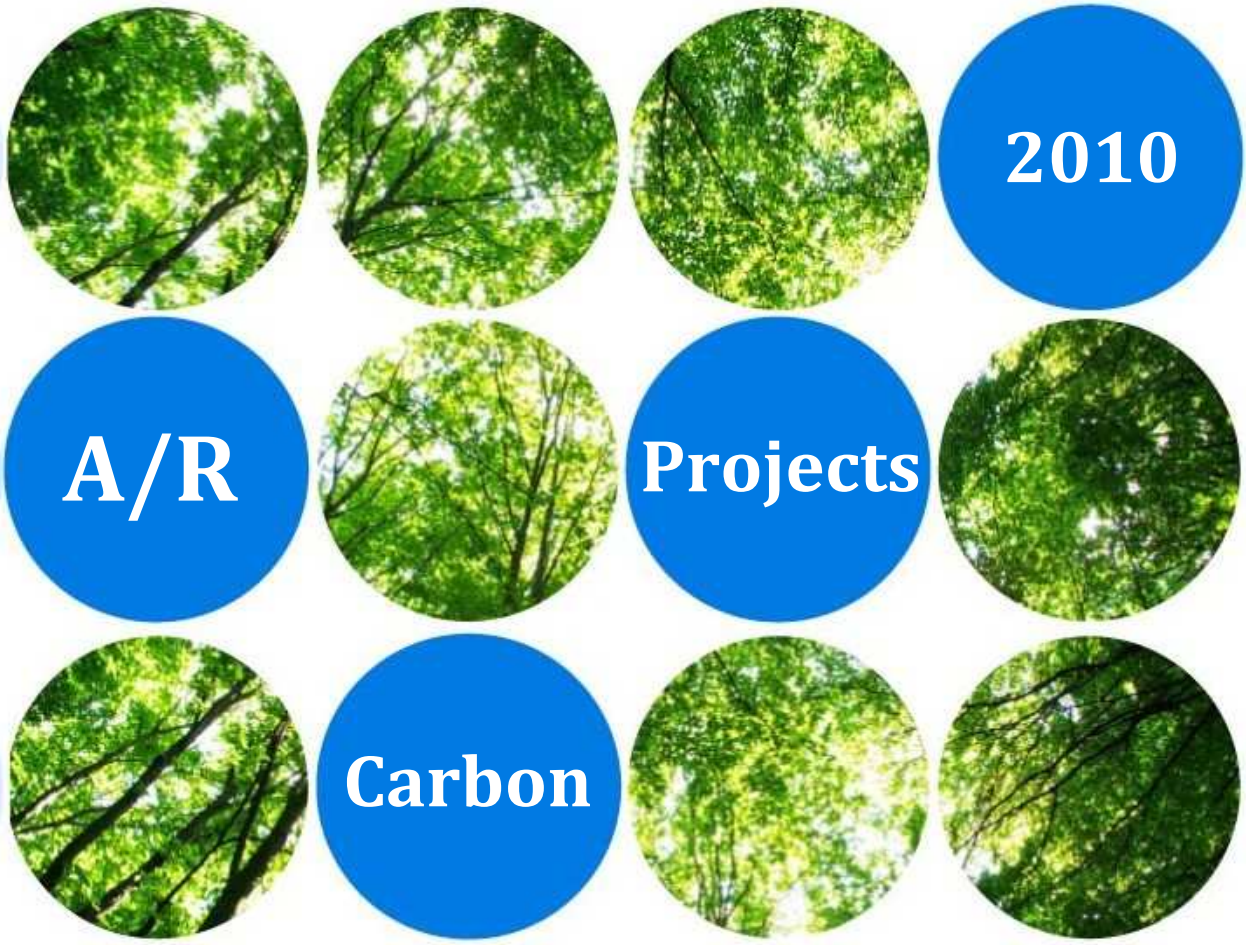

Status and Future of the Afforestation and Reforestation (A/R) Carbon Sector

E. Merger
August 2010

Acknowledgement

This report was prepared in order to provide forest carbon market participants with an outlook for the A/R forest carbon sector. It serves as a contribution to better understand the A/R sector and increase transparency in this diversified and fragmented marketplace.

I would like to thank all project developers who participated in the survey and shared information.

For the support in conducting the survey and publishing the report many thanks to Ian Hamilton and Carbon Positive.

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Introduction

In the recent few years, there have been a number of controversies and criticisms targeted at carbon forestry, despite its important role in greenhouse-gas (GHG) emission reductions. As forestry needs to play a major role in global GHG mitigation efforts in order to achieve reductions, the forestry sector increasingly gains public attention and market acceptance within this arena, as a recent forest carbon offset survey undertaken by EcoSecurities (2010) showed.

