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The Big Picture

For hurricane watchers, 2005 was a year for the record books. A startling number of hurricanes hit the Gulf of Mexico, causing over US$100 billion in damages. Hurricane Katrina alone displaced 1 million people and left 1000 dead (http://en.wikipedia.org/wiki/2005_Atlantic_hurricane_season).

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, namely a hurricane in the southern Atlantic. For over 40 years, weather satellites circling the globe have seen hurricanes and cyclones in the north Atlantic, and on both sides of the equator in the Pacific, but never – until 2004 – in the southern Atlantic. On 28 March, Hurricane Catarina slammed into Brazil, proving 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?

While there is no level of data or anecdote that that will satisfy hardened sceptics, many scientists now believe that the storms of 2004 and 2005 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, and 2005 was the hottest year of the last 150 years (Linden, 2006).

Again, sceptics 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.

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 380ppm, 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.

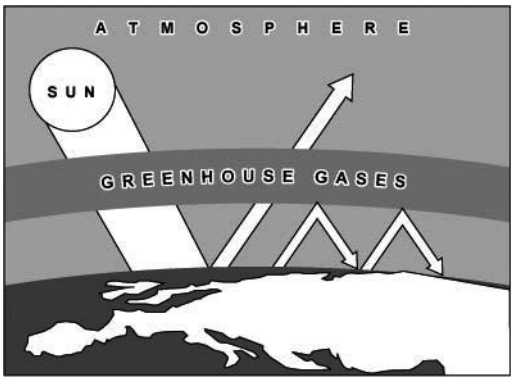

Figure 1.1 *The greenhouse effect*

Source: Pew Center on Global Climate Change (2001) 'The greenhouse effect', In Claussen, E. (ed) *Climate Change: Science, Strategies and Solutions*, Brill, Boston

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).

Market theory

To start towards stabilized levels of atmospheric CO_2, 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 GHG 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-à-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 today's European emissions market, for instance, emitting 1 ton of CO_2 has in the past cost polluters anywhere from under 7€ to 30€ (Hamilton, 2006). In a world where pollution has no price, the default decision will always be to pollute. In a world where pollution costs between 7€ and 30€ a ton, the decision is no longer quite so easy. 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 technology, 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, down the line, they will be able to make them back through emissions reduction technologies. 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 such benefits, 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, the UK based non-governmental 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), we have seen environmental markets emerging to trade in everything from wetlands to woodpeckers.

Carbon markets

The term *carbon market* refers to the buying and selling of emissions permits that have been either distributed by a regulatory body or generated by GHG emission reductions projects. Six GHGs are generally included in 'carbon' markets: CO_2, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons and perfluorocarbons.

GHG emission reductions are traded in *carbon credits*, which represent the reduction of GHGs equal to one metric ton of CO_2 (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 tons of carbon dioxide (i.e. tCO_2e) over the course of 100 years. For example, the GHG methane has a GWP roughly 23 times higher than CO_2, hence one ton of methane equals

about 23 tCO_2e. Likewise, other gases have different equivalences in terms of tCO_2e, some of them (perfluorocarbons) are worth thousands of tons of CO_2e.

GHG emissions reduction 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. A*llowance-based transactions* involve the trading of issued 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.

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 (the exception here is the Chicago Climate Exchange).

Box 1.2 The Chicago Climate Exchange (CCX)

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 for the past four years 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 converted to tCO_2e. Unlike most of the voluntary carbon market, 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 their target. While CCX allows members to invest in offset projects as a means of meeting emissions targets, just 1/50th of the transactions taking place on the exchange are for CFIs generated through offset projects (Walsh, 2006). 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.

Since its launch in late 2003, CCX has grown in membership from 19 institutions to over 131 institutions. Ford Motor, International Paper, IBM, American Electric Power, the City of Chicago, the City of Portland, the City of Oakland, the State of New Mexico, the World Resources Institute and the Rocky Mountain Institute are just a few of its wide range of members from the business, governmental and philanthropic sectors. CCX traded 1.45 million tCO_2e in 2005 for a total value of US$2.7 million. The average weighted price per tCO_2e in 2005 was US$1.95. Trading prices spiked in the first quarter of 2006 to US$5.00 when post-2006 vintages were announced and – according to sources – a US Senator began openly speculating that the US. might someday adopt CCX as its de-facto carbon-trading scheme. The first quarter of 2006 also saw higher trading volumes, with a total US$1.25 million exchanged (Capoor and Ambrosi, 2006).

