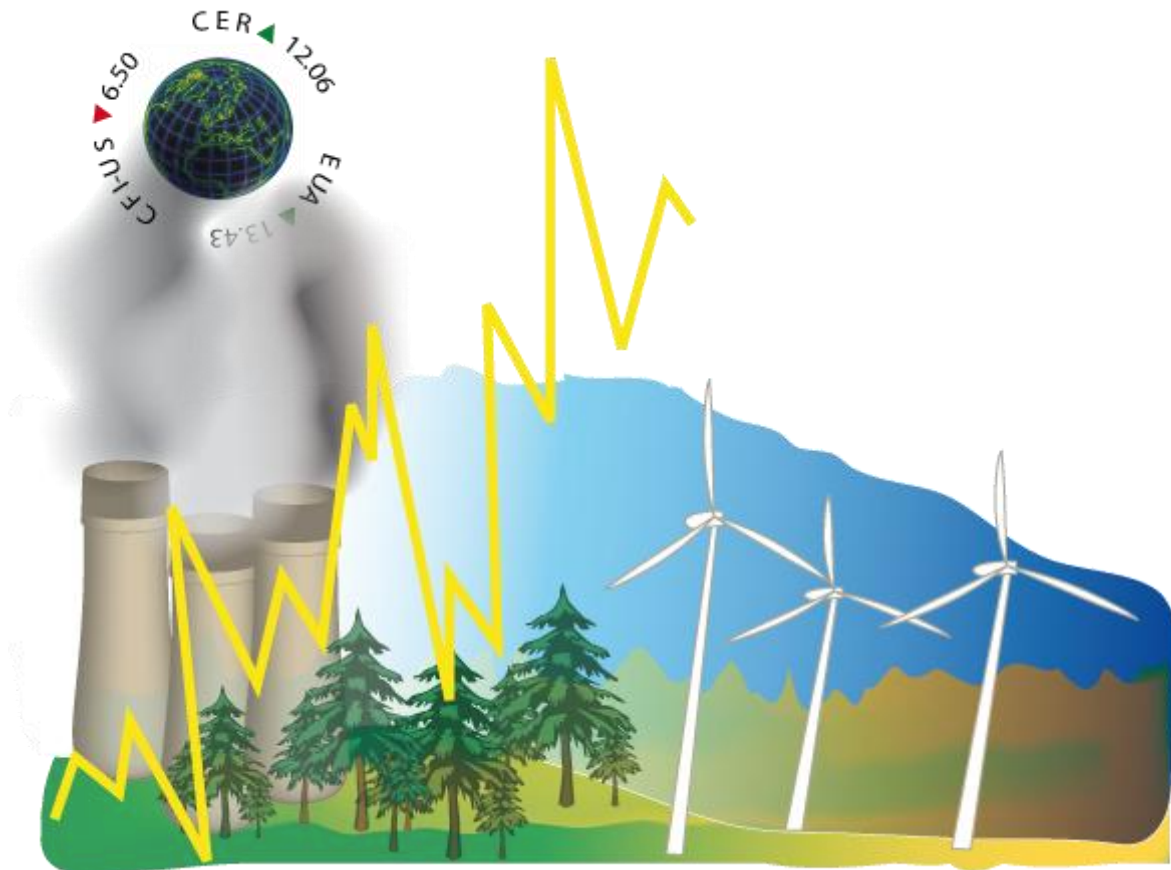




Voluntary Carbon Markets: How Can They Serve Climate Change Policies

Pierre Guigon, BlueNext



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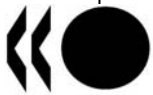
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ABSTRACT

In this paper, we aim to examine how voluntary carbon markets can provide a valuable contribution to strengthening domestic and international climate policies. Voluntary markets are defined as small and unregulated segments of an established carbon market that are driven by voluntary offsetting of GHG emissions.

We show that the several carbon project certification schemes that have emerged in the voluntary carbon market have developed potential innovative solutions to deal with some of the issues faced by compliance markets. These carbon offset standards, such as the Climate Action Reserve in North America, have established conditions that a carbon offset project must satisfy to demonstrate its additionality - one of the main challenges in the on-going reform of Kyoto's Clean Development Mechanism. New instruments have also been developed to help forestry carbon project developers overcome some of the technical and financial barriers that have kept forestry activities on the fringe of compliance carbon markets. As major emerging economies, such as China, begin to implement national mitigation measures under the Copenhagen Accord, we observe an interesting role of voluntary carbon markets in the interim before a potential establishment of domestic carbon markets, through the early development of market infrastructures, pilot activities, and/or data collection.

One of the main drivers of the voluntary market is "pre-compliance" market participants who seek early climate investments in hopes of gaining a return in the future compliance market. Should public institutions wish to build on the experience gained in voluntary carbon markets, we identify that they may draw lessons from the voluntary markets. Through the analysis of the US case, where the level of certainty over the approval and design features of future federal and regional cap-and-trade systems has been oscillating since 2009 in particular, we show that early investors need predictable and reliable visibility on planned government actions in order to manage the risk of their bets on future climate policies. The example of the World Bank, with several forestry methodologies for the voluntary carbon market in development, highlights that public institutions may also restore the confidence of market participants by providing them with tools they could regard as compliance-grade.

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Keywords: Climate change, Emission trading systems

RESUME

Ce document vise à examiner comment les marchés volontaires du carbone peuvent contribuer utilement à renforcer les politiques climatiques nationales et internationales. Il s'agit de petits segments non réglementés d'un marché du carbone bien établi qui reposent sur la compensation volontaire des émissions de GES.

Il ressort que les divers systèmes suscités par les marchés volontaires pour certifier les projets de compensation carbone apportent des solutions originales possibles à certains des problèmes qui se posent sur les marchés réglementés. Ces normes de compensation carbone, illustrées notamment par la Climate Action Reserve en Amérique du Nord, définissent les conditions auxquelles doit obéir un projet de compensation carbone pour donner la preuve de son additionnalité – l'un des principaux défis à relever dans la réforme en cours du Mécanisme pour un développement propre de Kyoto. Par ailleurs, de nouveaux instruments ont été élaborés pour aider les concepteurs de projets carbone forestiers à surmonter certains des obstacles techniques et financiers qui ont maintenu les activités forestières en marge des marchés réglementés du carbone. Dès lors que de grandes économies émergentes, notamment la Chine, commencent à mettre en œuvre des mesures nationales d'atténuation au titre de l'Accord de Copenhague, les marchés volontaires du carbone peuvent préparer le terrain, le temps que d'éventuels marchés intérieurs du carbone prennent forme, en stimulant rapidement la mise en place d'infrastructures de marché, des activités pilotes et/ou la collecte de données.

Les acteurs du marché non encore réglementé qui cherchent à réaliser des investissements climatiques en amont du processus dans l'espoir de tirer profit du marché réglementé à venir constituent l'un des principaux moteurs des marchés volontaires. Si les organismes publics entendent mettre à profit l'expérience acquise sur les marchés volontaires du carbone, ils peuvent selon nous en tirer des enseignements. L'analyse du cas des États-Unis, où le degré de certitude quant à l'approbation et à la conception des futurs systèmes fédéraux et régionaux de plafonnement et d'échange est particulièrement sujet à des fluctuations depuis 2009, montre que les premiers investisseurs ont besoin de se référer de façon prévisible et fiable aux actions gouvernementales envisagées pour maîtriser le risque qu'ils prennent en misant sur les politiques climatiques ultérieures. À en juger par l'exemple de la Banque mondiale, qui met en avant plusieurs méthodes applicables au secteur forestier pour le marché volontaire du carbone, les organismes publics peuvent aussi redonner confiance aux acteurs du marché en leur apportant des outils assimilables à des critères de conformité.

