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The voluntary carbon offsets market

An analysis of market characteristics and opportunities for sustainable development

Elizabeth Harris

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Abstract

A global carbon market has evolved in recent years, following negotiations for the United Nations Kyoto Protocol. A number of distinct markets are encompassed within its remit, including a voluntary retail arm. Although very small in comparison with other segments, it has large growth potential as it can extend to countries, customer groups and technologies not embraced by the existing compliance regime. However, this market has been characterised by an absence of publicly available market information and lack of transparency.

This study, which focuses on forestry, renewables and demand-side energy efficiency, found that voluntary market projects are usually small scale and located worldwide. A perceived customer preference for additional benefits such as sustainable development and conservation may account for the high prices sometimes observed. However, the voluntary rather than regulatory demand drivers mean significantly lower prices are typically paid, notably in North America. The US market is also characterised by a conflation with the Renewable Energy Certificates (RECs) market and a prevalence of projects situated in the home country.

Challenges exist for this nascent market. There are concerns about the lack of credibility, which could hinder future investment and growth. Alongside the absence of a universal registry, a causal factor is the range of different procedures currently applied to projects. Some standards and processes are backed by credible organisations. However, many are not publicly available and could be substantially less rigorous. A market benchmark standard is being developed though expectations regarding key content, such as additionality and vintage, vary.

The introduction of credible project and retailer standards and labelling has the potential to greatly influence the market by enhancing credibility and driving demand. Standardisation could lead to a more fungible market, which would probably favour larger, more industrial projects over the more costly typically smaller-scale community-focused projects, a development evident in the Clean Development Mechanism (CDM).

Nevertheless, rigorous standards are critical to ensure market credibility and provide assurance that offsets are genuine, high quality and are not double counted. If the voluntary market's standards are not widely accepted or applied there is a risk that investors will focus exclusively on the compliance market. This would ultimately be to the great detriment of projects with sustainable development benefits, at least in the short term, given the CDM's current failure to promote such projects.

Although the level of trading was insignificant in 2005, rapid growth rates in 2006 suggest that a far greater contribution to emissions reduction could be realised very quickly. What is more, the voluntary market's greater flexibility allows it to act as a complement to the CDM by acting as a learning ground and test bed for innovative new methodologies whilst extending the reach of the carbon market and promoting the establishment of a price for carbon. Despite its positive attributes, many retailers consider that the role of offsetting should be only temporary, creating much needed early emissions reductions and generating awareness, whilst being only a small part of a much wider and longer term global effort to tackle climate change.

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Abbreviations and acronyms

Abbreviation/Acronym	Description
AAUs	Assigned Amount Units
Annex I Parties	List of the parties with obligations in the Kyoto Protocol
Annex B Parties	Countries included in Annex B to the Kyoto Protocol
C	Carbon
CAC	Command-and-control
CCBA	Climate, Conservation and Biodiversity Alliance
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CEE	Central and Eastern Europe
CERs	Certified Emission Reductions
CO_2	Carbon dioxide
CO_{2eq}	Carbon dioxide equivalent
DOE	Designated Operational Entity
ERCs	Emission Reduction Credits
ERs	Emission Reductions
ERUs	Emission Reduction Units
ETS	Emissions Trading Scheme
EU	The European Union
EUAs	EU Allowances
GGAS	Greenhouse Gas Abatement Scheme (New South Wales)
GHG	Greenhouse gas
HFC	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LULUCF	Land use, land use change and forestry
M	Million
MW	Megawatt
N_2O	Nitrous oxide
NGO	Non-governmental organisation
NSW	New South Wales, Australia
PDD	Project Design Document
RECS	Renewable Energy Certificate System
RECs	Renewable Energy Certificates
RGGI	Regional Greenhouse Gas Initiative (north-eastern U.S. States)
t	Tonnes
TAC	Technical Advisory Committee (Gold Standard)
TRCs	Tradable renewable certificates
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
US(A)	United States (of America)
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit
VERs	Verified Emissions Reductions

1 Introduction

Over the last eight years a greenhouse gas (GHG) emissions market has evolved. Its origins lie in negotiations for the UN Framework Convention on Climate Change (UNFCCC) and subsequently in its Kyoto Protocol, in recognition of the need for mechanisms to drive cooperation between countries and lower emissions reduction costs.

Two distinct markets have developed: compliance and voluntary. Although dominated by the Kyoto agreement's project-based Clean Development Mechanism (CDM) and by the European Union's allowance-based Emissions Trading Scheme (ETS), the compliance market also comprises markets including Kyoto's Joint Implementation (JI) and non-Kyoto markets such as New South Wales's Greenhouse Gas Abatement Scheme (GGAS).

A retail offset market has also emerged, which focuses on voluntary participation by parties not bound by specific caps or regulations. GHG emissions can be offset by investing in projects that provide emissions reduction elsewhere. Whilst the compliance sector currently dominates the market, this voluntary market nevertheless possesses significant potential for growth and is not constrained by the absence of regulation post 2012.

Although it is argued the compliance market is immature and lacks transparency (Capoor and Ambrosi, 2006 a) the market is regulated and an increasing volume of literature is emerging covering all aspects of this sector. In contrast, in the voluntary retail market there has been little information or critical analysis within academic and grey literature (although after this survey was undertaken, by early 2007, this was beginning to be addressed).

In 2006 two of the most comprehensive studies of the carbon market, Capoor and Ambrosi's *State and Trends* (Capoor and Ambrosi, 2006 a) and Point Carbon's *Carbon 2006* report (Hasselknippe and Røine, 2006), made only passing reference to the retail market. The few other published documents available on this market at this time included a 2004 review of voluntary retailers (Braun et al., 2004), and a paper aimed at offset consumers attempting to explain some of the complexities in choosing projects and retailers (Sterk et al., 2004). The only focused research at the time of writing was a survey carried out in 2005 as part of a wider paper (Butzengeiger, 2005).

As this paper was bring updated in 2007, an increase in attention was evident both by greater coverage within the key annual carbon market reports by Capoor and Ambrosi (2007) and Point Carbon (2007), and by the increasing number of other dedicated publications. These include a document by Clean Air-Cool Planet (Clean Air-Cool Planet, 2006) reviewing and rating offset retailers whilst a book including a series of papers on the voluntary carbon market has been published by Earthscan (Bayon et al. 2006) expected to be followed late in 2007 by a quantitative survey.

From the market information that is publicly available some idea of the market potential, issues and developments is evident, though still largely unexplored. For instance, concerns currently surround the compliance market's failure to promote sustainable development (Pearson, no date; Sutter et al., 2005). Through the absence of formal regulation, leading to greater flexibility, the voluntary market currently has an opportunity to redress this perceived imbalance. Promotion of additional benefits could be vital given concerns that the whole market could only ever be a zero sum game (The Gold Standard, 2006), alongside wider

concerns by some commentators about the use of offsets at all as a solution to tackling climate change.

Critically, the voluntary market is also still unregulated in that it has no market benchmark standard. A widespread lack of transparency is generating a lack of credibility in the market. Some standards and codes are increasing in application and the outcome and application could significantly affect the market both in terms of driving demand by enhancing consumer confidence but also by affecting the type of offset projects and the prevalence of projects with additional development benefits.

1.2 Aims and objectives

This paper aims to describe the structure and dynamics of the retail voluntary carbon market and in light of these findings consider the future developments and implications for sustainable development of this market.

Specifically this paper will:

- Describe the characteristics of the market including:
    - Market structure (including: retailer types, locations and approaches; and customer groups)
    - Key features (size, pricing, growth to date)
    - Project attributes (type, size and location)
    - Customer preferences
    - Emission reductions (credits)
    - Project procedures and standards
- Discuss perceptions of the market and its role in tackling climate change
- Examine sustainable development attributes of the current market
- Explore future market developments, and the impact on development benefits

1.3 Research methods

Important context was established through a comprehensive literature review of both the compliance markets and of the little literature currently available on the voluntary market. A review of all offset retailers' websites was also conducted. A self-completion survey formed the basis of primary research, conducted from May to August 2006. This survey was directed at all intermediaries ('retailers') worldwide (total identified population of 53). Retailers were considered to be best placed in the market to provide the required descriptive data alongside perspectives on aspects of the market including supply and demand-side characteristics. The population was identified through extensive web research, through contacts made at CarbonExpo in 2006 and including a snowball sample question within the questionnaire. Population and sample information are provided in Table 1. Participant details are given in Appendix 1.

Table 1 Population and sample results from survey of retailers

Total population	Sample obtained No. (% of total)	Self-completion No. (% of sample)	Interview No. (% of sample)	Telephone interview No. (% of sample)
53	35 (66%)	26 (74%)	4 (11%)	5 (14%)

Not all respondents answered the survey in full. Consequently, effective response rate differs by question. Where results are presented, sample size and proportion of total population is indicated. The term 'CO_2' is used throughout for simplicity, and is intended to include other GHG equivalents.

Questionnaire development

External advice on content was provided by Emily Tyler from South*South*North and by Dr Jon Knight of Imperial College. A further level of development was provided through an interview with a UK retailer, Climate Care, to ensure questions were relevant and clear, and the most appropriate formats were used.

1.4 Report structure

Chapter 2 establishes important carbon market background and context. In Chapter 3, the structure of the market is described, largely based on the quantitative survey results. Perceptions of the market are explored in Chapter 4, based on interviews with retailers and secondary research. In Chapter 5 the sustainable development attributes of the market are examined, while market developments and possible impacts on sustainable development are further discussed in Chapter 6, both chapters drawing on survey results, retailer interviews and secondary research.

1.5 Note

The bulk of primary and secondary work for this paper was conducted between May and September 2006. An update was made to the commentary and discussion, and to statistics for the compliance market, in early 2007.

2 Background

2.1 Origins of the carbon market

Over the last eight years, a worldwide GHG emissions market has evolved, based on a theory for creating property rights for nature, proposed by Coase in 1960 (see Coase, 1960). Market mechanisms as a form of regulation are a relatively recent phenomenon. Conventional command-and-control (CAC) methods have been predominantly used for environmental goals to date. However, public doubts over conventional regulation, and improvements in monitoring (Ellerman, 2005), alongside successes of early market-based instruments in the United States (US) such as the Sulfur Allowance Trading (SAT) programme (Stavins, 2003), have also encouraged wider use.

The specific 'framework for market-based management of the global atmosphere' has been created through the UNFCCC and Kyoto Protocol (Capoor and Ambrosi, 2006 a). Meanwhile 2005 marked 'the birth of a global carbon market' (Hasselknippe and Røine, 2006), with the launch of the EU ETS and the Kyoto Protocol entering into force.

2.2 Carbon market structure

Despite the 'global' label, today's greenhouse gas market (hereafter referred to as carbon market) is actually composed of a variety of different markets. Two different categories of transactions can be identified: allowance-based and project-based, with distinct sectors: compliance (or mandatory) and voluntary (or retail). A representation of the market is depicted in Figure 2.1.

Compliance segment

Driven by regulation, the compliance market is currently dominated by the Kyoto project-based scheme, the CDM, and by the allowance-based EU ETS. Other important schemes include JI and non-Kyoto markets including New South Wales' GHG Abatement Scheme (GGAS). Annex I parties bound by caps under the Kyoto protocol are key participants.

Voluntary segment

Although compliance markets provide by far the greatest volumes some voluntary schemes are making meaningful progress, notably the Chicago Climate Exchange (CCX). A project based retail market has also emerged through which parties not bound by specific caps or regulations can voluntarily 'offset' carbon emissions by investing in emission reductions projects. Businesses create substantial demand, primarily for strategic reasons (Ecosystem Marketplace, undated). Further demand is generated by 'green' conferences and institutions including governments, and individuals altruistically choosing to offset travel or energy use.

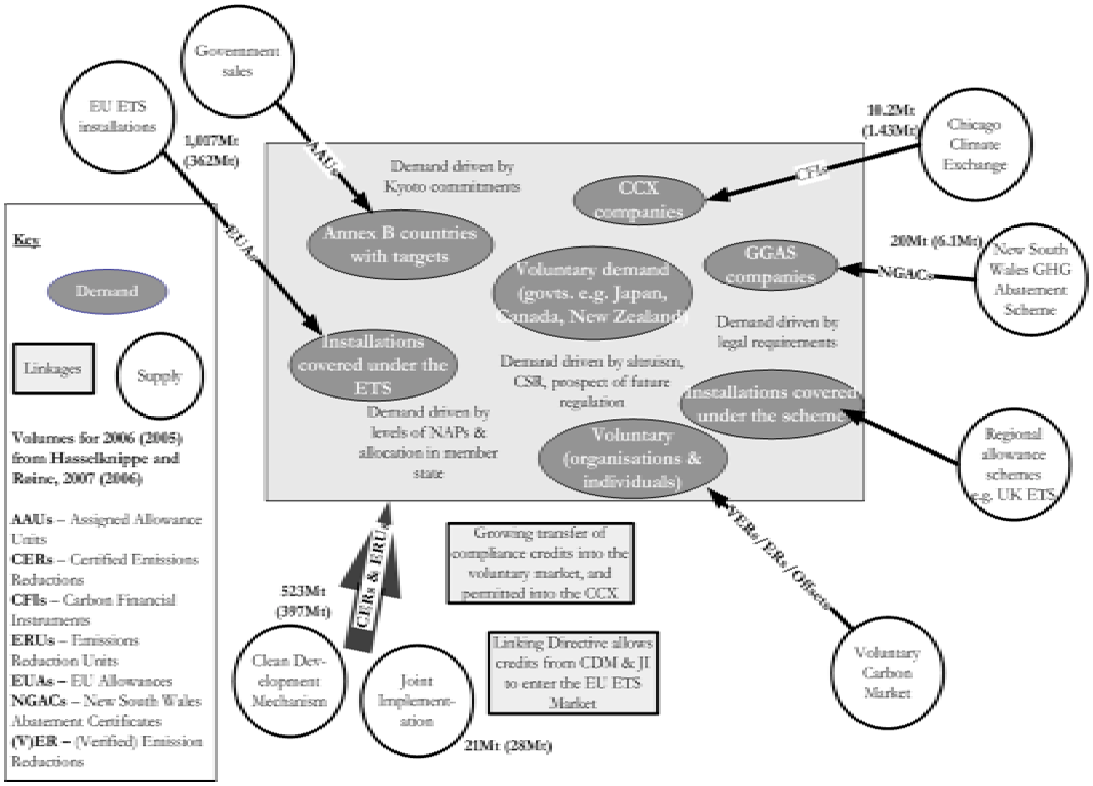


Figure 2.1. A carbon market schematic

Allowance-based transactions

Allowances, or credits, represent a specified quantity of GHG emissions reductions (typically one tonne of carbon dioxide equivalent, hereon CO_2) issued by regulators, and can be sold to buyers in order to meet their reduction objectives if not achieved in-house. Credits include Allocated Amount Units (AAUs) under the Kyoto Protocol and EU Allowances (EUAs) created in the EU ETS. Under the Kyoto Protocol, countries with emissions reductions targets are allocated emissions credits equal to their 1990 levels of emissions minus their reduction commitment. These can then be transferred to legal entities within their country, such as polluting industries.

Tradable permits can be classified into three categories: credit trading, averaging and allowance trading (for more information see Ellerman, 2005). Allowance trading ('cap-and-trade'), used in the EU ETS, is the most advanced form. An absolute limit is placed on emissions and a permit must be given up by the company for every unit of discharge. Price of credits, dictated by cap level and marginal cost curves, will determine whether it is cheaper for a company to reduce emissions internally, selling any surplus, or to buy credits. Issues remain including the measurement of emissions reductions and allocation of emission rights (Lefevere, 2005).

In the 1997 negotiations, Emissions Trading was agreed as the main mechanism for achieving targets set under Kyoto. Bachram (Bachram, 2004) suggests this was in response to heavy corporate lobbying by the US. International Emissions Trading is not yet operational though some national governments have established independent schemes (see section 3.4)

Project-based transactions

Emission reduction credits (ERCs) can be produced by a project that can 'credibly and verifiably demonstrate that it reduces GHG emissions compared to what would have happened otherwise' (Capoor and Ambrosi, 2006 a). The CDM, producing certified emission reductions (CERs) and JI, producing emission reduction units (ERUs) are important examples, although projects in the voluntary sector are being developed.

The CDM is a flexible Kyoto mechanism. Its objectives, which are outlined in Article 12 of the Protocol (United Nations, 1997), are to assist non-annex I Parties in achieving sustainable development, and Annex I Parties in meeting their targets. Involvement of developing countries is a key distinction of the CDM. Based on a similar concept to CDM, JI (Article 6 of the Kyoto Protocol) allows Annex I Parties to jointly undertake projects that reduce emissions or enhance sinks in an Annex I Party, leading to emission reduction units (ERUs).

Project-based credits are typically higher risk than allowances. They have higher transaction costs and do not legally exist until they are issued based on performance verification. Since the voluntary and retail markets operate outside formal regulations, without established verification processes, buyers of voluntary project based credits often rely on external third party verification to provide credibility, producing credits called verified emission reductions, which are not or have not yet been registered with the CDM Executive Board.

2.3 Market demand and supply

Demand

Demand across the markets is currently driven primarily by the number of AAUs issued under the Kyoto Protocol and EUAs authorised by the EU ETS (Capoor and Ambrosi, 2006 a). Potential demand can be assessed through the likelihood of countries hitting their Kyoto targets, which Point Carbon (Hasselknippe and Røine, 2006) suggests leaves them 9.5% above their collective Kyoto targets. With the USA's non-ratification, potential demand in the market decreases further.

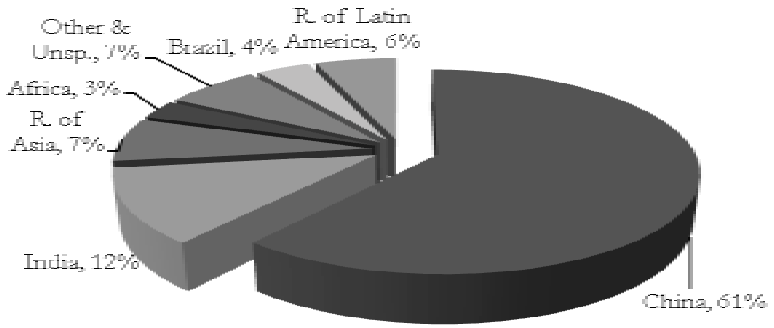
European private buyers are also interested in compliance with the EU ETS. Further demand is being created by Japanese companies through anticipation of future domestic regulation, US multinationals operating in Japan and Europe or preparing in advance for the Regional Greenhouse Gas Initiative (RGGI), power companies regulated by the New South Wales GGAS, and North American companies with voluntary but legally binding compliance objectives in the Chicago Climate Exchange (CCX) (Capoor and Ambrosi, 2006 a). Individuals and companies seeking to offset their own carbon emission footprints are also creating some retail demand within the voluntary sector.