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). And CCX announced the creation of three new exchanges in 2006: the Montreal Climate Exchange (MCX), the Northeastern Climate Exchange (NECX), and the New York Climate Exchange (NYCX). These initiatives are presumably designed to interface with carbon credit schemes in Canada and with the Regional Greenhouse Gas Initiative (RGGI) in the US Northeast.

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, although it is directly concerned only with the biggest of them. Ratified by 163 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:

- 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 from the formerly communist

countries of Eastern Europe). Emissions 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 take the form of Certified Emissions Reductions (CERs).

The carbon compnay analyst, Point Carbon, estimates that in 2005 buyers contracted for 397 million tons (Mt) of CO_2e under the Clean Development Mechanism (CDM) of the Kyoto Protocol (up from 14Mt in 2004). Assuming payment on delivery and a 7 per cent discount rate, they estimated that this market was worth €1.9 billion (about $2.38 billion). The other Kyoto mechanism for flexibility was believed to have traded only 28Mt of carbon, and was worth around €96 million ($120.5 million) (Point Carbon, 2006).

Beyond these direct Kyoto markets, countries have established (or are establishing) national or regional emissions trading schemes to help them meet their Kyoto targets. The largest of these schemes is the EU Emission Trading Scheme (EU ETS), which the European Union launched in January 2005 to help achieve the greenhouse gas emission reductions required of the region 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 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.

By the end of its first year of trading, the ETS had transacted an estimated 362 million tons (Mt) of carbon, worth approximately €7.2 billion- (or US$9 billion-) worth of carbon credits (Point Carbon, 2006; Capoor and Ambrosi, 2006). According to Point Carbon, this was up from 17Mt of forward trading the year prior).

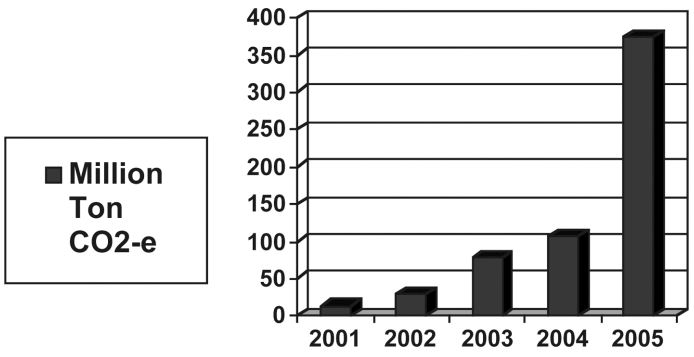

Figure 1.2 *Growth in the global carbon market*

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

Outside 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 Canada was in the process of setting up a scheme when there was a change of government. The current government has since said it is not sure it will meet its Kyoto targets and has talked of scrapping plans for emissions trading. The environment minister, however, has given indications that the country may seek to link up with trading schemes in the US.

The explosive growth of the global compliance carbon market under the Kyoto Protocol has meant that prices for carbon credits have been extremely volatile. Despite this volatility, the market now seems to be maturing, as regulators and participants refine their approach to allocating and trading carbon credits. A short paragraph from the World Bank's 'State and Trends of the Carbon Market 2006' report suggests the level of sophistication to which the compliance carbon market quickly evolved:

> *Financial innovation thrived as a plethora of clever carbon-based securities and hedge instruments became available to hedge carbon price risk against price volatility in other commodity markets. Brokers, consultants, carbon procurement funds, hedge fund managers and other buyers scoured the globe for opportunities to buy credits associated with projects that reduce emissions in developing countries. Innovative structures that managed both downside and upside carbon price risk and reduced delivery risk began to emerge, which aligned purchases of carbon with an interest in the underlying project through equity, debt, mezzanine finance, technology or operating agreements. The City of London developed as a sort of hub for many of these activities and a vibrant new climate services industry developed (Capoor and Ambrosi, 2006).*

Echoing the World Bank's analysis, 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. Inspired by the active market in Europe, Petsonk says people 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 not only are feasible, but also are capable of changing the way businesses relate to environmental issues (Kenny 2006).

Movement in the US

While neither Australia nor the US (two of the largest per-capita emitters of GHGs in the world) chose to ratify the Kyoto Protocol, state governments in both countries have initiated their own regulatory processes, alone or in conjunction with others.

