Study on global voluntary carbon market opportunities for New Zealand agriculture and forestry

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November 2008

A collaborative report produced by The Karo Group for The Ministry of Agriculture and Forestry

THE KARO GROUP LTD

THE KATOOMBA GROUP'S Ecosystem Marketplace

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 Executive Summary[1]

Market size

Despite rapid growth, the global voluntary carbon market remains a small fraction of the size of the regulated markets (about 2%), and only slightly larger than New Zealand's net annual emissions. It is however, experiencing a higher volume growth rate than regulated markets and is an important outlet for non-compliance demand.

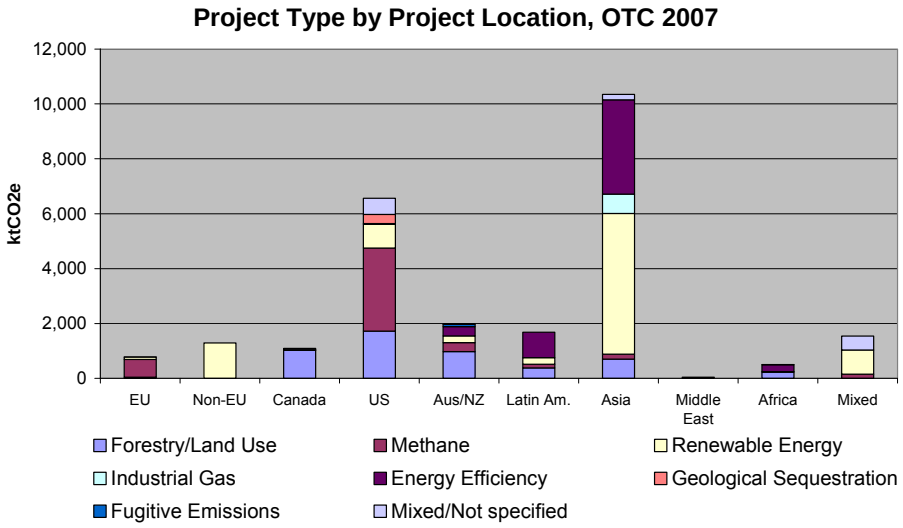
Ecosystem Marketplace, in partnership with New Carbon Finance, tracked 42.1 million tonnes of carbon dioxide equivalent ($MtCO_2$-e) transacted on the over-the-counter (OTC) market in 2007. This, together with 22.9 $MtCO_2$-e transacted on the Chicago Climate Exchange in the same year, equates to a total volume of 65.0 $MtCO_2$e transacted in the voluntary carbon market in 2007, representing about US$330 million in turnover.

Demand

Buyers are primarily located in Annex 1 countries. The analysis of the OTC market in 2007 indicated a clear trend; customers are getting more specific about the type of offset credits they want to purchase and, especially those in the US and Australia, prefer offsets from projects close to home.

Demand in 2007 came from non-governmental organisations (13% of credits transacted); governments (<1%); individuals (5% of credits on the OTC market); and the balance from companies. The latter's demand increasingly comes from offering carbon offsets to individual customers bundled with their goods as well as in offsetting their own inventory.

Figure 1: The global voluntary carbon market, 2007



[1] In much of the report the reader may be uncertain of the meaning of certain terms or acronyms. In such cases we suggest reference to the following web page: http://www.carbonpositive.net/viewarticle.aspx?articleID=44.

Local supply

Our examination of the emissions profile highlighted/demonstrated that the key to a large abatement market in New Zealand will be abatement projects targeted at New Zealand's largest Key Categories within its UNFCCC reporting:

- Maintaining or increasing carbon stock in forests (23.9% of the New Zealand Key Category total);
- Reducing methane from enteric fermentation (22.3%);
- Reducing nitrous oxide from animal excreta (about 10% including secondary effects).

These three emission categories represent 83% of the combined 'Agriculture' and 'Land Use, Land Use Change and Forestry' (LULUCF) sector emissions profile. However, all three have some challenges in the world voluntary carbon market.

No reports of projects related to enteric fermentation or nitrous oxide reduction from animal excreta have been received. Livestock projects tend to focus on manure management in animal waste management systems. In forestry, where only one Clean Development Mechanism (CDM) project has been registered, the proportion of credits traded in the voluntary market has actually dropped.

Based on size and likelihood of implementation, we examined several projects that could target a significant share of New Zealand's total emissions from a voluntary market perspective and used them as examples of possible New Zealand projects in a survey of the international voluntary carbon market. These projects if successful, would represent a significant proportion of that still growing market.