During the initial stages of the over-the-counter (OTC) voluntary carbon market, the forestry sector was the largest sector. Since 2005, with the diversification and rapid growth of the OTC voluntary market, the market share of forestry projects has oscillated but a steady increase in absolute volumes was maintained. In 2009, the Afforestation/Reforestation (A/R) sector comprised 10% of all transactions (4.3 million tCO_2-eq) in the OTC market (Hamilton et al., 2010). The major reasons for the steady but slow growth of the forestry sector were mainly due to the criticism and difficulties surrounding land-based projects - the complexity of such projects, the non-permanence of forests, and the perceived high risks.

With the maturation of the OTC market and the development of third-party project standards and registries, a market infrastructure developed which guarantees a "consistent level of quality, reduced transaction costs for buyers and builds consumer trust" (Bayon et al., 2009).

Although there are historical and current data available on the *development* of the forest carbon markets, to date there is limited quantitative data available on the *current status* and the *expected future* of the diversified forest carbon markets. While other surveys focused on investigating historical data, this report provides the market with a forecast for A/R projects that are currently active and those that will be developed and implemented in the next few years. Therefore, the **objectives of this report** are to

1. Inform potential buyers on the supply volumes of A/R credits they can expect
2. Characterise A/R projects that are coming on-stream
3. Identify what contractual arrangements developers require for their A/R projects
4. Identify what project developers require from forest carbon standards
5. Determine forest carbon standards' popularity

This report provides a detailed overview of A/R projects currently being developed and implemented. It delivers data and identifies characteristics of 118 global A/R projects captured from 70 project-developing organisations that represent a large proportion of A/R carbon markets.

Data Collection Methodology

The survey involved global A/R project developers in order to capture data and the characteristics from currently active and future A/R projects in forest carbon markets.

Data sources

An online survey was conducted from 11th March 2010 to 23rd April 2010 and was facilitated by Carbon Positive. The survey was posted and announced on the Carbon Positive website, in the IISD Forest_L newsletter, and on Ecosystem Marketplace's Forest Carbon Portal.

Survey Respondents

All project developers participated voluntarily and had the opportunity to supply characteristics to a maximum of 3 A/R projects. Incomplete and inconsistent data were excluded. The captured data obtained from 70 valid organisations provided information on 118 A/R projects that commenced or will commence between 1995 and 2015.

Important to note is that the captured data represents not the entire forest carbon markets due to the non-transparent nature of the marketplace. Thus, considering the studies by Hamilton et al. (2010) and Chenost et al, (2010) the real number of project-developing organisations and projects in reality is likely to be higher than the data presented in this report.

Characteristics of A/R Projects

This chapter characterizes the 118 A/R projects with respect to their project start dates, location, scale, forest types and the length of forest growth. Based on this data, the expected future supply of carbon credits from these projects were determined.

Start dates

Historically, the OTC voluntary carbon market has provided the most favourable environment for forest carbon projects and facilitated approximately 75% of all forest carbon transactions (Hamilton, Chokkalingam et al., 2010). This survey illustrates that, since 2005, with the development of third-party standard schemes and registries, A/R projects have increasingly been developed.

- Up until 2004, only 21 A/R projects commenced. However, in the last 5 years, an additional 81 A/R projects have been initiated or will be commencing this year. This constitutes a share of about 70% of the entire data sample. From 2005 to 2010, the average annual increase of A/R projects was approximately 27%.

- The data indicates that 2010 will experience a large amount of new A/R projects (30 projects) coming on-stream, while in the future years the launch of new A/R projects declines significantly and levels off up to 2015.

- The sharp decrease in growth of new A/R projects from 2011 to 2015 is mainly due to the uncertainties of the global policy arena with respect to a post-2012 climate framework. This is causing a general uncertainty among market actors to invest in new projects. In addition, companies are not planning much longer than one year in advance. Thus, the number of new forestry projects commencing post-2012 could be much higher if positive signals from international climate negotiations emerge.