Current carbon markets all suffer from a lack of certainty about the role of emissions trading post 2012 (Bell et al., 2005). However, longer term commitment has at least been made by the EU ETS, an important driver in the market, and some countries have signalled domestic initiatives will continue beyond 2012 whilst decisions on Kyoto are awaited.

Supply

Allowances can be supplied by parties in cap-and-trade schemes who have made internal emissions reductions, and at the country level by Annex B parties who exceed their targets, thus creating surplus AAUs. Meanwhile, about 100 non-Annex I countries qualify to supply CDM projects. Supply tends to be dominated by a handful of countries including China, India, Brazil and Mexico (Figure 2.2). These four leading countries continue to host an increasing share of new CDM projects, rising from 50 per cent of all projects in the first quarter of 2004 to 83 per cent in the second quarter of 2006 (Fenhann et al., 2006). Credits for the voluntary market meanwhile, can be located anywhere and are supplied by various project developers.

Project-based credits can also be generated by Central and Eastern European (CEE) countries who qualify under JI, where it is less costly to reduce emissions than in other countries (Hasselknippe et al., 2006). Surplus credits, known widely as 'hot air', can also be created if projected growth is not realised. This can be seen in CEE countries due to the high allocation relative to demand as downturns in emissions followed the disintegration of communism (Anderson et al., 2005). It is estimated that Russia will have 3.1B tCO_2, Ukraine 1B tCO_2 and CEE countries 1.2B tCO_2 surplus AAUs available 2008 2012 (Gorina, 2006). 'Green investment schemes' have been proposed to counter hot air, directing AAU sale revenues to environmental activities, avoiding price crashes while channelling money into environmental activities. However, concerns may not be realised as buyers of credits have shown a preference for evidence of real activities, given concerns regarding public image (Anderson et al., 2005).



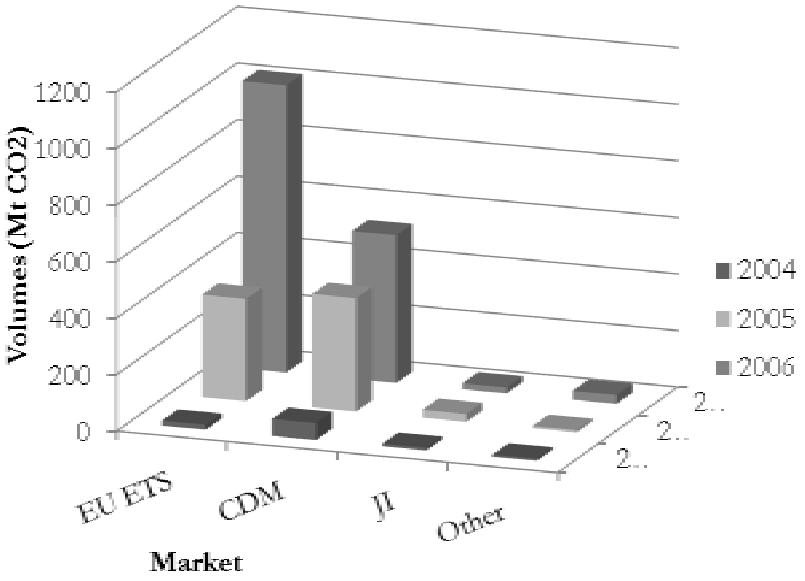
Proportions as a share of volumes supplied for 2006

Figure 2.2 2006 Location of CDM emission reductions projects

(Capoor and Ambrosi, 2007)

2.4 Current market size

Growth in the market is evident with record high volumes of 684M tCO_2 traded in the first half of 2006. EU ETS and CDM dominate the carbon market, evident in Figure 2.3.



Based on reported and estimated volumes of emission reductions, in million tonnes of CO_2.

Figure 2.3 Carbon market volumes for 2004 - 2006

(Hasselknippe and Røine, 2006 & Point Carbon, 2007)

The EU ETS traded 1017M tCO_2 in 2006, with CDM/JI at 544Mt of CO_2 in this period (Point Carbon, 2007). Other schemes, though still small, are also growing quickly. Total market forecast for 2007 is 23,601M tCO_2 (Point Carbon, 2007).

2.5 Summary

The global carbon market is developing, and procedures and institutional capacity are being established. But it is still a relatively immature market, and many issues remain, not least that of suppressed demand through the absence of key participants in regulatory schemes. Moreover, even at the volumes already reached, it is only a small proportion of that needed to meet stabilisation targets, which require immediate action. Compliance markets, dominating the market, clearly offer the largest potential to generate demand. However, political negotiations regarding extensions of such schemes can be lengthy. The voluntary market, operating on a similar premise to the CDM without the need for regulation, offers an opportunity to extend the reach of the compliance market in a shorter time frame, whilst potentially promoting additional benefits such as development. This market will be discussed in the next chapter.

3 Market structure

Although the voluntary market is immature and is much smaller than the compliance market, it has nevertheless generated a wide variety of actors - from project developers to retailers and brokers, verifiers and certification organisations. A chain of supply is evident in the market from projects to customers, via consumer intermediaries who sell or broker the project credits. In addition, it has been suggested that a small proportion may be sold to speculators, although credits are predominantly sold on to individuals, businesses or other organisations. At this point the credit is effectively retired, although no formal registry is currently in widespread use. A schematic of the retail market is presented in Figure 3.1.

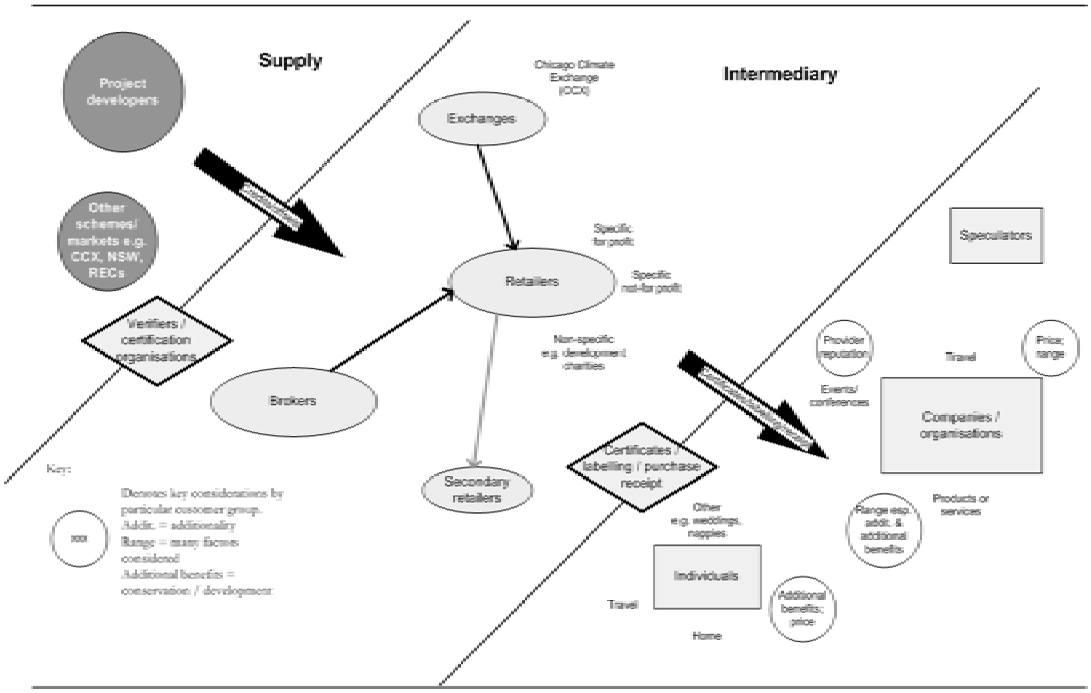


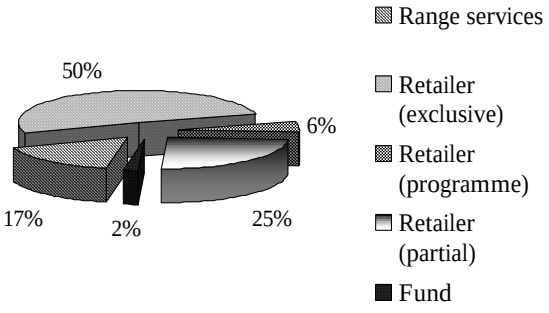
Figure 3.1 Voluntary carbon market schematic

3.1 Retailer approaches

Retailers vary in several key characteristics including supply chain, target customer group, project activity, procedures and standards, and marketing proposition.

Those retailers who invest directly in projects or conduct bilateral deals typically source their projects through their own networks of developers. At the time of the survey, supply appeared to be high compared to demand and consequently there was little proactive project sourcing, though more has been observed in 2007.

A quarter of retailers have evolved from other principal but related activities, such as renewable energy or forestry, and have included carbon offset marketing within their range of existing activities, some supplying their own projects (see Figure 3.2). Others have been created specifically to enter the voluntary carbon market. In 2007 it is evident that more organisations that previously focused primarily on the compliance market are taking an interest in the voluntary space, notably brokers.



Based on website data, the population frame was assigned to categories: Range services - includes brokerage, advisory, portfolio & risk management; Retailer (exclusive) - focused on the voluntary carbon market; Retailer (partial) - offer offsetting alongside other services; Retailer (programme) - offers offsetting through a scheme or programme and is involved in sourcing credits but does not retail to other customers.

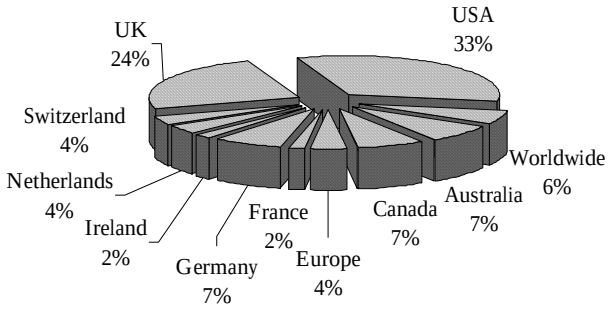
Figure 3.2 Retailer categories

The survey showed that there is a relatively high proportion (23 per cent of population) of retailers with non-profit status, reflecting the voluntary nature of the market. However, more sophisticated participants, offering a range of services such as advisory and asset and risk management, are also active.

Data shows that retailers tend to target particular customer groups, though few do so exclusively. Those targeting individuals tend to have online calculators as the means to establish the value of the sale. These calculators appear to have different underlying assumptions, which are not always listed. A handful of organisations, often related to forest conservation use emission calculators but do not offer emission compensation services. These online calculators are primarily an awareness / education tool, designed to further the organisations' aims rather than promote offsetting (for example American Forests, undated; Trees for Life, 2006). Retailers targeting businesses also offer online calculators and augment this with bespoke calculation, consultancy services and marketing support. Labelling services such as The Carbon Neutral Company's (TCNC, 2006) CarbonNeutral tag and logo are also offered as part of the marketing opportunity, whilst many offer certificates as proof of purchase (Sterk et al., 2004).

3.2 Retailer location

It is evident that Europe is leading the voluntary retail market and has a large proportion of retailers. The UK is particularly notable, which is unsurprising given its lead in formal carbon markets. Though the total number of retailers in the USA is large, numbers were low relative to size (18 at the time of survey) compared to Europe (25 at time of survey) in 2006. It is believed that the US market has huge potential, particularly given the absence of federal regulation, and should begin to grow significantly over the next year or two. Canada and Australia also support a small market, although with far fewer retailers than Europe and the USA (Figure 3.3).



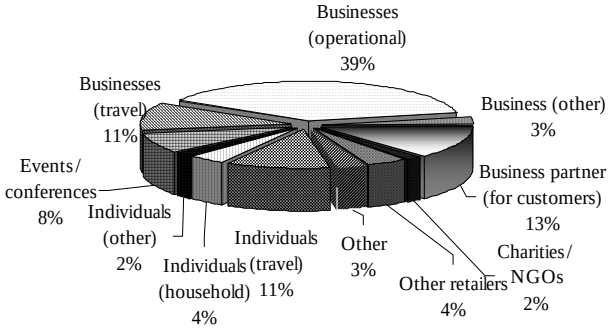
Data was obtained from secondary website research in summer 2006 and retailers were assigned geographical regions. Where operating in more than one country, this was assigned as 'Europe' or 'Worldwide'. Whole population used.

Figure 3.3 Location of voluntary carbon market retailers

3.3 Customer groups

Business forms the most important customer category (Figure 3.4), largely for offsetting operational activities, with carbon neutrality thought to be becoming the 'it' commodity (Wright, 2006). The branding and labelling services offered by many retailers support this trend, enabling logos to be used in marketing material and on products.

However, the market is also important for individuals who otherwise have little means of participating in the carbon market, and who still comprise an important market share. Individuals' purchases are likely to be driven by a sense of moral obligation or social responsibility, weaker drivers than those for business where offsets can provide a commercial advantage. Consequently the individuals' segment is smaller than business's. However, individuals are also involved through what was suggested to be a rapidly growing trend for GHG-neutral products and services; secondary research uncovered products as diverse as carpets, music records and insurance.



Retailers provided customer group information as a share of their customer base, which were averaged across the sample. Individuals (other) and Business (other) contain information where the respondent aggregated specific individual groups (travel, household) and business groups (travel, operational) respectively. **Sample:** 24 (45 per cent).

Figure 3.4 Customer groups

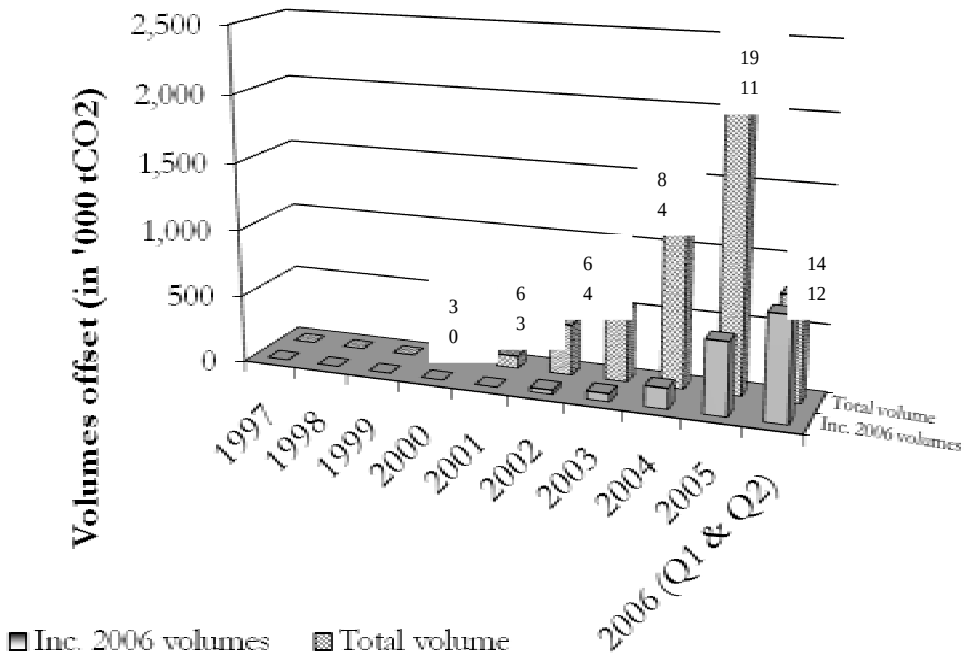
In all instances individuals are key to the market. They not only form a primary demand in offsetting their own lifestyles, and through purchasing carbon offset products and services,

but inspire companies to offset operational activities to present a positive image to their consumers.

3.4 Market size

Significant uncertainty surrounded the size and growth of the voluntary retail market in 2006. Respondents in this research were reticent about providing estimates for either, the few responses received indicating a range of 3 – 50 million tonnes CO_2. Such a large range suggests a general lack of knowledge, which is not surprising given the informal nature of the market and the lack of transparency therein. Capoor and Ambrosi (2006 a) believe that around six million tonnes of CO_2 was offset within the voluntary retail market in 2005, a figure generally supported by this research which, for a sample of roughly two fifths of retailer population, gives a figure of 2,161,821 tonnes of emission reductions traded in 2005 (Figure 3.5). A simple multiplication of this figure to establish total market volume is not possible as it cannot be firmly established if this is a representative sample. However, it would not be unreasonable to suggest that total market size was at least double this figure and probably much higher. In their later edition, Capoor and Ambrosi (Capoor and Ambrosi, 2007) put the voluntary market at 10+ million tonnes CO_2 for 2006, demonstrating the market growth.

To put the size of the voluntary market in context, for 2005 Capoor and Ambrosi (2006 a) put the compliance allowance market size at about 330 million tonnes of CO_2, with the CCX at one and a half million tonnes of CO_2 and the NSW GGAS at about six million tonnes of CO_2, and the project market at 374M tCO_2, with CDM at 346M tCO_2 and JI at about 18M tCO_2 (Capoor et al., 2006). The voluntary project sector is therefore, currently, only a tiny portion of the worldwide carbon market.

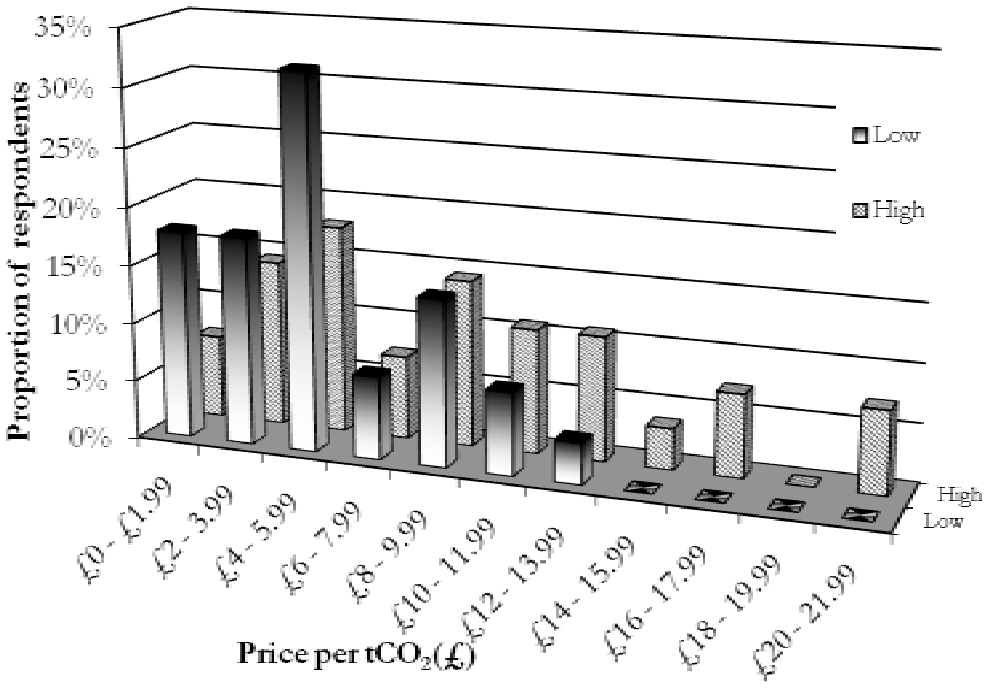


Striped series indicates volumes provided in total, shaded series indicates volumes only for those retailers also providing 2006 data. It should be noted that where a retailer had indicated proportion of sales to other retailers, the respective proportion has been removed from the data set. **Sample**: 23 (43 per cent); 12 giving 2006 data (23 per cent). Effective sample size for each year is indicated above, with 'Total volume' sample above, and 'Inc. 2006 volume' sample below.