International market survey

The international market survey was conducted by Ecosystem Marketplace and involved a formal questionnaire for market participants and a dialogue with standards providers.

Together with the previous work that Ecosystem Marketplace have done, and a review of the regulatory and market framework, this international market survey has informed the findings of this report.

Price

Between 2006 and 2007, the average price of a credit sold on the OTC market rose from US\$4.10/tCO_2e to US\$6.10/tCO_2e. While this is a significant increase in its own right, the absolute values are much smaller than similar credits in the compliance market where CER prices ranged between US\$15 and \$25/tCO_2e.

There is also significant variation between types of units. The most expensive offset credits generally came from native and plantation reforestation or afforestation projects, where prices averaged $6.80 and $8.20 per tCO_2e, respectively. The lowest-priced credits tended to originate from industrial gas projects and geological sequestration: $3.70 and $2.50/$tCO_2e$ respectively.

Standards

Our review of standards available showed us that such an infrastructure is well developed in global carbon markets. In fact, there is already significant confusion around the numerous standards, and many traders are generally most interested in only a handful of standards to ensure increased fungibility in the marketplace. The value added by creating new standards should be carefully considered. Currently the Voluntary Carbon Standard AFOLU Guidelines and California Climate Action Registry Forestry Protocol are the most relevant guidelines.

In agriculture, emissions associated with livestock could present interest because, other than by manure methane destruction, this is an area that has not been fully understood and there are significant opportunities for new emission reduction methodologies.

Measurement methodologies

Many methodologies in the voluntary market are based on the Clean Development Mechanism and it is logical that these will conform to the UNFCCC accounting system.

The UNFCCC accounting and reporting system, which measures our national inventory, also provides measurement technologies that could be used in voluntary markets. The literature suggests that New Zealand is playing a leading role in defining the UNFCCC methodologies that measure those emissions that the country is most exposed to: methane from enteric fermentation; nitrous oxide from animal excreta; and carbon stock in forests.

Many of the baselines and project boundaries for the emission reduction projects listed in this study could be best established at a national or at a regional level across similar agro-ecosystems.

For those projects where benefits can be tracked to the project or enterprise level, emission reduction behaviour is unlikely to be optimised while project benefits are unable to be delivered to those that undertake that behaviour.

Double counting

Most buyers are located in Annex 1 countries, which are subject to UNFCCC reporting rules and to Kyoto accounting. Current standard provider rules do not allow emission reduction from projects in those countries from being registered under their standard except in certain circumstances. This double

counting issue will therefore present a significant challenge to creating a large market for New Zealand voluntary market emission reductions.

At this stage New Zealand projects cannot be certified under most voluntary market standards for any voluntary offset activity that falls under the Kyoto regulatory scope. Any units that are associated with activities that are accounted for in the national greenhouse gas inventory are ineligible for certification under most voluntary market standards.

Exceptions include those activities that lie outside of the UNFCCC accounting and reporting framework, or inside it but outside Kyoto Commitment Period 1 (CP1) obligations, such as post-1989 pre-CP1 forests and emission removals in pre 1990 forests, or Joint Implementation (JI) projects; projects with locally generated and locally retired emission reductions; or emission reductions that are accompanied by an attached Assigned Amount Unit (AAU), New Zealand Unit (NZU) or confirmation of a cancelled AAU or NZU.

This problematic issue has the biggest effect on the potential for development of the New Zealand voluntary market, and exists because relative to the compliance market, the price of Verified Emission Reductions (VERs), Voluntary Carbon Units (VCUs) and other voluntary credits are very low. When voluntary market prices are less than compliance market prices, it is unlikely a unit holder will choose to forgo income in the more lucrative compliance market to cancel or retire a compliance unit.

On the other hand, if there was price parity between the voluntary and compliance markets, then both emitter and abater will be indifferent about using a New Zealand Unit (NZU), AAU, or Emission Reduction Unit (ERU) to sell their emission reduction on the voluntary market.

Market environment

Our study of the voluntary carbon market has identified the way in which voluntary and compliance markets interact as being a key consideration for a voluntary market development strategy. There are several points in relation to this that we believe are relevant, as outlined below:

Voluntary markets operate on the basis that emissions reductions lead to revenue to those creating the abatement (we call these parties ‘abaters’). In contrast, compliance markets operate on the basis that emissions are capped and the scarcity of permits to pollute creates their value.