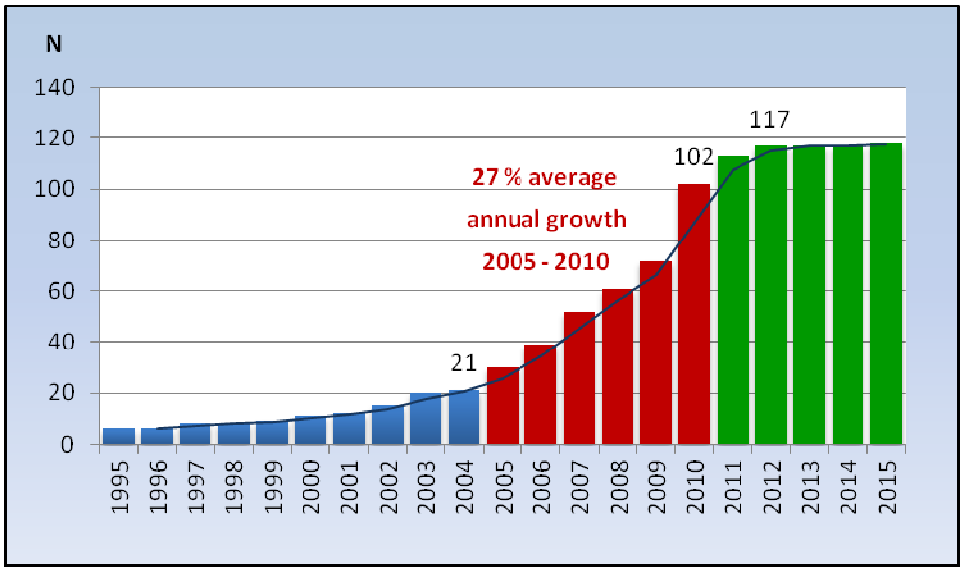

Figure 1: Cumulative A/R project commencement 1995 – 2015

Location

Comparing the project location of the surveyed A/R projects with the preferences of forest carbon buyers, surveyed by EcoSecurities (2010), there is a significant overlap between buyer preferences and the location of A/R projects. In the survey, buyers considered forest carbon credits from South America, Africa, Asia and the US as most desirable.

- Out of the 118 A/R projects, 41 projects are and will be located in South America, followed by Africa with 34 projects, Asia with 25 projects and North America with 14 projects. This constitutes a share of 97% of the total project sample representing 114 A/R projects.

- The remaining 3 projects are distributed among Europe and Oceania.

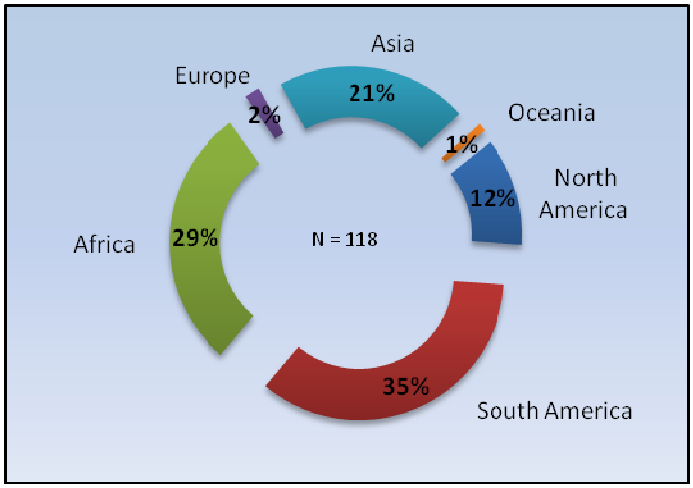

Figure 2: Location of A/R projects

Scale

The study classifies the size of A/R projects into five categories from micro-scaled (< 100 hectares (ha)) to very large projects types (> 15,000ha).

- There is a fairly even distribution among projects in terms of scale, but large differences in area covered, as illustrated in figures 3 and 4.

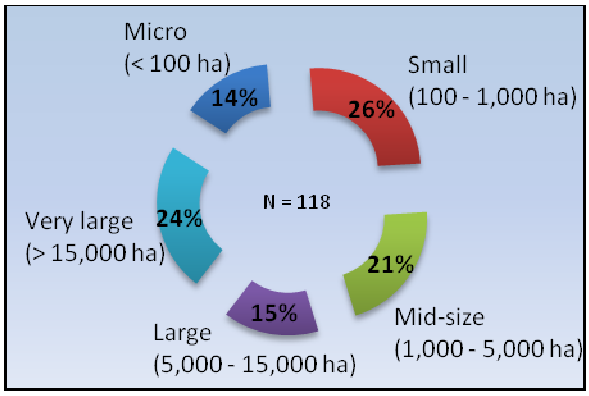

Figure 3: Scale of A/R projects

From the captured data from the 118 A/R projects, an area of over 655,000ha is represented with an average project size of 5,500ha.

- Out of 655,000ha, the 17 micro and 30 small-scale projects represent only a minor share in terms of area - approximately 2.5% (16,300ha) - while the 25 mid-sized projects represent an area of 9% (59,000ha).

- Almost 90% (580,000ha) of the entire forest area is covered by 18 large and 28 very large-scale projects.