Figure 3.5 Volumes offset

3.5 Pricing

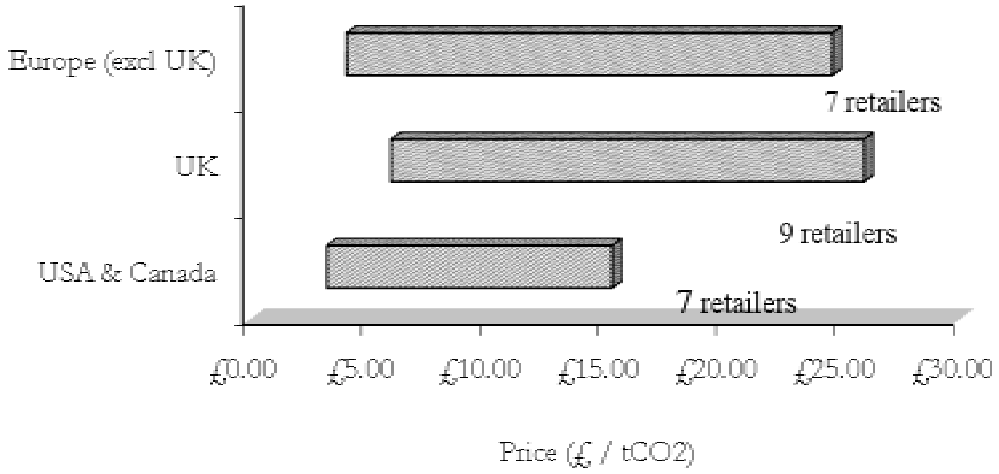
Results from this research indicated a price range of £0.27 to £20.55 (per tCO_2) (see Figure 3.6), though distribution of the lowest and highest volumes suggests a skew to lower prices, probably around £4–6, broadly in line with the range suggested by Ecosystem Marketplace of US$5 - US$12 per tonne of CO_2 (£2.73 - £6.45) (Ecosystem Marketplace, undated).



Price ranges were obtained rather than price-volume data as many retailers consider price information to be sensitive. Prices provided were converted to sterling (£1/US$0.55/€0.68/AU$0.41/CA$0.48) for comparison purposes. High and low prices for each retailer were assigned to designated price bands, and the number of respondents within each price band calculated. Where respondents used a flat rate this was assigned in both the high and low series. **Sample**: 28 retailers (53 per cent).

Figure 3.6 Distribution of minimum and maximum prices

This research also discovered an underlying geographical basis for price (Figure 3.7). Europe commands the highest prices, possibly an indication of greater demand although lowest prices are relatively consistent across geographical markets. That the US commands generally lower prices could be related to the high use of CCX offsets and RECs. CCX offsets in particular trade at very low prices.



Price ranges were aggregated on the basis of retailer's location. Countries with fewer than two respondents are excluded or amalgamated. **Sample**: 23 (43 per cent).

Figure 3.7 Price range by location

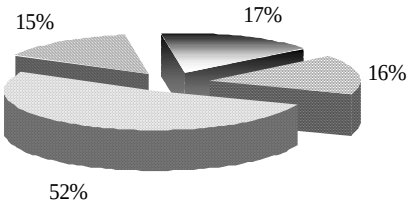
The highest prices established in this research are significantly higher than those in the compliance market. Capoor and Ambrosi (Capoor et al., 2007) put the highest CER values at \$24.75/tCO_2 (c. £14) in 2006**.** Such disparity could be explained by a lack of transparency, but is likely to be due to customer demand for additional attributes; projects that display strong sustainable development or biodiversity components will have stronger marketing potential and can therefore command a higher price. Survey respondents also suggested that sale volume dictated their transaction price, implying that smaller volumes would push up prices. These explanations are supported by the Ecosystem Marketplace (Ecosystem Marketplace, undated) that states that buyers in the retail market typically pay a premium since they often deliver strong environmental and sustainable development co-benefits, though they also suggest the premium is related to the small volumes purchased.

It is not surprising that lower prices are also found in the retail market, given that demand is on a voluntary basis and not enforced by regulation. Though volumes are often small, which raises relative transaction costs, the flexibility of procedures such as verification and registration can make the lower prices more feasible than would be the case in the CDM for example.

3.6 Project attributes

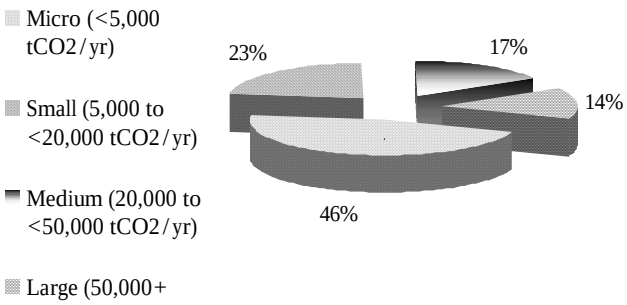
Project size

A large number (though not necessarily volume) of projects are micro (<5,000t tCO_2) to small scale (5,000 - <20,000 tCO_2) (Figure 3.8 and Figure 3.9). This probably reflects the relatively small market demand for voluntary credits, making it harder to justify and fund larger projects. However, it is also an outcome of strong customer demand for additional attributes such as conservation / development, which are typically displayed in smaller projects.



Project size categories as a proportion of the number of projects in portfolios, averaged across sample. **Sample:** 21 (40%)

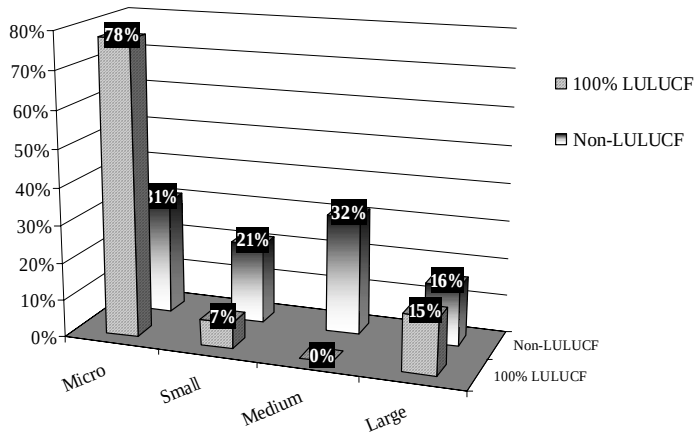
Figure 3.8 Project size (as proportion of sample)



Project numbers for each size category, displayed as proportion of the total from sample. **Sample**: 14 (26%).

Figure 3.9 Project size (number of projects)

Underlying the dominance of micro projects is another trend, evident in Figure 3.10. By comparing datasets for project type and size, and separating out those portfolios with 100 per cent forestry, it is clear that forestry projects tend to be much smaller. Other project types are more evenly distributed across the size ranges.



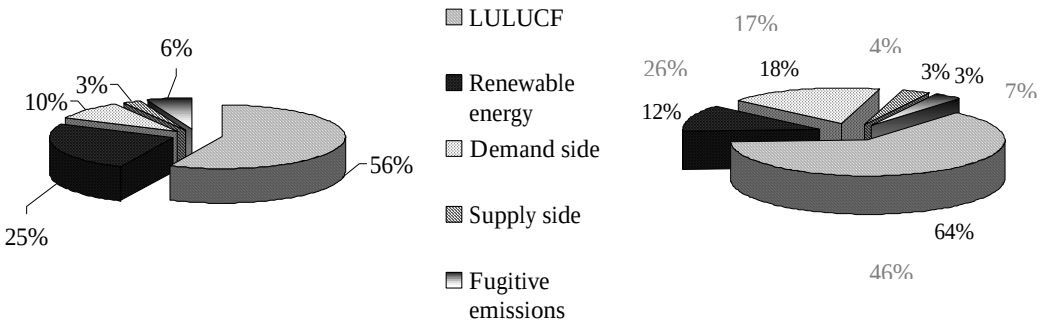
Datasets for project type and size were compared, and 100 per cent forestry portfolios separated from other retailers' portfolios. The proportions for each size category were averaged to provide an indication of dominance of different size categories. **Sample**: 21 (40 per cent) of which ten are 100 per cent forestry.

Figure 3.10 Averaged portfolio project size distribution (forestry v. non-forestry)

Project categories

Results have shown a prevalence (in number) of forestry projects, typically reforestation or afforestation (Figure 3.11 and Figure 3.12). This reflects a strong customer preference for projects involving trees, probably due to the other associated attributes such as biodiversity,

which can be strong marketing tools. It also reflects the presence of a number of forestry organisations that have added offsets to their range of activities.



Information was provided by project numbers rather than volumes, to encourage response. Some retailers still considered this sensitive preferring to provide information only as a proportion of total portfolio.

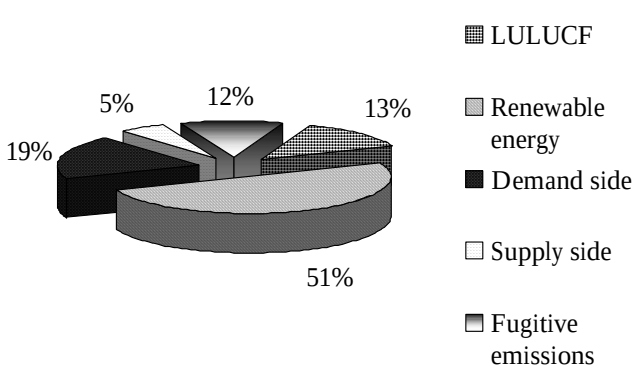
Retailers provided project type information as a share of portfolio by project numbers and some simply as proportions of their portfolio. Data were then averaged across the sample to indicate an average distribution by number of projects. **Sample:** 26 (49%).

Figure 3.11 Project categories (averaged portfolio share)

Data presented by numbers of projects within each category. For comparison, underlined values indicate averaged proportions for the sample. **Sample**: 12 (23%).

Figure 3.12 Project categories (by number)

Given the apparent multitude of forestry experts in the voluntary carbon market, further analysis was carried out to establish any underlying trends in the survey data. Retailers with 100 per cent forestry were removed from the sample and proportions for each retailer for each category were averaged, indicating that forestry is far less prominent with retailers who are not forestry experts, and renewable energy is more important (Figure 3.13).

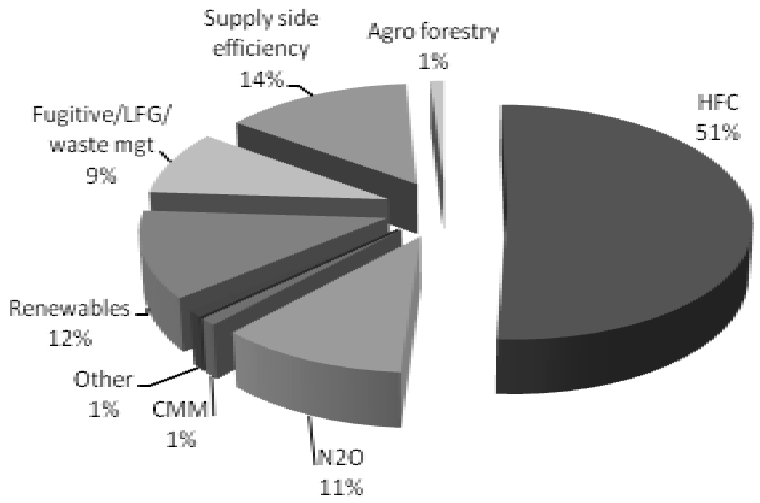


Thirteen of the 26 respondents had portfolios of 100 per cent LULUCF (forestry). These were excluded from the data set and the average proportions of the remaining retailers were calculated. **Sample**: 13 (25 per cent).

Figure 3.13 Average portfolio split excluding 100 per cent forestry

Complex technical projects can be harder to understand and market than forestry. However, such projects are still relatively common; renewable energy projects and demand-side efficiency projects represent a very important and increasing portfolio share, particularly by volume when they are likely to dominate due to their typically larger size. This becomes more evident on further analysis of the data showing the importance of renewable energy to those retailers not exclusively focused on forestry (Figure 3.13).

This distribution of project types, with large numbers of forestry but high volumes also from renewables and energy efficiency (evident in Figure 3.11 and Figure 3.12) contrasts with the CDM (Figure 3.14), where industrial projects such as HFC destruction dominate, with renewables at only 12 per cent by volume contracted and few efficiency or forestry projects. The low demand for forestry is largely due to restrictions within the EU ETS.



CMM: coal mine methane; HFC - h**ydrofluorocarbons**; LFG - landfill gas; N_2O - nitrous oxide

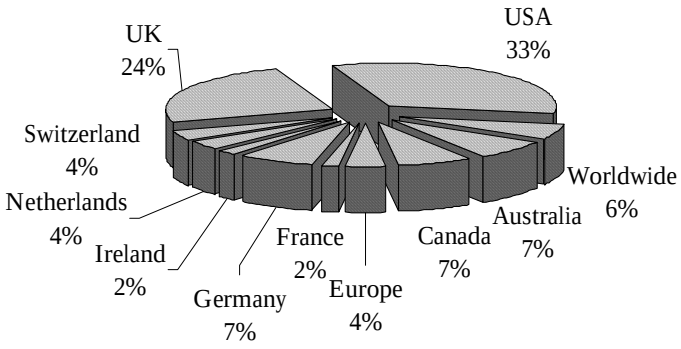
Figure 3.14 2006 technology share of CDM projects (by volume contracted)

Capoor and Ambrosi (2006 b)

Other more industrial project types such as HFC-23 destruction are notably absent from the voluntary market, reflecting the lack of customer engagement with such projects. Nevertheless, it has been suggested that a trend towards more technical projects is being driven, largely by business. Businesses tend to buy in greater volume and may therefore devote more time to understanding project complexities and benefits, whilst some businesses may choose technologies they are familiar with in their own line of work. This trend is increased by the controversy around use of forest sequestration projects.

Project location

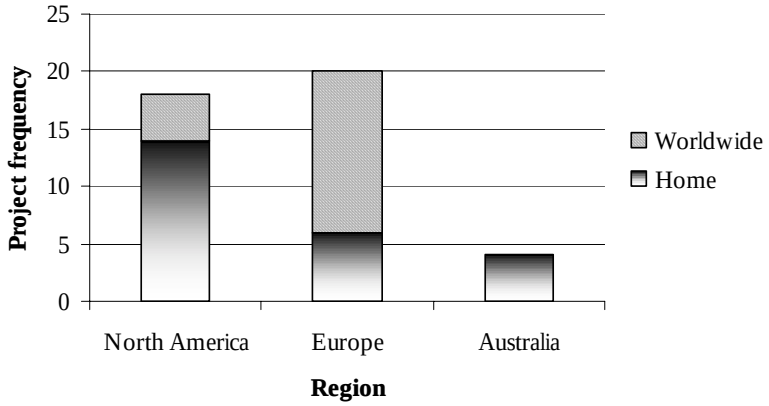
Given the non-regulatory nature of the market, it is not surprising that voluntary market projects are also being located in developed countries that fall outside the scope of the CDM, particularly North America (Figure 3.15). It has been suggested that customers sometimes prefer projects located near home, where they seem more tangible, a trend particularly noted in North America (Figure 3.16). However, a relatively high number of retailers appear to locate projects in Africa (Figure 3.15), in marked comparison to the CDM with just 3 per cent by volume (UNFCCC, 2006) (Figure 2.2). This again reflects the importance of additional sustainable development attributes within projects.



Number of retailers locating at least one project in each specific location was tallied for all retailers to give an indication of important locations. This does not provide location by number of projects or by volume. **Sample**: 43 (81 per cent).

Figure 3.15 Location of voluntary market projects

The data was grouped by those locating only in their home country and those also locating in other countries (Figure 3.16). The preference within North America and Australia to locate projects in their home countries is evident, whereas retailers in Europe more often use projects located elsewhere. This is perhaps unsurprising given they are Kyoto signatories (and projects could be double counted by the offset sale and also by government in meeting their Kyoto target).



Retailers' websites provided information on project location. This was compared with the retailer location to establish how many prefer to locate projects in their home country. **Note** project locations were recorded by number of retailers locating at least one project in the area, not by volume or project number.

Figure 3.16 Proportion of voluntary market projects located in home country, by region

An anomaly arises when credits generated from developed Annex I countries, which have not taken a Kyoto target, are sold to countries which do have a Kyoto commitment. These countries are effectively being rewarded for their inaction – known as free-riding. Furthermore, if they take on a target in the future, as the projects will inevitably still have

been implemented after the baseline year, so the credits will be double counted – used by consumers as offsets *and* by the government in meeting their targets.

3.7 Project and offset selection

Project selection by retailers

Results suggest that retailers choose projects as a result of negotiation based on consideration of a range of factors, including risk (country, currency, project etc) and price. Other factors are still important, usually depending on customer preferences. Geographical location was raised unprompted by some retailers because of the possibility of double counting; under Kyoto regulations, projects could not be considered additional if they are within an Annex B country. Although not bound by these regulations, activities carried out within the country itself could nevertheless count towards a country's domestic target and in effect be double counted. Although the regulations do not apply to the USA and Australia, an observed trend to locate projects in these areas is still considered widely to be non-additional and undesirable as it would effectively reward their laggard behaviour.

Offset selection by customers

Many categories were thought to be important to customers in purchasing offsets, including price, reputation of provider (suggested to cover attributes such as additionality) and what was referred to as 'story' attributes including biodiversity / conservation benefits, development / community benefits, project location and type (Table 2).