Classifications JEL : Q54, Q58

Mots clés : Changement climatique, Systèmes d'échange de droits d'émission

FOREWORD

This paper was prepared by Pierre Guigon from BlueNext as an input to the Workshop on Global Carbon Markets, 19-20 April 2010. An earlier draft was reviewed by the Working Party on Structural Policies in May 2010.

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EXECUTIVE SUMMARY

The voluntary carbon market was created outside of governmental regulatory schemes by firms and individuals voluntarily buying carbon offsets to reduce their greenhouse gas (GHG) emissions for learning, image management, or regulation anticipation purposes (Bellassen et al., 2007). This means of offsetting is directly inspired by the compliance carbon market and relies on the acquisition and retirement of carbon credits generated by projects reducing GHG emissions at sources and/or enhancing removals by sinks. Despite a significant growth over the years, the voluntary market remains a niche. Hamilton et al., (2010a) found that 93 Mt CO₂e were transacted in 2009, which only accounts for roughly more than 1% of total transactions in global carbon markets (Kossoy and Ambrosi, 2010). However, in this paper we seek to identify to what extent this small market may nonetheless bring a valuable contribution to on-going discussions on the place and design of carbon markets in future international and domestic climate policies, either by providing potential solutions to address some of the challenges faced by existing compliance markets, or by preparing the ground for emerging compliance markets.

Using the Kyoto's Clean Development Mechanism (CDM) as a global benchmark, a number of carbon project certification schemes emerged in the voluntary market in response to criticisms over the lack of quality control due to the absence of a regulated framework (Kollmuss et al., 2008). We show that the several of these "carbon offset standards" have developed potential innovative solutions to deal with some of the issues faced by compliance markets. As an example, the Climate Action Reserve in North America has established clear conditions that a carbon offset project must satisfy to demonstrate its additionality - one of the main challenges in the on-going reform of Kyoto's Clean Development Mechanism to provide transparency in eligibility criteria and therefore predictability to investors.

New instruments have also been developed to address the climate change mitigation potential of forestry across a wider range of activities than the CDM, and to propose investor-friendly solutions to deal with the risk of non-permanence of GHG sequestration in forest sinks, issues which have both contributed to keeping forestry activities on the fringe of compliance carbon markets. The implementation of these innovative solutions in the numerous forestry projects that voluntary carbon markets have unearthed can help assess the relevance of using market mechanisms in the REDD+ national schemes as defined by the Copenhagen Accord, or to value domestic forestry activities within Annex I countries.

The emergence of the voluntary market can also lay the basis for building national capacity in carbon markets in countries whose climate policies may have yet to establish carbon market schemes. As major emerging economies, such as China, begin to implement national mitigation measures under the Copenhagen Accord, we observe this interesting role of voluntary carbon markets in the interim before a potential establishment of domestic carbon markets, through the early development of market infrastructures, pilot activities, and data collection.

While from an environmental viewpoint voluntary markets cannot be a replacement for compliance markets, they can be an important, if small, complement to a compliance market. Voluntary markets can provide an early pre-compliance arena in which to test and develop systems needed to transition to a compliance market. Should public institutions consider implementing a carbon market, we may then explore the possible ways for them to build on the experiences gained in voluntary markets. As illustrated

through the forestry sector or the US voluntary market, the main driver for voluntary markets remains pre-compliance demand from entities seeking early investments in climate actions with hopes of gaining a return in the future compliance market. In order to stimulate the private sector's innovation and investment capacity in early climate mitigation activities as a learning ground for future policies, public authorities may first provide them with predictable and reliable visibility on planned government actions with regard to carbon market policies. Although subject to congressional debate, the example of US climate bill S.1733, which lists a set of qualitative requirements for voluntary offset programs to earn recognition under a future federal cap-and-trade, sends signals to market participants to identify the early initiatives which may be rewarded in a future compliance market. The private sector may also welcome voluntary programmes or quantification protocols directly established by public institutions; as we have seen, the several methodologies developed by the World Bank under the VCS AFOLU act to restore market participants' confidence in using voluntary yet compliance-grade instruments.

1. Introduction

The voluntary carbon market was created outside of governmental regulatory schemes by firms and individuals voluntarily buying carbon offsets to reduce their greenhouse gas (GHG) emissions for learning, image management, or regulation anticipation purposes (Bellassen et al., 2007). This means of offsetting is directly inspired by the compliance carbon market and relies on the acquisition and retirement of carbon credits generated by projects reducing GHG emissions at sources and/or enhancing removals by sinks.

Using the Kyoto's Clean Development Mechanism (CDM) as a global benchmark, a number of carbon project certification schemes emerged (e.g. Gold Standard in 2003) in the voluntary market in response to criticisms over the lack of quality control due to the absence of a regulated framework (Kollmuss et al., 2008). These "carbon offset standards" establish a set of requirements, procedures, and tools for voluntary market players to develop projects and verify their emission reductions/removals (and eventual co-benefits to the environment and local communities) in order to ensure that each credit generated by the project corresponds to 1 metric ton of CO₂e reductions/removals that would have not occurred in its absence. Most of these standards have also developed registries which provide transparency and integrity to the voluntary marketplace by tracking the successive transfers and retirement of each carbon credit, thereby ensuring it is not sold twice (double-counted).

Despite a significant growth over the years, the voluntary market remains a niche. Hamilton et al., (2010a) found that 93 Mt CO₂e were transacted in 2009, which only accounts for roughly more than 1% of total transactions in global carbon markets (Kosoy and Ambrosi, 2010). However, in this paper we seek to identify to what extent this small market may nonetheless bring a valuable contribution to on-going discussions on the place and design of carbon markets in future international and domestic climate policies, either by addressing the challenges faced by existing compliance markets, or by preparing the ground for emerging ones. Should public institutions consider implementing a carbon market, we may then explore the possible ways for them to build on the experiences gained in voluntary markets.

2. Voluntary Carbon Markets: their roles in international and domestic climate policies

This section aims to identify the potential contribution of voluntary markets to the development of carbon market mechanisms in climate policies. Some voluntary offset standards (Appendix A) have brought innovative developments which can help identify interesting lessons to deal with some of the issues in the existing compliance carbon markets. In countries where the latter are not yet established, voluntary carbon markets can accelerate the practical implementation of compliance project based mechanisms and also contribute to building national capacity in carbon markets.

2.1 Voluntary carbon markets provide innovative tools to address new challenges in existing carbon markets

Like the CDM, the project certification schemes of voluntary standards define a project cycle, which usually starts with a project design document (PDD) that describes the project activity, quantifies its environmental outcomes and demonstrates they go beyond a business-as-usual scenario. After validation by an independent third party, the project shall be submitted to the administrator of the scheme for formal registration. The issuance of carbon credits is subsequent to an ex-post third party verification of the emissions reductions and/or removals it has generated.

Where do we see innovation?

As illustrated in Table 1, voluntary standards feature a number of new solutions to address some of the challenges faced by project stakeholders under the Kyoto mechanisms. Their first benefit has been to bring carbon finance to new or under-represented sectors and regions in the CDM through the development of technologies and tools to quantify their climate action potential and deal with their specificities. Considerable efforts were also made to value occasional ancillary benefits, and to overcome some of the issues under scrutiny in the CDM reform such as the lack of transparency and objectivity in the additionality demonstration of carbon projects, or the backlogs inherent to their approval process (Guigon et al., 2009).