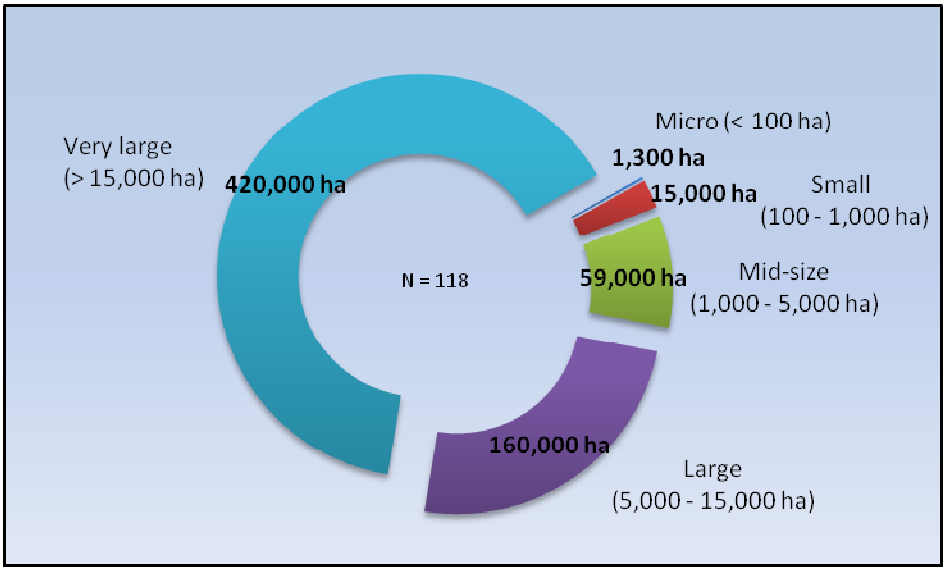

Figure 4: Total forest area by project size

Forest Characteristics

An often cited major concern with A/R projects is that carbon finance may encourage the planting of fast growing exotic monocultures that may harm ecosystem services, disrupt water flows, reduce biodiversity or negatively affect rural communities (Hamilton et al., 2010; Schuchard et al., 2007). Therefore, the survey required A/R project developers to define the tree species and forest types they plant.

- The survey found that 83% of all A/R projects seeking carbon finance will plant native or mixed forests that are likely to have positive environmental impacts.

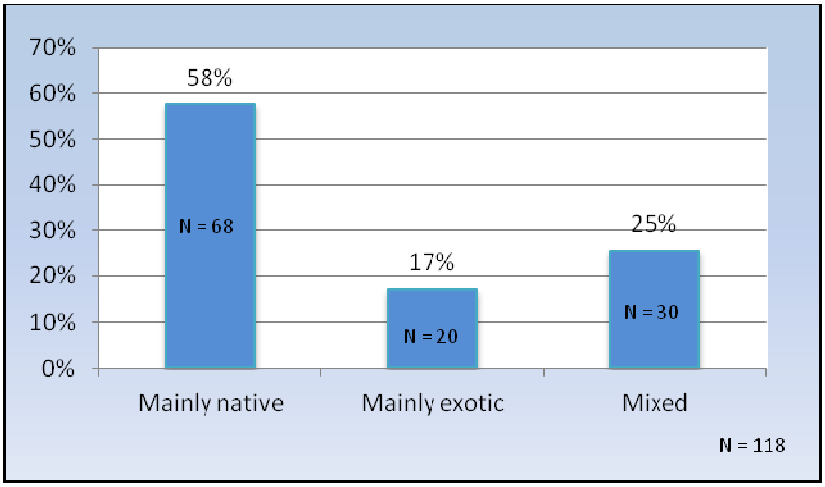

Figure 5: Forest types

Furthermore, the survey determined what kind of silvicultural management practices A/R projects apply, respective of forest type.

Therefore, the differentiation between *rotation forestry*, *selective harvesting*, and *conservation forests* was executed.