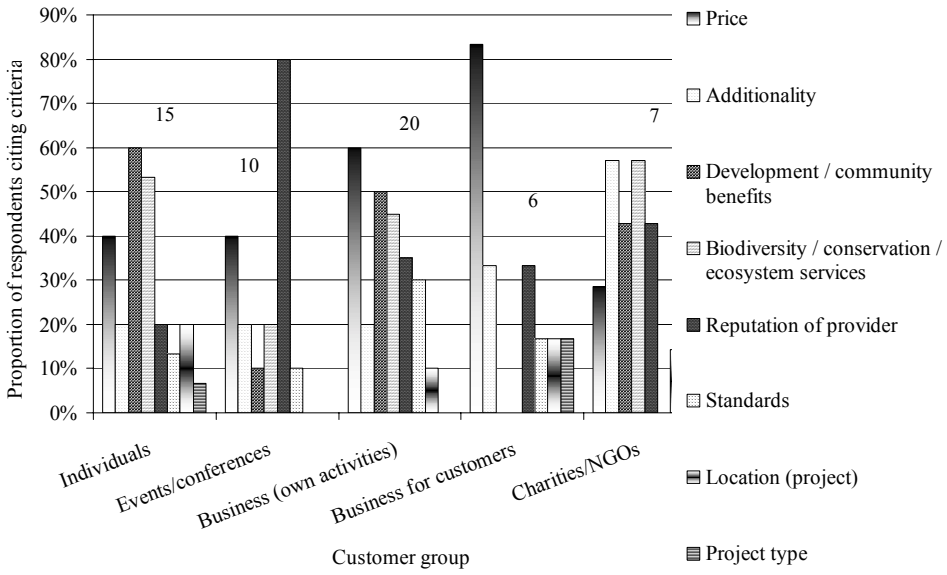
Table 2 Frequency of offset criteria cited by retailers as of importance to customers

Criteria	No. times cited	% of total criteria cited	Ranking
Price	30	21%	1
Development and community	25	18%	2
Biodiversity and conservation	23	16%	3
Reputation of provider	23	16%	3
Additionality	15	11%	5
(Standards)	12	9%	6
(Location)	10	7%	7
(Project type)	2	1%	8
Total	140		

Retailers either ranked a set of given criteria for each customer group or provided answers in open prose. In order to use both sets of data, the total number of times a particular criterion was ticked or mentioned was tallied overall, giving a broad indication of generally important factors across all customer groups. These data can be indicative only, given the amalgamation of open and closed format answers. Price, development/community, biodiversity/conservation, provider reputation and additionality were given in closed format questions, whilst standards, location and project type were added from prose answers. These latter understandably scored the least as they were unprompted, although an 'other' criteria could be selected and indicated in the closed question. **Sample**: 26 (29 per cent).

Perceived differences can be identified between customer groups, displayed in Figure 3.17. Individuals were thought to prefer projects with a 'story', appreciating benefits in addition to mitigation, and considering location important. Price was also important for this group, reflecting the voluntary nature of the market.

When offsetting their own activities (e.g. travel, energy use) businesses consider a wider variety of factors. Businesses are more likely to come under public scrutiny, so their project choice is important. Offsetting has a communications and marketing benefit for some companies. Consequently, it would not make business sense to choose offsets that would reflect poorly on the company, for example, through questionable standards or negative local community impact. However, it is unlikely that a single project could be considered by all consumers as "perfect", displaying such characteristics as strong standards, high level of emissions reductions, additional benefits and reasonable cost and risk, whilst being truly additional. Businesses may therefore in future employ a balanced portfolio consisting of a range of different projects, to deflect potential negative consumer associations. To assist in their current project choice some businesses employ consultancies, who have more experience of the factors that should be considered.



The number of times a particular criterion was ticked or mentioned was tallied for each customer group. Where a prose answer was provided with no distinction by customer group, it was used in the analysis if it was evident from their previous answers (proportion or ranking by customer group) that they had a clearly dominant customer group; their answers therefore only being applied to that customer group. Data is given here as the proportions (of respondents providing information for reach customer group), with effective sample for each customer group indicated above the columns. 'Standards' and 'Location' were unprompted categories, whereas the other five criteria were provided in early, closed questionnaire formats. **Sample:** 26 (49 per cent).

Figure 3.17 Important criteria by customer group

Businesses are often thought to prefer technical projects, viewing these as a more rigorous way to address climate change, particularly if they possess knowledge of the technology involved. 'Story' is still desirable though, and in these cases a company may prefer to have projects that resonate with the customer base, perhaps through a perceived link between the company product or service and the project.

When businesses buy on behalf of customers, for example to provide a product that is 'climate neutral', it is suggested that price is the overriding factor in decision-making. This is

probably attributable to the focus on profit and loss; additional product costs due to offsetting must reflect the consumers' minimum additional willingness to pay for having a 'neutral' product/service. Furthermore, offsetting is the key selling point, and marketing opportunity for other project attributes such as sustainable development may be limited.

Events and conferences are thought to express a preference for reputation of provider. Events' marketing material contain only limited opportunity to communicate offset features, so reputable providers may instead be used to confer credibility.

Charities and NGOs were thought to consider a wide variety of factors, though interestingly additionality, which did not rank highly for other customer groups, was thought to be the dominant factor. This reflects a key concern that genuine reductions are made.

However, despite its low ranking, for the majority of customers, retailers suggested additionality was a prerequisite, alongside validation and verification. Such considerations of 'quality' alongside other factors such as price and risk were thought to be weighed up in the final decision. The importance of price as an underlying consideration is reflected in the consumer websites that are beginning to show price comparison tables, such as EcoBusinessLinks (EcoBusinessLinks, 2006).

3.8 Emission reduction credits

Consistent with the disparate nature of the voluntary market, units of transactions vary significantly. Although the compliance market uses a wide variety of credits (e.g. CERs, ERUs, EUAs), these are all formally recognised (equalling 1tCO2) and are fungible, with some restrictions. Within the voluntary market, the unit of transaction is consistent (1tCO2 GHG emissions reductions/offset), but the lack of formal standards can lead emission reductions to display considerably different attributes depending on the procedures followed (e.g. for additionality, verification and validation), and intrinsic to the project itself (e.g. conservation or sustainability attributes). When externally verified, credits can be more formally termed verified emissions reductions (VERs), non-verified offsets - formally known as emissions reductions (ERs), although non-compliance ERs are increasingly simply termed VERs, or voluntary emission reductions. In marketing material these reductions are frequently referred to as 'reduction certificates' or 'carbon offsets'. In 2006 over 80 per cent of retailers used these emission reductions (Figure 3.18), of which 71 per cent used no other type of credit.

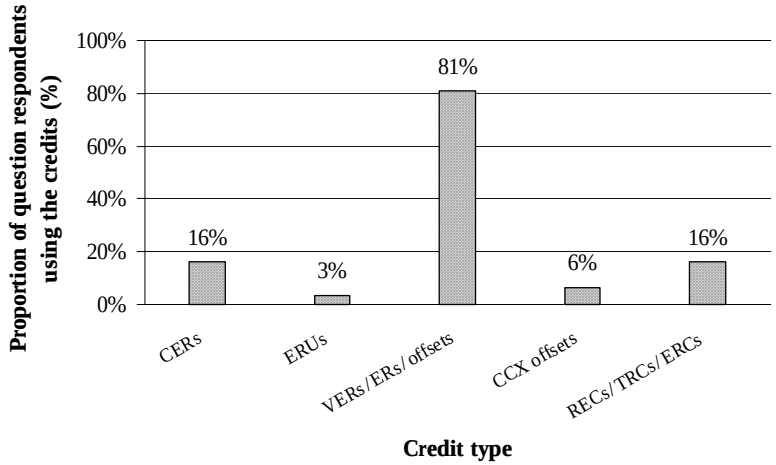
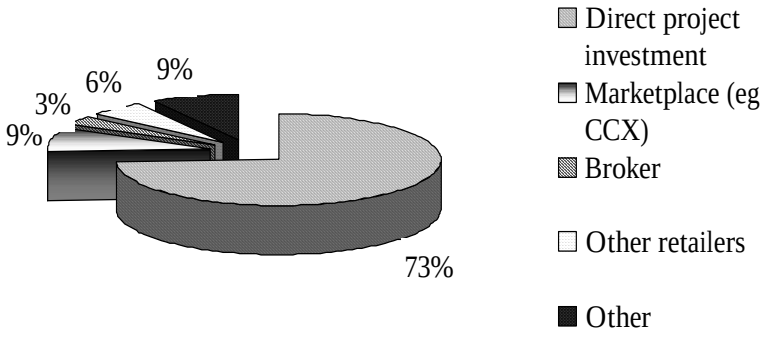


Chart indicates the number of respondents (as a proportion of sample) using different type of credits. As some retailers can use more than one credit type, the total does not add up to 100 per cent. **Sample size:** 31 (58 per cent of population).

Figure 3.18 Distribution of credit types

It is notable that in 2006 a large proportion of the retailers invested directly in the projects (Figure 3.19). This could be in part due to the small volumes and lack of maturity of the market; it is probable that as the market matures more brokers and other compliance market players will be involved adding complexity to the supply chain.



Retailers were asked to give source of credits, and given options of: direct project investment; marketplace; and broker. Results are shown here as proportions by number of retailers using each source, averaged over sample, not by volume of credits. 'Other' includes 'bilateral deals' with developers and 'utility companies'. **Sample:** 32 (60 per cent).

Figure 3.19 Source of offset credits

Given that demand stems from social responsibility rather than emission reduction compliance, customers tend to have more flexibility than compliance customers in choosing their credits, depending on their values and requirements. Attributes displayed by different projects, and therefore project credits, gain greater importance than in the compliance market, including 'story', location and project type. Customers can also buy compliance credits such as CERs, through a desire for enhanced credibility or through expectations of future

regulation. These credits are more expensive than other 'voluntary' credits and often come from more industrial projects located in a handful of countries including China, India and Brazil. This research suggests that use of this type of credit by voluntary retailers is currently proportionately low, but by early 2007 was a growing trend. Other credit types are offered, usually by retailers with portfolios consisting of a balance of credit types suggesting a customer requirement for diversity. Credits include compliance units (although no ERUs at the time of the survey), carbon financial instruments from CCX and also Renewable Energy Certificates (RECs) or Tradable Renewable Certificates (TRCs).

Conflation of offsets and Renewable Energy Certificates

In the USA credits called Renewable Energy Certificates (RECs), Tradable Renewable Certificates (TRCs) or Green Tags are being sold either interchangeably with other types of offsets or by RECs providers, using carbon offsetting as a marketing tool alongside the promotion of renewable energy technologies (see Box 3.1). A market for RECs existed before the relatively recent offset phenomenon, selling the 'green' attributes of energy generation through renewable sources, measured in megawatt hours (MW h). Dr Mark Trexler (Trexler, 2006 a) suggests this recent crossover is driven by price, as carbon offsets have surpassed market prices for RECs. Ecosystem Marketplace recently reported that one RECs supplier suggested that the RGGI in Northeast USA could eliminate the RECs market (Ecosystem Marketplace, 2006).

RECs can be considered comparable to emissions offsets, as they effectively reduce GHG emissions through substitution of fossil fuels with renewable energy. However, one important premise of offsets is that they are truly additional; the projects would not have gone ahead without the additional finance from the market so creating emission reductions that would otherwise not have happened. It can be argued that RECs do not fulfil this criterion. Mike Burnett (Burnett, 2006) at The Climate Trust in the USA states that an offset must be able to answer the question: "Did my money help to cause a project to be implemented that drives atmospheric GHG levels down so the end result is as if I never took that plane flight?" Burnett argues that RECs do not answer this question and cannot be considered as offsets. Furthermore, a renewable energy generator could sell RECs and gain the additional revenue whilst also participating in the CCX, leading to an issue of double counting.

Green-e, an initiative of the Center for Resource Solutions (CRS) have recently developed an overarching standard with a partial objective of providing greater integrity in the use of RECs as offsets. This is discussed more in section 6.2.

Box 3.1 Marketing of RECs in the offset market

Through website research, it is evident that RECs markets are increasingly merging with offset markets:

● 3 Phases (3 Phases, undated) regard the RECs as a '… low-cost way to offset pollution due to electricity usage' .

● Pembina (Pembina, undated), a Canadian not-for-profit environmental policy research and education organisation that also retails RECs, suggests that 'When you purchase Wind Power Certificates you personally offset some, or all, of the environmental impacts associated with the electricity used in your household, without changing your electricity provider'.

● Green Mountain Energy (eMission Solutions, undated) regards RECs as an 'innovatively direct means to offset the carbon emissions impact on the environment associated with an organization's emissions footprint.'.

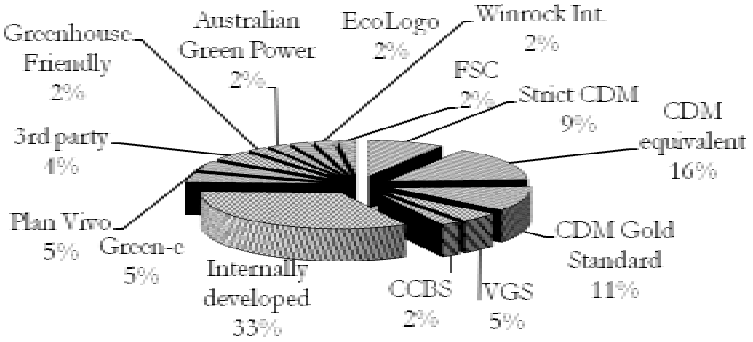
● Certified Clean Car, apparently a pure emissions 'offsetter' when you first visit their website, is part of Renewable Ventures LLC, a 'renewable energy investment and management company which finances and operates renewable energy power plants' (Certified Clean Car, undated).

The prevalence of RECs and CCX credits in the US voluntary carbon offset market is probably an outcome of the trend to situate projects within the home country. This is to the detriment of projects supporting additional benefits in other countries, particularly community development benefits found in the less economically developed countries.

3.9 Standards

Operating outside formal regulations, no set of rules applies universally in the voluntary and retail markets. This has lead to the development of an array of project and accounting processes (Figure 3.20). Many attempt to gain more formalised status through support by credible organisations such as charities and NGOs, with over two thirds of retailers at the time of the survey using some form of recognised procedure. Almost a third of retailers use protocols internal to the organisation, although secondary research of websites indicated that over two-thirds of these have some form of verification process in place (though the rigour of these processes could not be established).

With no benchmark for comparison, the application of such a wide range of standards presents a difficult choice to consumers. A general lack of transparency with respect to standards' content means it is possible that significantly less rigorous procedures may be followed, generating doubt about credibility. This is discussed in more detail in section 6.2.



The number of retailers using each procedure was tallied. More than one standard could be selected by respondents. **Sample**: 30 (57 per cent).

Figure 3.20 Project procedures applied in the voluntary market

4 Market perceptions

4.1 Criticisms of the market

Proponents of market-based trading schemes argue that they can provide greater certainty than other options, from environmental taxation to caps and that they and can provide stricter compliance regimes (McCarthy et al., 2004) in a more cost-effective way through the introduction of flexibility. As it is not possible to determine where emission reductions come from, projects can be located in places that can generate more emissions reductions for the same money.

However, attitudes to the use of market mechanisms in general are mixed, and these debates apply not just to the compliance market but to the voluntary sector as well. Some far-sighted concerns revolve around the carbon market support of the wider project of neoliberalism, with its devotion to market forces, the 'self-regulating market' (McCarthy et al., 2004) and the requisite commodification of nature. It is argued that rather than providing a solution, such assigning of property rights instead provides participants with a 'right to pollute', and contributes to increased corporate power (Carbon Trade Watch, 2005) allowing the rich to 'buy their way out of their obligations, sanctioning their wasteful lifestyles' (Lefevere, 2005). It is argued this distracts from truly effective action on climate change, and will not force the fundamental changes required, that will drive change in consumption patterns and thus fossil fuel use. Instead they slot into the oil, coal and gas continuum (Ma'anit, 2006) and fail to challenge the consumption ethic (Bachram, 2004).

With respect to the application of the mechanisms, it is argued that the cost gains can be over-estimated, and the implementation costs under-estimated (Soleille, 2006). In addition, polluters with relatively advanced technology could simply invest abroad using existing technology (Lefevere, 2005), targeting 'low hanging fruit', rather than the needed technological development. Meanwhile, weak caps can actually lead to over-allocation, while less than full participation can lead to carbon leakage (Kallbekken, 2006), defined as 'the ratio of policy-induced increase of emission from a non-abating country over reduction of emission by an abating country' (Sijm, 2003 pp. 12), (for a wider discussion see for example Hourcade et al., 2001).

A function of the market mechanism is that theoretical economic efficiency is achieved by allowing reductions to be made where they are cheapest, typically in less developed countries. Despite the opportunity for projects with sustainable development benefits, some believe the system is inequitable, relying on projects in developing countries to atone for emissions made in developed countries. Bachram (Bachram, 2004) terms this development 'carbon colonialism'.

4.2 Arguments for the market

In support of market mechanisms, alongside the economic efficiency gains, it can be argued that offsetting generates additional benefits alongside direct mitigation, by generating awareness through GHG-neutral marketed products and services and by efforts of 'environmental leaders' such as HSBC. The Head of Sustainable & Responsible Investment funds at Henderson Global Investors has even suggested recently that 'At the stage we are now, carbon neutrality can be considered best practice in the financial sector' (Wright, 2006). Furthermore, it is thought that consumer offsetting encourages buyers not just to purchase

offsets for their own activities but to consider the wider ramifications of their lifestyle and better understand their carbon footprint. Voluntary market retailers do seem to encourage such considerations. Many retailers' websites provide consumers with detailed information on the importance of other domestic actions, maximising their opportunity to educate their client base. A small proportion of retailers, typically those also offering carbon management services, attempt to engage organisations in making internal reductions, withholding 'carbon reduced' status (and labelling) unless internal reductions are made alongside offsetting. Such actions imply a genuine desire to tackle climate change, rather than just being profit driven, an attitude that is in some cases associated with the non-profit status of the retailer.

A critical case for offsets lies in the urgency and scale of the climate change challenge. Unlike generating social reform and a widespread change in lifestyles, offsetting offers a means to achieve a huge volume of emissions reductions quickly with the resources available. Furthermore, as is the nature of this market mechanism, with time the price of offsetting will rise as the cheaper projects abroad will already be in place. With time this price will approach the marginal cost of abating at home and make more domestic reductions viable.

4.3 Arguments for the voluntary carbon market

Within the confines of the carbon market, strong arguments can be made for the positive role of the voluntary sector of the market. Whilst the compliance market faces restrictions in terms of country participants and customer segments, the voluntary market provides an opportunity to extend the reach, notably to markets such as the USA, and to individuals and companies not covered by existing regulation and to technologies currently lying outside its remit. Through increasing coverage and use, the concept can become more commonplace, and the necessary institutional framework can begin to develop.

This not only applies to countries not currently under regulation, but also to sectors. For example, by enabling private individuals' access to the carbon market, retailers offer an opportunity for the general public to understand better the concept of managing their individual carbon footprint. This could help to move toward personal carbon allowances, a regulation contemplated for example by David Miliband, then UK environment minister, who in 2006 announced a proposal for personal carbon allowances (Adam and Batty, 2006).

The voluntary market can also be a source of innovation, extending the technologies covered as the CDM is restricted by its approved methodologies list. In this capacity it acts as a source of innovation. With time such innovations can increase in practice and feed into the CDM. In effect, the voluntary market can therefore also be considered a test-bed and may, with time, pave the way for much wider compliance regimes, with the power to generate substantially more reductions.

4.4 Issues with forestry projects

Forestry projects are very popular in the voluntary carbon market (see Figure 3.11), largely due to their tangible nature and additional attributes such as ecosystem services, conservation, biodiversity and community benefits. Furthermore, emissions from land use changes and deforestation contribute significantly to GHG emissions, so a strong theoretical argument can be made for addressing this source. Nevertheless, the use of forestry and land use change projects is contentious, focusing on five key issues: questionable science, lack of permanence, distraction from core issues, wider social ramifications and leakage.

