help resolve this global challenge.

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Soil Carbon in Africa: Potentials and Pitfalls

by Michael Streck

Imagine a world where African farmers raise their standard of living by shifting towards sustainable agriculture that mitigates climate change — while cashing in on this shift via ecosystem service payments. If you can't imagine it, drop in on the real deal: in the Kiambu District of Central Kenya, where a groundbreaking pilot project is testing new financing mechanisms that capture carbon in soil.

First in the Series: *The Road to Accra*, leading up to the October Katoomba Meeting in Accra, Ghana.

9 September 2009 | Most of the 9,000 members of the Komothai Smallholder Farmers Cooperative earn their livelihood farming just over a half-hectare of land. That's about the size of a soccer field, and it's usually split evenly between a coffee-growing part and a subsistence farming part.

Modern farming methods have ratcheted up production of food products around the world — but often at the expense of tomorrow's fertile fields. Now, however, farmers of the Komothai Smallholder Farmers Cooperative are managing their 7,000 hectares in ways that preserve the land for tomorrow, improve coffee quality, and suck carbon from the atmosphere so it can be stored in the soil. This carbon storage gives them an opportunity to earn the carbon credits that could ultimately make sustainable agriculture more profitable in the short term than current intensive methods.

Supported by international coffee trader ECOM Agroindustrial Corp and the German Technical Cooperation, GTZ, farmers involved in this pilot project produce shade-grown and bird-friendly coffee. The World Bank is helping to turn that stored carbon into carbon assets, and the Bank's BioCarbon Fund intends to buy the emission-reduction credits generated by this project, which the bank believes will mitigate 3.5 tons of carbon dioxide equivalent (tCO_2e) per hectare each year — or roughly 30,000 tCO_2e in the entire project area per year. The credits will then be sold in the voluntary carbon market for US$ 3-5 t/Co_2e.

It is estimated that the yield per hectare will increase from 1.5 to 5 kilograms without requiring the addition of anorganic fertilizers. Moreover, the new farming techniques will improve soil fertility and water holding capacity, and strengthen the land's resilience to climate change.

Can it be Replicated?

Can this example be a model for other farming communities in Africa? Can carbon market revenues help farmers adopt more sustainable agricultural practices? Can a project that works for coffee farmers in Kenya also work for cocoa farmers in Ghana? And can farmers in Africa become more than farmers, like their colleagues in Europe where the EU and national governments pay them not only to produced food but to restore and protect ecosystems that are vital to a societies economy and future?

US Secretary of Agricultural Tom Vilsack certainly thinks so. On a recent trip to Africa, he said countries there can boost global efforts to curb emissions through absorbing greenhouse gases by improving its farming sector.

"With proper techniques and management, Africa can help the world better balance its greenhouse gas emissions."

Johannes Woelke agrees. He's the senior economist at the World Bank's Africa Department and has been working in Kenya to get carbon finance projects up and running.

"Carbon payments can be a catalyst to push for change in Africa," he says — adding that change is desperately needed.

The African Challenge

Africa has the highest projected growth in agricultural emissions due to population growth and changing diets. Many countries risk heavy losses in agricultural production caused by climate change. Already, 66% of Africa's crop land is severely degraded. And African forests are disappearing faster than in other tropical regions of the world, mainly because they are being converted into new crop land.

"If you ask African politicians and experts what are the three problems which need to be tackled, they will answer 'agriculture, agriculture, agriculture'," says Ralph Aston from the Terrestrial Carbon Group.

Therefore, land use and land-use change in Africa have huge climate-change mitigating potential. Soil carbon projects offer new possibilities for a continent that's largely been missing on the global carbon market map. This would be welcome news to Africa's rural people, of whom 229 million belong to the extreme poor.

REDD All Over Again?

Assuming a price of just 10 US$ t/Co_2e, the resulting carbon revenues would be twice as high as official development aid flowing to African agriculture every year.

But in order to include African countries' (or any other regions') soils in carbon markets, other math needs to be done. And that's where the difficulties just begin.

It is a bit like a déjà vu. Remember when forests as carbon sinks appeared on the radar screen of emission traders, project developers and NGOs a few years ago? When contentious issues like additionality, leakage, permanence, verifying and monitoring seemed to be hurdles too high to overcome. Not to mention all those ideological questions about whether rich countries should be allowed to offset their emissions by financing forestry projects in developing countries.

Today, almost all agree that forestry should be an integral part of any post-2012 climate framework. The arguments are mainly over who should foot the bill.