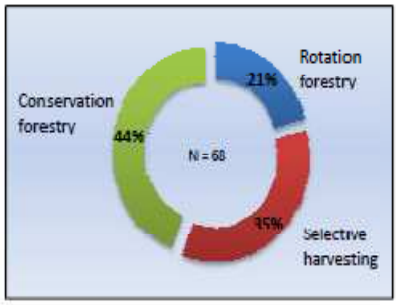

Figure 6: Mainly Native

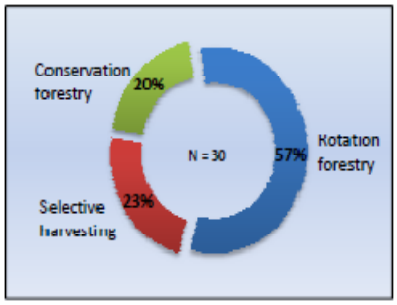

Figure 7: Mixed

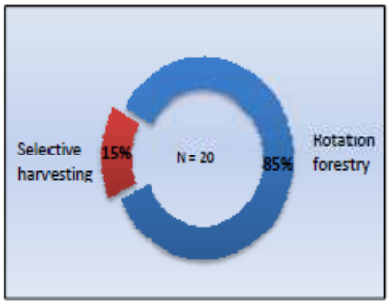

Figure 8: Mainly Exotic

Forest maturity

As forests normally grow over several decades, the GHG benefits from A/R projects also accumulate over this long period of time. The age of forests is also decisive for the provision of ecological services, as older forests serve not only as a large carbon sinks but also deliver more positive ecosystem services compared to young forests. The survey asked project developers to provide information on the time period of their forests' growth in order to determine the GHG benefits these will generate in the long-term.

- The average maturity age of all forests is 22.1 years. The average maturity age of the 68 A/R projects planting *native tree species* amounts at about 24.8 years, the 30 projects planting *mixed forests* reach maturity at an average of 19.3 years and the 20 *exotic forest* projects have an average maturity age of 16.8 years.

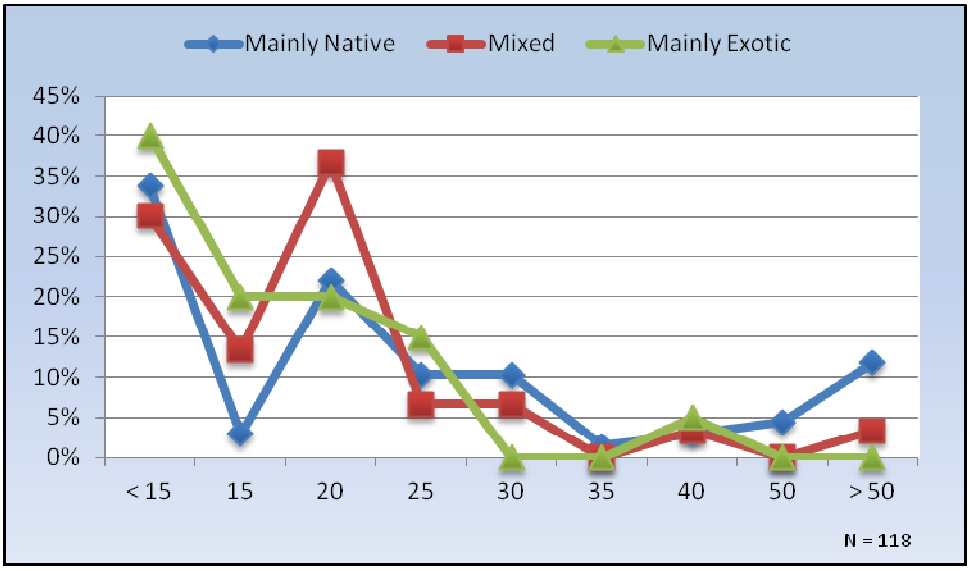

Figure 9: Forests' maturity lengths (in years)

Carbon Credits and Vintage

One major aim of the survey was to identify and calculate the long-term climate impacts of A/R projects and provide information about the vintage of carbon credits originating from the 118 surveyed.

In order to calculate the tonnes of carbon dioxide-equivalent (tCO_2-eq) that will be sequestered by projects, default values for annual net tCO_2-eq sequestration per hectare were determined for *native*, *mixed* and *exotic* species. These are based on the review of different A/R project design documents (PDDs) that are certified to different forest carbon standards. Therefore conservative default values were determined amounting to 8 tCO_2-eq/ha/yr for *native* forests, 12 tCO_2-eq/ha/yr for *mixed* and 16 tCO2/ha/yr[1] for *exotic* tree species.

As all projects will be most likely certified to at least one of the available forest carbon standards as a prerequisite for access to the carbon markets, most projects must withhold a certain amount of the issued credits in a buffer pool ranging between 10% and 60%. The buffer amount is dependent on the standard. This study assumes a fixed average buffer of 30% is deducted from the calculated carbon credits.

- Based on this calculation approach[2], annually about 2.8 million ex-post carbon credits can be expected from these projects.

- In sum, from all projects a total of 140 million ex-ante credits can be expected that will be converted to ex-post credits in a period of 50 years.

Generally speaking, A/R projects do not deliver carbon credits in the first 3 to 10 years of their lifetime, due to initial baseline and leakage emissions. Thus, the amount of ex-post credits to be delivered to the market should be expected to be lower in the upcoming years, as the market has just started to evolve.

[1] Note that according to the region, climate and soil the tCO_2-eq sequestration rate per ha/yr may differ significantly. The default values of 8, 12 and 16 tCO_2-eq/ha/yr for *native*, *mixed* and *exotic* forest types are conservative estimations based on the review of A/R PDDs.