Many factors affect forests' carbon sequestration rate, so understandably methodologies to establish baselines and additional emission reductions from forestry projects can be complex. A distinct lack of land-use change project methodologies in the CDM has also hindered the development of the voluntary market, although work is being undertaken to develop new methodologies (Bosquet, 2006). Meanwhile claims of impermanence are well founded; there are many ways in which a forestry project can release stored carbon, such as fires, illegal logging and insect damage.

A focus on forestry projects can also be controversial as it is argued they 'do nothing to address the root of climate change problems: the burning of fossil fuels' (Biello, 2005), whilst they can also be controversial because of their social impacts. In an edition devoted to carbon offset projects, the New Internationalist highlighted how carbon credits could promote the expansion of large-scale tree plantations, which could greatly affect local communities' ability to use the resource (Kill, 2006). Retail market projects are not immune from such social ramifications but there are several projects that explore and use best practice to avoid unwanted negative social effects. For example, Plan Vivo's Scolel Te project in Southern Mexico has the aim of working with communities and small-scale farmers in the state of Chiapas to develop socially beneficial forestry and agroforestry systems (Plan Vivo, undated). The Climate, Conservation and Biodiversity Alliance (CCBA, 2006) has also developed procedures for forestry projects supporting strong additional benefits,

Given the high probability that an area already has an economic use, such as for fuelwood or agriculture, before being used as a carbon sink, the likelihood of leakage is high. Some argue that there should be greater focus on the concept of non-renewable biomass and therefore on avoided deforestation. This project type is not currently approved within the CDM despite its great potential to achieve substantial emissions reductions and sustainable development. Cook stove projects, which greatly improve efficiency and therefore reduce the volume of fuel wood used, are a prime example, and one that is currently quite prevalent in the voluntary market and where substantial work is being undertaken to develop rigorous methodologies.

4.5 Role of offsetting

Despite the positive attributes of the voluntary market, this research found a general perception amongst retailers that the market should only be temporary and just one part of a coordinated response to climate change, involving all sectors, with government direction and utilising all the available tools. Carbon management is one of these tools and a clearly defined role for offsets within carbon management is becoming increasingly important for the voluntary carbon market. The Carbon Trust (The Carbon Trust, 2006) have carried out work with this in mind concluding that: first, businesses should focus on reducing their own cost-effective direct emissions; second, that indirect cost-effective emissions up and down the supply chain should be reduced; and third, if appropriate, offsetting should be considered.

This is becoming recognised as a hierarchy of carbon management action, with the importance of internal reductions stressed. It is certainly critical that emissions are reduced within the home country, given the scale of the challenge. However, strong arguments can be made for using offsetting *alongside* and not just *after* making direct emissions reductions. Emission reductions are needed quickly and on a massive scale. Offsets offer great potential to realise huge volumes. Given resource constraints, they can achieve larger volumes more cost effectively than by simply focusing on emission reductions domestically. Retailers largely believe that the market creates at least some positive and much needed early action,

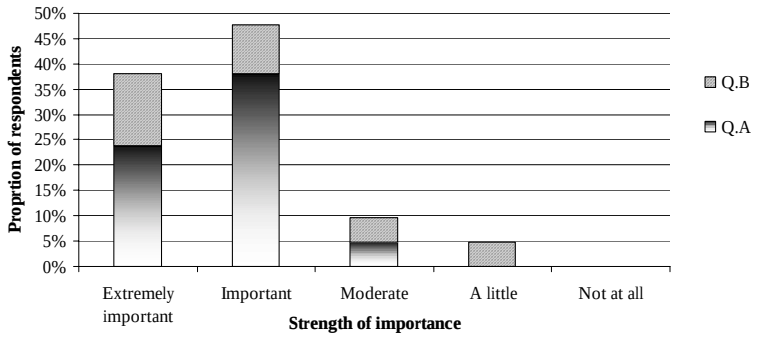
whilst cost effective technologies, policies and practices are implemented at home to improve efficiencies and produce low carbon energy over the longer term. Once these domestic changes come to fruition the offset market should become significantly less important. Retailers suggested that the lifespan of the voluntary carbon market should therefore be limited to 10 to 20 years.

5 Sustainable development in the current market

5.1 Sustainable development in the voluntary carbon market

Within the voluntary market there are clearly many projects offering strong sustainable development benefits, including projects for agroforestry, efficient stoves and lighting, and community-based renewable energy. These projects are typically small scale at the moment.

Some commentators suggest that projects with strong sustainable development benefits are vital for the market, as the market may only ever be a 'zero-sum game' (The Gold Standard, 2006). Retailers themselves believe the presence of additional attributes is important (Figure 5.1). Many of these projects are located in developing countries. In these instances a strong theoretical case can be made that by furthering development goals using carbon financing, those most vulnerable to climate change are being assisted. It makes practical sense to optimise funding to achieving multiple goals wherever possible, particularly as development goals may be hampered by climate change impacts (Davidson et al., 2003).



Q. A: extent retailers used additional development/conservation benefits of projects within marketing material. Q. B: how important retailers considered these attributes to be. NB question A & B were asked to different retailers. **Sample**: 21 (40 per cent).

Figure 5.1 Importance of development / conservation benefits

5.2 Sustainable development in the CDM

Despite its twin stated objectives of cost-efficient emission reductions and sustainable development, in an analysis of the CDM portfolio Sutter and Parreño (Sutter et al., 2005) suggest that there is a trade-off between the two objectives, with the objective of cost-efficient emission reductions strongly favoured over sustainable development. This is clearly demonstrated when analysing the CDM projects, with 58 per cent of these projects by volume between January 2005 and March 2006, coming from HFC projects (Hasselknippe and Røine, 2006). These are large-scale industrial projects with few or no additional attributes.

Importantly, the CDM is only locating in a handful of countries (see Figure 2.2) although about 100 developing countries qualify. Four leading countries, China, India, Mexico and Brazil, host an increasing share of new CDM projects - 83 per cent in the second quarter of 2006 (Fenhann et al., 2006). There is a notable absence of projects locating in Africa, as illustrated in the official CDM map of projects (Figure 5.2).

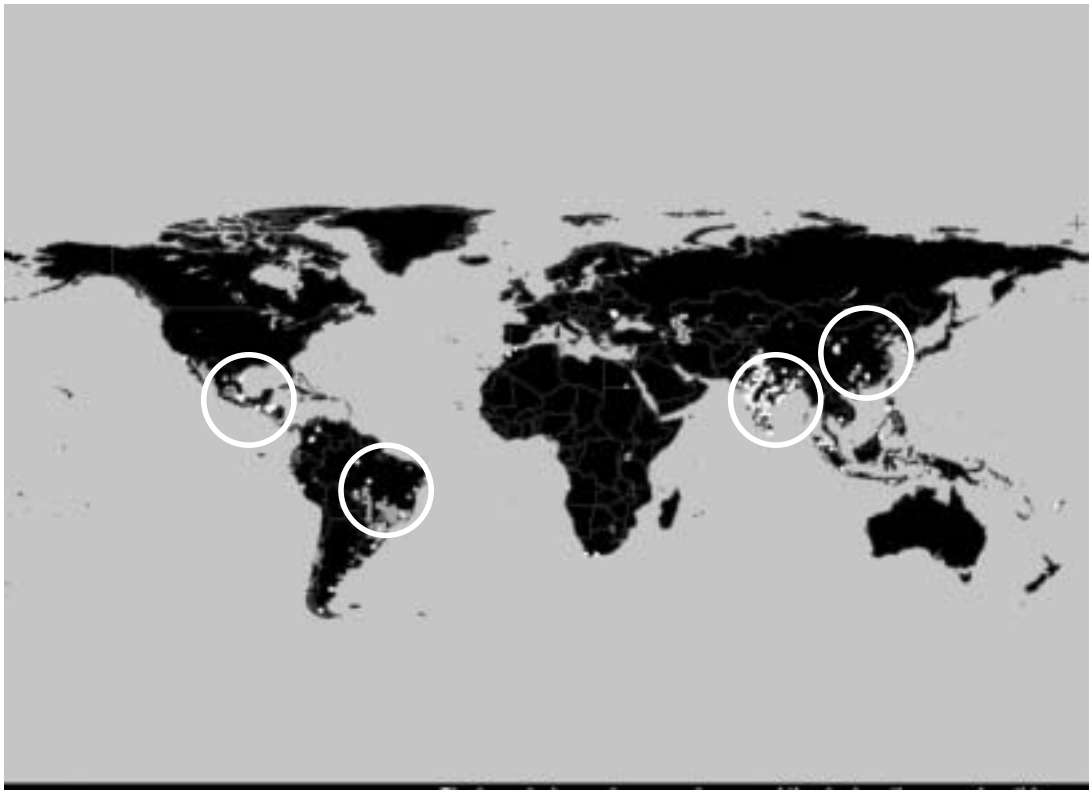


Figure 5.2 Map of CDM projects

UNFCCC (2006 b)

5.3 Procedural differences between the CDM and VCM

There are a number of reasons for the disparities between the CDM and VCM. Within the formal markets the drivers are compliance based, which places a focus on cost. Consequently the market has evolved towards greater commodification. This favours the larger, less risky and therefore cheaper options situated in the more developed of the host countries where infrastructure is more reliable and incentives established.

Projects with sustainable development attributes also often have longer payback times. Small projects bearing proportionately higher costs need longer crediting periods to break even. They are also often located in the least economically developed areas where infrastructure is weak, demanding time for the necessary developments and with risk of delay in delivery. These paybacks often extend beyond 2012, which marks the end of the current CDM. Vintages after this period have a low market price and few sales have been made due to the uncertainty over the mechanism's continuance. Such uncertainty is keenly felt by project developers requiring long paybacks. The voluntary carbon market does not have such restrictions and can offer an outlet for these projects.

The institutional and procedural structure within the CDM has also contributed to the absence of projects with strong sustainable development benefits. Transaction costs associated with

the required procedures are proportionately too high for smaller projects, a problem that has yet to be adequately tackle. As Tyler's analysis of SouthSouthNorth's CDM Kuyasa project (Tyler, 2006) showed, such projects with strong sustainable development attributes are unfeasible under the rigorous but costly and bureaucratic CDM. If it follows CDM procedures the project will make a loss (based on market prices of €11-14/tCO_2), whereas it will make a profit on the voluntary market (at €15/tCO_2). The principal differences in costs arise from greater flexibility at project development stage (through no requirement for formal PDD), and at verification stages as choice of verifier is not as restrictive. Legal fees are reduced and validation is significantly less, resting on transparency and stakeholder credibility rather than formal procedures. Costs for project CDM registration and administration and for the contribution to the CDM Adaptation Levy also do not apply. Given the prevalence of such projects in the voluntary market, and a strong customer preference, it is questionable whether the standard will be feasible for these projects if it is too rigid in its design.

Bureaucracy within the CDM has also contributed to delays in developing and processing important methodologies such as those for non-renewable biomass (for example where efficient stoves could reduce the use of local, non-renewable fuelwood), a critical area for the least developed countries. The costs of developing innovative new methodologies, largely applicable to projects with the strongest additional benefits, and obtaining the CDM Executive Boards' approval are prohibitive for a small project. In the current voluntary market, as no formal benchmarks are required, project originators and retailers can apply innovative, internally developed methodologies without this costly and lengthy approval process. With time such methodologies can be refined and consolidated and be used withint the compliance market.

At present the CDM's processes and methodologies are geared towards point source technologies, such as power plants or industrial factories. Many of the important project types relevant to sustainable development are distributed in space, such as stoves and biogas digesters, and therefore problematic under the current CDM. The CDM's Executive Board (EB) has recently attempted to address some of the issues confronting these distributed project types through programmatic CDM. However, an adequate proposal has still not been tabled.

5.4 Consumer preferences for additional attributes

Aside from procedural issues within the CDM, drivers to buy in the voluntary market are an important reason for the prevalence of projects with strong sustainable development benefits. Consumer demand in the voluntary market is based around altruistic, commercial or political motivations. Without the pure price focus of the compliance market, other project aspects become important including additional environmental or social benefits.

Such consumer preferences, greater flexibility in project procedures and lower transaction costs place voluntary offset retailers in a better position to fund projects with additional benefits. And without the institutional restrictions to project scope, the market can fund important project types currently absent from the CDM. This is a very positive characteristic of the market, especially given the CDM's current failure to meet its sustainable development objectives.

However, despite their desirable attributes, retaining the focus of the voluntary market towards such projects may prove difficult to achieve in practice. It is projected that the supply of such projects cannot meet demand, potentially being able to provide less than 20M tCO2

over the next five years (Molitor, 2006). Moreover, as the market develops it may become less favourable for these projects. This will be discussed further in section 6.

6 Market progression and impacts on the prevalence of sustainable development benefits

6.1 Market growth and potential

Compared with the compliance market, the voluntary market is extremely small on the basis of volumes traded. In 2005, it accounted for approximately 4 – 6 $MtCO_2$, about one hundredth the size of the compliance market. Its impact in tackling climate change has been negligible in the past, particularly given that the effectiveness of the compliance market itself has been questioned; if the ETS, one of the carbon market's largest participants and the product of substantial political will and negotiation, reaches its targets it will still 'not significantly dent the GHGs causing climate change' (Kenny, 2006). Nevertheless, in spite of its current size, and even if it proves a temporary phenomenon, it is growing rapidly. And the potential of all the carbon markets together to reduce emissions is huge.

Exponential growth in the market has been observed over the last few years (evident in Figure 3.5), alongside a rapidly increasing number of retailers and brokers entering the market. Individual retailer growth rates in the first half of 2006 was suggested by some retailers in this survey to be up to 1000 per cent. Such high growth rate projections correspond to those estimated by Capoor and Ambrosi (2007) who concluded a volume of around 10Mt in 2006, and by Molitor, who has suggested demand could be as high as 500M tCO_2 over the next three years (Molitor, 2005). 500ppm's Ingo Puhl has suggested such massive growth is possible, if credibility continues to grow, as at present only 1 per cent of potential has been realised (Biello, 2005). At these volumes, the market would be significantly more important, albeit still small in comparison to what is needed globally to combat climate change.

In the absence of formal federal regulation, great potential particularly exists within North America, and it is possible much of the market's overall growth will be realised here. Much of the demand may be through anticipation of future regulation, whether through state-level initiatives, such as the RGGI already being developed, or even at federal level. The Bank of New York's new voluntary offset registry (discussed in section 6.2) seems to be anticipating such growth.

As discussed in section 3.8, a preference appears to exist in the US for domestic projects, and RECs and CCX offsets are widely used already within this voluntary carbon market. The opportunity for the sale of offsets from projects in developing countries that also support other attributes such as community benefits may therefore be more limited in this region. As yet offsets sourced from the US do not appear to be used by other countries. However, there exists great potential volume of cheap credits given the absence of a formal carbon market. With no restrictions on the purchase of credits from these locations, cheap US credits could swamp the market. Although demand for the more costly credits with additional benefits is unlikely to disappear completely, far greater volumes of these cheaper credits could nevertheless be traded.

6.2 Credibility and standards

As a new entity, the voluntary offset market needs to develop demand. An important component of generating this demand, besides enhancing awareness and motivation, is to build greater assurance for consumers and investors that offsets are high quality, genuine, permanent reductions that are truly additional. Although these are issues also shared by the

compliance market, the latter is at a more advanced stage of development and has set about improving credibility by setting up rigorous verification procedures that are generally applicable, though lengthy.

The wide range of project procedures currently in use in the voluntary market (see Figure 3.20) and the widespread lack of transparency make it difficult for consumers to know the basis of their offsets. This is exacerbated by the absence of a widely used registry, which raises concerns that emissions reductions could be double counted. Furthermore, even with greater accountability, the complexity and intangible nature of the product are generally beyond the interest of individual consumers and often of businesses. This has prompted calls for best practice labelling of retailers themselves and also of the various projects providing offsets.

Project standards

Two notable initiatives are currently in progress in efforts to provide the needed market integrity with respect to project accounting. The Voluntary Carbon Standard (VCS) (The Climate Group, 2006) is backed by The Climate Group, the International Emissions Trading Association (IETA) and the World Economic Forum (WEF). The Voluntary Gold Standard (V-GS) (Schlup, 2006) has the backing of 40 non-profits, and is currently sponsored by WWF International, Renewable Energy and Energy Efficiency Partnership (REEEP) and the Royal Danish Ministry of Foreign Affairs (Danida) and is the sister standard to the CDM market's Gold Standard.

The VCS is intended to be a project based market standard that aims to underpin rather than replace existing credible standards such as the V-GS, with key goals of ensuring emissions reduction are additional, real, quantifiable and permanent. Although the results of the second consultation phase are yet to be released, indications suggest it will largely follow CDM rules, for example in the requirements for documentation of reductions, monitoring and verification (Trexler, 2006 b). Some flexibility is evident though, for example by providing a route for non-CDM methodologies, which are nevertheless of a good quality with adequate baseline and emission reductions calculations.

Given the voluntary nature of the market, the standard must achieve a level of integrity that will provide investors with confidence whilst not placing too heavy a burden on projects in terms of transaction costs – a very difficult balance to achieve. The substantial debates on key areas such as additionality indicates the difficulty this standard faces in achieving the fine balance required. This area in particular is the focus of great scrutiny but many feel that without strong additionality requirements the VCS will not be able to generate the trust or usage needed to assure the market's credibility. Meanwhile questions remain regarding such issues as location (permitting projects in developed countries such as the US) and vintage (allowing projects dating as far back as 2000 to obtain VCS carbon finance), which also have the potential to undermine the quality of credits.

The Voluntary Gold Standard protocol was launched in May 2006, and is already available and is generally regarded as robust. Very few projects have achieved Gold Standard certification though it has been suggested the number of projects going through the process is increasing. It shares several characteristics with the CDM Gold Standard, but with some notable differences particularly for micro-scale projects. Instead of all micro projects following mandatory verification procedures, they will instead pay a nominal sum. A

proportion will be selected for verification and supported from funds collected. Non-micro scale projects will need to be independently validated by UN-approved bodies called Designated Operational Entities (DOEs) for project design and verification of the emissions reductions. Flexibility will also be introduced through the ability to submit non-CDM approved methodologies to its Technical Advisory Committee for approval. As with its compliance counterpart, the standard only applies to renewables and demand side energy efficiency in countries with no quantitative target under Kyoto.

This research (based on a sample of 40 per cent of identified population) suggested that retailers, at the time of the survey in 2006, were not universally intending to apply either the VCS or V-GS, particularly those engaged in forestry projects. There seemed to be great uncertainty over how the market would develop over the coming year. However, just over half retailers did indicate that they were 'probably' or 'definitely' going to use each of the standards. It is likely that applicability of the VCS to retailers using forestry projects will depend on how it deals with the following: new methodologies, as there are very few CDM approved; permanence issues, especially given the debate over sequestration versus actual emissions reduction; and the balance it achieves with respect to cost.

There are also developments on the Climate, Community and Biodiversity Alliance (CCBA) working with Plan Vivo, another of the more credible set of procedures for forestry projects with strong sustainable development benefits. It is possible this standard will provide the benchmark for such projects. Llike the Voluntary Gold Standard, it remains to be seen if the VCS will provide adequate measures for forestry projects and if it will be able to complement the CCBA and Plan Vivo procedures.