Table 1. Contribution of voluntary carbon standards to innovation in existing carbon markets*

	INNOVATIONS	BENEFITS	EXAMPLES
PROJECT DESIGN	<p>New quantification protocols</p> <p>A quantification methodology measures emissions reduced at sources or removed by sinks against a project specific baseline scenario or a sectoral standardized baseline.</p>	<ul style="list-style-type: none"> ▪ Widen GHG abatement possibilities and increase carbon credits supply; ▪ Expand carbon finance out of the classic CDM sectoral scope. 	<ul style="list-style-type: none"> ▪ Destruction of Ozone Depleting Substances (ODS): <p>The Climate Action Reserve (CAR) developed and adopted (February 2010) standardized protocols to account for emissions reductions generated from the destruction of ozone depleting substances used in refrigerant equipments and blowing agents in the production of foam (CFCs and HCFCs). The protocols cover projects that destroys ODS within the U.S and Montreal Protocol’s Article 5 countries.</p>
	<p>Development of clear sectoral benchmark approaches to demonstrate additionality</p> <p>To be “additional” a project activity must demonstrate it goes beyond business-as-usual practices and faces barriers to implementation (investment, technological) that can be addressed through the generation of carbon credits. This demonstration is performed either on a project-by-project basis or against pre-defined sectoral thresholds.</p>	<ul style="list-style-type: none"> ▪ Streamline additionality demonstration and control; ▪ Reduce operational costs; ▪ Provide transparency in eligibility criteria; ▪ Provide predictability to investors. 	<ul style="list-style-type: none"> ▪ CAR Protocols: <p>The CAR has established a clear a priori delineation of what conditions must be satisfied to demonstrate additionality. This standardized approach applies across all eligible project types. For example, in the Urban Forestry Protocols Version 1.1, the project must pass two tests:</p> <ul style="list-style-type: none"> -Legal requirement test ensuring that the emissions reductions and/or removals are not required by law (state, federal); -Performance standard test ensuring the project activity goes beyond a practice-based standard. In the case of utilities, any tree planting is considered as additional as it is not considered as common practice.
	<p>Methods to assess ancillary benefits delivered by offset projects</p> <p>Ancillary benefits are environmental and social positive outcomes generated by the project activity beyond the emissions reductions and/or sequestration.</p>	<ul style="list-style-type: none"> ▪ Valuation of biodiversity and ecosystem services; ▪ Poverty alleviation; ▪ Acceptation of the project activity by local communities; ▪ Reduced risks associated to the project activity; ▪ Potential price premium on carbon credits. 	<ul style="list-style-type: none"> ▪ Gold Standard’s sustainable development matrix (for renewable energy, energy efficiency activities): <p>Features a set of sustainable development indicators (environment, social development, economic and technological development) to be assessed, mitigated if negative, and monitored along the project life. Only projects obtaining positive scores are eligible for validation under the GS.</p>
	<p>Alternative approaches to manage reversal risks and generate permanent carbon credits from biological sinks</p> <p>The carbon sequestered in biological sinks (forests, soils) can be reversed back into the atmosphere following natural disasters (wildfire, pests) or human practices (agricultural land use rotations). To deal with the non-permanence risks of emissions removals, the CDM issues credits (tCERs or ICERs) which expire after a certain time and must be replaced.</p>	<ul style="list-style-type: none"> ▪ Generation of carbon permanent credits; ▪ Fungibility of carbon credits ; ▪ No replacement obligation (burden); ▪ Restore investors’ interest in forestry carbon assets; ▪ Unlock supply of land-use based offsets (cost containment); ▪ Pooling of risks across AFOLU projects. 	<ul style="list-style-type: none"> ▪ Buffer Pool mechanism: <p>The buffer system is an insurance-based mechanism that requires projects to maintain a reserve of non tradable credits used to cover unplanned reversals. An initial non-permanence risk analysis determines the size of the buffer, and regular evidence that no reversal occurred permits to progressively release the buffered credits.</p> <p>This approach is common to a number of standards: VCS Buffer Pool, CCX Carbon Pool Reserve, ACR Buffer Pool, Panda Standard Buffer Pool.</p>

Continued at the next page

Table 1. Contribution of voluntary carbon standards to innovation in existing carbon markets* (continued)

	INNOVATIONS	BENEFITS	EXAMPLES
PROJECT APPROVAL	<p>New approaches for facilitating validation and verification of small-scale projects**</p> <p>Independent evaluations of the project activity must be performed to gain certification against a carbon standard (validation), and to quantify the emissions reductions and/or removals it has generated (verification). These steps entail fixed transaction costs that can be a strong financial barrier for small-scale project proponents.</p>	<ul style="list-style-type: none"> ▪ Streamline the certification process ▪ Lower transaction costs ▪ Support the development of small scaled projects 	<p>Gold Standard's provisions for micro-scale projects :</p> <p>The GS exempts eligible micro-scaled projects (< 5 ktCO₂e/year) from automatic validation and verification. Instead, these projects contribute to two dedicated funds, the validation and verification funds, which are used by the GS Foundation to pay for random validation and verification of the micro-scaled projects seeking certification or issuance of credits. This provision considerably lowers the external certification costs of small projects compared to other schemes. (Guigon P. et al., 2009).</p>
	<p>New modalities for facilitating project registration</p> <p>Registration is generally granted after the PDD and validation report of the project are submitted to the standard's technical staff, eventually to the public, for final peer review and consultation.</p>	<ul style="list-style-type: none"> ▪ Streamline the approval process ▪ Avoid delays in the approval process ▪ Lower transaction costs 	<p>Voluntary Carbon Standard (VCS) registration and issuance process:</p> <p>The VCS delegates authority to a third party auditor to approve the project thereby gaining 8 weeks (in theory) from the CDM scheme. This contributes to halving the certification timeline of the VCS compared to the CDM (Guigon P. et al., 2009).</p>

*This table does not intend to provide an exhaustive list of the existing carbon standards.

** Under the CDM, small-scale projects are renewable energy projects with a maximum output capacity of 15 megawatts, energy efficiency improvement projects reducing energy consumption by up to the equivalent of 60 gigawatt hours per year, and other project types emitting less than 60 ktCO₂e/year (decision 17/CP.7., paragraph 6(c), amended by 1/CMP.2, paragraph 28.) or less than 16 ktCO₂e/year for forestry projects.

Source: author

As discussions occur over reforming the current and/or developing the future carbon market mechanisms, voluntary standards may therefore provide interesting solutions whose quality and relevance are worth assessing. Even if the relative small size of the voluntary market has limited the practical implementation of some of these innovations, considerable return on experience has nonetheless already been acquired in some sectors such as forestry.

Case study: the forestry sector

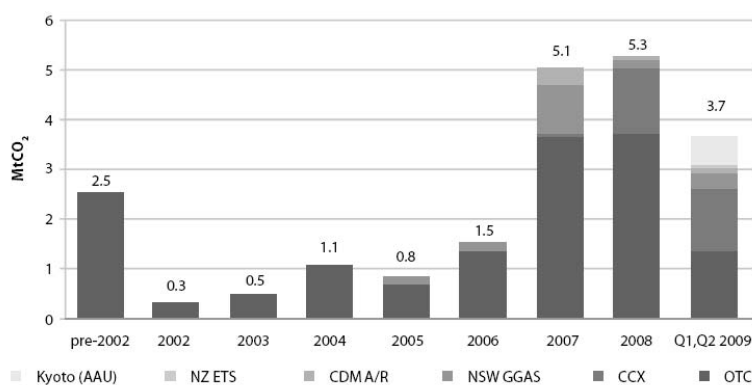
There are a number of climate change mitigation activities recognized for increasing and/or maintaining the area of forest lands which can be broadly classified in three categories as explained in Appendix B: Afforestation/Reforestation (A/R), Improved Forest Management (IFM), and Reduction of Emissions from Deforestation and Degradation (REDD).