[2] The calculation of carbon credits over a period of 60 years is based on the following equation:
[(Average age of forest type to get mature (<15 - >50 years) * (tCO_2 sequestration rate/ha/yr) * (Entire area occupied by the forest type (ha))] - (Buffer 30 %)

Financing

One specific characteristic of A/R projects is the long-term horizon of project lifetimes, whereby the bulk of the costs occur at the beginning of a project mainly due to planting activities and certification in the first years.

Revenues occur normally only when the forest matures. Therefore, A/R projects often are not attractive to investors due to lower internal rates of return (IRR), along with the variety of physical risks attached. Thus, in most cases upfront carbon finance is crucial in order to overcome such investment barriers of A/R projects (Chenost et al., 2010).

The forest carbon markets are not well standardised in terms of contractual set-up of carbon transactions, particularly in the OTC voluntary carbon market where transaction terms vary case-by-case. Thus, there are many different carbon payment arrangements between project developers and buyers of credits.

Based on the delivery timeframe and the contracts between buyers and carbon-credit owners, the differentiation between *ex-ante* ($VER_{futures}$), *ex-post forwards (VERs with a future vintage)* and *ex-post (VERs)* credits is made.

While $VER_{futures}$ credits are sold before the actual carbon has been sequestered and without a fixed vintage date, *VERs* credits have already achieved emission reductions in a certain year.

In case of *VERs with a future vintage*, transaction contracts are designed in a manner that set specific vintage years of credit delivery, normally 5 or 10 years forwards.

The difference between $VER_{futures}$ and *VERs with a vintage* might be seen as marginal, but speaking from a purely legal standpoint there are major impacts on the liability carried by a project developer, as illustrated in the following example.

In 2010, a project sold 5,000 *VERs with a vintage* of 2015:

Technically speaking, the 5,000 VERs are *ex-post forward* sales with a vintage in 2015. If the forest burns down and these credits are not generated until 2015, the project developer is legally liable to replace the *VERs* already sold, with other *VERs* of the same vintage. Practically, in most cases this is not realistic as project developers would have to buy *ex-post (VERs)* credits from other projects in order to fulfil their liabilities.

In the case where the project developer sold his 5,000 credits as $VER_{futures}$, these credits would still have a vintage in 2015. But the project developer would not be liable to replace the carbon credits in 2015 after forest burning with other *ex-post (VERs)* credits. Instead, the project developer would be liable for replanting the area so that the amount of carbon sold will be sequestered in the future - the vintage would adapt respectively.

With respect to the types of carbon credits, forest carbon standards have adopted different approaches to the issuance of carbon credits, as the following table shows:

Forest Carbon Standards	Ex-ante ($VER_{futures}$)	Ex-post forwards (VERs)	Ex-post (VERs)
A/R CDM	•	✓	✓
American Carbon Registry (ACR)	•	✓	✓
Climate, Community and Biodiversity Standards (CCBS)	•	•	•
CarbonFix Standard (CFS)	✓	✓	✓
Climate Action Reserve (CAR)	•	✓	✓
Plan Vivo Standards	✓	✓	✓
Voluntary Carbon Standard (VCS)	•	✓	✓

As the contractual payment set-up is often decisive for the economic feasibility of A/R projects, the survey asked what kind of financial arrangements project developers require for their projects.

- 44% of all project developers indicated that they require upfront financing for their projects, 13% do not require upfront financing for their projects, while 43% of respondents did not know or did not provide information about their financial requirements.

These results illustrate that there is currently no standardized method of contracting transactions for forestry credits. This is mainly due to transactions in the voluntary market occurring case-by-case and over-the-counter, and carbon credit exchanges, by contrast, always being associated with a project-specific contractual design that significantly raise overall transaction costs.