A sensitive balance must be achieved by standards, particularly by the VCS, which aims to underpin all other credible standards, between the rigour of the requirements and the cost of meeting these requirements. Application of the VCS to projects with sustainable development attributes, which are often small- or micro-scale, rests on the additional transaction costs, and thus on the rigidity of the standard design. Such projects may become unfeasible when confronted with overly rigorous, costly formal standards, as demonstrated in the Kuyasa cost comparison (section 5). However, standards in the voluntary market should always remain more affordable than the CDM procedures and require less management time.

Although the market is still immature, rapidly increasing demand and media attention is placing great pressure on standards to supply the needed market credibility. This credibility must be achieved quickly to avoid the risk of losing consumer confidence. It is notable that in the UK (a market leader in the carbon markets) the Government (Department for the Environment, Food and Rural Affairs) has recently launched a consultation for a code of best practice and a standard proposing exclusive use of CERs, ERUs and EUAs. Other recent initiatives focusing on the wider aspects of the market such as communications and the role of offsetting include the Center for Resource Solutions' Green-e Retail Carbon Reduction Certification Program (CRS, 2006) intended for the North American market. This draws on other voluntary project standards such as the VCS and V-GS. The Climate Group also launched early consultations on a possible Carbon Stewardship Council overseeing the wider market from footprinting through to internal energy efficiency and savings actions, and offsetting.

Impacts of standards on the market

A trade-off appears to exist between quality and cost; although some argue that this is a false dichotomy, achieving the required balance in one standard may be impossible. Given the voluntary nature of the market, and potentially lower prices (though not always the case), such standards may impose a heavy burden on the voluntary market and significantly affect its dynamics. However, in return the introduction of an appropriate market standard would lead to a more cohesive market with sufficient credibility to maintain vital investor confidence.

Small-scale projects, with proportionately higher transaction costs than larger projects, are currently far more prevalent in the voluntary market than in the compliance market. These projects may be unfeasible if forced to meet stricter standards due to the burden of management time needed for documentation and the transaction costs associated with putting emission reductions through a certification process. Stricter standards are likely to drive the market towards larger projects which are more viable in the face of increased transaction costs. However, such projects are currently less compatible with the perceived existing preference by many voluntary customers for the attractive additional attributes smaller projects often have. The search for parallels in voluntary standards with CDM procedures would therefore be destructive to the sustainable development attributes of the market.

With a growing market, underpinned by a minimum standard, fungibility is likely to increase and a market price will become more evident, particularly with the use of formal registries. In parallel with the CDM development, in this situation cheaper, typically larger-scale projects would probably predominate - a divergence from the current situation. This is likely to have a detrimental impact on projects with additional attributes, which are often smaller-scale and therefore only feasible because of the higher prices commanded by those additional attributes. Furthermore, risk-averse investors may increasingly place the onus on developers to accept development risk, as in the CDM. This would be a further setback for such projects, which are more likely to need upfront funding.

However, counteracting this market dynamic, businesses will still demand projects with additional attributes, as the commercial advantage will remain and the drivers are often altruistic. Nevertheless, quality assurance will be required. This is likely to be in the form of a standard with rigorous additionality requirements and higher transaction costs. Projects with additional attributes able to meet these standards, despite high proportionate costs, will be able to command a premium. Investors buying large volumes still have a focus on price though and may therefore create individual portfolios composed largely of cheaper, fungible credits but mixed with premium credits to be used in communications material. Final portfolio make-up will ultimately be dictated by individual requirements but it is probable that volumes of the very small-scale, high sustainable development projects will suffer to some degree proportionate to larger projects offering cheaper credits.

Recently, larger brokers have been noted entering the voluntary market. Scale is likely to be vital to these participants. Their interest in very small-scale projects with strong sustainable development attributes but offering low payback is unlikely to be as great. Focus could instead be on projects in non-Kyoto developed countries such as the US and on larger projects that have failed to obtain CDM certification because of, for example, delays in registration or issues with methodologies or designated national authorities.

Of greater concern for proponents of smaller community based projects, are moves by the UK Government to establish their code of best practice for the market. The basis for their involvement is sound: the protection of consumer interests by establishing a labelling scheme for retailers of best practice. This label would act as immediate assurance of minimum standards in the offset provision, without further need to understand the complex issues involved. However, the focus of this proposed project is on the exclusive use of compliance credits (CERs, ERUs and EUAs). As discussed in section 5, the CDM is currently not a favourable environment for projects with sustainable development benefits, while the JI and EU ETS projects are situated in developed countries. In addition to the greater credibility of the compliance markets, some critics prefer JI and EU ETS to CDM and similar project-based mechanisms that situate projects in developing countries as they avoid the suggested 'carbon colonialism' of offsetting developed-country emissions in a developing country.

Although this is just one country's government becoming involved in the voluntary market, the UK is a market leader and it is possible it would have influence elsewhere by setting the benchmark for good practice. Such influence would probably depend first on adherence by UK businesses, which will not be certain until late in 2007 as it is still a voluntary code.

Double counting and registries

Transactions in the voluntary retail market are not usually formally recorded or retired other than in individual retailers' accounts, unless purchased from the compliance market or from an exchange. Registries currently in operation, such as Triodos Bank's Climate Clearing House (Triodos Bank, undated) and the Environmental Resources Trust's GHG registry (ERT, undated) are not widely used. Therefore, in addition to the procedures followed by projects, a further tool for ensuring market integrity is the implementation of a formal registry to avoid the possibility of emissions reductions being sold to more than one customer. Aside from the credibility gained, it is possible that a registry would also increase the fungibility of credits. As part of the VCS development, at least one registry provider will be appointed to handle the transactions and ensure no double counting of credits. It is probable the Gold Standard will appoint the same registry provider. This is expected to be launched by early 2008.

The Bank of New York also recently developed a registry, highlighting that carbon credits will be verified by third parties that also validate projects in the compliance market (Bank of NY, 2006). It is clearly aimed at larger participants for whom perceived quality and credibility is essential. Although full details were not available, it is likely that its restrictions and high costs would have similar impacts on the function of the market as standards that mirror compliance rules, and would similarly affect market dynamics by creating a more fungible market. Other organisations entering this area are the Designated Operational Entities themselves – notably TUV, which in early 2007 launched its own registry.

7 Summary and conclusions

This research has revealed a small but rapidly growing voluntary retail carbon market. Although relatively immature compared to the compliance market, the presence of more sophisticated financial participants and recent introduction of a voluntary carbon fund indicate the market is developing.

Projects have typically been micro- to small- scale. This is possibly a manifestation of low demand but is also because of the prevalent project types, which are principally forestry projects, renewable energy and demand-side energy efficiency projects. Alongside the small volumes transacted, these characteristics appear to reflect a customer preference for projects with additional attributes such as development and conservation benefits, which are often a feature smaller projects. This is consistent with the location, by a large number of retailers, of projects in less developed countries, notably Africa. Such a preference for additional attributes, which can resonate with individuals and provide commercial advantage to business, is likely to be the driver for the higher prices sometimes observed.

Prices can exceed those in the compliance market, reaching over £20 per tonne of CO_2 in Europe. Predictably, some are also sold at a lower price than those found in the CDM, with a skew towards these lower prices, which is understandable given the voluntary nature of demand. Prices tend to be lower in North America than other regions, possibly a function of lower demand. Further geographical differences were evident in the market, with Europe appearing to be at a more advanced stage of development. A preference was also displayed within USA and Canada for projects located in the home countries. This conforms to an apparent conflation between the offsets and Renewable Energy Certificates market and a prevalence of CCX credits.

Evident market characteristics, participants' perceptions of the marketplace and available literature could be used to make tentative predictions about future market developments. Market credibility is clearly the key market issue. This is related to contentions about forestry projects (such as impermanence and uncertain methodologies), but more generally around opaque and insufficient project procedures. Although many procedures showed evidence of verification, it is believed that if the market is to maintain its growth investors need far greater reassurance of the credibility of the emissions reductions.

Recent market developments, including a registry and two new market standards, may provide the required credibility if widely applied (though debate continues regarding the VCS's content, important given its role as a market benchmark). A consideration in the development of market standards is the role the market is fulfilling. If it is acting as a learning ground, developing innovative new methodologies and setting the stage for future policy, it would 'make sense to apply different standards to voluntary offsets' (Trexler, 2006 b), to ensure the market is not constrained in scope like the compliance market, which has specific policy mandates. However, these standards must nevertheless provide assurance that the offsets are at the very least additional, not double counted, permanent and genuine. Given the complexity of the market, and the intangible nature of the product, confidence through standards or labelling is important.

As the market develops and rigorous standards become widely applied, taking the CDM as an example, it is possible that the market will become more fungible, and that cheaper, larger projects will increase in importance. However, a notable difference to the CDM may be an increase in projects situated in non-Kyoto countries, such as the US.

Smaller projects with additional attributes, facing rigorous standards and therefore higher proportionate transaction and management costs, will find it difficult to compete on price against larger projects. Voluntary standards will nevertheless still be less prohibitive to such projects than compliance regimes, particularly given the absence of appropriate methodologies in the CDM. Furthermore, it is unlikely that demand for such projects would dissipate completely given the commercial advantage they can provide to businesses in their communications. Large businesses are likely to invest in portfolios that include some projects that support strong additional benefits but alongside a larger volume of cheaper offsets that are less likely to support such additional attributes. Projects with strong additional benefits that can feasibly meet the standards are therefore likely to command a premium.

Despite its great potential, the market is generally perceived by retailers to be only a temporary and partial solution to climate change, even with substantial growth. However, it is considered to provide much needed early action on climate change, whilst adding value through improving awareness of climate change, of carbon management and of domestic actions that can be taken to reduce emissions.

Emissions reduction volumes (in 2005-6) in the voluntary market were insignificant when compared to the compliance market, and the total emissions reductions needed worldwide. However, with the current growth rates, a substantially greater contribution could be realised in two to three years, with subsequent positive feedback on awareness and regulation. The ability of this market to meet its potential will be dictated by its development in the near future, which will determine if market credibility will be assured.

Although more robust voluntary standards may negatively impact upon very small projects with sustainable development benefits, failure to generate credibility is likely to have an even greater impact, without investor confidence in the voluntary market, compliance credits, which are widely regarded as lacking additional development benefits, will instead be used to meet voluntary targets.

8 References

3 Phases (undated) *Switch to Renewable Energy with Green Certificates.* 3 Phases, San Francisco, USA. [Online] Available from: http://www.3phases.com/certificates/index.pl?g=Our%20Services [Accessed: 24th July 2006].

3C (undated) *Climate Neutral.* 3C climate change consulting, Farnkfurt, Germany. [Online] Available from: http://www.3c-company.com/index_en.htm [Accessed: 31st August 2006].

Adam, D. & Batty, D. (2006) *Miliband unveils carbon swipe-card plan.* The Guardian. [Online] Available from: http://www.guardian.co.uk/climatechange/story/0,,1824241,00.html [Accessed: 3rd August 2006].

American Forests (undated) *Plant Trees.* American Forests, Washington DC, USA. [Online] Available from: http://www.americanforeststore.org/plant.html [Accessed: 25th August 2006].

Anderson, J. & Bradley, R. (2005) Joint Implementation and emissions trading in Central and Eastern Europe. In: Yamin, F. *Climate Change and Carbon Markets: A Handbook of Emission Reduction Mechanisms.* Earthscan, London, UK, 200-230.

AtmosClear (undated) *Undo your CO_2 emissions.* AtmosClear Climate Club, Massachusetts, USA. [Online] Available from: http://www.atmosclear.org/ [Accessed: 31st August 2006].

atmosfair (undated) *What is atmosfair?* atmosfair, Bonn/Berlin, Germany. [Online] Available from: http://www.atmosfair.de/index.php?id=0&L=3 [Accessed: 31st August 2006].

Bachram, H. (2004) Climate Fraud and Carbon Colonialism: The New trade in Greenhouse Gases. *Capitalism Nature Socialism,* 15(4).

Bank of NY (2006) *The Bank of New York Creates Global Registrar and Custody Service for Voluntary Carbon Units.* The Bank of New York, New York, USA. [Online] Available from: http://www.bankofny.com/htmlpages/npr_2006_2222.htm [Accessed: 2nd August 2006].

Baseline (undated) *Our services...* Baseline Emissions Management Inc., Calgary, Canada. [Online] Available from: http://www.baselineemissions.com/Contactus.asp [Accessed: 31st August 2006].

Bayon, R., Hawn, A. & Hamilton, K. (Eds) (2006) *An International Business Guide to What They Are and How They Work.* Earthscan.

BEF (undated) *BEF Supply Resources.* Bonneville Environmental Foundation, Oregon, USA. [Online] Available from: http://www.b-e-f.org/renewables/supply.shtm [Accessed: 31st August 2006].

Bell, W. & Drexhage, J. (2005) *Climate Change and the International Carbon Market.* International Institute of Sustainable Development (IISD), Manitoba, Canada. [Online] Available from: http://www.iisd.org/pdf/2005/climate_carbon.pdf [Accessed: 5th May 2006].

Biello, D. (2005) *Speaking for the Trees.* Ecosystem Marketplace. [Online] Available from: http://ecosystemmarketplace.com/pages/article.news.php?component_id=3842&component_version_id=5516&language_id=12 [Accessed: 2nd August 2006].

Blue Source (undated) *Blue Source.* Blue Source, Utah, USA. [Online] Available from: http://www.ghgworks.com/index.html [Accessed: 31st August 2006].

Bosquet, B. (2006) The BioCarbon Fund:Including LULUCF in a Climate Change Mitigation Portfolio. 10 - 12th May 2006.Portfolio'. Paper presented at CarbonExpo, Cologne, Germany.

BP (undated) *BP Global Choice.* BP, Australia. [Online] Available from: http://www.bp.com/subsection.do?categoryId=9008057&contentId=7015466 [Accessed: 31st August 2006].

BR&D (undated) *BR&D Trust.* Bioclimate Research and Development Trust, Edinburgh, Scotland. [Online] Available from: http://www.brdt.org/ [Accessed: 31st August 2006].

Braun, M. & Stute, E. (2004) *Anbieter von Dienstleistungen fur den Ausgleich von Treibhausgasemissionen.* Germanwatch-Hintergrundpapier, Bonn/Berlin, Germany. [Online] Available from: http://www.germanwatch.org/rio/thg-ad03.pdf [Accessed: 1st May 2006].

Burnett, M. (2006) *All Tons are Not Created Equal - Yet.* The Climate Trust, Oregon, USA. [Online] Available from: http://www.climatetrust.org/pdfs/The%20Climate%20Trust%20Spring%20Newsletter%202006.pdf [Accessed: 18th July 2006].

Butzengeiger, S. (2005) *Voluntary compensation of GHG-emissions: Selection criteria for offset projects.* Hamburg Institute of International Economics (HWWI), Hamburg, Germany. [Online] Available from: http://hwwi.hwwi.net/fileadmin/hwwi/Publikationen/Research/Report/HWWI_Research_Report_1.pdf [Accessed: 1st May 2006].

C LEVEL (undated) *Welcome to C LEVEL.* C LEVEL, UK. [Online] Available from: http://www.clevel.co.uk/index.htm [Accessed: 31st August 2006].

c4c ltd (undated) *Overview.* c4c ltd (concepts for carbon), Bern, Swizterland. [Online] Available from: http://www.c4c.ch/ [Accessed: 31st August 2006].

CantorCO2e (undated) The Global Hub for Carbon Commerce. CO2e, London, UK. [Online] Available from: www.co2e.com/trading/ [Accessed: 31 August, 2006].

Capoor, K. & Ambrosi, P. (2006 a) *State and Trends of The Carbon Market 2006.* International Emissions Trading Association (IETA) and The World Bank, Washington DC, USA.

Capoor, K. and Ambrosi, P. (2006 b) *State and Trends of The Carbon Market 2006 Q3 Update. [Online]* Available from: http://www.ieta.org/ieta/www/pages/getfile.php?docID=1929

Capoor, K. and Ambrosi, P. (2007) *State and Trends of the Carbon Market 2007.* International Emissions Trading Association (IETA) and The World Bank, Washington DC, USA. [Online] Available from: http://www.ieta.org/ieta/www/pages/getfile.php?docID=2281 [Accessed May 2007].

Carbon Clear (2006) *Reduce what you can, Clear the rest!* Carbon Clear, London, UK. [Online] Available from: http://www.carbon-clear.com/ [Accessed: 31st August 2006].

Carbon Footprint (2006) *Welcome to carbon footprint.* Carbon Footprint, Hampshire, UK. [Online] Available from: http://www.carbonfootprint.com/ [Accessed: 31st August 2006].

Carbon Planet (undated) *Everything you do leaves footprints.* Carbon Planet Pty Ltd, Adelaide, Australia. [Online] Available from: http://www.carbonplanet.com/home/index.php [Accessed: 31st August 2006].

Carbon Trade Watch (2005) *Hoodwinked in the Hothouse: The G8, Climate Change and Free-Market Environmentalism.* Carbon Trade Watch, Amsterdam. Report: Transnational Institute briefing series No. 2005/3.

CCBA (2006) Climate, Community and Biodiversity: Project Design Standards. [Online] Available at: http://www.climate-standards.org/images/pdf/CCBStandards.pdf [Accessed November 2006].

CRS (2006) *The Green-e GHG Product Standard.* [Online] Available from: http://www.resource-solutions.org/mv/docs/Intro_to_GHG_Product_Standard.pdf

Certified Clean Car (undated) *What is a Certified Clean Car?* Renewable Ventures LLC, San Francisco, USA. [Online] Available from: http://www.certifiedcleancar.com/menu/about/index.htm [Accessed: 24th July 2006].

Clean & Green (undated) *Welcome.* Keep America Beautiful, Florida, USA. [Online] Available from: http://www.cleanandgreen.org/ [Accessed: 31st August 2006].

Clean Air-Cool Planet (2006) *A Consumer's Guide to Retail Carbon Offset Providers.* [Online] Available from: http://www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf

Cleaner and Greener (undated) *The Cleaner and Greener[sm] / Health and ClimateCare Program.* Leonardo Academy Inc., Wisconsin, USA. [Online] Available from: http://www.cleanerandgreener.org/ [Accessed: 31st August 2006].

Climate Care (2006) *What is carbon offsetting?* Climate care, Oxford, UK. [Online] Available from: http://www.climatecare.org/ [Accessed: 31st August 2006].

Climate friendly (undated) *Welcome.* climate friendly, Sydney, Australia. [Online] Available from: http://www.climatefriendly.com/ [Accessed: 31st August 2006].

Climate Neutral Group (undated) *Climate Neutral Group.* Climate Neutral Group, Arnhem, Netherlands. [Online] Available from: http://www.climateneutralgroup.com/ [Accessed: 31st August 2006].