If it comes to soil carbon, we are still at the outset.

Potential…

Soils are assumed to offer the largest potential for carbon storage of the terrestrial carbon cycle, but estimates of their dimension differ widely.

Many experts believe that enriching soil carbon and protecting existing carbon stocks is a good idea. It improves soil quality and retains water and nutrients — so it's good for food security. Many farming techniques — such as crop rotation, mulching, manure management, reduced tillage, terracing, and agroforestry — are already in-use, time-tested, and can quickly be implemented. Also, enhancing soil nutrients through organic methods means using less fertilizers.

Some experts recommend biochar, which is charcoal made from organic waste, as a possible solution. Advocates of this newly rediscovered traditional way of fertilizing poor soils calculate that if biochar were applied on just 10% of the world's crop land this could store 29 billion tons of CO2 equivalents offsetting nearly all emissions from fossil fuel burning. This might be a bit of a stretch, and critics, asking where all the additional organic material should come from in Africa, fear that this will lead to chopping down trees for 'biochar-plantations' if it were to be produced on in larger quantities. But it's an ancient practice that had been used by tribes in the Amazon for millennia, and can be applied quickly on a small scale.

…and Pitfalls

Whether African soils are well-suited for soil carbon projects is a different story.

Research done by the Terrestrial Carbon Group found that only two African countries — South Africa and Congo — offer a high potential of soil carbon sequestration. Soil specialist and retired Duke University professor William Schlesinger is now president of the Cary Institute of Ecosystem Studies in New York. He says that peatlands, wetlands and cold regions are, in general, better places for locking up significant amounts of carbon in soils.

"Since soil carbon contents are driven more by decomposition rates than input rates, hot areas and deserts simply do not store as much carbon," he says, adding that the best road to sequester carbon in soils in Africa would be to focus on incorporating crop residues or their ash into soils, where this has not been done traditionally.

Modeling vs. Measuring

Which brings us to the question of how to measure changes in carbon stocks. Releasing carbon from soils takes much longer than from trees and sequestering is a much longer process as well.

"Measuring and validating an estimate of soil carbon over any considerable area is a non-trivial amount of work due to the high degree of spatial variation in soil characteristics and the relatively small changes in the carbon content that will be seen on an annual basis," says Schlesinger, adding that modeling cannot replace field surveys because the models are too dependent on the parameter estimates that drive them.

But Woelke believes that a robust, cost-effective method of measuring additional emission reductions and monitoring carbon-stock changes can be developed. In fact, his team has just done that for Kenya. He uses default values for variations in carbon stocks depending on agro-ecological zones and soil types. The method has been submitted for approval to the international Voluntary Carbon Standard, which was designed to give accountability to the voluntary carbon market. If accepted, other projects will be able to use it too.

Woelke admits that implementing these projects is challenging.

"The efforts are huge, and the mitigation potential for single units of land is small," he says. "For the entire region, however, it's big."

That means it's necessary to cover larger land areas and bundle projects together.

Soil Carbon as Bellwether

Ken Newcombe, CEO of carbon finance firm C-Quest Capital, believes that soil carbon credits could eventually have dual currency as an indicator of environmental health and sustainability.

"This is one of the really intriguing prospects for soil carbon," he says.

Other businesses, however, are not convinced yet.

Carbon trading companies and project developers remain skeptical of whether it will be possible — and at which cost — to allocate credits for all the different types of soils, climates and land use systems.

Permanence and Other Echoes of REDD

Anna Lehmann from project developer Syndicatum Carbon Capital in London, doesn't believe soil carbon credits should be recognized on the carbon market — largely because you don't really know how long and how much of the stuff is being stored. Undisturbed, soil carbon will sit in the ground for millennia. But disturbances are far from rare events.

"This is even more difficult to manage than forestry, and much harder to verify," she says, adding that a single tilling can again release 60–80% of stored carbon.

And then there are the old problems of credit fungibility, accounting and a dual credit system will be back.

"The market doesn't like this," says Lehmann.

Schlesinger believes the price for carbon credits would have to climb well above its current levels if soil carbon is to become profitable. Otherwise, he says, it will be more expensive to establish and validate soil carbon stores and their changes than the credits are worth.

The Regulatory Status

As for now, the only place you can sell soil carbon credits is the voluntary market — and then only for very short vintages.

Experts agree that in order to scale up and increase its mitigation effect, land use will have to be incorporated into the international frameworks for climate change. While there is a broad consensus among negotiators that carbon credits form reduced emissions from deforestation and forest degradation (so called REDD mechanism) should be included into any new climate treaty, soil carbon is still a long way to go.

