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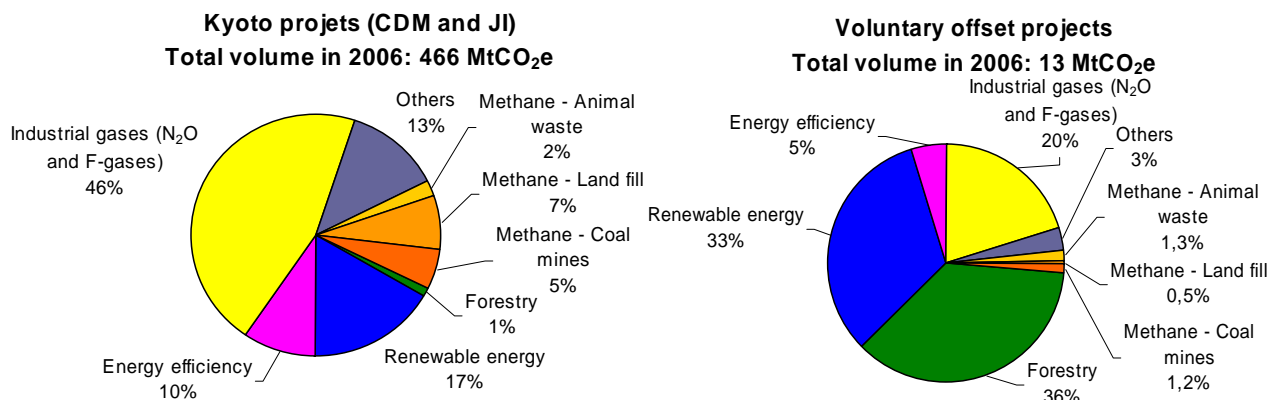
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The emergence of voluntary carbon offsetting

Parallel to the implementation of the Kyoto Protocol, a growing number of companies and private individuals are making a voluntary commitment to offset their greenhouse gas emissions. The voluntary offset market is rapidly growing, with over 10 million tons of CO₂ resulting from emissions reduction projects already being traded. Voluntary offsetting finances projects that are not subject to the “Kyoto” methodological framework, are often smaller, varied and sometimes innovative. This diversity is a source of richness, but the vagueness of the methodological rules and low product traceability can allow for poor quality projects and does not provide secured information for the buyer. This results in a troubling lack of price uniformity. The various quality labels and good-conduct approaches should permit progress towards improved product standardization and the emergence of a genuine market.

Figure 1 – Comparison between “Kyoto” projects and voluntary projects



Voluntary offset projects are most often developed in forestry and renewable energies sectors. Voluntary compensation projects involving industrial gases (N₂O and fluorinated gases) are far less common than those under the Kyoto Protocol.

Sources: World Bank, Ecosystem Marketplace

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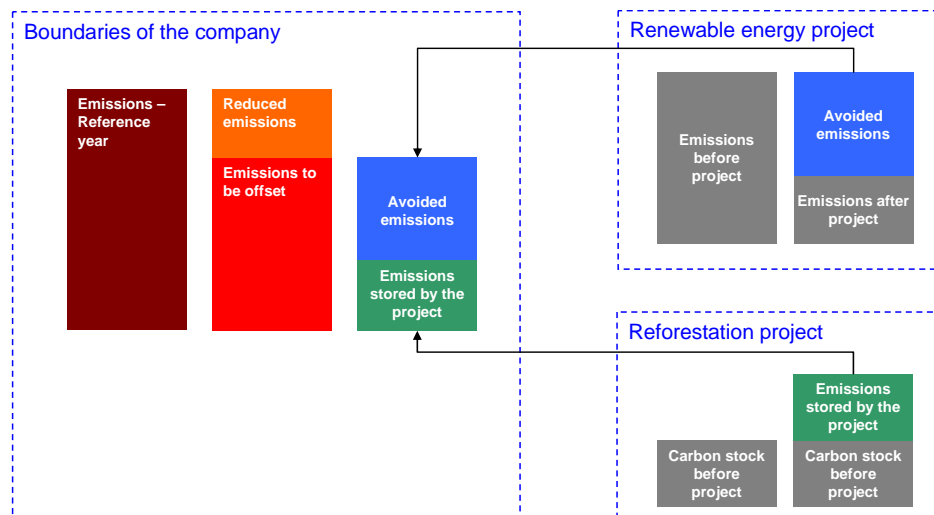
I. Emission reductions, voluntary compensation, carbon neutrality

In 1989, the American electric power production firm AES Corp decided to finance an agri-forest project in Guatemala, investing two million dollars. The aim of the project was to offset the emissions of a new power plant the group had built in Connecticut by planting 50 million trees. Eight years before the signing of the Kyoto Protocol, and sixteen years before the introduction of the European allowance trading system (EU ETS), voluntary approaches to offsetting had begun.

Why compensate? To fight climate change, the first useful action consists of reducing one's own greenhouse gas emissions. Multiple tools are in fact available to actors who wish to reduce their carbon footprint by cutting their emissions: energy savings, reduced use of private cars, recovery of methane produced by waste, etc. Such emissions reduction actions can be freely chosen by the actors. They may also result in the implementation of public policies, within supra-national (Kyoto Protocol, European Union) or national (climate plans) frameworks.

Emission reduction actions have limits in certain cases, however. Within the scope of current technologies and organizations, it can be very difficult and costly to reduce emissions as much as desired. Hence, in addition to reducing one's own emissions, the idea of offsetting emissions by financing an equivalent of emission reductions by another actor has developed. For example, if you have to take a flight that emits 2 tons of CO₂ emissions, you could decide to finance a renewable energy project that would avoid the emission of those 2 tons. In this case, illustrated in Figure 2, when actual emissions are equivalent to compensated emissions, we speak of "carbon neutrality".

Figure 2 – Example of the introduction of a carbon neutrality policy



Source: Caisse des Dépôts - Mission Climat

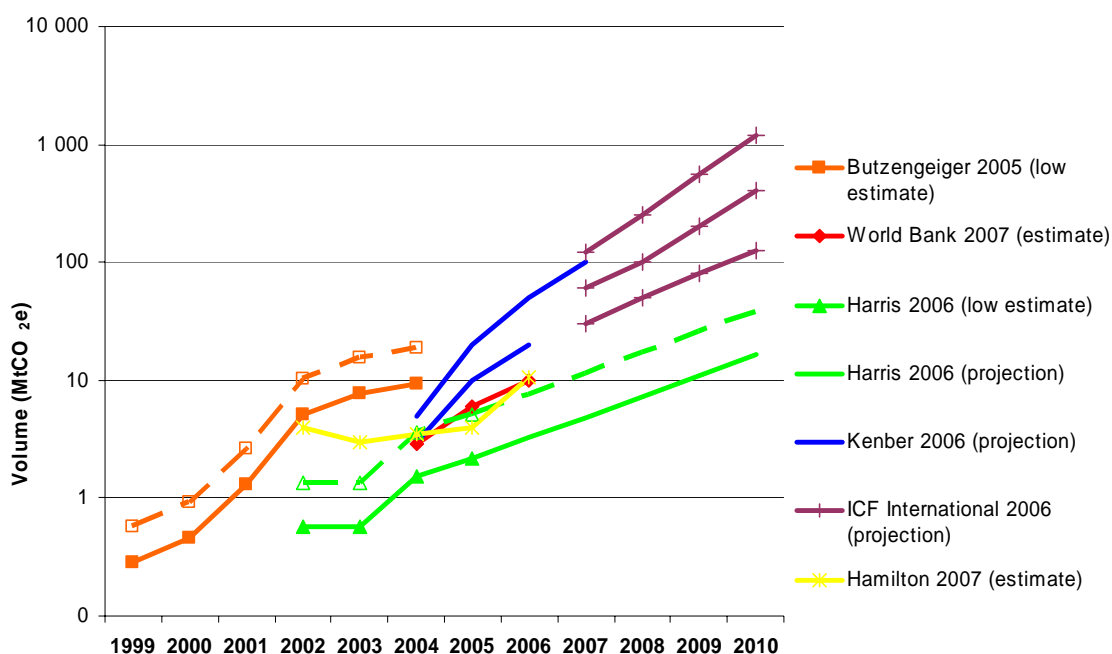
In the fight against climate change, offsetting is relevant to a certain extent. Indeed, the emission of one ton of greenhouse gas into the atmosphere has the same impact on global warming, regardless of where it originates. Therefore, the reduction of a ton of CO₂, no matter where or how it is done, results in the same climate benefit. Based on this principle of equivalence, the Kyoto Protocol devised mechanisms for projects that would enable governments and companies with binding emissions reduction objectives to use the principle of offsetting to meet part of their obligations. The international market of greenhouse gas emission reduction projects under the Kyoto Protocol is at the core of this approach. According to the World Bank, in 2006 it represented 466 million tons of CO₂ equivalent (CO₂eq.) for a total of 5.4 billion dollars.

The term “voluntary offsetting” includes all the approaches adopted by actors who voluntarily choose the compensation method to limit their CO₂ emissions or to aim for carbon neutrality. In 2006, they were responsible for significantly lower amounts, on the order of ten tons of CO₂eq and 50 million dollars. Nevertheless, voluntary offsetting initiatives tend to multiply through a proliferation of initiatives that reflect our society’s awareness of climate risk. The various estimates and projections presented in

Figure 3 testifies to this emerging market, in which the volume (i.e. the quantity of carbon credits that are traded), has doubled every year since 2004.

Most actors are confident about the future of voluntary offsetting. According to the projections of ICF International, the volumes will reach between 100 and 1,000 million tons of CO₂eq by 2010. This report will focus on these apparently promising initiatives by studying the characteristics of voluntary compensation first in terms of the demand, second in terms of supply, and finally, examine the effectiveness of these approaches in helping to reduce greenhouse gas emissions.

Figure 3 – Volume of the voluntary offset market: estimates and projections



The estimates were made by sampling, whereas the projections are the result of hypotheses concerning the current state and evolution of the market. The dotted lines indicate the upper spread of the corresponding estimate, according to the calculations of Mission Climat based on the authors’ data.

Source: Caisse des Dépôts - Mission Climat

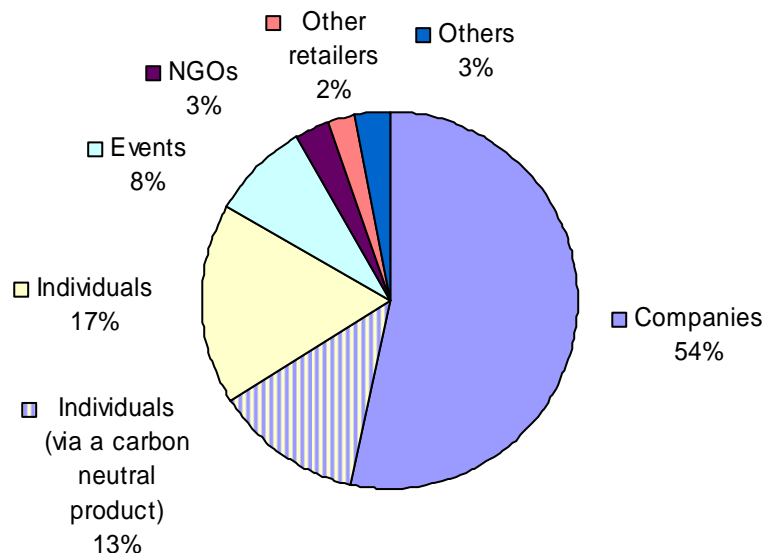
II. Demand for voluntary offsetting

A. Where does the demand for voluntary offsetting come from?

It is rather difficult to map the demand for voluntary offsetting. The map reproduced above is modeled on the chart proposed by Elisabeth Harris, one of the most thorough academic works on this topic. The figures mentioned should be considered only as rough estimates. They depend on the sampling method used, which probably gives too much weight to English-speaking countries.

In 2006, slightly more than half of the demand for voluntary offsetting came from companies that wanted to compensate for their own emissions. This proportion would probably have been higher if the same survey had been conducted several years earlier: firms, such as the electric power company AES, were the first actors to undertake experiments in voluntary compensation. Furthermore, they make up most of the market in terms of volume, with 80% of the traded volume, according to a recent study by Ecosystem Marketplace.

Figure 4 – Average makeup of the customer portfolio of voluntary offset operators (in volume)



Size of sample: 24 operators.

The figures shown here were obtained by averaging the makeup of operator portfolios.