Forestry activities have however been under-represented in the Kyoto Protocol Clean Development Mechanism (CDM) since its implementation by the Marrakesh Accords in 2001. As of April 2010, only 52 A/R projects have been submitted to the UNFCCC (13 are registered) which accounts for 1% of total CDM projects (UNEP RISOE). These projects are expected to generate about 15Mt CERs by 2012 (0.5% of total expected CERs), although none have been issued to date. A number of reasons may explain why forestry has remained on the fringe of the international compliance carbon market. The main one lies in the historic negotiations over the integration of Land Use, Land-Use Change and Forestry (LULUCF) activities in the CDM which ended two years after the conclusion of the Marrakesh Accords, as LULUCF's main supporters, the U.S. and Australia, had announced in 2001 that they would not ratify the Kyoto Protocol. Concerns over measurement, monitoring and additionality demonstration in forestry activities led the CDM to leave out REDD and IFM project activities and only include A/R (Article 3.3). In addition, the developers of CDM A/R projects face a lack of interest from investors since the EU ETS, which has been the main market for the CDM, excluded the credits generated by LULUCF CDM projects (Linking

Directive 2004/101/EC). However, as the Copenhagen Accord reached in December 2009 recognizes the need to fund mechanisms for reducing greenhouse gas emissions from deforestation and forest degradation and for promoting forest conservation, enhancement of forest carbon stocks, and sustainable forest management (referred to as REDD+ mechanisms), the post-2012 era is expected to offer a brighter future to forestry activities in climate policies.

Up to now, this sector has found much more fertile ground in the voluntary carbon market where credits generated by a diversity of forestry project types (A/R, REDD and IFM) accounted for 24% of total transaction volumes in 2009 (Hamilton et al., 2010a). As shown in Figure 1, total historical volumes of forestry carbon offsets in the voluntary carbon market (up to 2008) reach 17.9Mt which represents 86.1% of the transactions of the global forestry carbon offsets market (voluntary and regulated). The co-existence of two drivers for the voluntary demand in forestry offsets explains such figures; First, a “pure voluntary demand” exists based on demands from firms or individuals that prefers to buy assets of forestry projects for their positive social and environmental outcomes beyond their the strict carbon accounting dimension of carbon neutrality. The second driver is a “pre-compliance” demand from market actors anticipating that post-2012 compliance carbon markets will open to other forestry activities than A/R.

Figure 1. Historical transaction volumes in the forestry carbon markets



Source: Hamilton et al., 2010b (data from 226 projects). As a complement, Hamilton et al., 2010a tracks a total of 8.4Mt of forestry credits in the voluntary market in the year 2009.

A number of innovative methodologies and tools have therefore emerged to supply the demands for charismatic and compliance-grade voluntary forestry carbon credits generated. Two certification standards, namely the Voluntary Carbon Standard (VCS) and the Climate, Community & Biodiversity Standards (CCBS), account for the bulk of historical forestry credits transactions (47% according to Hamilton et al, 2010) and are regarded as international benchmarks for Agriculture, Forestry and Other Land Uses (AFOLU) carbon projects. In November 2008, the VCS Association published a set of tools to assist project proponents in developing AFOLU quantification protocols and projects (Voluntary Carbon Standard website). The VCS AFOLU defines three categories of eligible forestry activities that are Afforestation, Reforestation and Revegetation (ARR), Improved Forest Management (IFM) and Reducing Emissions from Deforestation and Degradation (REDD) (see Appendix B for more details). Non-permanence of carbon sequestration, which has been the main reason for compliance market participants to move away from the forestry CDM (see Table 1), is addressed through a buffer mechanism that withholds carbon credits from the market and deposits them in a pooled buffer account to cover anticipated reversals, thereby creating a permanent carbon asset. As of April 2010, there is only one forestry project registered¹

¹ Reforestation of degraded grasslands in Uchindile & Mapanda, Tanzania.

under the VCS, and it is currently not possible to size the pipeline of projects since a project validated and registered has until it is verified and issued to be made public on the VCS project database. However, the VCS has fostered much of the AFOLU carbon accounting protocols to date, with one ARR, four IFM, and five REDD methodologies currently under approval. The Climate, Community & Biodiversity (CCBS)² is regarded as a complement (but can also stand alone) of a pure carbon accounting standard such as the VCS, since it also focuses on validating that the carbon project brings environmental and social benefits beyond the emissions reduced and/or removed. These standards were created in 2005 and have registered 42 forestry projects to date. Among other things, the CCBS administration developed a tool for assessing the financial viability of REDD projects and is currently drafting new “REDD+ Social and Environmental Standards” specific to REDD and other forest carbon programs.

Voluntary carbon markets have therefore provided an interesting learning ground for forestry activities to leverage on, as their future in post-2012 compliance carbon markets is being considered. It is the experience gained from the numerous REDD projects currently in place in the voluntary market arena (Chenost, C. et al. (2010) tracked sixty eight of these) which partly served the progression made on forestry at the 15th Conference of the Parties in December 2009 that set the road for the establishment of REDD+ mechanisms. It however remains to be seen if and how these existing voluntary projects, mostly undertaken by the private sector, will be grand-fathered into future national REDD+ frameworks which, if these are backed by market mechanisms, may only deliver credits against national deforestation baselines and not at the project level.

Complex accounting rules under article 3.3 and 3.4 of the Kyoto Protocol have also limited the interest of investors in implementing forestry projects within Annex I countries through the Joint Implementation (JI) process. Deheza et al., 2010 (see Box 1) reveals interesting potential in using voluntary carbon markets as an alternative to pursue certification of forestry projects in these countries. As the 2009 revision of the EU ETS Directive (Article 24a) introduces a new mechanism for EU member states to implement domestic projects (Von Unger and Hoozgaard, 2010), such early initiatives could help speed up the practical implementation of forestry projects under this new crediting instrument in the phase III of the EU ETS.

² Climate, Community & Biodiversity Standards website at: <http://www.climate-standards.org/>

Box 1. Getting carbon value out of the forestry and wood sector in Annex I Countries: The French Example.

This study uses France as an example to examine the actions possible for Annex I Countries' possible actions to value carbon in the forestry and wood industry in light of these sectors' characteristics and the Kyoto regulatory framework. While mechanisms of substitution (wood-energy, wood-material) can only be indirectly valued through compliance markets to avoid double counting of credits, opportunities do exist on the voluntary market for projects sequestering carbon in forest or wood products.

The alternative of pursuing voluntary carbon certification for projects increasing carbon sequestration is analyzed across seven hypothetical projects, and shows the certification of afforestation projects or improved forest management could be profitable with potential to sequester several millions of tons of CO₂ on a national scale. An afforestation policy in the order of 30,000 ha/year could indeed allow the sequestration of approximately 35 MtCO₂ over a period of 25 years. However, benefiting from this opportunity however requires putting together projects of sufficient size to reach profitability, along with demonstrating their additionality. A robust methodology to deal with the risk of double counting between compliance and voluntary markets is also critical.

Source: Deheza and Bellassen (2010)

2.2 Voluntary carbon markets provide capacity building to emerging carbon markets

The Copenhagen Accord, noted by the 15th Conference of the Parties' (COP 15) negotiations in December 2009, conserves the Kyoto Protocol's principles of shared yet differentiated responsibility and directs international funding to help developing countries reach national non-binding emissions targets for 2020. This may initiate a transition from current climate policies towards a patchwork of regional climate change mitigation initiatives. This could catalyse the emergence of pre-compliance strategies as companies and individuals in developing countries may start preparing for a national future climate regime. This context offers interesting ground for voluntary carbon markets to settle and grow in these countries, as it was observed in the U.S. from 2003 (Chicago Climate Exchange).

The basis for future compliance carbon markets

If market-based mechanisms are to be endorsed in some national climate mitigation strategies, then voluntary carbon markets could become a useful basis for the future domestic climate finance architecture of these countries. As shown in Table 2, voluntary markets can kick start and mobilize the development of social, economical and technical domestic capacity in carbon markets, notably through their early involvement in creating certification standards, pilot project activities, data collection and market infrastructures.