Support, however, is growing.

"We want all terrestrial carbon to be included in either a reformed CDM or new mechanism", says Aston.

The Holistic View

A wider use of carbon trading could help recession-hit industrialized countries add to pledged 2020 cuts which now total only 10–14% below 1990 levels which is below the 20–40% demanded by the UN climate panel to avoid the worst consequences of climate change.

The case for a holistic view in terms of land use is easily to understand if one looks at the link between forest protection and agriculture: 89% of deforestation in Africa is driven by expanding agriculture. To change this land productivity needs to be significantly increased.

"This won't be possible without trade-offs", says Bernard Mercer from the Forests Philanthropy Action Network, which works on priorities for terrestrial carbon options in Africa.

He argues that it's necessary to intensify agriculture to take pressure off the forests. That means it might be necessary to use climate-harmful fossil-fuel-based fertilizers if we want less deforestation.

"And," he adds. "Even if most African NGOs are opposed to it, we have to think about genetically-modified crops."

More Research Needed

Mercer, who admits to be a bit unorthodox, also criticizes that the debate on land use and carbon mitigation zooms too much in on accounting and not enough on science.

"On the road to Copenhagen, people are fixed on the financial side," he says. "But the topic of soil carbon is extremely under-researched, and we need to know what makes sense in a given context and is effective. The finance is second."

He makes the analogy to the kick-start of Silicon Valley.

"You have to build the computer first and prove that it's working. Then banks invest."

Cocoa and Soil Carbon

So, what might work in West Africa, where the World Bank says no soil-carbon projects in the pipeline?.

Probably, the first thing to look at is the important, export-driven and large-scale cocoa production.

Cocoa trees could be mixed with other tropical trees to form agroforestry projects which are already eligible under CDM rules. Agroforestry methodologies have been approved by the UNFCCC for afforestation and reforestation projects.

Another option is to adapt soil enhancing techniques for cocoa plantations that cannot be shifted to an agroforestry system. These large, connected and more homogenous areas are, relatively speaking, easier to

quantify and monitor. Like the coffee project in Kenya, they are more likely to whet investors appetite once those problems have been tackled.

It will be much more difficult to attract project developers and private carbon finance outside the forest and cocoa plantation areas.

Lessons of EU's CAP

Beyond the plantations, we mostly find small-scale subsistence farming, where "soils are plagued with inherent or human induced infertility", as the FAO states, and are susceptible to severe erosion. Much of the land is not very productive. Many areas face accelerated desertification. But this is the land that could benefits most from improving soil quality. Here, reformed national policies could bring leverage to bear on change.

For Lehmann, the most promising route may be the European Union's often-criticized Common Agricultural Policy, which nevertheless promotes soil fertility and environmental protection.

"Through subsidies, you can strongly influence farming practices like using fertilizers," she says.

Mercer also favors agricultural policy interventions.

"We could use money from assigned REDD funds and distribute it to governments to push for land use reforms," he says. "We have to start with what we can do today."

If lessons were to be learned from CDM and forestry, which could be considered a failure given the few projects actually realized, a terrestrial carbon scheme that also includes soils and wants to harness carbon finance faces huge problems with accounting, application and verification costs especially in Africa.

"At the end we need a simple plan", says. "For me that means national inventories of carbon stocks."

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Green Resources is First to Achieve Validation for Tree-Planting Under VCS

by Steve Zwick

*Norwegian forestry and carbon offset group **Green Resources** last week became the first carbon offset project developer to register a reforestation project under the Voluntary Carbon Standard's guidelines for reducing greenhouse gas emissions from agriculture, forestry, and land use. This week, a second project was also verified — and plenty of others are sure to follow.*

22 July 2009 | On Friday, July 17, German carbon offset project verifier TÜV Süd wrapped up a two-year audit and gave its stamp of approval to the first-ever carbon offset project recognized under the Voluntary Carbon Standard's (VCS) guidelines for agriculture, forestry, and land use (AFOLU), which were finalized in 2007.

The project, which covers two locations (Uchindile and Mapanda) in the Southern Highlands of Tanzania, was launched in 1997 by Green Resources, a Norwegian company focused on carbon offsets and forest products. It will reforest 10,814 hectares of degraded land and conserve 7,565 hectares for local biodiversity.