Source: Harris 2006

Private individuals have entered more recently into the voluntary offset market, which remains poorly structured to meet individual demands. There are two distinct segments allowing individuals to offset their emissions:

- The purchase of products or services that include in the selling price the cost of offsetting the emissions generated by the product or service. For example, customers of the British car rental company *Carrentals.co.uk* can calculate the emissions arising from the use of hired vehicles and offset them by paying a supplement to the standard rental contract. Similarly, the purchaser of Interface Carpeting can buy “carbon neutral” products by paying a 1% supplement intended to offset the emissions generated by carpet production and delivery. Thirdly, EDF Energy, the British subsidiary of EDF, offers consumers both carbon-neutral gas and electricity, for a price supplement of 0,147 pence per kWh of gas and 0,42 pence per kWh of electricity, all taxes included.

- The purchase of a compensatory service by private individuals from specialized providers that sell emission reductions. In general, the service provider offers to calculate the customer's emissions and offset them. This type of service is mainly used to offset emissions linked to private transport.

The third segment of voluntary offset demand comes from the organizers of events which generate greenhouse gas emissions, mainly for the travel and accommodation of the participants. Most major international events such as the Olympic Games now include a budget intended to compensate for the greenhouse gas emissions they engender.

The last segment of voluntary offset approaches includes associations and regional authorities. The low level of current voluntary compensation in this segment is striking.

The following series of examples of voluntary offset approaches by type of consumer will explain more fully what lies between these main segments:

B. Companies and financial institutions: learning, anticipation, image management

A pioneer: the American electric power company AES Corp

The American electric power company AES Corp is a relatively young company, set up in 1981, with its first power plant was built in Texas in 1985. The company was quickly internationalized using the possibilities offered by deregulation in the energy sector. Its decision in 1989 to offset part of its CO₂ emissions by launching carbon sequestration projects in Guatemalan forests was made at a time when the instruments for carbon measurement and accounting were still rudimentary. It was a socially responsible approach – facilitating according to some sources the acceptance of a new thermal power station by American regulatory authorities that turned out to be premonitory. The constraint of climate change was transformed into an opportunity for this electric power company. The specialized firm Trucost notes that AES is better positioned than the average American producer to deal with the probable tightening of regulations on greenhouse gases, due to an energy mix that emits less CO₂. In the area of voluntary compensation, it has combined its know-how with that of Agcert to create AES-Agriverde, with the aim of achieving more than 20 million tons of emission reductions by 2012.

ST Microelectronics, a forestation project manager

In terms of determining emissions objectives and strategy, ST Microelectronics is a company that made an early commitment to emission reductions. In 1999, it set for itself the twofold objective of reducing its relative emissions (tCO₂eq/USD of value added) by 5% per year and achieving carbon neutrality by 2010. The calculation of emissions, based on the *GHG Protocol*¹, which encompasses direct emissions related to industrial processes and indirect emissions including electricity use and employee transport, resulted in total emissions of 1.7 MtCO₂eq for 2004. The offset projects launched by ST Microelectronics to compensate for its residual emissions after reaching the reduction target included forestry projects in Morocco, Australia, the United States and Italy.

¹ Measurement protocol developed by the *World Resources Institute* (WRI) and the *World Business Council for Sustainable Development* (WBCSD) : www.ghgprotocol.org

The pro-active attitude of ST Microelectronics has perceptibly improved the image of the company, which received the European Commission's *Management Award for Sustainable Development* in 2002. The cost of compensation, stemming directly from financing and project organization, however, has been high. Nevertheless, when the company had first launched its offset efforts, there were no organized service providers to manage its voluntary compensation, forcing the company itself to oversee the development and monitoring of emission reduction projects.

HSBC and the Caisse des Dépôts: the use of carbon assets

The commitment of the British bank HSBC in December 2004 to become the first carbon neutral bank in 2006 received favorable media attention. The objective was reached in the last quarter of 2005. The emissions calculation takes into account only the CO₂ emissions linked to consumption of electricity, oil and gas, as well as employee transport, totaling 0.66 MtCO₂ in 2005. After setting internal reduction objectives ranging from 1% to 7% over three years, HSBC offset 0.17 MtCO₂, corresponding to its emissions during the last quarter of 2005. The bank launched a call for projects and purchased emission reductions from four projects, developed both within and beyond the Kyoto framework: wind energy in New Zealand, compost in Australia, agricultural methane capture in Germany, and biomass-energy in India.

In France, the Caisse des Dépôts has been carbon neutral since 2006, as part of its "Horizon climat" approach consisting of an annual emission reduction objective of 3% per year until 2012, coupled with offsetting residual emissions. During the initial period (2006-2007), the compensation of emissions has been assured by the purchase from retailers of 30 000 credits per year, generated from Kyoto projects: wind energy production in India, animal waste management and renewable electricity production in the Philippines and a small hydroelectricity facility in Brazil.

BP, limited compensation

The case of the oil company BP is original. Starting in 1997, the company developed a stronger "green" image in changing its logo and renaming itself "*Beyond Petroleum*". It later launched a plan to measure and reduce its emissions based on an inventory carried out on the company and its subsidiaries including emissions of all greenhouse gases produced by its direct activities and electricity consumption. The inventory totaled 91.9 MtCO₂eq in 2005, and achieved the internal reduction objectives (excluding electricity) of 10% compared with the year 1997. For the moment, remaining emissions have not been included in the offset program, but the company has launched additional neutrality programs associated with its products, particularly in the United Kingdom and Australia. It is the final buyer, the BP customer, who chooses neutrality; the company positions itself as a neutrality service provider. This approach offers the company the significant advantage of having customers pay the cost of compensation. It also contributes to the awareness of the general public regarding the fight against climate change.

C. Private individuals: forests and transport

Private individuals account for one third of the voluntary offset market. The expansion of this sector depends on two main factors: the type of information available to the public and the concrete possibilities for easy compensation.

The general public frequently associates voluntary compensation with planting trees to sequester carbon. Indeed, the majority of early voluntary compensation offers involved forestry projects.

Parallel, the demand for offsetting transport-related emissions has developed and has, in fact, become the primary source of demand from private individuals. Communication concerning air transport, which attracts a solvent clientele, has been especially widespread. Offsetting transport-related emissions often takes the form of the purchase of tons of CO₂ from specialized service providers that usually put a calculator online to estimate the amount of emissions to offset. Another possibility consists in buying a travel package in which the consumer opts to buy the emissions compensation in addition to the standard service at the time of payment: British Airways, Expedia, Hertz, Voyageurs du Monde, Air France, etc.

At present, there is no reliable study that has measured the penetration of voluntary compensation among consumers and their motivation. Like other socially responsible initiatives such as organic farming and equitable trade, there is probably a significant gap between the media attention paid to climate change and the consumer's choice when confronted with budgetary constraints. For example, the initial results of the voluntary compensation offer by British Airways have failed to meet the expectations of its promoters.

D. Compensating for the carbon footprint of events

The Olympic Games in Salt Lake City

The 2002 Winter Olympic Games in Salt Lake City was one of the first major events to adopt a voluntary compensation approach. The emissions generated by the event, linked to transport, accommodations and operating facilities, were estimated at 180,000 tons of CO₂eq. These emissions were offset through system of *sponsorship* including companies such as DuPont, Waste Management Inc., and BlueSource. Each sponsor gave the organizing committee a contribution to the compensation of the event. The system was labeled *Climate Cool* by the Climate Neutral Network.

The 2006 Football World Cup

The 2006 Football World Cup in Germany also engaged in partial compensation in its "*Green Goal*" program. The scope was limited to emissions generated by the event in Germany, i.e. the construction of stadiums, travel within the country, electricity consumption at the stadiums, temporary facilities and those used to accommodating fans. Reduction measures enabled a savings of 22,500 tCO₂eq, mainly in transport, representing nearly a quarter of total emissions, estimated *a posteriori* at 93,000 tCO₂eq. The effectiveness of these savings exceeded the forecasts of the organizing committee, which had bought 100,000 tCO₂eq in compensation credits to ensure the carbon neutrality of the event. The "*Green Goal*" program also included other environmental performance objectives, particularly in the areas of water and waste. The entire operation was assessed *ex post* by the International Federation of Association Football (FIFA).

"Small" events

Voluntary compensation approaches also exist for smaller events that receive less media attention. This is the case, for example, for the 2007 Annual Meeting of EDF shareholders. The French electricity company cut the emissions linked to the organization of its annual shareholders' meeting in half by concentrating its efforts on a single item, namely the emissions linked to producing, transporting and end-of-life disposal of paper and cardboard. The 47 tons of residual CO₂ emissions were offset by the construction of solar panels in Martinique.

A second example is the 2006 graduation ceremony of the Yale School of Forestry and Environmental Studies. The ethical and educational link between the event and compensation was

clearly emphasized, as the students themselves calculated the emissions, purchased the credits, and emphasized individual responsibility by communicating to each graduate the emissions linked to the attendance of his or her guests. The total came to 325 tCO₂eq. The credits selected from the bids submitted were from reforestation and renewable energy projects. These approaches, while modest in size, give a definite impetus to action: according to Ecosystem Marketplace, more than 280 colleges and universities in the US have already made a commitment to carbon neutrality in one form or another.

E. Public actors and associations: a strong potential for dissemination

The sector of associations and public actors accounts for an even more modest portion of voluntary compensation demand. Nevertheless, several recent initiatives suggest that this sector, capable of giving a strong impetus towards action, could become more committed to this type of approach in the future.

Central administrations: the United Kingdom takes the initiative

Following Tony Blair's commitment in 2005, the British administration has undertaken the compensation of emissions relating to the air travel of its high civil servants from April 2006 to April 2009, i.e. 305,000 tons of CO₂. This compensation is being achieved mainly through the introduction of the *Government Carbon Offsetting Fund* (GCOF), collecting *Certified Emissions Reductions* CERs.² While most ministries accomplish their offsetting via the GCOF, others have initiated their own programs, such as the Foreign and Commonwealth Office. The portfolio of the GCOF is restricted to CERs from small projects involving renewable energies or energy efficiency approaches bolstering the other two pillars of sustainable development (social and economic). Other administrations have since followed suit: the central administrations of Norway and New Zealand, the French Ministry of Ecology and Transport, and the Finnish Presidency of the European Union in 2006 have compensated a portion or all of their emissions.

The future: countries that are totally carbon neutral? Three countries are seriously thinking about it and made announcements on the topic in 2007. In April 2007, Norway announced that it planned to be carbon neutral by 2050. In July, Costa Rica declared it was aiming to reach this objective by 2021 and head up a network of carbon neutral countries. The following week, the Vatican indicated that it was going to install solar panels to reduce its emissions, and finance the planting of 7,000 hectares of forest in Hungary, intended to offset the residual emissions of the 921 inhabitants of the Holy See. The next step planned is the individual carbon neutrality of Catholic churches.

Local communities: the carbon neutrality of State-Regional Plan Contracts

In France, since the first decentralization measures in 1982, State-Regional Plan Contracts (CPER) have supported the transfer of duties. With the start of the 2007-2013 plan, these seven-year action plans co-financed by the state and the region will be carbon neutral: if projects financed by the CPER, such as the construction of a highway ramp, generate emissions, they must be offset by other emissions reduction projects, such as improved public transport. The special feature of this approach is the absence of monetary compensation: carbon neutrality is achieved "internally" by balancing projects that emit and projects that cut emissions at the regional level.

² CERs are credits associated with projects carried out within the scope of the *Clean Development Mechanism* (CDM) of the Kyoto Protocol.

The City of Seattle

Despite the absence of a system of greenhouse gas emission reduction objectives at the federal level in the United States, a number of regional authorities have taken up the issue of global warming themselves. Thus, after initiating the commitment of 431 American mayors to the objectives of the Kyoto Protocol, Greg Nickels, the mayor of Seattle, pushed the City's public electricity company to become carbon neutral. Energy savings campaigns and giving preference to renewable energies, which represent 90% of the electricity sold, limit the emissions of Seattle City Light to 0.2 MtCO₂eq per year. These residual emissions are offset by a biofuel project and an emissions reduction project at a DuPont plant in Kentucky. This approach allows the mayor to communicate about his environmental policy: "*We can power our city without toasting our planet*". But it has also exposed him to journalistic investigations, and therefore to criticism of the environmental integrity of the compensation projects selected.

WWF-UK

Some associations, such as the British WWF office, have also become committed to voluntary offset approaches. The 800 tCO₂eq emitted in 2006 by electricity consumption and employee transport were offset by credits from a biomass combustion project in India.