Table 2. Contribution of voluntary carbon standards to national capacity building

	ROLES	BENEFITS	EXAMPLES
CERTIFICATION STANDARDS	A third party standard establishes a set of requirements, procedures, guidelines and tools for the project stakeholders to develop the project and verify its emission reductions/removals.	<ul style="list-style-type: none"> ▪ International carbon standards: <ul style="list-style-type: none"> -Establish global standardization for the design of carbon offset projects; -Participate in the emergence of a global price benchmark for voluntary carbon credits. ▪ Domestic carbon standards: <ul style="list-style-type: none"> -Establish country specific benchmarks for carbon accounting methodologies, baseline determination, and additionality requirements; -Involvement of local experts, businesses, and possibly government and the standard development and/or administration; -Initiate collection of fragmented data and accelerate their consolidation at a regional and/or national level; -Knowledge sharing and networking facilitation between the participants (international and domestic); -Trigger adaptation of the national/regional regulatory framework (new type of asset class). 	<ul style="list-style-type: none"> ▪ International carbon standards: <ul style="list-style-type: none"> Voluntary Carbon Standard (VCS); Gold Standard (GS); American Carbon Registry (ACR); Climate, Community and Biodiversity Standards (CCBS). ▪ Domestic carbon standards: <ul style="list-style-type: none"> Climate Action Reserve (North America); Panda Standard (China).
PILOT ACTIVITIES	Pilot project activities seek to prove the operational validity of new initiatives (carbon offset project, carbon trading scheme) before scaling them up at a sub-national or national scale.	<ul style="list-style-type: none"> -Ex-ante consultation and analysis to determine and prioritise target regions and activities with the highest outcomes; -Technical strengthening for emission measurement, reporting and verification (MRV); -Outreach activities to dependant populations; -Experience sharing, knowledge dissemination and consolidation; -Early deployment of clean technologies; -Establish the basis of the initiative to be rolled out on a higher scale. 	<ul style="list-style-type: none"> ▪ Trading schemes: <ul style="list-style-type: none"> Tianjing Climate Exchange (TCX) in the municipality of Tianjin (China). ▪ Pilot offset projects: <ul style="list-style-type: none"> Panda Standard AFOLU carbon projects to be developed in some pilot regions in China (2010-2011).
AUDIT	Courses to train third party auditors to perform projects audits to validate/verify their carbon benefits, financial statements, and/or socioeconomic and environmental ancillary benefits.	<ul style="list-style-type: none"> -Establish formal and transparent procedures for third party auditors selection and training (beside those for Designated Operational Entities under the CDM); -Allow for local businesses or local governmental agencies to develop the capacity to conduct independent audits of carbon projects. 	<ul style="list-style-type: none"> -Climate Action Reserve's Verification Training (US); -Panda Standard Capacity Building Workshops (China, 2010).
REGISTRY	A registry is a market infrastructure responsible for the issuance, transfer and retirement of carbon credits.	<ul style="list-style-type: none"> -Market integrity: traceability of carbon credits (unique serial number) and transparency of transfers from issuance to retirement; -Registration and transfer of emission reductions/removals ahead of their issuance to allow for long-term hedging; -Insurance function through the maintenance of a buffer pool to ensure the permanence of credits generated from registered subject to the risk of reversal (AFOLU). 	<ul style="list-style-type: none"> ▪ Market infrastructure providers : <ul style="list-style-type: none"> E.g. Caisse des Dépôts, APX, Markit. ▪ Administration of standards: <ul style="list-style-type: none"> E.g. American Carbon Registry.
EXCHANGE	A carbon exchange is market infrastructure offering a secured platform to trade standardized carbon credit contracts.	<ul style="list-style-type: none"> -Security of transactions through the management of counterparty risks; -Non discrimination through the anonymity of transactions; -Liquidity and price discovery efficiency from a diverse pool of market actors (natural participants, speculators); -As regulated entities, their emergence necessitates adaptations in the national regulatory framework. 	<ul style="list-style-type: none"> Exchange groups: <ul style="list-style-type: none"> e.g. BlueNext (NYSE Euronext), China Beijing Environment Exchange (China Beijing Equity Exchange), Chicago Climate Exchange (Climate Exchange Plc).

Source: author

Case study: China

Although non-binding, the recent commitment of the People's Republic of China's (PRC) government to implement economy-wide carbon intensity cuts under the Copenhagen Accords shall nonetheless soon be translated into an extensive set of domestic measures (see Box 2). Should market-based mechanisms be part of these national mitigation policies, China may draw upon existing pilot initiatives and roll them up on a national scale. As of today, there are two noticeable market-based initiatives under development in China which aim to support the commitment of the PRC Government to change the emissions intensity of its economy and contribute to building a national capacity in domestic carbon markets.

The Panda Standard³ was founded in December 2009 by state owned China Beijing Environment Exchange, the China Forestry Exchange, BlueNext, and Winrock International. It is the first nation-wide Chinese domestic voluntary carbon standard, designed to provide transparency and credibility in the nascent Chinese carbon market and to advance the PRC Government's poverty alleviation objectives by encouraging investments in China's rural economy. The Panda Standard first focuses on promoting Agriculture, Forestry and Other Land Use (AFOLU) carbon offset projects with significant poverty alleviation impact. Throughout 2010, its co-founders will convene appropriate Chinese and international experts and select pilot regions based on poverty alleviation priorities and assessment of GHG reduction and/or removal potential, develop China specific AFOLU protocols, and build capacity for project implementation, verification and registration through pilot offset projects and training modules.

The Tianjin municipal government is to launch a pilot trading scheme in 2010, which will set an intensity-cap on heat suppliers for residential buildings in the city of Tianjin. The scheme will be operated by carbon exchange Tianjin Climate Exchange, a joint-venture of the China National Petroleum Corporation Assets Management, the Tianjin Property Rights Exchange, and the Chicago Climate Exchange. In February 2010, Citigroup and Gazprom concluded the first pilot transaction, buying 11,500 Carbon Emissions Allowances (CEAs) from the heating utilities aiming to beat their emissions-intensity target ("Chinese City...", 2010).

³ Panda Standard website at: <http://www.pandastandard.org/>

Box 2. From Copenhagen 2009 to Beijing 2010

On January 28th 2010, Director General of Climate Division of the National Development and Reform and Commission (NDRC) Su Wei submitted China's proposed climate mitigation actions under the Copenhagen Accord. Earlier announced by President Hu Jintao at the United Nations General Assembly in September 2009, China's pledges consist of:

- Reducing its carbon dioxide emissions by 40-45% per unit of GDP by 2020 compared to the 2005 levels;
- Increasing the share of non-fossil fuels in primary energy consumption to around 15% by 2020;
- Increasing forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from the 2005 levels.

In March 2010, the 11th National People's Congress (China's highest legislative body) held its third session to report on the current work of the government and define the economic and social development plans of the upcoming 12th Five-Year Plan (2011-2015) and beyond. It is reported that more than 10 percent of the proposals submitted by the 3000 deputies focused on environmental measures ("CPPCC...", 2010). Premier Wen Jiabao placed special emphasis on the need to promote an aggressive transition towards low carbon economy in the basics of China's domestic policy and international cooperation. 2010 therefore holds the definition of a set of policies and measures to implement China's national mitigation action plan by promoting energy conservation, clean technology development, and emission reductions. The Chinese authorities, as they recognize the cost-effectiveness of markets to promote mitigations actions Xie Zhengua (2010), are expected to progressively phase-in market-based mechanisms, drawing upon the experience gained from the CDM and some selected domestic pilot initiatives.

Thanks to the flexibility of its self imposed rules and the dynamism of the private sector, the voluntary carbon market has become a learning arena to watch for lessons that could be applied to future climate policies. However, the relative small size of the voluntary carbon market limits the contribution it can bring to the development of international and/or domestic compliance carbon market mechanisms. The example of forestry shows that in order to deploy this potential at a significant level a strong pre-compliance demand must emerge and complement that from pure voluntary buyers.

3. The role of public institutions in the emergence of the “pre-compliance” market

This section aims to identify to what extent public institutions may create a favourable environment for private market participants to manage risks over their bets on future climate legislations and help “pre-compliance” drive the development of the voluntary carbon markets.