In 1997 the US state of Oregon enacted the Oregon Standard, the first regulation of CO_2 in the US. The Oregon Standard requires that new power plants built in Oregon reduce their carbon dioxide emissions to 17 per cent below the most efficient combined cycle plant. Plants may achieve this target by offsetting their emissions through proposed offset projects or by paying mitigation funds to The Climate Trust, a non-profit organization created to implement projects that avoid or sequester CO_2 emissions. Since its creation, The Climate Trust has offset more than 1.6 million metric tons of carbon dioxide. The organization has a portfolio of over US$4 million invested in greenhouse gas offset projects, and anticipates securing an additional US$4-to-$6 million in project-based reduction in 2006 (www.climatetrust.org/).

On the East Coast of the US, eight states are developing the Regional Greenhouse Gas Initiative (RGGI), a regional strategy to reduce carbon dioxide emissions utilizing a cap-and-trade system. The programme commits participating states to cap their emissions at 1990 levels after 2009 and then drop them by 10 per cent by 2018. RGGI will cover electric utilities capable of producing at least 25 megawatts of power, giving power plants three-year compliance periods to submit one CO_2 allowance for every ton of CO_2 emitted.

The programme allows utilities to use offset projects that occur away from the power plant itself to meet emissions targets, but only on a limited basis. Initially, utilities may use offset projects – which include capturing landfill methane, planting trees and energy efficiency programmes – to cover 3.3 per cent of their emissions. If allowance prices rise beyond expected levels, then RGGI will allow utilities to use more offsets (Biello, 2006).

Importantly, the RGGI memorandum of understanding highlights an interest in expanding 'the geographic reach of the Program.' In thinking about future expansion, RGGI's architects are watching California especially closely. While California does not have any trading scheme functioning yet, the state commission charged with developing its GHG programme has expressed an interest in cap-and-trade programmes and has called for links with RGGI and the state passed landmark legislation in August 2006 in the form of a bill called AB32. The bill requires a 25% cut in the state's carbon dioxide emissions by 2020, and insiders say that cap-and-trade will, indeed, be one of the mechanisms used to reach the target. California also has one of the most highly developed registries of carbon credits (the California Climate Action Registry, or CCAR), a registry that might be mimicked not only in the US Northeast, but also in the US Midwest. If programmes on the East and West coasts link up, say carbon market experts, a national trading programme in the US, will not be far behind (Anderson, 2006).

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 NSW Greenhouse Gas Abatement Scheme is a state-level programme designed to reduce emissions from the energy sector through carbon trading. Under the scheme, NSW energy producers may not emit any more than their apportioned share of a statewide target. Legislators set the target at 8.65 tons of carbon dioxide equivalent per capita in 2003, decreasing by about 3 per cent each year thereafter through to 2007, when it will remain at 7.27 tons (Hanley, 2006).

Under the scheme, energy producers exceeding their allotment of emissions can offset them either by surrendering NSW Greenhouse Abatement Certificates (NGACs) purchased from other producers, or by paying an $11/tonne fine. 'Prices started at about A$6 when the scheme started, but we've recently seen deals that settle early 2010 trade at A$17.10,' says Ken Edwards, a broker at Sydney-based Next Generation Energy Solutions (Hanley, 2006). Prices, say observers, are trading above the fine because operators can get tax benefits from buying GHG credits, but not from paying the fines.

'The spot price is trading lower than the fine, but the forward price is above that, so the market is anticipating that the fine will go up,' says Edwards. 'I think the government is orchestrating a steady-as-she-goes policy with the market, looking for a target of about A$20/tonne.' (Hanley, 2006).

Iemma's vision for a national approach got a lift in August 2006, when Australia's nine states and territories proposed a National Emissions Trading Scheme (NETS) aimed at putting Australia on a path to reduce emissions by 60% by 2050. The NETS Taskforce outlined a plan to introduce mandatory emission limits for stationary energy generators based on either 2000 or 1997 levels. The proposed scheme would launch in 2010.

Unfortunately, the emission reductions driven by 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 GHG emissions, models suggest the amount of CO_2 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 gigatons of CO_2 emitted into the atmosphere will produce how many degrees of warming, they do agree that roughly seven billion tons – seven gigatons – of CO_2 emissions must be prevented from entering the atmosphere during the next 50 years in order to stabilize the concentration of CO_2 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-gigaton cut (Pacala and Socolow, 2004). With each slice representing one gigaton of carbon dioxide emissions, Western Europe's emissions comprise about one wedge 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 one slice 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.