F. The driving forces behind multifaceted demand

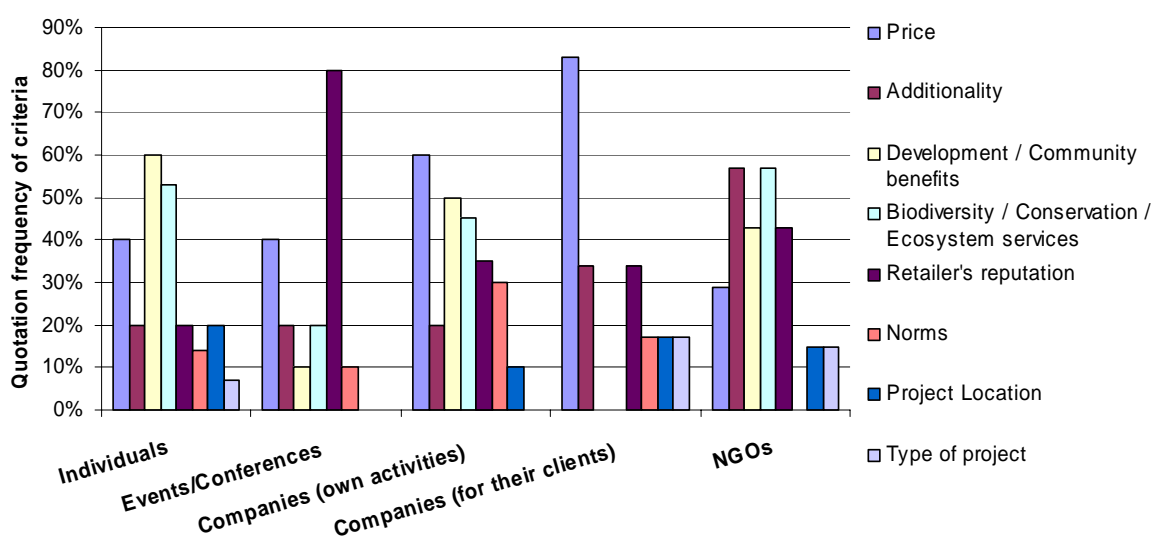
The profiles briefly presented above reveal a wide variety of contexts and motivations for adopting compensation approaches. This diversity is also found when users of voluntary offsetting are questioned. Their responses bring out four driving forces behind the demand for voluntary offsets.

- **Social or ethical imperative** – This is apparently the underlying motive for most of the compensation approaches adopted by private individuals and associations. In both cases, the aim is to bring one's conduct in line with one's principles, whether they are personal, in the case of individuals, or stipulated in the by-laws of associations.
- **Communication and reputation** – For events, the aim is often to draw attention to the problem of climate change. For companies, the goal is to improve brand image. This motive is especially important for financial institutions, which are increasingly becoming the target of campaigns by environmental organizations. The reputation aspect implies that the direct and indirect benefits of compensation can be clearly identified. According to a study conducted in 2007 by R. Bayon, nearly half of European consumers of carbon compensation declare that they would be ready to pay more for these indirect benefits.
- **Creating added value** – Some companies develop "carbon neutral" products to meet consumer expectations. The compensation approach associated with the product is then an added value that may have repercussions on the price of the product and the market share of the company. Thus, Interface, an interior design firm, put a range of carbon neutral floor covering called "Cool Carpet" on the market in 2003. "Cool Carpets" are sold with a 1% neutrality supplement on the standard price.
- **Pro-active apprenticeship in the workings of the carbon market** – Companies that are not yet subject to the mandatory carbon market may undertake a voluntary compensation approach to acquire experience in the workings of the carbon market. The sectors concerned are therefore generally those about to be included in a mandatory carbon market. This is the case, for example, of the aviation sector in Europe, which is expected to be integrated into the European allowance trading system (EU ETS) in January 2011 and has greatly increased its voluntary offset initiatives since 2005.

In relation to the choice of compensation projects, the study conducted by Elizabeth Harris on the carbon neutrality service providers, allows to distinguish eight pertinent criteria (see Figure 5), among which figure the following two primary parameters:

- **The price** – Except for the very narrow niche of associations, price is always mentioned among the primary criteria for choosing a form of compensation. One of the conditions for the development of the voluntary offsetting market is to have a transparent, reasonable price system.
- **The Reputation of the Service Provider** – In a predominantly unstructured market where few labels are available, the reputation is perceived by most actors as an assurance of the quality of offsets.

Figure 5 – Criteria for choosing compensation projects according to type of consumer (as perceived by service providers)



Source: Harris 2006

III. Voluntary offset supply

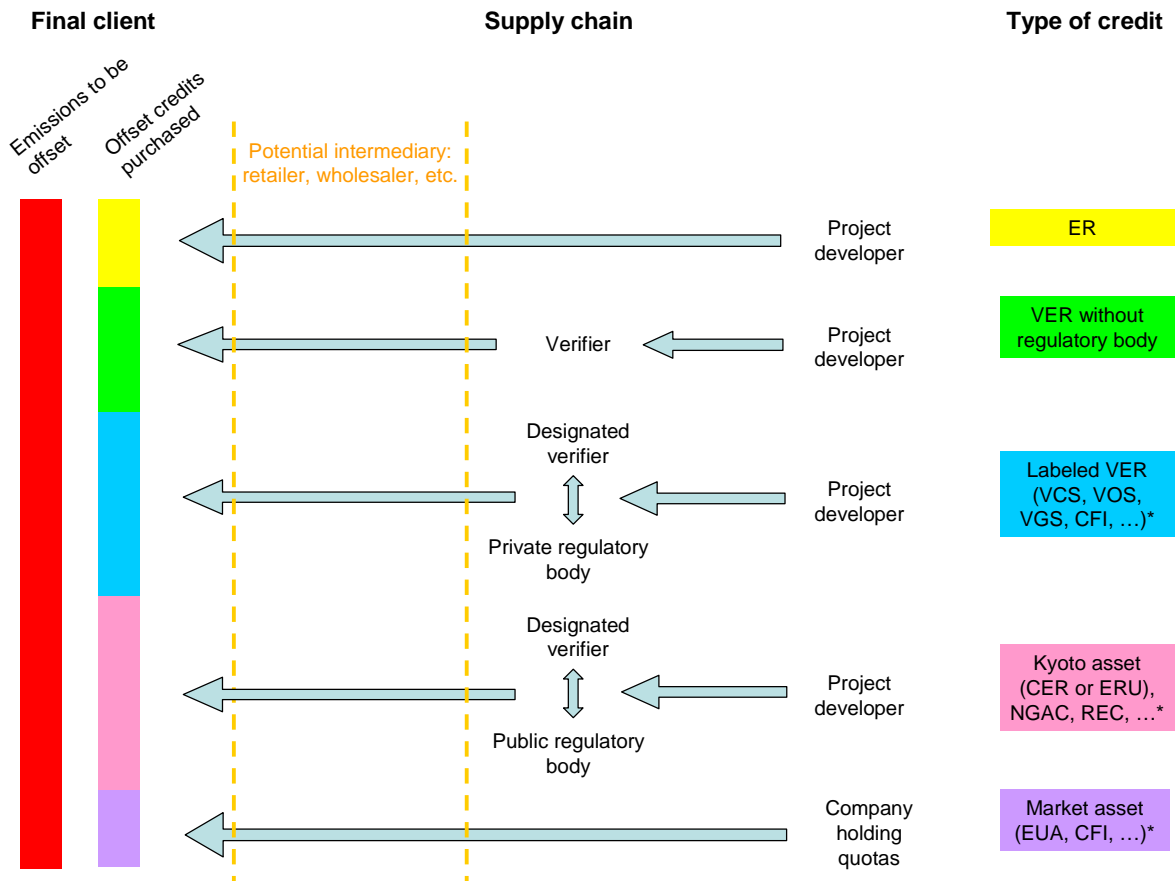
Parallel to the emerging multi-form demand for voluntary compensation, the supply has been developed by an increasing number of diverse actors. Offerings have been rapidly expanding since 2004, when the major mandatory carbon markets came into force: the Kyoto Protocol took effect in February 2005 and the European system CO₂ allowance trading scheme the same year. This shows the complementary nature of these two segments. The structure of voluntary offsetting activities is difficult to pin down owing to the extremely diverse approaches to which public authorities have yet to apply a common framework of rules and standards.

A. Channels of voluntary offsetting

Most users of voluntary compensation services have only a rather vague idea of the operations required to enable them to buy tons of avoided emissions. Indeed, there is no common rule for putting them on the market. The supply can be divided schematically into five possible channels, which differ by the type of assets used in offsetting:

- The first two channels are most characteristic of voluntary compensation. According to Harris' estimates, they accounted for half of voluntary offset supply in 2006. They consist of supplying emissions reductions obtained by project developers who have chosen to remain outside labeling systems and schemes set up by market authorities or public authorities. If project developers do not practice external verification, the asset under consideration is called an *Emission Reduction* (ER); if they request a validation of their methods and emission reduction calculation by a third party, and a verification of the emission reductions, the asset becomes a VER, or *Verified Emission Reduction*.

Figure 6 – The five supply chains of voluntary compensation



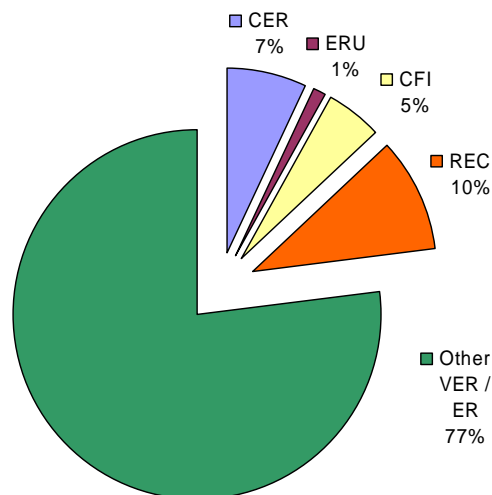
* See glossary (p. 31) for an explanation of types of credits

Source: Caisse des Dépôts - Mission Climat

- The third channel requires that the greenhouse gas emissions reduction project is subject to a methodology defined by a private authority, which may be either a market authority within the scope of an organized voluntary market (the largest is the Chicago carbon market), or an actor in charge of issuing specific rules for establishing a label. This adds a degree of constraint for the project developer, but gives a better guarantee of the quality of the project and its actual ability to reduce greenhouse gas emissions (see section IV). Due to the recent introduction of these labels, this channel of labeled VERs is still in the minority, and comes almost exclusively from the North American continent. Nevertheless, it is developing and diversifying geographically.
- In the fourth channel, emissions reductions come from project developers who are subject to the rules issued by a public authority. Most of this channel rests on the two project mechanisms of the Kyoto Protocol, which set the most restrictive and universal standards. However, there are also regional systems in Australia and the United States, regulated by public authorities at the state level.

- The fifth channel consists of buying allowances from actors whose emissions are capped by public policy (EU ETS, Kyoto) rather than emission reductions. By canceling these allowances, the right to emit a ton of greenhouse gas is withdrawn. Use of this channel is rare.

Figure 7 – Average composition of an operator’s asset portfolio (in volume)



Size of sample: 28 operators

The figures shown were obtained by averaging the composition of operator portfolios.

Source: Harris 2006

The analysis of the makeup of the asset portfolio used by Harris reveals a preponderance of VERs and ERs. This means that the majority of credits cannot go through marketplaces. Aside from Kyoto assets, only Carbon Financial Assets (CFIs) and the Renewable Energy Certificates (RECs) can be traded, respectively, on the Chicago Climate Exchange and in markets such as the Automated Power Exchange based in California. The preponderance of transactions outside stock exchanges contributes to low market transparency and partially explains the significant variability of pricing practices.

B. The actors of voluntary offsetting

Within each of these channels, the supply of emission reductions to end customers may take place more or less directly. Cases of direct supply, usually through an invitation to tender which is often prepared by specialized consultants, are limited to major clients.