There are two reasonable strategies for market actors to mitigate risks on their pre-compliance bets. The first is to engage/invest in a voluntary program recognized as (or expected to be) early actions in a future climate regime; this is possible if the piece of cap-and-trade legislation contains provisions acknowledging the credits issued by a voluntary program can be banked for future compliance, should the program be nominatively designated or meet some eligibility requirements. If there is no recognition of early actions, then market actors can at least engage/invest in eligible project activities which will be (or are expected to be) in the future cap-and-trade scheme. In this case, pursuing voluntary certification may be chosen by default in the absence of a compliance standard.

3.1 *Providing predictable and reliable government action*

Case study: the US

The sensitivity of voluntary market actors to future climate legislations has been illustrated in the US, particularly over the last year. The development and growth of the US voluntary market has indeed been oscillating along with the level of certainty over the implementation and the design features of future federal and/or regional cap-and-trade systems.

At the federal level, the 111th United States Congress has introduced several major climate bills to date that, if passed, would implement a U.S. cap and trade mechanism covering roughly 6 billion tons CO₂e emissions per year. The American Clean Energy Security Act (H.R. 2454), referred to as the “Waxman-Markey” bill, was historically passed by the House of Representatives in June 2009. The Clean Energy Jobs & American Power Act (S. 1733), or “Kerry-Boxer” bill was the Senate counterpart to the Waxman-Markey; however its passage in the Senate is very unlikely. In November 2009, Senator Debbie Stabenow introduced The Clean Energy Partnerships Acts (S. 2729) which lays the details for a domestic offset program. Currently, Senators Kerry, Lieberman, and Graham are collaborating to draft a climate bill that may have greater chances for passage in Senate. A draft of this bill is expected in spring of 2010.

At the state level, several regional carbon schemes have also emerged. California is intending to start its own scheme covering about 400 million tons CO₂e /year from 2012, and several states have also signed agreements to collaborate with their neighbours to set up Cap & Trade mechanisms; The Regional Greenhouse Gas Initiatives (RGGI), which commenced in 2009, gathers 10 northern states which covering 170 million tons CO₂e /year and the Western Climate Initiative (WCI) which will cover 900 million tons CO₂e /year throughout 7 Western states and 2 Canadian provinces from 2012. Under these initiatives, implicated entities are allowed to use domestic offset credits for compliance (up to certain limits).

Point Carbon (2010) estimates that transactions of credits from voluntary US based projects reached 19.4 million CO₂e in 2009 (\$74 million) up 37 percent from 2008 and 63 percent from 2007; a 263 percent growth in volume and 321 percent growth in value is forecast for 2010 if federal cap-and-trade passes in June. The same study also estimates that pre-compliance purchases accounted for 65 percent of the total primary voluntary market in the US in 2009 in volume (\$48 million). The pre-compliant demand has therefore surged over 2009, and has driven the growth of the US voluntary market since 2009.

Table 3 shows how US pre-compliant market actors read coming cap-and-trade legislation and value climate investments in actions ahead of schemes’ starting date. The provisions pertaining to the pre-

emption, also referred to as “grandfathering”, of voluntary programs as well as those on the eligible project activities are of utmost importance to investors in voluntary markets today.

To illustrate, under HR.2454, the only voluntary program likely to be recognized for early actions crediting is the CAR, due to its establishment before 2009. Amongst the methodologies developed by the CAR, only 6 fit in eligible activities under the bill; as shown in Appendix C, a farm waste methane project developed under the CAR can generate early actions credits. HR. 2454 also lists other types of eligible activities for which there are methodologies available under the CAR, such as agricultural soil management. A project proponent wishing to develop such a project may therefore choose to use the VCS, ACR or CCX programs which, if not eligible for early crediting, are however the only ones with available methodologies for this project activity. This early certification by default may speed up the implementation of the project according to a compliance standard when it is available.

The CAR provides an interesting case study on how the development of a voluntary offset standard can be influenced by the design of and certainty level in upcoming regulatory framework. Established in 2001, the CAR has known a recent uptake in transactions as the Climate Reserve Tons (CRTs) generated by CAR projects accounted for 65 percent of the US market value in 2009 with 8 Mt CO₂e for only 0.5 Mt CO₂e issued (Point Carbon, 2010). As of April 2010, there are 36 CAR projects and 139 others seeking registration; the supply has reached 3.1Mt CRTs issued and the CAR administration announced it would expect up to 8Mt CRTs to be issued by end-2010.

Table 3. Reading pre-compliance provisions in US federal regional Cap & Trade initiatives

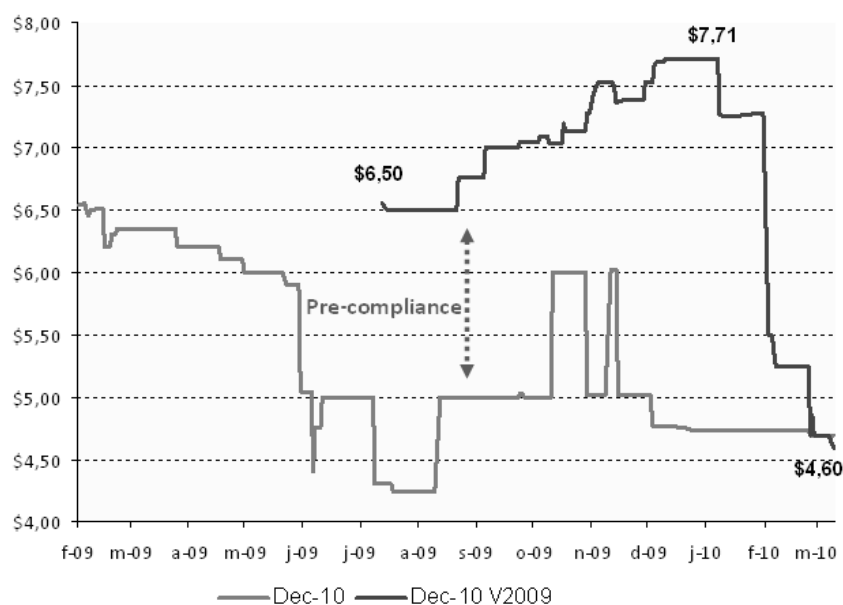
Domestic offsets in federal and regional Cap and Trade initiatives				Pre-emption of the voluntary offset programs and their project activities						
Scope	Ref.	Domestic offsets limit (CO _{2e} /year)	Early offset supply provisions:	Eligibility	CAR 0.5 Mt*	VCS 1.3Mt	ACR 2.9 Mt	EPA	CCX 1.9Mt	GS 0.0Mt
Federal (state not defined)	H.R. 2454	1 Gt	-Governance: EPA Administrator and/or USDA Secretary (SEC.740); -Qualified program: any regulatory or voluntary offset program that was established before January 1, 2009 under State or Tribal law or regulation (+qualitative requirements) -Early offset issuance: 2009 to 3 years after enactment of the bill at exchange rate 1:1 2001 to 2008 at exchange rate equal to average value of 2006-2009 (money H.R. 2454 or allowances S.1733).	Eligible programs for early action crediting.	Yes, very likely	These programs maybe be eligible to generate credits exchangeable for compliance credits in the future cap-and-trade defined by H.R. 2454. This is subject to US EPA and/or USDA approval par quality criteria in bill				
	S.1733	1.5 Gt		Number of project activities of the programs which will generate domestic offsets in the future cap-and-trade (see APPENDIX C)	6	9	9	2	7	0
	S.2729	N/A	-Governance: US EPA & USDA (SEC.110) - Qualified program: any regulatory or voluntary offset program that was established before January 1, 2009 (+qualitative requirements); - Early offset issuance: January 1, 2001 up to the date official methodologies take effect.	Program	Same as H.R. 2454					
				Activities	7	11	11	3	9	2
				Program	Maybe, , subject to US EPA and USDA approval par quality criteria in bill					
				Activities	8	14	14	4	11	3
California (2012)	A.B. 32	16 Mt (4% of 400Mt)	-Governance: California Air Resources Board (§38562(b)(3)); -Qualified program: the CARB shall incorporate the standards and protocols developed by CCAR where appropriate and to the maximum extent feasible.	Program	YES	NO				
				Activities	Eligible project activities not mentioned in A.B 32					
Western States (2012)	WCI	N/A	No early offset supply provisions in the WCI Program Design Recommendations.	Program	N/A					
				Activities	7	9	9	4	9	3
Eastern States (2009)	RGGI	5.6 Mt (3.3% of 170 Mt)	No early offset supply provisions in the RGGI Model Rule.	Program	N/A					
				Activities	3	5	5	3	3	2

*Credits issued from US based projects for 2009 reductions as of 2/22/10 (Source: Point Carbon, 2010).