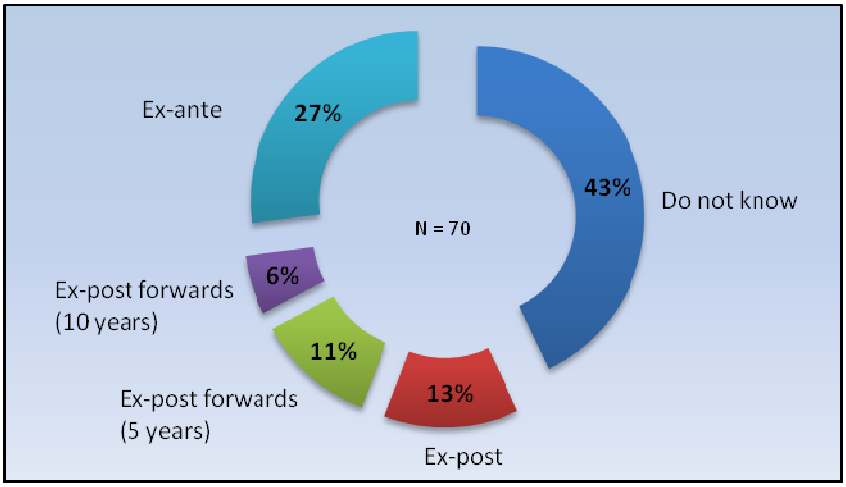

Figure 10: Financial requirements of project developers

Forest Carbon Standards

Forest carbon standards serve as 'quality assurers' for forest projects and carbon credits. They reduce information asymmetries over the quality of carbon credits that otherwise exist between project developers and buyers. Therefore, they facilitate efficient exchange through the reduction of transaction costs, the risks of moral hazard[3] and adverse selection[4]. Standards serve also as a minimum quality and credibility insurance mechanism on which buyers may base their decisions to purchase forest carbon credits (Merger, 2010). Project developers often have difficulty in selecting the appropriate certification standard, depending on various factors such as applicability to their activity, credit prices achievable under the standard, the level of co-benefits and costs of meeting the standard. Therefore, project developers were asked which features are most important to them in a forest carbon standard.

- The most important criteria for project developers in standard selection is the ability to sell the credits, followed by the practical application of standards.

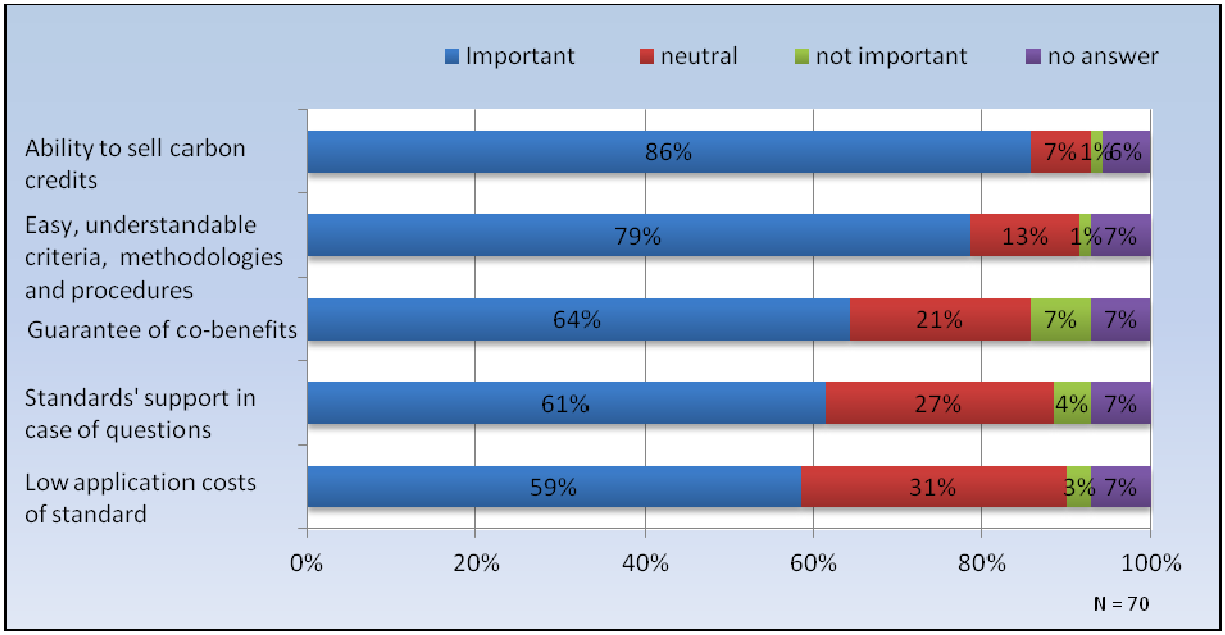

Figure 11: Project developers' demands on forest carbon standard

[3] The problem of moral hazard is associated with the risk that a party to a transaction has not entered into the contract in good faith, has provided misleading information and about its assets, liabilities or credit capacity or has the incentive to behave opportunistically.

[4] Sellers often do not know the preferences of buyers, whereas buyers are not sufficiently informed about the quality, durability and safety of products. This complicates a potential exchange between the buyer and seller and bears the risk to conduct exchanges leading to adverse selection.

Standards' Popularity

Since there are different forest carbon markets and an array of forest carbon standards existing within these carbon markets, project developers have to make careful decisions with respect to selection of appropriate standard(s). Therefore, project developers were asked to provide information on the standards they have used or intend to use for their projects. Multiple responses were allowed, as project developers often are not certain about the utilisation of standards.