Climate Neutral Network (undated) *The Climate Cool Brand.* Climate Neutral Network. [Online] Available from: http://climateneutralnetwork.org/ [Accessed: 31st August 2006].

Climate Stewards (undated) *Welcome to Climate Stewards.* A Rocha UK, Middlesex, UK. [Online] Available from: http://www.climatestewards.co.uk/ [Accessed: 31st August 2006].

Climate Wedge (undated) *Climate Wedge.* Cheyne Capital, London, UK. [Online] Available from: http://www.climatewedge.com/ [Accessed: 31st August 2006].

ClimateSAVE (undated) *About ClimateSAVE.* ClimateSAVE, Massachusetts, USA. [Online] Available from: http://www.climatesave.com/about.html [Accessed: 31st August 2006].

CO2 Solidaire (undated) *Compensations volontaires.* Groupe Energies Renouvelables, Aubagne, France. [Online] Available from: http://www.co2solidaire.org/ [Accessed: 31st August 2006].

co2balance (undated) *carbon dioxide is causing global climate change.* co2balance Ltd, Somerset, UK. [Online] Available from: http://www.co2balance.com/home.php [Accessed: 31st August 2006].

Coase, R.H. (1960) The Problem of Social Cost. *Journal of Law and Economics,* III, 1-44.

coolAction (undated) *Who We Are.* coolAction.com, Ontario, Canada. [Online] Available from: http://www.coolaction.com/html/who_we_are.html [Accessed: 31st August 2006].

CRS (2006) *Green-e forms group to advise new retail carbon reduction certification.* Center for Resource Solutions, San Francisco, USA. [Online] Available from: http://www.resource-solutions.org/where/pressreleases/2006/Green-e_Forms_GHG_Advisory_Group.8.22.06.htm [Accessed: 30th August 2006 2006].

Davidson, O., Halsnaes, K., Huq, S., Kok, M., Metz, B., Sokona, Y. & Verhagen, J. (2003) The development and climate nexus: the case of sub-Saharan Africa. *Climate Policy,* 3(Supplement 1), S97-S113.

DriveNeutral (undated) *Put the brakes on climate change.* DriveNeutral, San Francisco, USA. [Online] Available from: http://driveneutral.com/ [Accessed: 31st August 2006].

DrivingGreen (undated) *Driving Green.* AgCert, Dublin, Ireland. [Online] Available from: http://www.drivinggreen.com/about.html [Accessed: 31st August 2006].

EAD (undated) *Be Part of the Solution.* EAD Environmental, New York, USA. [Online] Available from: http://www.eadenvironmental.com/ [Accessed: 31st August 2006].

EcoBusinessLinks (2006) *Environmental Directory: Carbon Emissions Offsets.* . [Online] [Accessed: 2nd August 2006].

Ecosystem Marketplace (undated) *Backgrounder: Non-Kyoto.* Katoomba Group, California, USA. [Online] Available from: http://ecosystemmarketplace.com/pages/marketwatch.backgrounder.php?market_id=11&is_aggregate=0 [Accessed: 4th July 2006].

Ecosystem Marketplace (2006) *The Ecosystem Marketplace's V-Carbon News.* Ecosystem Marketplace. [Online] Available from: http://www.ecosystemmarketplace.com/pages/newsletter/vc_7.24.06.html [Accessed: 07/25 2006].

Ellerman, A.D. (2005) A Note on Tradeable Permits. *Environmental Resource Economics,* 31(2), 123.

eMission Solutions (undated) *Renewable Energy Credits (RECs).* Green Mountain Energy Company, Texas, USA. [Online] Available from: http://www.emissionsolutions.biz/how_carbonoffsets.php [Accessed: 24th July 2006].

Environmental Finance (2006) *Carbon volumes reach new high.* Environmental Finance. [Online] Available from: http://www.environmental-finance.com/onlinews/1008pcb.htm [Accessed: 10th August 2006].

Envirotrade (undated) *Welcome to Envirotrade.* Envirotrade Limited, London, UK. [Online] Available from: http://www.envirotrade.co.uk/ [Accessed: 31st August 2006].

ERT (undated) *GHG Registry Program.* Environmental Resources Trust, Inc., Washington DC, USA. [Online] Available from: http://www.ert.net/ghg/full.html#3 [Accessed: 26th August 2006].

ETA (undated) *Climate Neutral.* Environmental Transport Association, Weybridge, UK. [Online] Available from: http://www.eta.co.uk/pages/Climate-Neutral/27/default.htm [Accessed: 31st August 2006].

Evolution Market (undated) *Environmental Markets.* Evolution Markets, New York, USA. [Online] Available from: http://www.evomarkets.com/ [Accessed: 31st August 2006].

Factor (undated) *Welcome.* Factor Consulting and Management AG, Zurich, Switzerland. [Online] Available from: http://www.factor.ch/index.php [Accessed: 31st August 2006].

Fenhann, J. & Vincentz, R. (10th August 2006) *Climate-l email bulletin: The UNEP Risoe CDM Pipeline Overview has been updated.* UNEP Risoe Center, Roskilde, Denmark.

Gorina, N. (2006) Cooling Down Hot Air. Environmental Finance, Global Carbon 2006 Supplement.

Greenfleet (undated) *Our Program.* Greenfleet, Victoria, Australia. [Online] Available from: http://www.greenfleet.com.au/greenfleet/objectives.asp [Accessed: 31st August 2006].

growaforest (undated) *Carbon Reversal.* growaforest, UK. [Online] Available from: http://www.growaforest.com/ [Accessed: 31st August 2006].

Hare, W. (2003) *Assessment of Knowledge on Impacts of Climate Change. Contribution to the Specification of Article 2 of the United Nations Framework Convention on Climate Change.* Wissenschaftlicher Beirat Der Bundesreigierung Globale Umweltveranderungen (WBGU), Berlin, Germany.

Hasselknippe, H. & Røine, K. (2006) *Carbon 2006: Towards a Truly Global Market.* Point Carbon, Copenhagen.

Hourcade, J.C. & Shukla, P. (2001) Global, Regional, and National Costs and Ancillary Benefits of Mitigation. In: Pachauri, R. *Climate Change 2001: Mitigation. Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, New York, USA, 499-560.

Kallbekken, S. (2006) *Why the CDM can reduce carbon leakage.* Center for International Climate and Environmental Research (CICERO), Oslo, Norway. Report: CICERO Working paper 2006:02.

Kenny, A. (2006) *The Thin End of the Wedge?* Ecosystem Marketplace. [Online] Available from: http://ecosystemmarketplace.com/pages/article.news.php?component_id=4374&component_version_id=6308&language_id=12 [Accessed: 2nd August 2006].

Kill, J. (July 2006) 10 things you should know about three 'offsets'. *The New Internationalist*. NI 391, pp. 7.

Lefevere, J. (2005) The EU Greenhouse Gas Emission Allowance Trading Scheme. In: Yamin, F. *Climate Change and Carbon markets: A Handbook of Emission Reduction Mechanisms.* Earthscan, London, UK, 75-149.

Ma'anit, A. (July 2006) If you go down to the woods today... *New Internationalist*. NI 391, pp. 2-6.

McCarthy, J. & Prudham, S. (2004) Neoliberal nature and the nature of neoliberalism. *Geoforum,* 35, 275-283.

Molitor, M. (2006) Carbon Volunteers: Part 2. *Carbon Finance,* [Online] (24),. Available from: http://www.climatewedge.com/download/CW-CarbonFinance_0512.pdf [Accessed 22nd June 2006].

Molitor, M. (2005) Carbon Volunteers. *Carbon Finance,* [Online] (23),. Available from: http://www.climatewedge.com/download/CW-CarbonFinance_0511.pdf [Accessed 22nd June 2006].

myclimate (undated) *The myclimate foundation.* The Climate Protection Partnership, Zurich, Switzerland. [Online] Available from: http://www.myclimate.org/index.php?lang=en&m=about [Accessed: 31st August 2006].

NativeEnergy (undated) *Welcome to NativeEnergy.* NativeEnergy, Vermont, USA. [Online] Available from: http://www.nativeenergy.com/ [Accessed: 31st August 2006].

Pearce, F. (2002) *Tree farms won't halt climate change.* New Scientist. [Online] Available from: http://www.newscientist.com/article.ns?id=dn2958 [Accessed: 2nd August 2006].

Pearson, B. (undated) *The Clean Development Mechanism and Sustainable Development.* Tiempo. [Online] Available from: http://www.tiempocyberclimate.org/newswatch/comment050301.htm [Accessed: 17th April 2006].

Pembina (undated) *Power Your Home.* The Pembina Institute, Alberta, Canada. [Online] Available from: http://www.pembina.org/wind/wind_power_home.php [Accessed: 24th July 2006].

Plan Vivo (undated) *Scolel Te.* Plan Vivo. [Online] Available from: http://www.planvivo.org/projects/projects.html [Accessed: 3rd August 2006].

Point Carbon (2007) *Carbon 2007 - A new climate for carbon trading.* Røine, K. and H. Hasselknippe (eds.). [Online] Available from: http://www.pointcarbon.com/getfile.php/fileelement_105366/Carbon_2007_final.pdf

PowerTree (undated) *Program Summary.* PowerTree Carbon Company LLC, Mississippi, USA. [Online] Available from: http://www.powertreecarboncompany.com/program.htm [Accessed: 31st August 2006].

PRIMAKLIMA (undated) *PRIMAKLIMA - weltweit - e.V.* PRIMAKLIMA-weltweit- e.V., Dusseldorf, Germany. [Online] Available from: http://www.prima-klima-weltweit.de/english/intro.php3?top=english [Accessed: 31st August 2006].

Reuters (2006) *Bank of NY Spawns Voluntary CO2 Registry.* Reuters News Service. [Online] Available from: http://www.planetark.org/dailynewsstory.cfm/newsid/36873/story.htm [Accessed: 2nd August 2006].

Schlup, M. (2006) The Gold Standard for Voluntary Offsets: Objectives and Market Strategy. 10 - 12th May 2006. Paper presented at CarbonExpo, Cologne, Germany.

SELF (undated) *Our Misson...* Solar Electric Light Fund, Washington DC, USA. [Online] Available from: http://www.self.org/ [Accessed: 31st August 2006].

SILVACONSULT (undated) *SILVACONSULT.* SILVACONSULT AG, Winterthur, Switzerland. [Online] [Accessed: 31st August 2006].

Soleille, S. (2006) Greenhouse gas emission trading schemes: a new tool for the environmental regulator's kit. *Energy Policy,* 34(13), 1473-1477.

Stavins, R.N. (2003) *Market-Based Environmental Policies: What Can We Learn from U.S. Experience (and Related Research)?* Resources for the Future (RRF), Washington DC, USA. Report: 03-43.

Sterk, W. & Bunse, M. (2004) *Voluntary Compensation of Greenhouse Gas Emissions.* Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany. Report: Policy Paper No. 3/2004.

Sutter, C. & Parreño, J.C. (2005) Does the current Clean Development Mechanism deliver its sustainable development claim? 28-29 October. Paper presented at International Conference: Climate or development? Hamburg Institute of International Economics (HWWA), Hamburg, Germany. International conference: Climate or development?

TCNC (undated) *Welcome.* The CarbonNeutral Company, London, UK. [Online] Available from: http://www.carbonneutral.com/ [Accessed: 31st August 2006].

Teixeira, M.A., Murray, M.L. & Carvalho, M.G. (2006) Assessment of land use and land use change and forestry (LULUCF) as CDM projects in Brazil. *Ecological Economics,* in press.

TerraPass (undated) *TerraPass.* TerraPass Inc., California, USA. [Online] Available from: http://www.terrapass.com/ [Accessed: 31st August 2006].

The Carbon Fund (undated) *About us.* The Carbon Fund, Mississippi, USA. [Online] Available from: http://www.thecarbonfund.org/about.shtml [Accessed: 31st August 2006].

The Carbon Trust (2006) *The Carbon Trust three stage approach to developing a robust offsetting strategy. [*Online] Available from: http://www.carbontrust.co.uk/publications/publicationdetail?productid=CTC621 [Accessed: November 2006].

The Climate Group (2006) *Further Information: The Voluntary Carbon Standard.* The Climate Group, Woking, London. [Online] Available from: http://www.theclimategroup.org/index.php?pid=778#3 [Accessed: 25th August 2006].

The Climate Trust (undated) *The Climate Trust.* The Climate Trust, Oregon, USA. [Online] Available from: http://www.climatetrust.org/ [Accessed: 31st August 2006].

The Gold Standard (2006) *The Gold Standard: Premium quality carbon credits.* The Gold Standard, Basel, Switzerland. [Online] Available from: http://www.cdmgoldstandard.org/uploads/file/GS_Newsletter1_06.pdf#search=%22zero%20sum%20game%20michael%20schlup%22 [Accessed: 30th August 2006].

The Woodland Trust (undated) *The Woodland Trust.* The Woodland Trust, Lincolnshire, UK. [Online] Available from: http://www.woodland-trust.org.uk/ [Accessed: 31st August 2006].

Tree Canada (undated) *Tree Canada.* Tree Canada, Ottawa, Canada. [Online] Available from: http://www.treecanada.ca/index_e.htm [Accessed: 31st August 2006].

Trees for Cities (undated) *Trees for Cities.* Trees for Cities, London, UK. [Online] Available from: http://www.treesforcities.org/ [Accessed: 31st August 2006].

Trees for Life (2006) *Be part of the solution to Global Warming!* Trees for life, Forres, Scotland. [Online] Available from: http://www.treesforlife.org.uk/tfl.global_warming.html [Accessed: 25th August 2006].

Trees for Travel (undated) *Vliegen met klimaatcompensatie.* Trees for Travel Stichting, Enschede, Netherlands. [Online] Available from: http://www.treesfortravel.nl/index2.html [Accessed: 31st August 2006].

Trexler (undated) *Innovative Solutions.* Trexler Climate + Energy Services, Oregon, USA. [Online] Available from: http://www.climateservices.com/ [Accessed: 31st August 2006].

Trexler, M.C. (2006 a) *Are renewable energy credits (RECs) and carbon offsets exchanged in totally different markets, with little crossover potential for project developers and investors?* ClimateBiz. [Online] Available from: http://www.climatebiz.com/sections/news_detail.cfm?NewsID=30387 [Accessed: 2nd August 2006].

Trexler, M.C. (2006 b) *What is the Voluntary Carbon Offset Standard?* ClimateBiz. [Online] Available from: http://www.climatebiz.com/sections/asktheclimateexpert_detail.cfm?NewsID=30837 [Accessed: 2nd August 2006].

Triodos Bank (undated) *Climate.* Triodos Bank, Utrechtseweg, The Netherlands. [Online] Available from: http://www.triodos.com/com/climate/?lang= [Accessed: 26th August 2006].

Tyler, E. (2006) *CDM for small, sustainable projects: Where is the value added?* Ecosystem Marketplace, California, USA. [Online] Available from: http://ecosystemmarketplace.com/pages/article.opinion.php?component_id=4126&component_version_id=5905&language_id=12 [Accessed: 25th August 2006 2006].

UNFCCC (2006) *CDM Statistics.* United Nations Framework Convention on Climate Change. [Online] Available from: http://cdm.unfccc.int/Statistics [Accessed: 27th July 2006].

UNFCCC (2006 b) Interactive map. United Nations Framework Convention on Climate Change. [Online] Available from: http://cdm.unfccc.int/Projects/MapApp/index.html

World Land Trust (undated) *carbon balanced by wlt.* World Land Trust, Suffolk, UK. [Online] Available from: http://www.carbonbalanced.org/ [Accessed: 31st August 2006].

Wright, C. (2006) *Carbon Neutrality Draws Praise, Raises Expectations for HSBC.* Ecosystem Markteplace. [Online] Available from: http://ecosystemmarketplace.com/pages/article.news.php?component_id=4473&component_version_id=6546&language_id=12 [Accessed: 2nd August 2006].

Appendix 1: Participant list and population frame

Paricipant list

Retailer	Location	Retailer	Location
3C climate change consulting GmbH	Germany	myclimate foundation / South Pole Carbon Asset Management Ltd.	Switzerland
Baseline Emissions Management Inc	Canada	Native Energy**	USA
BP Australia Pty Ltd (BP Global Choice)	UK (HQ) (Ops Australia)	Pembina Institute for Appropriate Development**	Canada
BR&D (act in escrow for Plan Vivo)	UK	PRIMAKLIMA - weltweit - e.V.	Germany
Cantor CO2e	UK	Reforest the Tropics	USA
Carbon Clear	UK	SILVACONSULT AG	Switzerland
Carbon Footprint Ltd (The)	UK	The Carbon Fund	USA
Certified Clean Car**	USA	The CarbonNeutral Company (TCNC)	UK
Cleaner and Greener**	USA	Tree Canada	Canada
Climate Care	UK	Anonymous	
Climate Friendly**	Australia	Anonymous	
Climate Neutral Group / Face Foundation	Netherlands	Anonymous	
Climate Stewards	UK	Anonymous	
CO2Balance	UK	Anonymous	
CO2e	UK	Anonymous	
DriveNeutral	USA	Anonymous	
DrivingGreen	Ireland	Anonymous	
Evolution Markets	USA		
Greenfleet	Australia		

** Offer RECs

Retailer population

Retailer	Retailer	Retailer	Retailer
3C climate change consulting GmbH Germany (3C, no date)	**(Global Choice)** Australia (UK HQ) (BP, no date)		
AtmosClear USA (AtmosClear, no date)	**C LEVEL** UK (C LEVEL, no date)	**C LEVEL** UK (C LEVEL, no date)	**C LEVEL** UK (C LEVEL, no date)
atmosfair gGmbH Germany (atmosfair, no date)	**c4c ltd (concepts for carbon)** Germany (c4c ltd, no date)	**c4c ltd (concepts for carbon)** Germany (c4c ltd, no date)	**c4c ltd (concepts for carbon)** Germany (c4c ltd, no date)
Baseline Emissions Management Inc. Canada (Baseline, no date)	**CantorCO2e** UK (CantorCO2e, no date a)	**CantorCO2e** UK (CantorCO2e, no date a)	**CantorCO2e** UK (CantorCO2e, no date a)
Bioclimate Research & Development UK (BR&D, no date)	**Carbon Clear** UK (Carbon Clear, 2006)	**Carbon Clear** UK (Carbon Clear, 2006)	**Carbon Clear** UK (Carbon Clear, 2006)
Blue Source USA (Blue Source, no date)	**Carbon Footprint** UK (Carbon Footprint, 2006)	**Carbon Footprint** UK (Carbon Footprint, 2006)	**Carbon Footprint** UK (Carbon Footprint, 2006)
Bonneville Environmental Foundation (private non-profit) USA (BEF, no date)	**Carbon Planet** Australia (Carbon Planet, no date)	**Carbon Planet** Australia (Carbon Planet, no date)	**Carbon Planet** Australia (Carbon Planet, no date)
BP Australia	**Carbonfund.org** USA		