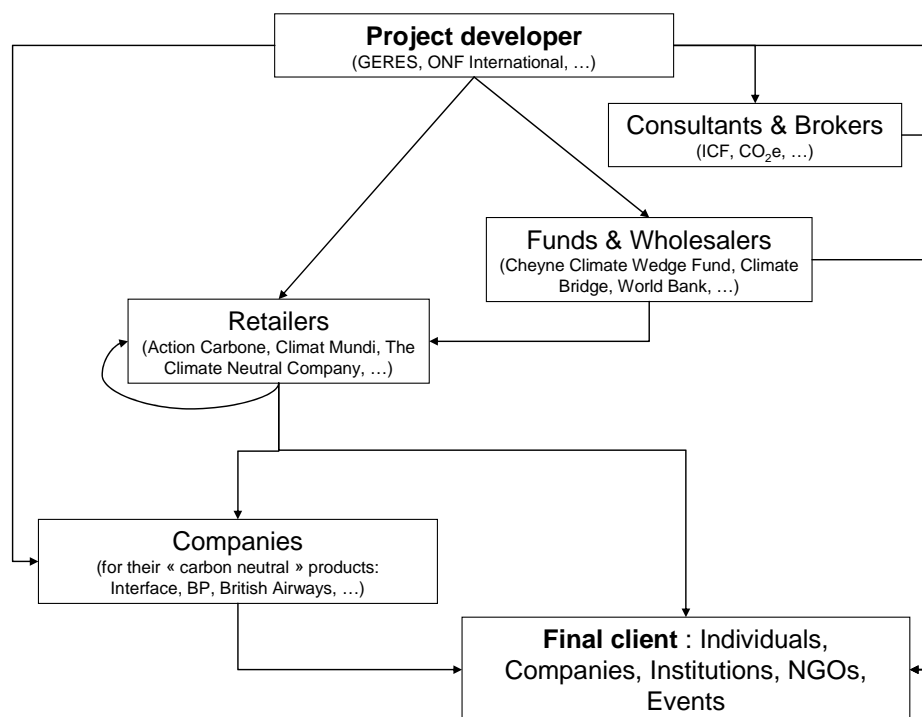
The voluntary offset supply chain generally includes at least one link between the generation of carbon credit and the final consumer of neutrality. The survey conducted by Elizabeth Harris brings out the pivotal role of service providers specializing in voluntary carbon compensation. Nearly three-quarters of these providers assert that they are supplied directly by project developers. They therefore play a crucial role in the emergence of voluntary offsetting.

To give a better idea of voluntary offset supply, a list of specialized service providers has been compiled (see Appendix 1). This sampling was carried out on the basis of recent studies on the subject,³ supplemented by our own research: the selected service providers are those that clearly propose compensation for a given amount of carbon, usually with posted prices and a calculator

³ Particularly Butzengeiger 2005, ADEME 2006, ICF 2006, Harris 2006, Kolmuss & Howell 2007, Heughebaert 2006, Clean Air-Cool Planet 2006, Taiyab 2006, Hamilton *et al.* 2007.

enabling clients to calculate the amount they wish to offset. In view of the sampling method, the list is probably biased towards specialized service providers from English- and French-speaking countries. The 83 listed service providers were nevertheless considered sufficiently representative to be used in the analyses presented in the next part of this report.

Figure 8 – Intermediaries in the supply chain



Source: Caisse des Dépôts - Mission Climat

Specialized service providers: main characteristics

Historically, the first specialized service provider identified by this study was Primaklima, a German association that finances reforestation projects, founded in 1991 before the signing of the Framework Agreement on Climate Change of Rio in 1992. It was not until 1997 and the negotiations leading to the signing of the Kyoto Protocol that an initial wave of four specialized service providers emerged: two British companies (The CarbonNeutral Company and Climate Care), an Australian association (Green Fleet) and an American association (the National Carbon Offset Coalition).

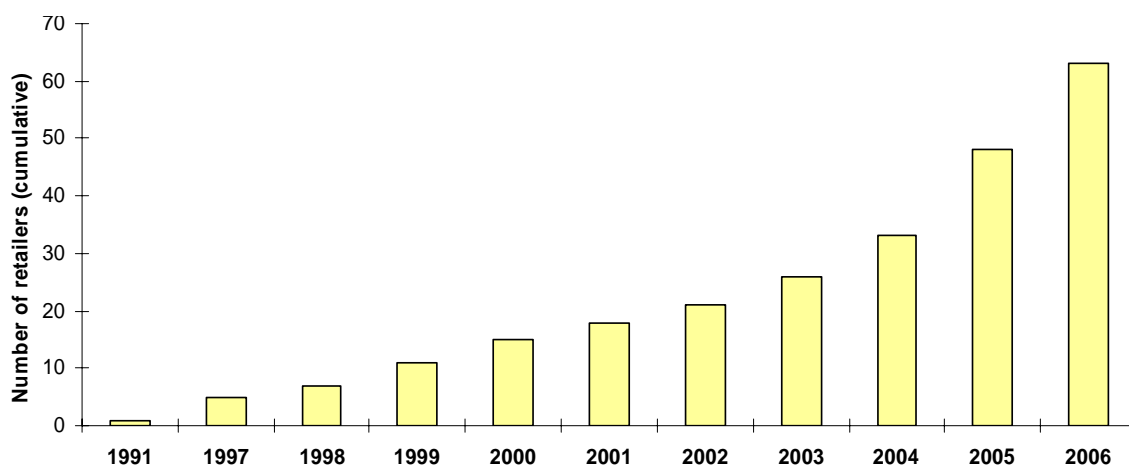
The slow pace of growth continued until 2005, when a veritable boom among retail companies occurred, which can certainly be explained by the introduction of the European allowance trading system. Since 2005, at least 33 new organizations have been set up in this niche. In France, the five service providers identified (Action Carbone, Climat Mundi, CO₂ Solidaire, ForestAvenir and Planète Urgence) correspond to this second wave.

Most of these companies are concentrated in the voluntary carbon compensation market, but some have developed a business selling voluntary offsets as a diversification of their pre-existing activities. This is the case, in particular, of AgCert, an Irish company whose primary purpose was to sell agricultural CERs, which has recently diversified into the sale of VERs through its Driving Green program. Another example of diversification, this time a not-for-profit, is the Target Neutral association set up by BP with the aim of offsetting emissions linked to automobile travel in the United Kingdom.

While compensation is the core activity of half the operators, it is often part of a wider set of services: measuring greenhouse gas emissions, supporting the definition of an internal reduction

strategy, facilitating communication on the offset approach, etc. Nearly 20% of the operators provide compensations only within a set of services that also include ancillary services such as consulting, particularly on calculating emissions and reduction strategies, communication, or preparing invitations to tender. Furthermore, a quarter of the operators developed their compensation offering in addition to their main activity, such as forest protection or renewable energy promotion.

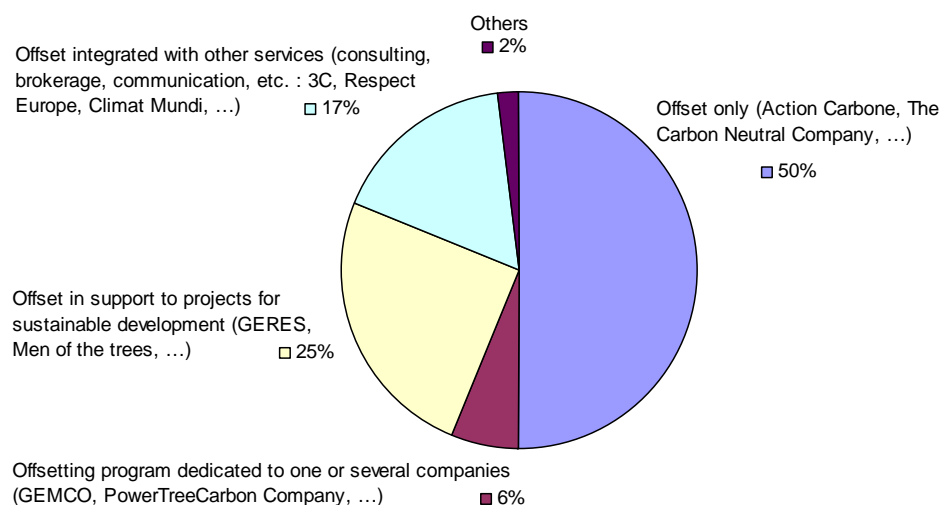
Figure 9 – Growth of the number of service providers specializing in voluntary offset



Size of the sample: 67 specialized service providers

Source: Caisse des Dépôts - Mission Climat

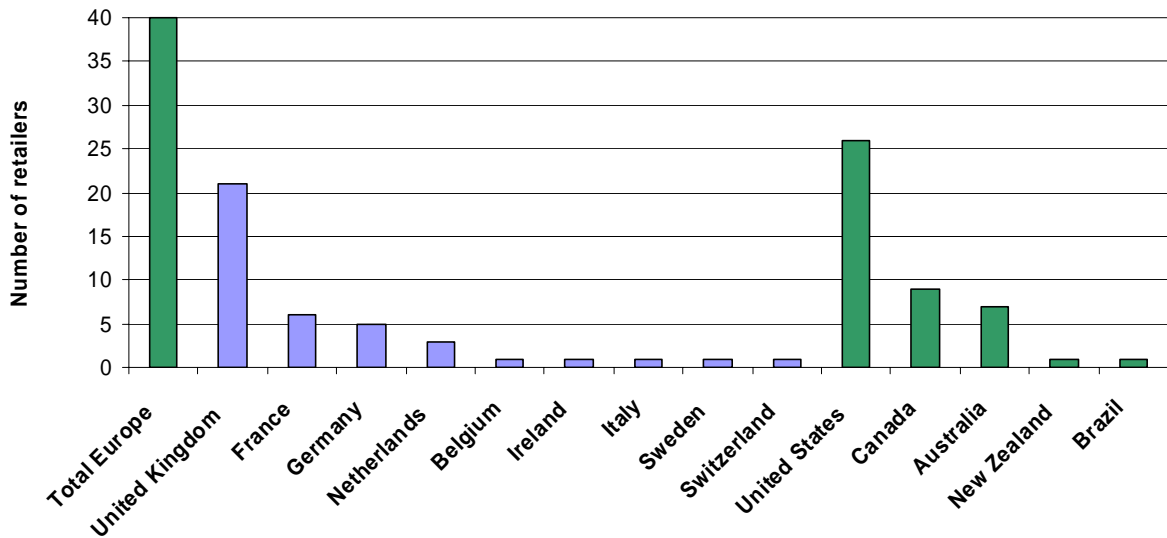
Figure 10 – Method of selling voluntary offsets



Source: Harris 2006

Not surprisingly, almost all of the service providers specializing in carbon neutrality come from northern countries, which are the source of most of the demand; only one service provider comes from a southern country, Brazil. Further, the location of specialized service providers does not appear to depend on the country's ratification of the Kyoto Protocol: with 49 listed service providers, Europe, Canada and New Zealand, which ratified the protocol, do not have significantly more than the United States and Australia, which have 33. Nevertheless, the considerable number of British service providers (21 listed, i.e. more than half of all European service providers) demonstrates the dynamism of the United Kingdom in the fight against climate change.

Figure 11 – Origin of service providers specializing in voluntary offsets



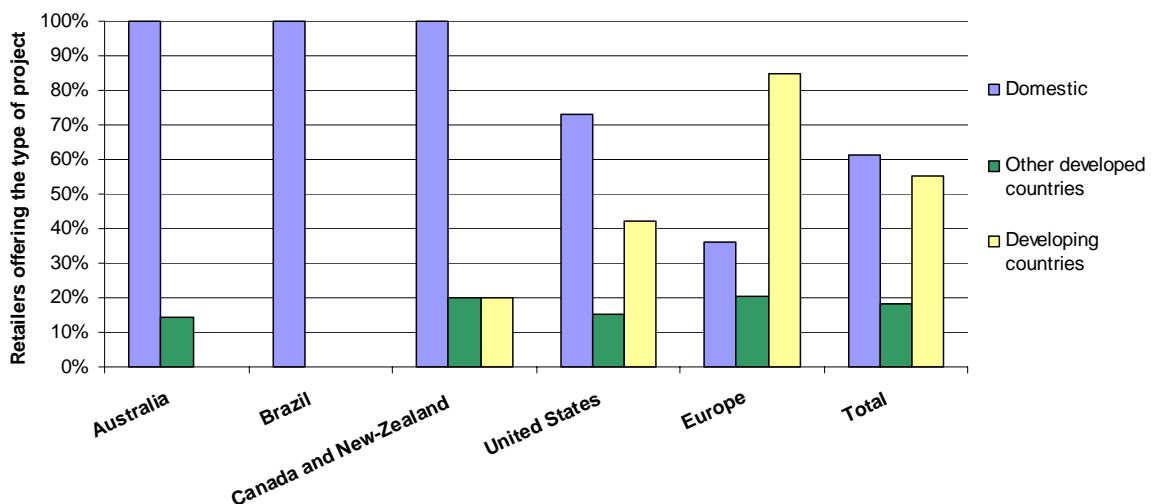
Size of sample: 84 specialized service providers

Source: Caisse des Dépôts - Mission Climat

Furthermore, the location of projects depends largely on the origin of the service provider: European service providers tend to propose projects in developing countries, whereas the other service providers tend to favor projects on their own territory. Africa, Asia and North America are the most sought-after continents with about 20% of the projects each, according to the survey by Elizabeth Harris.