- Although the A/R CDM is considered as too complex, bureaucratic and costly, 57% of project developers consider using this standard. This is probably due to the aspirations of project developers to generate carbon credits under a post-2012 compliance regime. However, the uncertainties of post-2012 lead project developers to also consider voluntary carbon accounting standards. Therefore, 41% of the participating project developers who considered the A/R CDM also selected other voluntary carbon accounting standards. This indicates the adoption of a dual strategy among project developers to access carbon finance from the voluntary carbon market and potentially a compliance market in future.

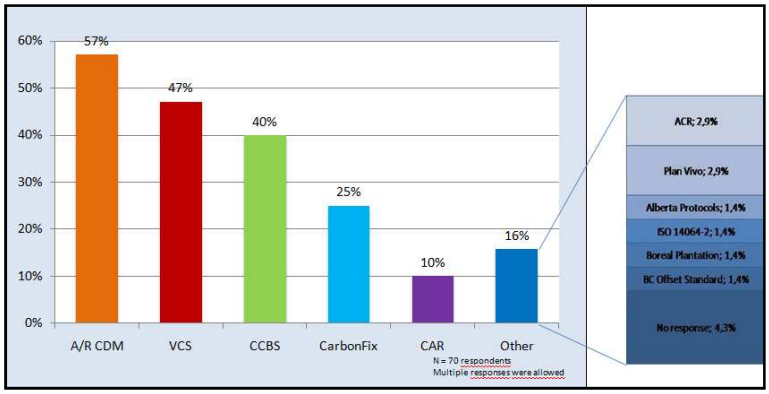

Figure 12: Popularity of standards

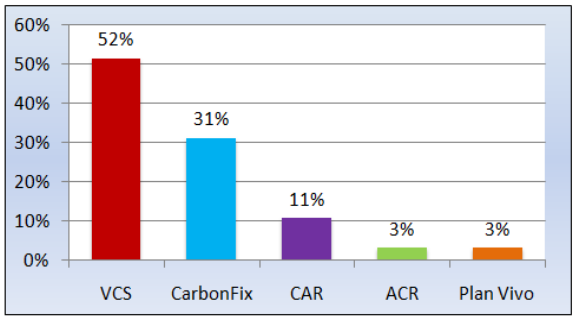

Figure 13: Popularity of voluntary carbon accounting standards

Considering the selection of carbon accounting standards[5] in the OTC voluntary carbon market, the survey showed the preferences of project developers as illustrated in figure 13. Thereby it was determined that the Voluntary Carbon Standard and the CarbonFix Standard are the most preferred carbon accounting standards for the OTC market.

[5] CCBS was excluded as the standard does not issue carbon credits.

Summary & Conclusions

The captured data from this survey indicates that the forest carbon sector has matured in the last 3 years. Significantly larger numbers of new A/R projects have been developed and implemented during the last 2 years. South America, Africa and Asia are the most favourable locations of A/R activities.

Credits | The total supply of A/R forest credits derived from the 118 projects will amount to about 140 million credits over the next 50 years. On a yearly base 2.8 million credits will be delivered, while in the first years of these projects very little ex-post credits are generated. Projects must firstly compensate for their baseline and leakage emissions to reach a positive net-sequestration rate.

Size | The captured data showed a wide distribution with respect to the size of A/R projects, ranging from micro (< 100ha) to very large projects (> 15,000ha), covering an area of 655,000ha in total, mainly by native and mixed tree species (83%). The average forest maturity age of all projects will be 22.1 years.

Standards | The numerous certification options for A/R projects are a challenge for project developers in selecting an appropriate forest carbon standard. Thereby, the certainty over the long-term efficacy of standards is decisive.

Moreover, the ability to sell the credits and practicability in applying the standards were the most important criteria for project developers in the selection of forest carbon standards.

Among all carbon accounting standards the A/R CDM was regarded as most popular. However, project developers considered voluntary carbon accounting standards as well. Among the voluntary carbon standards, VCS and the CarbonFix Standard are the most favoured choices in 2010.

To-Do | Due to the late initial delivery of ex-post credits and the large up-front costs to initiate and certify projects, innovative up-front financing mechanisms are necessary to provide sufficient assurance of delivery to the buyers. Thus, more standardised contractual arrangements for $VER_{futures}$ and *VERs with a vintage* should enhance the development of forest carbon projects.

Such types of credits provide project developers better financial security to develop high quality projects which ensure the long-term sequestration of carbon.

With the 118 A/R projects and further projects coming on-stream in the next years, expressed support from governments and large NGOs will be needed to reach market acceptance of forest carbon projects.

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