Source: author

The endorsement of four CAR protocols by the California Air Resources Board (from 2007 to 2009) made this standard a favourite in US voluntary markets. These moves indeed led participants to increasingly regard the CRTs as the only US based voluntary credits exchangeable for compliance offset credits in California's future cap-and-trade system. Established by the State of California, the CAR would also qualify as a “voluntary offset program established under State or Tribal law or regulation” thereby opening perspectives for CRTs to be grandfathered into a federal market (H.R. 2454 & S.1733). Figure 2 shows the price evolution of CRTs futures contracts (December 2010 expiry) since their inception in February 2009 on the Chicago Climate Futures Exchange (CCFE). Despite the low liquidity of these contracts (only 759Kt CO_{2e} traded from February 2009 to February 2010), it is interesting to observe the influence that the introductions of federal climate bills and other regional legislations on the pre-emption of early action credits may have had on the price of these voluntary offset credits.

Figure 2. Price of Climate Reserve Tons futures contracts on CCFE*



*The CRTs DEC-10 contract is a futures contract which guarantees delivery of CRTs in December 2010. The CRTs DEC-10 V2009 restricts its underlying to CRTs issued in 2009 only; the latter was introduced in response to the passage of H.R. 2454 which only recognizes the value of the credits issued from 2009.

Source: author from CCFE data

From February to July 2009, the price of CRTs contracts (CRTs Dec-10) listed on CCFE lost about 30% plunging from \$6.5 to \$4.50. This responded to the introduction of H.R. 2454 which only granted recognition at an exchange rate of 1:1 to credits issued after 2009. This led the CCFE to create new futures contracts for specifying a “vintage” for CRTs corresponding to their year of issuance. At inception in late July 2010, this new contract CRTs Dec 10 V09 (underlying restricted to CRTs issued in 2009) traded at \$6.55 which was \$2.25 above CRTs Dec 10 with no vintage; this spread gives an indication of the “pre-compliance” price at this point of time. From then to beginning of 2010, the introduction of S.1733 (keeping the early offset provisions of the H.R. 2454 unchanged) followed by that of S.2729 (supportive of domestic offsets) reinforced the confidence of market actors in the pre-emption of CRTs, which raised the price for CRTs Dec 10 V09 to \$7.71 in January 2010. However, over the two following months the contract plunged to \$4.60 to trade at the same price as CRTs Dec 10 with no vintage. Expected increase in the issuance of CRTs and growing pessimism that a federal cap-and-trade bill will pass in US Congress in 2010 pushed prices down. The decision of the California Air Resources Board (2010) last February to withdraw approval of the four CAR protocols and further considerations also undoubtedly sent negative signals to pre-compliance investors regarding the certainty of their bets. As a result, the pre-compliance premium on CRTs Dec 10 V09 no longer exists today.

3.2 Providing compliance-grade developments

Public authorities may also encourage pre-compliance developments by providing voluntary market participants with market-oriented instruments they could use while waiting for the compliance market to develop its own instruments. Although we find very few of these, two examples are worth mentioning.

A first interesting case is the contribution of the World Bank’s Biocarbon Fund to the development of VCS AFOLU methodologies that have been submitted for approval under the VCS double approval

process. The first quantification protocol estimates reductions of GHG emissions from mosaic deforestation (RED)⁴, and the other from the adoption of sustainable agricultural land management (ALM)⁵. Providing voluntary carbon markets with methodologies in the agricultural and forestry sectors, which are underrepresented in compliance carbon markets, is in line with the role of the multilateral bank which aims to incite innovation and attract private investments in sectors where it is most needed.

Another initiative is that of the United States Environmental Protection Agency (EPA) which launched the EPA Climate Leaders Program⁶ in 2002 to assist companies in achieving ambitious reductions of corporate-wide GHG emissions. As of today there are about 200 “Climate Leaders Partners” (large companies) and 100 “Small Business Network Members” that the EPA helps to develop and manage a GHG inventory, and establish long-term emission reduction goals. Although the emphasis of the program is placed on making internal reductions, partner companies can eventually invest in offset projects as an option. As of April 2010, the EPA’s Climate Change division has developed seven project methodologies (see Appendix C) with two others in development (Coal-mine methane and Forest management). All of them use performance standard approaches for baseline determination and additionality demonstration. Considering the few projects (4) approved to date, that their submission is restricted to Climate Partners, and that no credits are yet to be issued (there is no registry, thus no issuance, but a list of approved tonnes will be listed on-line), the EPA Climate Leaders Program is not yet regarded as a carbon market driven initiative. However, should the U.S government establish a federal offset system in the near future, the experience gained with the tools developed by the EPA under this program may also be a useful starting point for methodological development.

We have identified two ways in which public institutions can leverage the private sector’s profit-driven dynamism to stimulate early actions and pre-compliance activity. Although political uncertainty is inherent to the passage of any carbon market legislation, private participants need predictable and reliable visibility on the governments’ future climate actions. Absent a clear carbon price signal, one approach that could improve predictability would be for public institutions to provide voluntary carbon market with tools such as programmes or quantification methodologies which private actors could regard as compliance-grade and chose to develop early carbon offset projects.

⁴ Mosaic deforestation usually shows a patchy pattern of forest clearings and is associated to population pressure, shortened shifting cultivation cycles and other drivers. Methodology available at : http://www.v-c-s.org/docs/REDD_mosaic_methodology_15_Dec_2008.pdf

⁵ See Appendix B. Methodology available at : http://www.v-c-s.org/methodology_salm.html

⁶ EPA Climate Leaders website at: <http://www.epa.gov/climateleaders>

4. Conclusion

Voluntary carbon markets have the potential to bring valuable contributions to climate policies at various levels. This is especially relevant as a future reform of the CDM scheme is being discussed, since solutions for issues faced by the compliance market may be found through examining a number of other carbon offset standards which have moved away from this global benchmark and have benefited from exploratory activities under the absence of a regulatory framework. For example, some voluntary standards have established a clear a priori delineation of what conditions must be satisfied to demonstrate the additionality of certain project activities. These performance standards provide transparency in eligibility criteria and therefore predictability to investors. Another noticeable input of voluntary carbon markets has been to address the climate change mitigation potential of forestry across a wider range of activities than the CDM and to propose investor-friendly solutions to deal with the risk of non-permanence of GHG sequestration in forest sinks. The implementation of these innovative instruments in the numerous forestry projects that voluntary carbon markets have unearthed will help assess the relevance of using market mechanisms in the REDD+ national schemes as defined by the Copenhagen Accord, or to value domestic forestry activities within Annex I countries. The emergence of the voluntary market can lay the basis for building national capacity in carbon markets through the development of market infrastructures, pilot activities, or data collection in countries whose climate policies may have yet to establish carbon market mechanisms. A major emerging economy such as China, which recently committed to implementing national mitigation actions under the Copenhagen Accord, may use voluntary carbon markets to these ends in the interim before rolling them out on a compliance level.