Figure 12 – Location of offset projects according to the origin of service providers

(How to read the graph: 100 % of the listed Australian service providers propose Australian projects and 14% of them also propose projects in other industrialized countries)

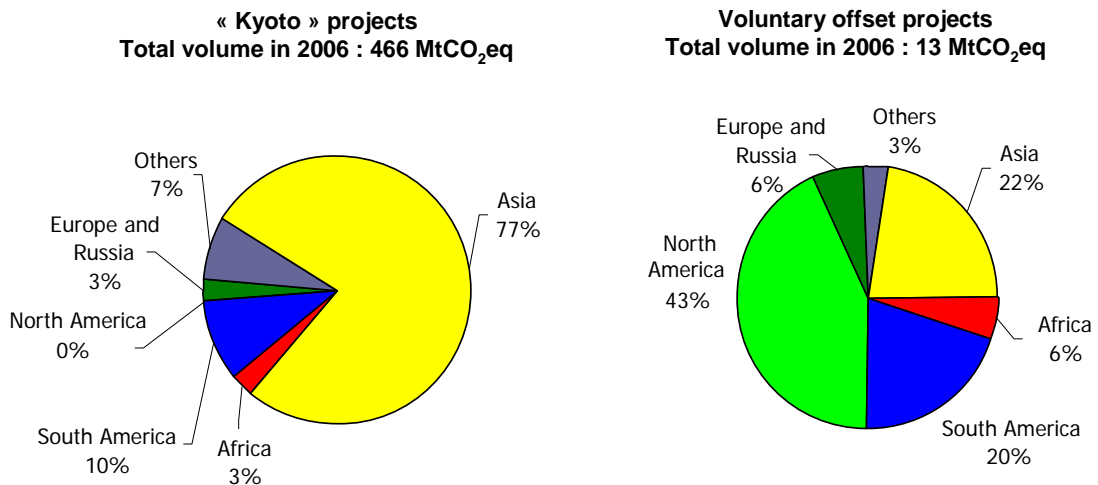


Size of sample: 79 service providers

Source: Caisse des Dépôts - Mission Climat

In terms of generated volumes, if compared in relation to Kyoto projects, Africa is clearly better positioned in the voluntary market. Further, Asia loses its dominant position in generating only one-fifth of voluntary emission reductions, against more than three-fourths of emission reductions generated by CDM projects.

Figure 13 – Countries of origin of emission reductions generated by Kyoto projects and voluntary offset projects



Sources: World Bank, Ecosystem Marketplace

Other actors

Funds and wholesalers

Sometimes intermediaries such as investment funds or wholesalers mediate between project developers and specialized service providers. For example, Climate Wedge, a company that manages the Cheyne Carbon Fund, is one of the rare investment funds that have made the voluntary offset market their core business. Other funds such as the World Bank's BioCarbonFund, are focused on mandatory carbon markets, but use the voluntary markets as a source of diversification. Thus, the BioCarbonFund launched a "second window" dedicated to projects using methodologies not approved by the United Nations, that therefore generate VERs. Wholesalers, such as Climate Bridge, a Sino-British company play a similar role, but operate on equity capital.

Companies offering carbon compensation along with their products

The sale of products labeled "carbon neutral" is a rapidly growing approach in the voluntary offset sector. From automobile insurance to bottles of wine and package tours, more and more companies are proposing carbon neutral products. "Global Choice" gasoline from BP and "Cool Carpet" by Interface are two examples that have received the most media attention.

Indeed, BP offers – independently of its British association Target Neutral – carbon neutral gasoline for fleets of company cars through its Global Choice program implemented in Australia. For a supplement of about €0.1/L, i.e. 1% - 2% of the liter price, the client company can opt for gasoline certified "Greenhouse Friendly" by the Australian administration. Since its creation in 2001, the program has had more than 12,000 clients, and claims more than 1.6 MtCO₂eq in offsets.

The floor covering company Interface was one of the first to launch this type of product intended for private individuals in 2003, with its "Cool Carpet" range. Within the scope of an approach certified by the Climate Neutral Network, Interface calculated the emissions generated during the entire life cycle of the product (production, sales and end-of-life disposal), and then bought compensation credits from various service providers. This allowed the company to offer customers a range of carbon neutral carpets for a price supplement of 1%. This type of offer appears to have met with some success, since 20% of Interface customers now opt for "Cool Carpet", thereby accumulating more than 0.4 MtCO₂eq in compensation since 2003.

One last original example is an offer by ClimateCare, a company that retails compensation credits. Its product, ClimateSure, is a form of automobile (or travel) insurance in which the offset of the emissions associated with the automobile vehicle (or the trips) is included. This initiative is original in two respects: first, it is an intangible product and secondly, it is an initiative on the part of the offsetter and not the producer, i.e. in this case, the insurers with which ClimateCare is associated, such as Groupama and Axa. Launched in 2006, the product is too recent for its success to be seriously evaluated.

Project developers

Voluntary compensation is essentially provided through credits coming from reduction projects. Oftentimes, specialized service providers call upon project sponsors directly to take charge of developing an emissions reduction project. The characteristics of this basic link in the carbon neutrality chain, which is the most vaguely defined, are extremely difficult to reconstruct, since any entity that can reduce its emissions or absorb CO₂ is a potential project developer. Furthermore, public information put online by specialized service providers does not always indicate the project developer for reasons of confidentiality.

We might mention the following project developers as examples:

- Owners of land to be reforested are mobilized by PrimaKlima to implement projects. In the same vein, the operator of a wind farm, a dump or livestock farm, would be a suitable project developer;
- Providers of technical assistance may include in their service a calculation of emissions reductions. In France, one could cite ONF International, a subsidiary of the National Forestry Office already involved in forestation projects within the scope of the CDM, which implemented a reforestation project in Chile generating VERs;
- A ministry or public body: this is the case, for example, of the efficient cooking hearth in Eritrea, sold by Climat Mundi, which is led by the National Energy Ministry;
- NGOs in the field: Tchendukua, which develops reforestation projects in Colombia or Gevalor for compost production in Madagascar, are two NGOs that produce products generating VERs sold by the Action Carbone program of Good Planet. The case of the GERES⁴, a French development association, is slightly different. Since 2004, this association, which has been involved in implementing development projects for 25 years, has been providing data on GHG emission reductions generated by its projects. The GERES itself sells directly about 15% of these credits through its own retail sales portal, CO₂ Solidaire.
- CDM project developers, who generated both CERs to offset emissions and VERs: since the 31st of December, 2006, the emission reductions produced by a CDM project before its registration by the United Nations are not eligible as CERs; verified by auditors accredited by the United Nations, these reductions are sold as VERs on the voluntary market. These VERs “quasi-CERs” having the same technical characteristics as CERs and benefiting from a reduction in price in comparison to CERs, are being actively developed.

Developers of projects developed within the voluntary market framework are in fact basically the same as CDM project developers. The “voluntary” market is chosen in particular when the transaction costs linked to the CDM are too high in relation to the profitability of the project, explaining the abundance of small projects.

⁴ Renewable Energy, Environment and Solidarity Group

C. Projects financed by voluntary offsetting

The voluntary carbon compensation market has mainly developed in areas left vacant by the mandatory carbon market.⁵ Indeed, there is little overlapping between the two markets: they use different assets (see Figure 7), small-scale projects and forestry projects are more frequent and many of them take place in industrialized countries, regardless of whether they have ratified the Kyoto Protocol. Thus, the average voluntary offset project is situated at 5,000 tCO₂eq/year, whereas its CDM counterpart reduces emissions by at least 50,000 tCO₂eq/year. This can be explained mainly by the transactions costs linked to the project mechanisms of mandatory carbon markets, which vary on average for CDMs between 20% and 40% of the value of the generated CERs, according to the World Bank. Projects that are not profitable in mandatory carbon markets can therefore become profitable in voluntary markets.

The niche of voluntary offsetting projects, which is less restrictive and more diversified, is therefore logically considered by many actors as a source of innovation where mandatory carbon markets will be able to find new reduction methods in the medium-term. And in fact it was on the basis of projects implemented as of 1995 within the voluntary framework of *Activities Implemented Jointly* that CDM and JI, the two project mechanisms of the Kyoto Protocol, were developed.

Table 1– Comparison between Kyoto and Voluntary Projects

Sector	Projets « Kyoto » (CDM et JI) in MtCO ₂ eq	Voluntary Offset Projects in MtCO ₂ eq
Forestry	4,7	4,7
Renewable Energy	77,6	4,3
Industrial gases (N ₂ O, fluorinated gases)	212,8	2,6
Energy Efficiency	45,0	0,7
Others	58,5	0,4
Methane – Animal Waste	9,3	0,2
Methane – Coal Mine	25,2	0,2
Methane - Landfill	32,9	0,1
TOTAL IN 2006	466	13

Among the different sectors in which voluntary projects are developed, the forestry sector is dominant and is the only sector where project used to the same extent by both voluntary and Kyoto project developers.

Sources: World Bank, Ecosystem Marketplace

It should be noted, incidentally, that some specialized service providers allow their clients to choose among different types of projects in their portfolio, even if this sometimes means proposing different prices depending on the origin of the compensation. This is the case, for example, of Carbon Zero and Native Energy.

⁵ The term “mandatory market” covers all the carbon credits traded within the scope of a “cap-and-trade” system imposed by a public authority such as the United Nations (Kyoto Protocol) or the European Union (EU ETS). This includes the credits generated by Kyoto Projects (CDM and JI).

D. In the great market of avoided tons: prices

The great variability of VER prices

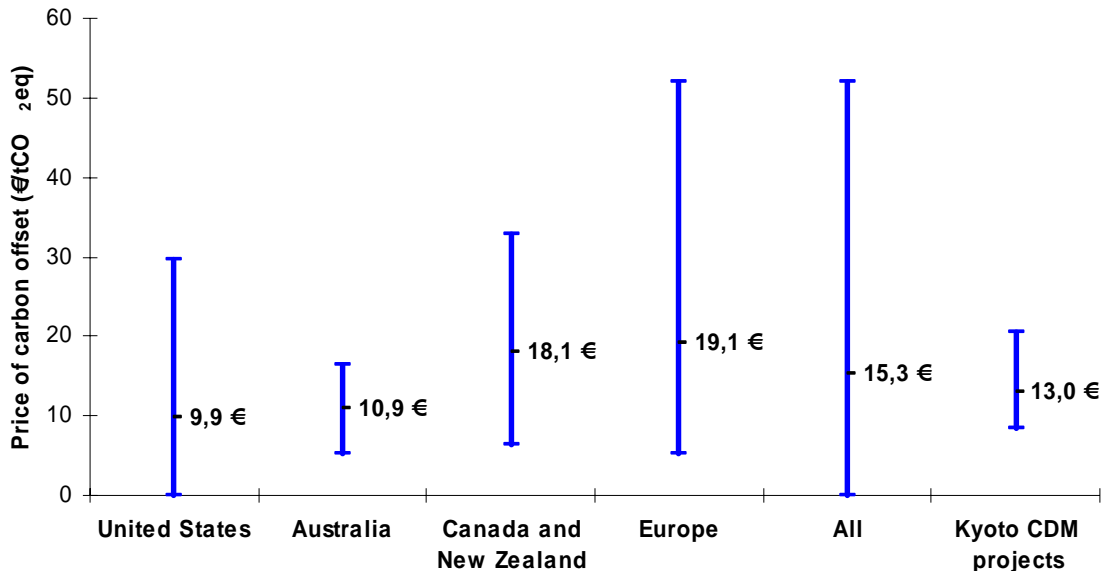
The price of voluntary offsetting for the sample we have studied varies from €0.1 to €52/tCO₂eq⁶. The origin of the specialized service provider is a prime explanatory factor of the considerable disparity. Indeed, the service providers in countries that have commitments under the Kyoto Protocol show higher prices overall. Only in Europe can they exceed €30/tCO₂eq, which no doubt can be partly explained by the comparable price levels observed in the EU ETS until early 2006.

For purposes of comparison, according to the World Bank, the price of CERs in 2006 ranged between €8.5 and €20.5/tCO₂eq, in function of the associated risk. Although CER transactions also widely occur outside market places, they are standardized commodities. It is therefore not surprising that the variability of CER prices should be less than that of VERs: indeed, VERs can reach very low prices when there are no transaction costs linked mainly to the verification of emission reductions and label registration, or very high prices, potentially linked to the special requirements of certain clients in regards to ancillary benefits. This diversity constitutes a second factor that explains the variability of observed prices.

The confidentiality of the transactions is no doubt the third explanatory factor: in the absence of public sales, specialized service providers have greater freedom to adapt their margin to each transaction.

Figure 14 – Variation of the price of voluntary compensation according to the origin of the service provider

The variation shown below corresponds to the minimum and maximum prices observed. The indicated price corresponds to the average for specialized service providers of the same origin.