Retailer	Retailer	Retailer	Retailer
(The Carbon Fund, no date)			
Certified Clean Car (MMA Renewable Ventures) USA (Certified Clean Car, no date)	**Certified Clean Car (MMA Renewable Ventures)** USA (Certified Clean Car, no date)	**Certified Clean Car (MMA Renewable Ventures)** USA (Certified Clean Car, no date)	**Certified Clean Car (MMA Renewable Ventures)** USA (Certified Clean Car, no date)
Clean and Green USA (Clean & Green, no date)	**Clean and Green** USA (Clean & Green, no date)	**Clean and Green** USA (Clean & Green, no date)	**Clean and Green** USA (Clean & Green, no date)
Cleaner and Greener USA (Cleaner and Greener, no date)	**Cleaner and Greener** USA (Cleaner and Greener, no date)	**Cleaner and Greener** USA (Cleaner and Greener, no date)	**Cleaner and Greener** USA (Cleaner and Greener, no date)
Climate Care UK (Climate Care, 2006)	**Climate Care** UK (Climate Care, 2006)	**Climate Care** UK (Climate Care, 2006)	**Climate Care** UK (Climate Care, 2006)
climate friendly Australia (Climate friendly, no date)	**climate friendly** Australia (Climate friendly, no date)	**climate friendly** Australia (Climate friendly, no date)	**climate friendly** Australia (Climate friendly, no date)
Climate Neutral Group Netherlands (Climate Neutral Group, no date)	**Climate Neutral Group** Netherlands (Climate Neutral Group, no date)	**Climate Neutral Group** Netherlands (Climate Neutral Group, no date)	**Climate Neutral Group** Netherlands (Climate Neutral Group, no date)
Climate Stewards UK (Climate Stewards, no			

Retailer	Retailer	Retailer	Retailer
date)			
Climate Wedge UK / Global (Climate Wedge, no date)	**Climate Wedge** UK / Global (Climate Wedge, no date)	**Climate Wedge** UK / Global (Climate Wedge, no date)	**Climate Wedge** UK / Global (Climate Wedge, no date)
ClimateSAVE USA (ClimateSAVE, no date)	**ClimateSAVE** USA (ClimateSAVE, no date)	**ClimateSAVE** USA (ClimateSAVE, no date)	**ClimateSAVE** USA (ClimateSAVE, no date)
co2balance Ltd UK (co2balance, no date)	**co2balance Ltd** UK (co2balance, no date)	**co2balance Ltd** UK (co2balance, no date)	**co2balance Ltd** UK (co2balance, no date)
CO2Solidaire (Groupe Energies Renouvelables, Environnement et Solidarités) France (CO2 Solidaire, no date)	**CO2Solidaire (Groupe Energies Renouvelables, Environnement et Solidarités)** France (CO2 Solidaire, no date)	**CO2Solidaire (Groupe Energies Renouvelables, Environnement et Solidarités)** France (CO2 Solidaire, no date)	**CO2Solidaire (Groupe Energies Renouvelables, Environnement et Solidarités)** France (CO2 Solidaire, no date)
coolAction.com Inc. Canada (coolAction, no date)	**coolAction.com Inc.** Canada (coolAction, no date)	**coolAction.com Inc.** Canada (coolAction, no date)	**coolAction.com Inc.** Canada (coolAction, no date)
DriveNeutral USA (DriveNeutral, no date)	**DriveNeutral** USA (DriveNeutral, no date)	**DriveNeutral** USA (DriveNeutral, no date)	**DriveNeutral** USA (DriveNeutral, no date)
DrivingGreen Ireland (DrivingGreen, no			

Retailer	Retailer	Retailer	Retailer
date)			
EAD Environmental USA (EAD, no date)	**EAD Environmental** USA (EAD, no date)	**EAD Environmental** USA (EAD, no date)	**EAD Environmental** USA (EAD, no date)
Environmental Transport Association UK (ETA, no date)	**Environmental Transport Association** UK (ETA, no date)	**Environmental Transport Association** UK (ETA, no date)	**Environmental Transport Association** UK (ETA, no date)
Envirotrade Limited UK (Envirotrade, no date)	**Envirotrade Limited** UK (Envirotrade, no date)	**Envirotrade Limited** UK (Envirotrade, no date)	**Envirotrade Limited** UK (Envirotrade, no date)
Evolution Markets LLC Worldwide (Evolution Market, no date)	**Evolution Markets LLC** Worldwide (Evolution Market, no date)	**Evolution Markets LLC** Worldwide (Evolution Market, no date)	**Evolution Markets LLC** Worldwide (Evolution Market, no date)
Factor Switzerland (Factor, no date)	**Factor** Switzerland (Factor, no date)	**Factor** Switzerland (Factor, no date)	**Factor** Switzerland (Factor, no date)
Greenfleet Australia (Greenfleet, no date)	**Greenfleet** Australia (Greenfleet, no date)	**Greenfleet** Australia (Greenfleet, no date)	**Greenfleet** Australia (Greenfleet, no date)
Grow a Forest UK (growaforest, no date)	**Grow a Forest** UK (growaforest, no date)	**Grow a Forest** UK (growaforest, no date)	**Grow a Forest** UK (growaforest, no date)
myclimate - the Climate Protection Partnership			

Retailer	Retailer	Retailer	Retailer
Switzerland (myclimate, no date)			
NativeEnergy USA (NativeEnergy, no date)	**NativeEnergy** USA (NativeEnergy, no date)	**NativeEnergy** USA (NativeEnergy, no date)	**NativeEnergy** USA (NativeEnergy, no date)
Pembina Institute for Appropriate Development Canada (Pembina, no date)	**Pembina Institute for Appropriate Development** Canada (Pembina, no date)	**Pembina Institute for Appropriate Development** Canada (Pembina, no date)	**Pembina Institute for Appropriate Development** Canada (Pembina, no date)
PowerTree Carbon Company LLC USA (PowerTree, no date)	**PowerTree Carbon Company LLC** USA (PowerTree, no date)	**PowerTree Carbon Company LLC** USA (PowerTree, no date)	**PowerTree Carbon Company LLC** USA (PowerTree, no date)
PRIMAKLIMA - weltweit - e.V. Germany (PRIMAKLIMA, no date)	**PRIMAKLIMA - weltweit - e.V.** Germany (PRIMAKLIMA, no date)	**PRIMAKLIMA - weltweit - e.V.** Germany (PRIMAKLIMA, no date)	**PRIMAKLIMA - weltweit - e.V.** Germany (PRIMAKLIMA, no date)
Reforest the Tropics** USA	**Reforest the Tropics**** USA	**Reforest the Tropics**** USA	**Reforest the Tropics**** USA
SILVACONSULT AG Switzerland (SILVACONSULT, no date)	**SILVACONSULT AG** Switzerland (SILVACONSULT, no date)	**SILVACONSULT AG** Switzerland (SILVACONSULT, no date)	**SILVACONSULT AG** Switzerland (SILVACONSULT, no date)
Solar Electric Light Fund (SELF)			

Retailer	Retailer	Retailer	Retailer
USA (SELF, no date)			
TerraPass USA (TerraPass, no date)	**TerraPass** USA (TerraPass, no date)	**TerraPass** USA (TerraPass, no date)	**TerraPass** USA (TerraPass, no date)
The CarbonNeutral Company UK (TCNC, no date)	**The CarbonNeutral Company** UK (TCNC, no date)	**The CarbonNeutral Company** UK (TCNC, no date)	**The CarbonNeutral Company** UK (TCNC, no date)
The Climate Trust USA (The Climate Trust, no date)	**The Climate Trust** USA (The Climate Trust, no date)	**The Climate Trust** USA (The Climate Trust, no date)	**The Climate Trust** USA (The Climate Trust, no date)
The Woodland Trust UK (The Woodland Trust, no date)	**The Woodland Trust** UK (The Woodland Trust, no date)	**The Woodland Trust** UK (The Woodland Trust, no date)	**The Woodland Trust** UK (The Woodland Trust, no date)
Tree Canada /Fondation canadienne de l'arbre Canada (Tree Canada, no date)	**Tree Canada /Fondation canadienne de l'arbre** Canada (Tree Canada, no date)	**Tree Canada /Fondation canadienne de l'arbre** Canada (Tree Canada, no date)	**Tree Canada /Fondation canadienne de l'arbre** Canada (Tree Canada, no date)
Trees for Cities UK (Trees for Cities, no date)	**Trees for Cities** UK (Trees for Cities, no date)	**Trees for Cities** UK (Trees for Cities, no date)	**Trees for Cities** UK (Trees for Cities, no date)
Trees for Travel Stichting Netherlands (Trees for Travel, no			

Retailer
date)
Trexler Climate + Energy Services, Inc. (TC+ES) USA (Trexler, no date)
World Land Trust (Carbon balanced Programme) UK (World Land Trust, no date)

9 Appendix 2: Questionnaire

Questionnaire template

Thank you for taking the time to complete this survey.

The questions are aimed at organizations involved in retailing or brokering Carbon Dioxide (or equivalent) emissions reductions or 'offsets' in the Voluntary Carbon Market.

This research is being undertaken with Imperial College, London, in collaboration with the International Institute of Environment and Development (IIED).

Results will be available to survey respondents. If you would like to receive the full report or have any further questions, please do not hesitate to contact me.

If you have any concerns about sharing information, various options are available, which are covered at the end of the survey. I am happy to discuss confidentiality issues to ensure your peace of mind.

Please note: Carbon Dioxide (CO2) is used throughout this survey for simplicity, and is intended to include other greenhouse gas equivalents.

Your help is greatly appreciated.

Elizabeth Harris
email: eh105@imperial.ac.uk
Imperial College

Depending on your answers, there are between 10 and 17 questions in total excluding confidentiality options and company details.
If you find yourself short of time, the most important questions are marked *!*. There are just 3 - 7 very important questions for which I would be most grateful for your answers.

If you find yourself short of time, the most important questions are marked *!*.

! Organisation details

Your name:

Your title:

Company / Organisation name:

Country of company / Organisation headquarters:

Country / countries of marketing focus:

The following questions relate only to the Voluntary Carbon Market. Please do not complete for the Compliance Market.

Customers

1. *!* How would you categorise your customers?

Please indicate the proportion (%) of offsets obtained from you by different customer groups.

If you do not have the exact proportions available please indicate a ranking (1 being your largest customer group). Leave blank any categories that do not apply.

Category	% of customer base / ranking
Individuals – travel	
Individuals – house	
Individuals – other (please specify)	
Events / Conferences	
Businesses – travel	
Businesses – buildings / day-to-day activities Operational activities	
Business on behalf of their customers (e.g. an airline, or for products & services)	
Other retailers (for onward sale)	
Charities / NGOs	
Other – please indicate:	

Additional notes:

2. What are the most important criteria for your customers? For each applicable customer group please tick the two most important criteria.

Criteria	Price	Addition-ality	Development / community benefits	Biodiversity / conservation / ecosystem services benefits	Reputation of provider	Other Please indicate: _____
Individuals						
Events / conferences						
Businesses for own activities						
Businesses on behalf of their customers						
Charities / NGOs						
Other Please indicate: _____						

Emissions reductions policy

3. This question is for respondents offering services to Businesses and other Organisations. Please leave blank if you do not provide services to Corporates or other Organisations.

What kind of policy do you follow with regard to reductions?

Please tick the most relevant statement.

☐ Offsets can be purchased from us **without confirmation** from the customer that a programme of emissions reductions is being implemented by the customer.

☐ We **encourage but do not require** that customers implement a programme of emissions reductions before purchasing offsets from us.

☐ Offsets can only be purchased after **with confirmation that** a programme of reductions is in place or is being implemented by the customer.

☐ Offsets can only be purchased **after we have established** that a programme of emission reductions is being implemented by the customer.

Market demand

4. *!* How many tonnes of Carbon Dioxide (CO_2) have you offset (or how many emission reductions credits have you retired) since your organisation offered these services?

Year	tCO_2
1997	
1998	
1999	
2000	
2001	
2002	
2003	
2004	
2005	
2006 (to date)	

Additional notes:

5. What do you estimate your company's growth rate is?

Estimated growth rate (as % of 2005 levels): %

Please indicate confidence in your estimation by ranking 1 – 5 (1 is extremely confident)

Additional notes:

6. Can you estimate the current size of the Voluntary Carbon Market?

_____ tC_2 per year

7. What do you think the future of the Voluntary Carbon Market is?

If possible please indicate expected growth rate.

Price

8. *!* How much do you charge to compensate 1 t of CO_2? Please indicate currency.

a) If you charge at a **flat rate**, please indicate the price per tonne here: / tCO_2

b) If you vary your price, please indicate the basis for variation and the price range.

i) Price range: / tCO_2 to / tCO_2

ii) Basis for variation:

Additional notes:

For retailers involved directly with projects only. If not relevant please move on to the next question.

9. What is the proportion (%) of your funding that goes directly to projects (excluding your own management time)?

Please indicate if using a currency other than GBP (£).

Year	Value of direct project funding (in £)
1997	
1998	
1999	
2000	
2001	
2002	
2003	
2004	
2005	
2006 (to date)	

Additional notes:

Credits

10. Which type of credits do you offer for offsetting/compensation? Please indicate a typical percentage (%) of total credits used for your Voluntary Customers.

Credit type	Proportion (%)
CDM (CERs)	
Emissions reductions (VERs/ERs)	
Renewable energy (RECs/TRCs)	
CCX (Emissions/Carbon Offsets)	

VCUs (Voluntary Carbon Units)
Other – please specify:

Additional notes:

11. Where do you obtain your credits from? Please tick all relevant options.

☐ Direct Project investment **(go to Q. 12)**

☐ Marketplace (e.g. CCX) **(go to Q. 20)**

☐ Broker or other retailer – please specify who: (this will help ensure there is no double counting in the survey) **(go to Q. 20)**

Additional notes:

Projects

(Questions only for companies involved with projects. Otherwise go to Q. 20)

12. *!* Please indicate the number of projects (or as % of total) per category used for compensation within your overall portfolio in the last year?

Project type	Number of projects
Reforestation/Afforestation	
Other LULUCF/sinks	
Renewable energy	
Demand side energy conservation (eg efficiencies)	
Supply side energy conservation or efficiency	
Fugitive emissions	
Other - please specify:	

Additional notes:

13. *!* Please indicate the number of projects (or as % of total) within your portfolio in the last year per size category.

Project size	% of projects
Micro (<5,000 tCO_2/yr)	
Small (5,000 to <20,000 tCO_2/yr)	
Medium (20,000 to <50,000 tCO_2/yr)	
Large (50,000+ tCO_2/yr)	

Additional notes:

14. What are the most important criteria in your project selection?

Please rank the following characteristics (1 = most important).

If more than one criterion are of equal importance, please mark all applicable with the relevant rank.

Characteristics	Rank
Additionality (strict reassurance that project would not have gone ahead otherwise)	
Price	
Verification (strict, formal procedures in place to validate & verify emissions reductions over life of project)	
Avoidance of double counting (projects only carried out in countries with no legally binding commitments)	
Community or development benefits	
Biodiversity/conservation benefits	
Project portfolio mix (that a range of different project types are maintained in your portfolio)	
Other - please indicate:	

15. How do you source your projects?

16. How much do you communicate your projects' development or conservation benefits within your marketing material?

Please tick one option.

If you do not consider that any of your projects have these benefits, please tick 'not relevant'.

☐ None
☐ A little
☐ Moderately
☐ Quite a lot
☐ Significantly
☐ Not relevant

[12b] How important do you consider it to be that projects demonstrate additional development/conservation attributes alongside emission reductions?

☐ Unimportant

☐ Slightly important
☐ Moderately important
☐ Important
☐ Extremely important

Additional notes:

Standards

17. *!* Which standards do you use? Please tick all that apply.

☐ Strict CDM rules
☐ CDM equivalent
☐ CDM Gold Standard
☐ Voluntary Gold Standard
☐ Climate, Community and Biodiversity Standard
☐ Internally developed
☐ Other - please specify:

Additional notes:

18. *!* If not using already, when finalised do you think you will use the new industry standards being developed?

Please tick as many as are relevant.

Standard	Definitely	Probably	Possibly	Unlikely	Definitely not
Voluntary Carbon Standard (IETA / Climate Group)	☐	☐	☐	☐	☐
Voluntary Gold Standard	☐	☐	☐	☐	☐
Other – please specify:	☐	☐	☐	☐	☐

Additional notes:

19. What impact do you think the Voluntary Gold Standard and Voluntary Carbon Standard will have on the development of small scale, community focused projects?

Standard	Positive	Negative	No difference	Unsure
Voluntary Carbon Standard (IETA / Climate Group)	☐	☐	☐	☐
Voluntary Gold Standard	☐	☐	☐	☐

Please provide a short explanation:

Market perceptions

20. What role do you believe offsets could serve within global efforts to reduce carbon emissions?

[13] Please indicate how important you believe this role to be and how this might change in the future.

[14] Please also indicate if you believe the offsets market could pose any threats or benefits to global efforts to reduce carbon emissions.

21. What do you think are the main issues in the Voluntary Carbon Market at the moment?

22. Do you have any other views or comments on your company or on the Voluntary Carbon Market?

Market participants

23. [15] To help ensure the results from this survey are comprehensive, it would be very helpful if you can suggest any participants currently excluded from this list of Voluntary Carbon market intermediaries.

[List input here - updated as population frame developed]

Confidentiality

Your responses are valued; if you are concerned about any information you consider

sensitive, several options are available.

Please select the options that best meet your requirements. Alternatively, please contact me at eh105@imperial.ac.uk to discuss this.

Are you happy for your company to be listed as a participant in this survey?

☐ Yes – our company can be identified as participants

☐ No – please keep our name anonymous

Please indicate your preference with regards to your responses.

☐ I am happy for our survey responses to be linked to our company name

☐ I would like our responses to be presented either under a generic title (e.g. Company A) or in an aggregated format (i.e. our responses cannot be linked directly to our company)

☐ Our responses can only be presented in an aggregated form

Your contribution to this survey is greatly appreciated.
With kind regards,

Elizabeth Harris
Imperial College

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International
Institute for
Environment and
Development

Environmental
Economics Programme

The voluntary carbon offsets market

An analysis of market characteristics and opportunities for sustainable development

A global carbon market has evolved in the wake of negotiations for the United Nations Kyoto Protocol. A number of distinct markets are encompassed within its remit, including a voluntary retail arm. Although the voluntary retail market is very small in comparison to other segments, it has large growth potential as it can extend to countries, customer groups and technologies not embraced by the existing compliance regime. This paper examines the structure and dynamics of the voluntary retail carbon market and in light of these findings considers the future developments and implications of this market for sustainable development.

Markets for Environmental Services Reports

Markets for Environmental Services (MES) is an initiative of IIED's Environmental Economics and Forestry and Land Use Programmes aimed at promoting the provision and maintenance of environmental services in ways that are equitable and beneficial for poor people. MES reports focus on the financial, environmental and poverty impacts of recent initiatives to develop markets, financial compensation mechanisms, fiscal incentives and other market-based instruments for environmental benefits (services) in rural areas of the developing world. They are targeted at developing country governments, private firms, donor agencies and other organisations working in the area.

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