While from an environmental viewpoint voluntary markets cannot be a replacement for compliance markets, they can be an important, if small, complement to a compliance market. Voluntary markets can provide an early pre-compliance arena in which to test and develop systems needed to transition to a compliance market. Pure voluntary demand from individuals and entities seeking carbon neutrality is not sufficient to drive the growth of voluntary carbon markets to levels at which their benefits may be a replacement for future climate policies. As illustrated through the forestry sector or the US voluntary market, the main driver for voluntary markets remains pre-compliance demand from entities seeking early investments in climate actions with hopes to gain a return in the future compliance market. Should public institutions wish to stimulate the private sector's innovation and investment capacity in early climate mitigation activities as a learning ground for future policies, they must first provide them with predictable and reliable visibility on planned government actions with regard to carbon market policies. Although subject to congressional debate, the example of US climate bill S.1733, which lists a set of qualitative requirements for voluntary offset programs to earn recognition under a future federal cap-and-trade, sends signals to market participants to identify the early initiatives which may be rewarded in a future compliance market. The private sector may also welcome voluntary programmes or quantification protocols directly established by public institutions; as we have seen, the several methodologies developed by the World Bank under the VCS AFOLU act to restore market participants' confidence in using voluntary yet compliance-grade instruments.

ACRONYM LIST

ACR American Carbon Registry
AFOLU Agriculture, Forestry, and Other Land Uses
ALM Agricultural Land Management
A/R Afforestation / Reforestation
CAR Climate Action Reserve
CARB California Air Resources Board
CCBS Climate, Community, and Biodiversity Standards
CCFE Chicago Climate Futures Exchange
CCX Chicago Climate Exchange
CDM Clean Development Mechanism
CER Certified Emission Reduction
CO₂e Carbon dioxide equivalent
CRT Climate Reserve Ton
EU ETS European Union Emission Trading Scheme
GHG Greenhouse Gas
GS Gold Standard
IFM Improved forest management
JI Joint Implementation
ICER: Long-term Certified Emissions Reduction
LULUCF Land Use, Land Use Change and Forestry
MtCO₂e Millions of tonnes of carbon dioxide equivalent
PS Panda Standard
REDD Reducing Emissions from Deforestation and Degradation
RGGI Regional Greenhouse Gas Initiative
tCER: Temporary Certified Emissions Reduction
UNFCCC United National Framework Convention on Climate Change
U.S. EPA United States Environmental Protection Agency
VCS Voluntary Carbon Standard
VER Verified (or Voluntary) Emission Reduction
WWF World Wildlife Fund

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APPENDIX A: VOLUNTARY OFFSET STANDARDS CONSIDERED IN THE PAPER

Standard	Creation date	Geographic scope	Sectoral scope	Proponents	Websites
American Carbon Registry (ACR)	1997	International	All	Winrock International	http://www.americancarbonregistry.org/
Chicago Climate Exchange (CCX) Offset Program	2003	International	Methane, carbon soil, forestry, renewable energy, ozone depleting substances	CCX	http://www.chicagoclimatex.com/
Climate Action Reserve (CAR)	2001	US, Mexico	Forestry, methane, Nitric acide production, ozone depleting substances	CAR	http://www.climateactionreserve.org/
Climate , Community & Biodiversity Standards (CCBS)	2005	International	Agriculture, Forestry and Other Land-uses	Climate , Community & Biodiversity Alliance	http://www.climate-standards.org/
EPA Climate Leaders - Offset Guidance	2002	US	All	US EPA	http://www.epa.gov/climateleaders/
Gold Standard VER (GS)	2003	International	Renewable energy, end-use energy efficiency	The GS Foundation	http://www.cdmgoldstandard.org/
Voluntary Carbon Standard (VCS)	2006	International	All	The VCS Association	http://www.v-c-s.org/
Panda Standard (PS)	2009	China	Agriculture, Forestry and Other Land-uses	China Beijing Environment Exchange (CBEX), BlueNext, Winrock Int., China Forestry Exchange (CFEX)	http://www.pandastandard.org/

Source: author

APPENDIX B: CLASSIFICATION OF LAND USE, LAND-USE CHANGE AND FORESTRY (LULUCF) ACTIVITIES

ACTIVITY TYPE	FORESTRY	AGRICULTURAL LAND MANAGEMENT
Land type	Forest land	Crop land and grass land
LULUCF activities recognized for mitigating climate change Emission reduction, carbon sequestration or carbon substitution	Activities increasing or maintaining the area of forest land and those of forest management that increase carbon stocks. Afforestation, Reforestation and Revegetation Establishing, increasing or restoring vegetative cover through planting, sowing or human assisted natural regeneration of woody vegetation to increase carbon stocks in woody biomass and soils.	Management activities of non-forest land that increase carbon stocks. Improved Cropland Management Activities include the adoption of practices that reduce net GHG emissions by increasing soil carbon stocks, reducing soil N ₂ O emissions, and/or reducing CH ₄ emissions (including silvo-arable agroforestry). Croplands are lands devoted, at least periodically, to the production of arable crops.
	Improved Forest Management Modification to forestry practices that produce wood products to enhance sequestration over time (e.g., lengthening the harvest-regeneration cycle, adopting low-impact logging). Increases carbon storage by sequestration and may also avoid CO ₂ emissions by altering management. May generate some N ₂ O emissions due to fertilization practices.	Improved Grassland Management Activities include the adoption of practices that increase soil carbon stocks and/or reduce N ₂ O and CH ₄ emissions (including silvo-pastoral agroforestry) Grasslands are land covered with herbaceous plants with less than 10 percent tree and shrub cover (rangelands, grazing land, agro-silvo pastoral systems, cultivated pasture).
	Reduction of Emissions from Deforestation and Degradation Activities that reduce emissions from human-induced conversion of forested land to non-forested land as well as the structure, function, species composition associated.	Cropland and grassland land-use conversions Activities include cropland conversion to perennial grass vegetation (increase below ground carbon stocks and/or reduce N ₂ O emissions by reducing N fertilizer and/or manure additions) and grassland conversion to cropland production. (Introducing crops or agroforestry practices on degraded pastures can increase soil and biomass carbon stocks).

Source: author, definitions from VCS AFOLU, 2008⁷

⁷ “Voluntary Carbon Standard Guidance for Agriculture, Forestry and Other Land Use Projects”. (2008). VCSA. Available at: <http://www.v-c-s.org/docs/Guidance%20for%20AFOLU%20Projects.pdf>

APPENDIX C: ELIGIBLE DOMESTIC PROJECT ACTIVITIES UNDER VOLUNTARY STANDARDS AN US FEDERAL/REGIONAL CAP-AND-TRADE AND OTHER MITIGATION ACTIVITIES

		H.R. 2454	S.1733	S.2729	WCI	RGGI	VCS	GS	ACR	EPA*	CAR	CCX
AGRICULTURE	Farm Waste Methane	X	X	X	X	X	X		X	X	X	X
	Agricultural Soil Management	X	X	X	X		X		X			X
	Grassland Soil Management	X	X	X	X		X		X			X
FORESTRY	Afforestation/Reforestation	X	X	X	X	X	X		X	X	X	X
	Improved Forest Management	X	X	X	X		X		X		X	X
	Conservation/Preservation	X	X	X	X		X		X		X	
	Urban Forestry	X	X	X	X		X		X		X	X
	Agroforestry	X	X	X	X		X		X		X	
	Forest products	X	X	X	X		X		X			X
OTHERS	Landfill Methane		X	X	X	X	X	X	X	X	X	X
	Coal Mine Methane		X	X			X	X	X			X
	Waste Water Methane			X	X		X	X	X	X		X
	Transportation								X	X		X
	Industrial gas			X		X	X		X			
	Energy Efficiency					X	X		X			
	Ozone Depleting Substances			X			X		X		X	X
Boilers									X			

*US EPA Climate Leaders Program

Source: author