Size of sample: 70 service providers

Source: Caisse des Dépôts - Mission Climat

⁶ These are catalogue prices (all taxes included) shown by the service providers. They therefore represent an overestimate of the market price, since the service providers often offer discounts when selling large volumes, which is not always posted. In the event that a service provider presents a range of prices, the medium range was selected.

Status of the service provider and the price of credit

The market is divided more or less equally between associations and entrepreneurs, with 58% of the service providers being not-for-profit organizations. This dichotomy of legal status has significant consequences in terms of taxation. Indeed, in a certain number of countries, the clients – private individuals and companies – of not-for-profit service providers can today assimilate their offset purchases to public interest donations and deduct part of the amount from their taxes, which means that the real price paid by the client is actually lower than the catalogue price. Nevertheless, there is no difference, on average, between the price proposed by the associations and the companies (around 15€/tCO₂eq. on our sample), at least before tax deductions.

The operating method of the specialized service provider could be a fourth factor that explains price variability. Thus, an association such as GEMCO, which acts as a fund for investment in VERs and redistributes to the companies that finance it offsets purchased, operates very differently from Action Carbone, which sells compensations at fixed prices and on a just-in-time basis. The number of intermediaries, operator efficiency and the quality of the selected offsets are essential parameters in understanding how a specialized service provider operates.

IV. The environmental integrity of voluntary compensation approaches

A. The advantages and risks of offset projects

As we have seen, projects financed by voluntary offsets can present two major advantages compared with “Kyoto” projects: they are profitable on a small scale and their ways of reducing emissions are often innovative. Yet, the international press, mainly from Anglo-Saxon sources, recently expressed harsh criticism of voluntary emissions compensation approaches. Behind the sometimes severe formulations – “a fool’s market,” “blowing hot air,” etc. – lie concerns based on a few examples of “carbon cowboys” that have sold offsets from poor-quality projects.

If these deviations are not correctly taken into account by the actors, in the long run they could jeopardize the credibility of the whole sector. To remedy the problem, several protocols and quality labels have recently been created. But between the need to ensure the environmental integrity of the compensation and the risk of reintroducing strong constraints that impoverish the “Kyoto” projects, the proper level of requirements is difficult to discern.

B. Protocols, “project” labels and “approach” labels

There are two types of standards applied in the area of voluntary carbon compensation: protocols and labels.

- The protocols, such as the GHG Protocol developed by the *World Resources Institute* (WRI) and the *World Business Council for Sustainable Development* (WBCSD), the ISO14064 standard, and the Bilan Carbone[®] of the French Environment Agency (ADEME), are methodological frameworks that can be followed by carbon neutrality operators to quantify emissions. The monitoring of the application of the frameworks can be verified by an independent third party, but there is no centralized auditing by the WRI, the WBCSD,

the ISO or ADEME. ADEME nevertheless recommends contacting services providers it has trained to have a Bilan Carbone[®] (emissions review) carried out.

Conversely, labels are monitored by the organization that owns the label to ensure that its criteria are properly met. Most of them keep internal record to be sure that the same emissions reduction is sold only once. There are two types of certification:

- “Project” labels concentrate on project characteristics and the way in which carbon credits are generated from these projects. They are aimed at introducing a set of minimal criteria with which projects must comply in order to receive the stamp. The most well known “project” label is definitely the CDM “label” which is applied to compensation projects under the Kyoto Protocol. In the world of voluntary carbon compensation, some essentially private initiatives recently came into being: in addition to the label delivered by the CCX for projects intended to supply the voluntary market in Chicago, there are also the *Voluntary Gold Standard* (VGS) promoted by some forty international environmental NGOs, the *Voluntary Carbon Standard* (VCS) being developed by the IETA, The Climate Group, the WBCSD and the World Economic Forum, the *Verified Emission Reduction +* (VER+) from the auditor Tüv-Süd, and the *Voluntary Offset Standard* (VOS) of INCIS, a group bringing together more than ten major banks and financial institutions.
- The “approach” labels validate the whole compensation process, examining the downstream (quality of the carbon credits) as well as the upstream (emissions calculation, internal reductions, etc.). Some rely on existing “project” labels. This is the case of the Code of Best Practices that the British Department of Environment Food and Rural Affairs (DEFRA) submitted for consultation, which in its current version authorizes only the use of CERs, ERUs or EUAs. Others have their own project validation processes, like the *Greenhouse Friendly* label delivered by the Australian administration, or the *Climate Cool* label awarded by the Climate Neutral Network. In France, ADEME recently launched a working group aimed at developing an “approach” label.

The characteristics of the various labels are summarized in Table 1. In addition to these protocols and labels, some projects receive “moral approval” thanks to the support of environmental protection associations. Thus, after an invitation to tender and an audit, the American NGO Environmental Defense selected five carbon compensation service providers offering projects corresponding to its environmental integrity criteria. The selected service providers benefit from a link to the NGO’s web page dedicated to carbon neutrality.

Table 2– Characteristics of the main labels

Source: Caisse des Dépôts - Mission Climat

Name	Organisation	Localisation of projects	Type of projects	Ancillary benefits	Additionality	Methodologies for measuring reductions	Verification	Registration cost
Clean Development Mechanism (CDM)	United Nations	Kyoto ratified, non-Annex B	EE, RE, SQ restricted to afforestation/reforestation	The project is coherent with the sustainable development policies of the host country and respects prescriptions on environmental impact assessments.	"Additionality tool" : financial, technological or prevailing common practice barriers exist that make carbon crediting necessary for the project's viability.	List endorsed by the United Nations.	List of verifiers designated by the United Nations	5 000-30 000 €/project + 2 % of the value of CERs
Joint Implementation (JI) (Track 1)	United Nations	Kyoto ratified, Annex B, high quality national inventory	All	Criteria defined by host country.	Criteria defined by host country.	Criteria defined by host country.	Criteria defined by host country.	Depends on criteria defined by the host country.
Voluntary Gold Standard (VGS) for projects > 5 000 tCO₂e/year	The Gold Standard Foundation ¹	All, except for countries in the Annex B of the Kyoto protocol	EE, RE	Yes. Net benefits in terms of sustainable development. Subject to a verification plan.	Necessity of the "Gold Standard" label for the project to take place, reductions higher than baseline scenario, compatibility with the "additionality" tool of the United Nations.	CDM list with additional criteria	List of verifiers designated by the United Nations	0,07 €/VER
Voluntary Carbon Standard (VCS)*	The Climate Group / IETA / WEF ²	All	EE, RE, et SQ when the VCS will have agreed on rules ensuring the permanence of reductions	No	Reductions higher than baseline scenario. This criteria will be detailed in a VCS decision.	CDM list or certified as equivalent by the verifier	List of verifiers designated (by the United Nations or the ISO norm)	na
Green-e*	Center for Resource Solutions	All	RE	No	Reductions higher than baseline scenario and than what is mandated by law.	Project specific	Independant third party	na
Carbon Financial Instrument (CFI)	Chicago Climate Exchange	All	RE, SQ	No	Specific to project type	Project specific	List of verifiers designated by the CCX	na
CCB	CCBA ³	All	SQ limited to forestry and agro-forestry projects	Yes. Net positive impact on local communities and on biodiversity. Subject to a verification plan.	Net positive impact on GHG emissions	Project specific	Independant third party	No registration cost
Voluntary Offset Standard (VOS)	INCIS ⁴	All	See CDM without industrial gas (HFC), and sectorial projects approved by the United Nations for the post-2012 above	See CDM, JI above	See CDM, JI above	CDM list (without HFCs), or sectorial methodology approved by the United Nations for the post-2012	Independant third party	na
Verified Emission Reduction + (VER+)	Tüv-Süd	All	CDM, limited to pre-2012 emission reductions	See CDM, JI above	See CDM, JI. Compatibility with the UN's "additionality tool"	CDM list or JI-compatible	Independant third party	na
Greenhouse Friendly	Australian government (AGO)	Australia	All	No	Reductions higher than baseline scenario, than what is mandated by law, and than potential "leakage" outside of the project perimeter.	Project specific	List of verifiers designated by Greenhouse Friendly	na
Climate Cool	The Climate Neutral Network ⁵	All	All	No	Reductions higher than baseline scenario, and than what would happen without carbon financing.	Project specific	Independant third party	3 800-7 500 €/operator/year
Code of Best Practice*	British government (DEFRA)	Kyoto ratified	EUA, CER, ERU	See CDM, JI above	See CDM, JI above	See CDM, JI above	See CDM, JI above	1 500-7 350 €/operator/year

¹ With the support of 37 NGOs including WWF

² The Climate Group : NGO supported by various companies, foundations and governments / IETA : International Emissions Trading Association / WEF : World Economic Forum Global Greenhouse Register

³ CCBA : The Climate, Community and Biodiversity Alliance, supported by NGOs and companies such as BP, Intel, The Nature Conservancy, ...

⁴ INCIS : International Carbon Investor and Services, group of banks and financial institutions including ABN Amro, Barclays Capital, Deutsche Bank, Morgan Stanley, ...

⁵ Recommended by various NGOs and companies such as BP, DuPont, The Nature Conservancy, WWF, ...

* Still at the consultation stage

"Project" label of the Kyoto protocol

"Project" label

"Process" label

C. The cornerstones of environmental integrity

The next part of this chapter lists the seven stumbling blocks that protocols and labels run into in calculating emissions to offset; measuring the emissions reduced by the projects and their additionality; methods for verifying these reductions; the reversibility of CO₂ storage in forestry projects or “non-permanence”; the time gap between emissions offsetting and generating compensations; and finally, monitoring VERs from their generation to cancellation.

Calculating emissions for offsetting

The way emissions to offset are calculated is an integral part of the environmental integrity criteria of a voluntary compensation approach. The extreme variability of emission calculators, which yield results varying for example by a factor of one to three for the same flight, is harmful to consumer confidence in the quality of existing offerings. This variability is even greater when one examines the carbon neutrality approaches used by companies and institutions. The scope covered by the emissions calculation is seldom identical from one example to another:

- Type of GES considered: HSBC chose to consider only CO₂ whereas ST Microelectronics included all greenhouse gases, particularly fluorinated gases, which account for the largest portion of its emissions.
- Geographical scope: the 2006 World Football Cup calculated only the emissions occurring on German territory, whereas the studies of Yale School for Forestry and Environmental Studies included the transport of guests to reach the site of the event.
- Legal scope: the carbon neutrality of the Caisse des Dépôts was achieved for the public institution only, without including its subsidiaries, whereas the company BP consolidated the emissions of its subsidiaries in proportion to the BP stake in each one.
- Scope of action (type of activity considered and the percentage of the life cycle associated with it): the British administration takes into account only the air travel of its high civil servants, whereas the City of Seattle addresses only its electricity supply. Furthermore, some companies such as Interface for its “Cool Carpets” take the entire product life cycle into account, whereas other such as ST Microelectronics focus on emission linked to production.

Measurement protocols such as the GHG Protocol or the Bilan Carbone[®] include the possibility of calculating the emissions for several different scopes. The variety of scope choices explains why most “approach” labels that already exist or are undergoing validation do not apply to companies but rather to their products, for which the definition of the scope is often less controversial. This was notably the choice made by DEFRA and by Greenhouse Friendly.

Measuring the emissions reduced by the projects and their additionality

It is obviously essential to measure the reduction of emissions generated by a compensation project. The questioning of the cornerstone of this measurement – additionality – is often emphasized by critics of voluntary compensation approaches⁷. The theory is simple: a project is “additional” when it cannot take place without sale of emission reductions on the carbon markets. Its immediate corollary: a “non-additional” project does not generate additional emissions and an actor that seeks to offset emissions through such a project is ultimately not taking part in the fight against climate change.

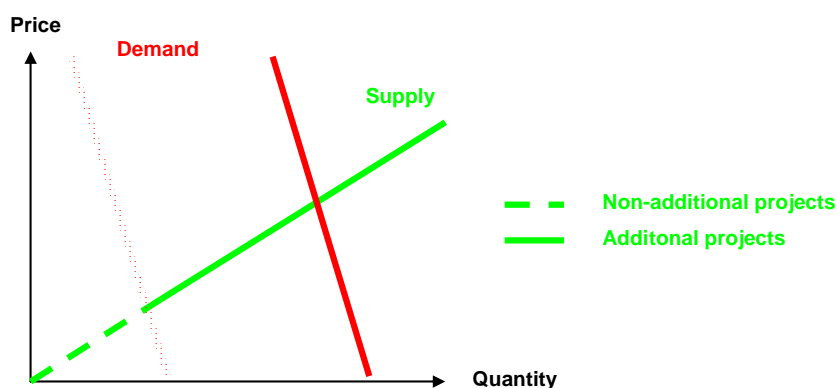
⁷ The appropriateness of using RECs, environmental credits generated in some American and Australian states from the production of a unit of renewable electricity, to compensate for CO₂ emissions has in particular has been subject to two critiques: firstly, there is no straightforward method to calculate the emissions avoided by the production of one kWh of green electricity; secondly, all renewable energy projects are not additional.