On a broader level, the project offers an opportunity to test the market's acceptance of forestry credits that aim to achieve credibility by applying the VCS's "buffer" approach — essentially allowing for the potential loss of forest by planting more trees than they sell credits for, and basing that set-aside on the perceived risk of damage.

"This is the first forestry-sector project to be validated under the VCS, and thus marks a tremendous milestone," says VCS Association CEO David Antonioli. "Kudos to Green Resources for helping to demonstrate that by using the VCS one can generate permanent removals from the forestry sector that are perfectly fungible with other emission reductions."

Long Time Coming

The project was initially launched to fund reforestation by generating carbon credits under the Kyoto Protocol's Clean Development Mechanism. When the protocol was finalized in 1997, however, the only afforestation and reforestation projects it recognized were those that began after 2000.

Green Resources then turned to the voluntary market, but found their efforts to sell offsets from the Tanzanian project hampered by the lack of standards. In 2008, the project was certified under the Forest Stewardship Council's (FSC) standard for sustainable forest management, but still lacked the kind of pedigree that companies interested in voluntarily offsetting their greenhouse gas emissions look for.

As standards evolved, it became clear that only the VCS could offer that kind of assurance.

"One of the great things about VCS is that it has provisions for early start," says Jenny Henman, Carbon Offset Certification Manager for Green Resources. "You basically have to prove that carbon income was considered from the beginning and that you had an independent review prior to 2002."

Buffering for Long-Term Credits

In negotiations leading up to the Kyoto Protocol, critics of forestry offsets argued that any credits generated by capturing carbon in trees should only be given temporary status because of forests' susceptibility to fires, pests, and illegal logging. Offset buyers, however, have been lukewarm to-called tCERs (temporary Certified Emission Reduction certificates), preferring instead permanent offsets that don't expire.

The VCS has chosen to deal with the permanence issue by recognizing forestry credits as permanent if project developers meet certain criteria and then agree to plant a buffer of more trees than they sell credits for.

The Tanzanian project will generate permanent Voluntary Emission Reductions (VERs) over a period of 99 years, with a reserve buffer of 40%.

"This is the first time the risk buffer has been applied," says Henman. "It's an interesting process, and the final buffer is linked to things like the certainty of land tenure, measures that you have in place to deal with things like fire and pest control, your relationship with the local community, and the political stability in the country."

The Pipeline

Green Resources submitted its project for validation almost as soon as the VCS guidelines for AFOLU were released in 2007. It's not clear how many others did the same, but those that did will be coming to light over the next few months.

TÜV Süd has already validated a second reforestation project, and Sebastian Hetsch, the TÜV Süd auditor who validated the Tanzanian project, says others are in the works.

"This shows that the voluntary market is attractive for project developers, and that it works," he says — adding that it's still more profitable for reforestation and afforestation projects to go the CDM route if they can.

"There are six affforestation/reforestation (A/R) projects registered under CDM right now, and around 50 have started the validation process," he says. "I wouldn't be surprised to see 15 CDM A/R projects registered by year-end, but only expect another four or five to be registered under VCS."

Henman agrees.

"We have other forestry projects, but they started after 2000, so we are going for CDM," she says. "We would, however, definitely look to VCS for other categories of forest project type — like REDD (Reduced Emissions from Deforestation and forest Degradation) or Improved Forest Management, which allows for enrichment-planting and forest restoration."

The second reforestation project to be verified under VCS is in Pucallpa, Peru, and was developed by Sustainable Forestry Management (SFM Ltd), which owns the emission reduction rights and manages the

carbon, along with SFM-BAM, a joint venture between SFM and a local Peruvian company that owns the land and is in charge of implementing the project, together with local non-governmental organization Asociación para la Investigación y Desarrollo Integral (AIDER), which provides technical support.

Both projects have applied for additional validation under the Climate, Community, and Biodiversity Standards, which ensure that projects not only sequester carbon but provide support to local communities and promote biodiversity.

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Ecosystem Marketplace

The Ecosystem Marketplace seeks to become the world's leading source of information on markets and payment schemes for ecosystem services (services such as water quality, carbon sequestration and biodiversity). We believe that by providing reliable information on prices, regulation, science, and other market-relevant factors, markets for ecosystem services will one day become a fundamental part of our economic system, helping give value to environmental services that, for too long, have been taken for granted. In providing useful market information, we hope not only to facilitate transactions (thereby lowering transaction costs), but also to catalyze new thinking, spur the development of new markets, and achieve effective and equitable nature conservation. The Ecosystem Marketplace is a project of Forest Trends. **www.ecosystemmarketplace.com**

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