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 ton of carbon dioxide. Institutions voluntarily purchasing credits either have set caps on themselves, such as 10 per cent reductions 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 market

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 market, the voluntary market does not rely on legally mandated reductions to generate demand. As a result, the market suffers from fragmentation and a lack of widely available impartial information. The fragmented and opaque nature of the voluntary market can, in large part, be attributed to the fact that it is partially 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 many types of carbon transactions on the voluntary market and 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 market has won it a great deal of criticism from some environmentalists who claim that it is 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 market since transactions often carry real risks of non-delivery. Some companies buying carbon credits also fear that they will be criticized by 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 market's lack of regulation may mean it cannot reach the scale necessary to impact the problem. Because it lacks a regulatory driver, demand for credits can be volatile and fickle. The sudden explosion of the Kyoto carbon market 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, president of Trexler Climate & Energy Services (Trexler, 2006).

Despite the shortcomings of the voluntary market, many feel it is a fast-evolving arena with some distinct and important advantages over the regulated carbon market. While the wide range of products emerging from the voluntary market 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, the cost of getting a carbon offset project approved by the CDM Executive Board under the Kyoto Protocol ranges anywhere from US$50,000 to US$250,000 (Krolik, 2006). 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 get carbon financing for methodologies that aren't currently 'approved' for sale by the CDM process. For example, the Nature Conservancy is working towards obtaining carbon financing for forest protection projects (what in Kyoto parlance is referred to as 'avoided deforestation'), a concept not currently approved to produce carbon credits within the CDM process.

The innovation, flexibility and lower transaction costs of the voluntary carbon market 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 market because it provides 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. And since individuals account for most of the GHG emissions currently being put into the atmosphere (more than 50 per cent by some counts; Biello, 2006), some environmentalists view the voluntary carbon market as an important tool for educating the public about climate change and their potential role in addressing the problem.

Last but not least, some sellers and buyers of carbon credits prefer the voluntary carbon market precisely because it does not depend on regulation. As the international political community struggles to implement an effective climate-change framework, the voluntary carbon market has the potential to become an active driver of change today.

A more formal affair

Be they fans or critics, experts agree that the voluntary carbon market is in a critical period right now. Spurred by the success of the regulated carbon markets, the voluntary market is formalizing, as investors who cut their teeth on the regulated market 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.

Although nobody has exact numbers on the size of the voluntary carbon market, most think it has grown rapidly in the last two years. Kenber of The Climate Group gives the following estimates of past and projected market size:

Table 1.1 *Voluntary carbon market size*

Year	*Estimated/projected market volume (million tons/yr)*
2004	3–5Mt
2005	10–20Mt
2006	20–50Mt
2007	100Mt

Source: Kenber, 2006

While maturing quickly, the voluntary market remains relatively small. Kenber's outside estimate that 20Mt of carbon may have traded on the voluntary carbon market last year is probably optimistic. And to put this number in perspective, 20Mt traded on the EU ETS in a single week in April 2006. Despite the comparatively small scale of the voluntary carbon market, some investors believe it is poised for explosive growth and some 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 market, making it 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 market more 'investor-friendly' by creating registries, documenting the size of the market, and standardizing the credits being sold.

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. According to an ISO press release, these standards are intended to:

- promote consistency, transparency and credibility in GHG quantification, monitoring, reporting and verification;
- enable organizations to identify and manage GHG-related liabilities, assets and risks;
- facilitate the trade of GHG allowances or credits; and
- support the design, development and implementation of comparable and consistent GHG schemes or programmes.

Several other, related initiatives include: the Voluntary Carbon Standard (VCS), which is still in its formative stages, and the Gold Standard for Voluntary Emission Reductions (GSV), which was released in May 2006.

The Bank of New York, meanwhile, has launched a global registrar and custody service to facilitate trading of voluntary carbon credits following the

VCS. According to the bank, the new service will allow buyers and sellers to transfer voluntary carbon credits in a centralized, secure and paperless environment. 'We expect our collective efforts will greatly assist in the development of this important market,' says Karen Peetz, senior executive vice president and head of The Bank of New York's Corporate Trust Division (Bank of New York, 2006).

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

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