The practical application of the concept is more complex, however, and it varies according to the selected label and the specialized service provider that is seeking to buy VERs. For example, of the five tests proposed by the GHG Protocol – regulatory context, technological context, financial context, current practices, date of project implementation – The Carbon Neutral Company selected financial additionality and considered that emission reductions are additional if more than 10% of the predicted revenue for the project comes from the sale of credits. In this case, as in any other, the test is necessarily imperfect; there could be false positives (non-additional projects validated by the test) and false negatives (additional projects eliminated by the test). A perfect additionality test requires a thorough and independent prior analysis, and generates costs that, in particular small projects, which dominate the voluntary offsets market, would be incapable of shouldering.

The requirement of additionality is all the more important as demand is low: the first projects to be financed are preferably false positives since by definition they do not require a high price to enter the market (see Figure 15).

With the increase in demand, prices have gone up sufficiently to allow more additional, and therefore costly, projects to enter the market. This observation gives reason to hope that the projected increase in voluntary offset demand will considerably reduce the number of non-additional projects in the market.

Figure 15 – The test of additionality is especially important as demand is low



Source: Caisse des Dépôts - Mission Climat

The verification of emission reductions

The verification of the reduction of emissions generated by projects is also subject to suspicion. Some specialized service providers use internal verification, which can appear suspect, while other call upon an independent third party, approved or not by the United Nations. The cost of verification is not negligible: in the case of CDM projects, which are verified project by project by an auditor accredited by the United Nations, the cost is several tens of millions of dollars, i.e. more than the value of the credits generated by certain voluntary projects. The lighter procedure set up for small CDM projects reduces the cost of transactions, but it remains a substantial barrier that explains the preference for orienting small projects towards the voluntary market.

Standardization of the supply towards labels brings with it the prospect of reduced verification costs. That is the practice, for example, for projects developed under the Voluntary Gold Standard: while all the projects must have their technical datasheets and verification plans validated by a UN-accredited auditor, only a few in-depth audits take place with on-site verification. These audits, carried out on a random selection of projects are financed by a contribution from all the projects developed under the aegis of the standard.

The issue of permanence: the case of forests

Planting trees is the first idea that comes to mind to offset greenhouse gas emissions, and the first transactions were indeed developed in this niche, as shown in the examples of AES Corp and Primaklima. Most compensation service providers offer this type of project, which seems especially popular among customers, particularly private individuals. And yet, some service providers are reducing the portion of forestry projects in their portfolio, sometimes even to the point of changing the name of the company. Thus, Future Forests has become The Carbon Neutral Company, reflecting the transition from a portfolio based exclusively on forestation in 1997 towards a portfolio containing only 20% of forest projects today. Furthermore, two major voluntary compensation labels, the Voluntary Carbon Standard and the Voluntary Gold Standard, are not open to forestry projects.

The reason for this ambivalent attitude towards forestry projects stems from the thorny question of permanence. The sequestration of a ton of CO₂ in a forestry project may indeed be called into question at any moment by a natural or man-made disturbance: fire, logging, etc. In that sense, forestry projects are distinguished from other energy and industrial projects that generate “permanent” emissions reductions: the methane destroyed in an agricultural methanizer can never be released into the atmosphere.

Taking the risk of the non-permanence of forestry projects seems to be the chief reason for the reticence of numerous investors and companies. From the technical standpoint, two solutions have been put forth to cope with this risk:

- A discount on the credits associated with the risk: only a certain percentage of the amount of sequestered CO₂ carry the right to compensation credits. The rest can be put in reserve into an insurance fund debited in the event of a disturbance, and even left for the benefit of the atmosphere. Thus, the *Greenhouse Friendly* label requires putting 20% to 30 % of the credits generated by the projects in reserve.
- Temporary credits: this is the choice that was made particularly for the forestry projects of the CDM. The credit has an expiration date, after which it must be replaced by another credit, either temporary or permanent. To compensate in 2007 the emission of a ton of CO₂ with temporary credits with a 5-year period of validity it would therefore be necessary to buy a credit in 2007, another in 2012, a third in 2017... even if it is the same 2007 emission that is being offset! This rather complicated gymnastics would in fact seemingly reserve these credits' use for companies.

In the mandatory carbon market, the majority of investment funds and companies included in the EU ETS declare they would be prepared to buy forestry credits if they were authorized. At the same time, a clear framework taking into account the degree of technical risk of non-permanence would foster demand for forestation-based voluntary offset projects.

The calendar associated with compensation

British Airways and its compensation provider Climate Care recently came under criticism for the calendar associated with offsetting their offer of carbon-neutral flights. A Swedish study published in 2007 shows that these flights do not achieve effective carbon neutrality until a century after the purchase of the compensations. The sale of these compensations to come (*ex ante*) is especially frequent among specialized service providers who propose forestry projects. Some service providers, however, offer customers a choice between *ex ante* and *ex post* credits. This is the case of Tree Canada, whose *ex ante* credits are worth €16/tCO₂eq, compared with €360/tCO₂eq for *ex post* credits.

The solution proposed by the DEFRA in its Code of Best Practices is to buy and cancel within a period of six months after the event or the sale of the product by *ex post* compensations. This type of practice should encourage the development of a secondary compensation market: unable to launch projects within such a short period of time, specialized service providers will seemingly turn to the secondary market to adjust their inventories to demand.

Transparency and monitoring the source of compensation

Single sale of compensation

Multiple sales of the same emissions reduction is another risk affecting the environmental integrity of the mechanism: legitimate suspicion could arise, for example, regarding multiple sources of project financing which is described by several service providers. Indeed, the system of inter-operable registers, ensuring traceability in mandatory carbon markets and enabling the compensation to be linked to a ton of effective emissions reduction, has no equivalent in the voluntary offset market. To remedy this problem, many operators have their own registries that allow them to monitor VERs from the moment they are generated to their cancellation. The GERES keeps this type of internal record of compensation credits generated by its projects, as well as the marketplaces that include voluntary offsetting, such as the CCX or the *Asian Climate Exchange* (ACX). Most of the labels also have kept their own records. The *Voluntary Carbon Standard* (VCS), for example, launched an invitation to tender in July 2007 for its record keeping. These initiatives reveal a need for traceability at every level in the chain.

The various registries are not inter-operable, however, because they manage different types of commodities: the VERs and the ERs concerned can be labeled or not, or use different labels. Nevertheless, the sector of voluntary compensation seems to be evolving towards uniform types of credits (VCS, VER+ or CCB as the label of standard quality, and VGS or VOS as the label of superior quality).⁸ If it is accompanied by a transparent, interoperable system of registries, this homogeneity can therefore lead to improved traceability of voluntary compensations and ensure that the end customer is indeed the only one to have the emissions reduction that he is buying.

Single use of compensation: the difference between carbon neutrality and “Kyoto-responsibility”

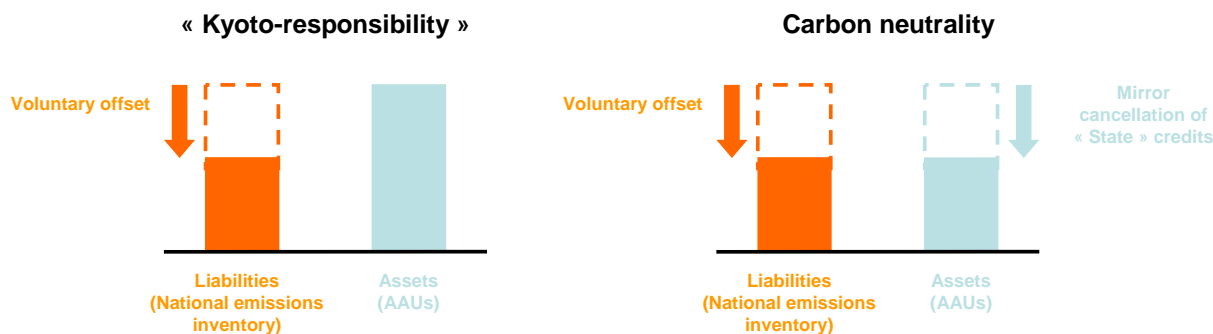
When the traceability of credits is assured, their cancellation in a registry guarantees their single use in the voluntary compensation market. The risk of reuse of credits by the state exists, nevertheless, in countries subject to a *cap-and-trade* system, and first and foremost countries that are subject to a constraint under the Kyoto Protocol as for January 1, 2008. Indeed, as long as the emissions reductions linked to credits have an impact on the national inventory, the offset approach adopted by private individuals will contribute to the country's efforts to reach its Kyoto objectives. As Figure 17 shows, this has more to do with “Kyoto responsibility” than with carbon neutrality, strictly speaking.

In the countries subject to a constraint on emissions, the single use of offset credits will therefore require projects that have no impact on their national inventory⁹, or that cancel the country's corresponding State obligation for each cancelled offset credit. This latter method, planned in the EU ETS, allows the voluntary cancellation of EUAs to count as emission compensation. This voluntary cancellation be accompanied as of 2008 by the cancellation of the country's corresponding right to emit, the AAU.

⁸ See TTable 2 for an explanation of the acronyms of the various labels.

⁹ National inventories are carried out according to more or less specific accounting rules and precise protocols depending on the segment: small-scale emissions reductions or reductions in segments that are not fully covered may therefore escape the national inventory. In France, for example, a generic coefficient is used for the enteric fermentation of cattle. Projects to reduce emissions by modifying the diet of cattle will therefore have no impact on the inventory, unless these projects become so numerous that a decision is made to revise the generic coefficient.

Figure 16 – “Kyoto-responsibility” and carbon neutrality for the countries with national emissions reduction objectives



Source: Caisse des Dépôts - Mission Climat

V. Outlook for the voluntary offset sector

Labels and guidelines are being developed in the voluntary offset market: the *Voluntary Carbon Standard* of the IETA, the Code of Best Practices of the DEFRA and the ADEME voluntary offset guidelines are expected by the autumn of 2007. Marketplaces also seem interested, among them *Asian Climate Exchange* (ACX), a marketplace originally created to trade CERs, which began trading VER in early 2007. Alongside the increasing volume of the market, all these factors tend towards standardization of the commodities sold and greater liquidity. This standardization is also expected to lead to greater uniformity in associated taxation: compensations will no longer be considered as movable property, subject to VAT and *a priori* non-deductible (i.e. unless the state decided to offer these products a special tax regime, as it did for example for solar water heaters).

There are unmistakable similarities here with other ethical approaches such as organic farming and equitable trade. Like those approaches, it is possible that the voluntary offset market will remain a niche market intended for a few responsible consumers. But that in no way detracts from its usefulness in carbon finance on the whole, since its role as a field for learning and pooling emission reduction methods for mandatory carbon markets is recognized by all the actors. Some even view the labels and company communication about their carbon neutrality approach as a privileged tool to generate awareness among the general public: an area allowing private individuals to learn about the issues which will prepare them to face systems that affect them more directly. The project of the British Minister of the Environment, David Miliband, for example, which plans to distribute individual carbon allowance cards that will be debited when the individual undertakes a high-emissions activity (a trip by air, filling the gas tank, etc.) will no doubt be easier to accept for citizens that have already acquired the habit of voluntarily compensating for these activities.

Appendix 1 – List of service providers specializing in carbon neutrality

This sampling is based on the lists found in recent studies on this topic (Kolmuss & Howell 2007, Hamilton *et al.* 2007, ADEME 2006, Butzengeiger 2005, ICF International 2006, Harris 2006, Kolmuss & Howell 2007, Heughebaert 2006, Clean Air-Cool Planet 2006, Taiyab 2006, Butzengeiger 2005) and supplemented by our own research: the service providers listed are those that clearly propose to offset a given amount of carbon, usually including prices and a calculator enabling customers to calculate the amount they wish to offset.

Name	Legal standing	Date of program creation	Country	Type of projects ¹	Project Location ²	Mean price (€/tCO ₂ e) ³
3 Phase renewables	For profit	2007	United States	RE	All	na
3C (Climate Change Consulting GmbH)	For profit	2003	Germany	EE, RE	NO, SO	9,7 €
Action Carbone / Good Planet	Non for profit	2006	France	All	SO	15,0 €
AgCert / Driving Green	For profit	2004	Ireland	RE	NO, SO	6,1 €
American Forests	Non for profit	na	United States	SQ	DO	2,3 €
AtmosClear	For profit	2004	United States	RE	DO	9,2 €
Atmosfair	Non for profit	2005	Germany	EE, RE	SO	20,0 €
Australian Carbon Biosequestration Initiative / Big Green Umbrella	Non for profit	na	Australia	SQ	DO	na
Bonneville Environmental Foundation / Green Tag	Non for profit	2000	United States	RE	DO	16,8 €
C level	For profit	2000	United Kingdom	EE, SQ	SO	na
Carbon Balanced / World Land Trust	Non for profit	2005	United Kingdom	SQ	DO, SO	10,3 €
Carbon clear	For profit	2005	United Kingdom	RE, SQ	SO	13,0 €
Carbon Footprint	For profit	2005	United Kingdom	EE, SQ	All	15,3 €
Carbon Neutral / Men of the trees / Trees for life	Non for profit	2001	Australia	SQ	DO	8,5 €
Carbon Neutral Newcastle	Non for profit	2003	United Kingdom	All	DO	20,0 €
Carbon Planet	For profit	2005	Australia	SQ	DO	11,4 €
Carbon Plus / CARbon Offset / The Woodland Trust	Non for profit	2006	United Kingdom	SQ	DO	30,5 €
Carbon Zero	For profit	2006	Canada	EE, RE	DO	32,8 €
CarbonCounter / Climate Trust	Non for profit	1999	United States	All	All	9,2 €
Carbonfund	Non for profit	2003	United States	All	All	4,2 €
CELB / Conservation International	Non for profit	na	United States	SQ	SO	7,6 €
Certified Clean Car / PVUSAsolar / Renewable Venture LLC	For profit	2005	United States	RE	DO	6,5 €
Clean and Green / Keep America Beautiful	For profit	na	United States	RE	DO	27,5 €
Cleanairpass	For profit	2005	Canada	All	All	8,0 €
Climat Mundi	For profit	2006	France	EE, RE	NO, SO	19,0 €
Climate Friendly	For profit	2004	Australia	RE	DO, NO	13,0 €
Climate Neutral Group / Business for climate	Non for profit	2002	Netherlands	EE, SQ	DO, SO	8,8 €
Climate Stewards / A Rocha	Non for profit	2006	United Kingdom	SQ	SO	14,7 €
Climatecare	For profit	1997	United Kingdom	All	SO	9,9 €
ClimateSAVE (Conservation Service Group)	na	2005	United States	RE	DO	29,6 €
CO2Australia Carbon Sequestration Program / CO2 Group	For profit	2004	Australia	SQ	DO	na
Co2balance	Non for profit	2005	United Kingdom	EE, SQ	All	12,7 €
CO2logic	For profit	2007	Belgium	All	SO	26,6 €
CO2OL E.V./ Futuro Forestal / Co2ol USA	Non for profit	1998	Germany	SQ	SO	26,0 €
CO2Solidaire	Non for profit	2004	France	EE, RE	SO	24,5 €
Conservation Fund: Go Zero	Non for profit	2006	United States	SQ	DO	3,1 €
coolAction.com Inc	For profit	1999	Canada	RE	DO, NO	na
Drive Neutral	Non for profit	2005	United States	EE	na	5,3 €
Ducks Unlimited Carbon Sequestration Program	Non for profit	na	United States	SQ	DO	5,0 €
Ebex21 (CarboNZero / Landcare research)	For profit	2001	New Zealand	SQ	DO	12,6 €
e-Blue Horizons	For profit	2006	United States	RE	DO	3,8 €

Name	Legal standing	Date of program creation	Country	Type of projects ¹	Project Location ²	Mean price (€/tCO ₂ e) ³
EcoAct	For profit	2006	France	RE, SQ	SO	na
Econeutral / ERA Ecosystem Restoration Associates	For profit	2004	Canada	SQ	DO	na
Environmental Synergy Inc. (ESI)	For profit	1999	United States	SQ	DO	1,5 €
EnviroTrade / Plan Vivo	For profit	na	United Kingdom	SQ	SO	9,5 €
Equiclimat / EBICo Ltd.	Non for profit	2006	United Kingdom	EUA	na	5,3 €
ForestAvenir / Forestour	Non for profit	2006	France	SQ	DO	16,4 €
Friends of conservation	Non for profit	na	United Kingdom	SQ	SO	6,6 €
Green My Flight / Uniglobe	na	2006	Canada	RE	DO	16,2 €
Green Seat	For profit	2003	Netherlands	All	All	10,5 €
Greenfleet	Non for profit	1997	Australia	SQ	DO	5,3 €
Grow a forest	Non for profit	2005	United Kingdom	SQ	DO	16,8 €
Impatto Zero / Lifegate	For profit	2003	Italy	SQ	All	52,0 €
MoorTrees	Non for profit	1998	United Kingdom	SQ	DO	32,0 €
Mycarbondebt.com	na	2006	United Kingdom	All	SO	17,3 €
MyClimate (site Switzerland)	Non for profit	2002	Switzerland	EE, RE	SO	23,0 €
National Carbon Offset Coalition	Non for profit	1997	United States	EE, SQ	DO	5,7 €
Native Energy	For profit	2000	United States	RE	DO	9,2 €
Offstters	Non for profit	2005	Canada	EE, SQ	DO, SO	13,0 €
Pacific Forest Trust / Climate Change Program / Forests Forever Fund	Non for profit	na	United States	SQ	DO	na
Plant a tree today	Non for profit	2005	United Kingdom	SQ	SO	na
Primaklima	Non for profit	1991	Germany	SQ	DO, SO	7,5 €
Renewable Choice Energy	For profit	na	United States	RE	DO	24,2 €
Respect Europe	For profit	2000	Sweden	na	na	na
Scarborough Fair Carbon / Cred Ltd.	Non for profit	na	United Kingdom	RE	na	44,1 €
Solar Electric Light Fund	Non for profit	2001	United States	RE	SO	7,6 €
Sustainable Travel International / MyClimate (site américain)	For profit	2002	United States	EE, RE	SO	13,7 €
Target Neutral / BP	Non for profit	2006	United Kingdom	RE	SO	7,6 €
TerraCarbon LLC	For profit	na	United States	SQ	SO	na
Terrapass	For profit	2004	United States	EE, RE	DO	7,6 €
The CarbonNeutral Company	For profit	1997	United Kingdom	All	All	15,0 €
The Compensators	Non for profit	2006	Germany	EUA	na	na
The Green Initiative	Non for profit	na	Brazil	SQ	DO	na
Third :: Direction	na	na	United States	All	SO	15,3 €
TIST - International Small Group & Tree Planting Svc.	Non for profit	1999	United States	SQ	SO	12,2 €
Tree Canada	Non for profit	2005	Canada	SQ	DO	30,0 €
Treeflights	Non for profit	2006	United Kingdom	SQ	DO	na
Trees for Life	Non for profit	2006	United Kingdom	SQ	SO	29,8 €
Trees for the Future	Non for profit	na	United States	SQ	All	0,1 €
Trees for Travel Stichting	Non for profit	na	Netherlands	SQ	SO	13,6 €
Uncook the Planet / SeaO2	For profit	na	Australia	EE	DO	16,4 €
Urgence climat / Planète Urgence	Non for profit	2007	France	SQ	SO	15,0 €
Vancouver Renewable Energy Cooperative	Non for profit	na	Canada	RE	DO	26,0 €
Zerofootprint	Non for profit	2005	Canada	RE, SQ	DO	6,5 €

¹ EE : Energy Efficiency / ER : Renewable Energy / SQ : Sequestration (most often forestry projects)

² DO : Domestic (in the retailer's country) / NO : Other developed country / SO : Other developing country

³ These are catalogue prices, as displayed by retailers. Therefore, it is an overestimate of market prices as retailers often offer discounts for large sales that are not always presented on their website. When the retailer displays a range of prices, the mean has been retained for this table.

Chart 3 – Main types of credits based on projects

	Credit	English term	Central authority
	ER	Emissions Reduction	None
	VER	Verified Emissions Reduction	Various, sometimes none, but verification by an independent third-party
	REC	Renewable Energy Certificate	Various voluntary or mandatory programs in the United States and in Australia
	CFI	Carbon Financial Instrument	Chicago Climate Exchange (CCX)
Credits related to mandatory “cap-and-trade” mechanisms	CER	Certified Emissions Reduction	United Nations within the scope of the <i>Clean Development Mechanism (CDM)</i>
	ERU	Emissions Reduction Unit	United Nations within the scope of <i>Joint Implementation (JI)</i>
	NGAC	New South Wales Greenhouse Abatement Certificate	New South Wales Greenhouse Gas Abatement Scheme (NSW GGAS)

N.B.: The CFI and the REC are not all credits based on projects. Most of the CFIs, for example, are allotted to companies registered on the CCX, based on their emissions reduction objectives.

Source: Caisse des Dépôts - Mission Climat

- AAU: Assigned Amount Unit, “Kyoto” credit held by a state
- CCX: Chicago Climate Exchange
- CDM: Clean Development Mechanism ou Mécanisme pour un développement propre
- EU ETS: European allowance trading system
- EUA: European CO₂ allowance
- GCOF: Government Carbon Offsetting Fund
- GHG: Greenhouse gas
- INCIS: International Carbon Investors & Services
- JI: Joint Implementation
- VGS: Voluntary Gold Standard
- VCS: Voluntary Carbon Standard

References

- Adam D. & Batty D. 2006, "Miliband unveils carbon swipe-card plan", *The Guardian*, July 19th, 2006
- Addley E. 2006, "Boom in green holidays as ethical travel takes off", *The Guardian*, July 17th, 2006
- ADEME 2006, "Les prestataires de la compensation volontaire de gaz à effet de serre – Etat des lieux", 12p.
- Bayon R. et al. 2007, "Voluntary Carbon Markets – An International Business Guide to What They Are and How They Work", *Earthscan*, 164p.
- Butzengeiger S. 2005, "Voluntary Compensation of GES – Selection Criteria and Implications for the International Climate Policy System", *HWWI*, 80p.
- Capoor K. & Ambrosi P. 2007, "State and Trends of the Carbon Market 2007", *The World Bank and IETA*, 52p.
- Chomitz K. 1999, "Evaluating Carbon Offsets from Forestry and Energy Projects: How do they Compare?", *World Bank Policy Research Working Paper No. 2357*
- Clean Air-Cool Planet 2006, "A Consumers' Guide to Retail Carbon Offset Providers", 28p.
- EcoSecurities 2006, "Should Temporary CERs be included in the EU ETS Linking Directive?", *Results of a Survey of Demand-Side Actors by EcoSecurities Consult*
- Elgin B. 2007, "Another Inconvenient Truth – Behind the feel-good hype of carbon offsets, some of the deals don't deliver", *BusinessWeek*, March 26, 2007, 5p.
- Hamilton K. 2006, "Navigating a Nebula: Institutional Use of the United States' Voluntary Carbon Market", *Master Thesis at the Yale School of Forestry and Environmental Studies*, 75p.
- Hamilton K., Bayon R., Turner G. & Higgins D., "State of the Voluntary Carbon Market 2007 – Picking Up Steam", *Ecosystem Marketplace & New Carbon Finance*, 59p.
- Harris E. 2006, "The Voluntary Retail Carbon Market: A Review and Analysis of the Current Market and Outlook", *MSc Thesis at the Imperial College of London*, 158p.
- Heughebaert A. 2006, "Etude comparative des programmes de compensation volontaire des émissions de CO₂ par les passagers d'avion", *Mémoire pour Diplôme d'Etudes Spécialisées à l'Université Libre de Bruxelles*, 90p.
- ICF International 2006, "Voluntary Carbon Offsets Market – Outlook 2007", 59p.
- Kenber M. 2006, "Raising the Bar for Voluntary Environmental Credit Markets", *Presentation at Green-T Forum New-York*
- Kolmuss A. & Bowell B. 2007, "Voluntary Offsets for Air-Travel Carbon Emissions – Evaluations and Recommendations of Voluntary Offset Companies", *Tufts Climate Initiative*, 45p.
- Leake J. 2007, "Offsetting your carbon footprint takes decades", *The Sunday Times*, March 11th, 2007
- Taiyab N. 2006, "Exploring the market for voluntary offsets", *IIED*, 36p.
- The Carbon Disclosure Project 2006, "CDP4 Responses – FT 500", <http://www.cdproject.net/>
- Trexler M.C. et al. 2006, "A Statistically-Driven Approach to Offset-Based GES Additionality Determinations: What Can We Learn?", *Sustainable Development Law & Policy*, Volume VI, Issue 2, pp. 30-40
- Tyler E. 2006, "CDM for small, sustainable projects: Where is the value added?", *written for Ecosystem Marketplace*
- UNDP 2006, "The Clean Development Mechanism – An assessment of progress", 168p.

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