In an ETS regime there is a natural symmetry between an emitter’s reduction in costs and an increase in revenue to abaters, provided the free allocation of capped units is ascribed directly to emitters.

In such a circumstance, an abatement market will exist through the sale of surplus compliance units, effectively providing the same benefits as those that a voluntary market could deliver.

It is therefore hard to recommend effort be spent on developing a voluntary market other than:

- Facilitating projects outside of the Kyoto framework;
- Ensuring costs and benefits are directly ascribed to emitters and abaters in the compliance market.

The sale of compliance units from the New Zealand ETS into the voluntary carbon market is another opportunity for market development.

Project methodologies

For those projects that are relevant to a voluntary market, we believe new project methodologies will be necessary, particularly for agricultural projects. These are likely to be similar as those that will be determined by MAF in the compliance market. In the case of the former, project developers seek revenue and in the latter emitters seek cost reductions. The processes used to determine outcomes will be similar but the outcomes may differ.

The government could work with project developers to develop CDM methodologies that would be eligible under the Voluntary Carbon Standard or Joint Implementation. These could be registered under the Voluntary Carbon Standard and potentially under the Clean Development Mechanism, putting New Zealand projects in an improved position to sell credits to the voluntary carbon markets or under Joint Implementation, were price parity to come about.

Targeting agricultural project reductions through the free allocation

In the New Zealand compliance market, and more specifically the agricultural sector, another key consideration is the way in which the free allocation may affect the general conclusion that abatement revenue equals emitters' cost reduction. There are several circumstances where the general symmetry between cost reduction and abatement revenue may not apply. The circumstances include;

- Where points of obligation do not coincide with abatement behaviour;
- Where penalty reductions are not the same as abatement revenue;
- Prior to the introduction of the ETS.

These circumstances may represent opportunities to use the voluntary market to achieve reductions, even in the presence of an ETS, and the New Zealand Government should be indifferent or better off (provided it manages its inventory risk well). Perhaps the most significant factor is that emitters will begin to adopt reduction behaviours as they will be introduced to a carbon regime that brings benefits not just costs.

The use of the voluntary market could occur through the free allocation. At the time the allocation plan is put together, the Minister could invite tenders for a portion of the free allocation that is distributed to those parties creating emission reductions. Importantly, this process can operate alongside the development of Points of Obligation.

A project in a voluntary market has a natural symmetry with a Point of Obligation. The Points of Obligation post 2012 will need to comply with methodologies stipulated under the ETS to prove reductions in order for the entities using their mitigation technology to be able to qualify for a reduced liability under the ETS.

A project mechanism could occur by allowing a project developer to make the case that their project will reduce New Zealand's Kyoto obligations. If successful, their voluntary market unit would include either the cancelling of an AAU or the conversion of an AAU to an ERU under the JI Track 1, or the issue or cancellation of an NZU.

These would not represent a free allocation because they would be accompanied by a proven reduction and in fact we recommend any such allocation be made from the existing free allocation.

Inventory risk

Wherever the Point of Obligation lies, the methodologies acceptable for allocation should be judged on the likelihood of that emission reduction occurring and that reduction being recognised in New Zealand's inventory.

There is a risk involved if AAUs are cancelled by New Zealand but the reduction is not recognised in New Zealand's Kyoto accounting obligations. This may be due to a timing difference between when methodologies are recognised or a permanent difference due to non-recognition of methodologies.

As a counter to this risk, it seems clear from the literature that New Zealand is a leader in the development of measurement mechanisms in the areas covered by this report. Provided those advances can be recognised in New Zealand's Kyoto accounting, inventory risk should be minimal for the New Zealand Government.

An important point to note is that MAF is in the best position to manage this risk, and would be well placed to do so by defining the voluntary market methodologies they would recommend be accepted before issuing, cancelling, or converting a compliance unit. This creates the opportunity for MAF to also work with standard providers in defining those methodologies.

Symmetry exists between voluntary markets and compliance markets

A projects-type market can operate alongside a compliance market and in fact, the convergence of voluntary and compliance markets is already occurring through the methodologies used. The convergence is likely to become most noticeable in the United Kingdom where the DEFRA Code of Conduct means that projects-based CDM methodologies will set the standard for the voluntary markets.

The extent to which convergence will occur in CP2 and beyond will be subject to political will, technological development, the allocation of permits, and the propensity to take up mitigating technology under either a revenue or cost-reduction basis.

The important point we make here is that a projects-based mechanism can be a valuable tool for development of both compliance and voluntary markets, and offers wider solutions than those from a permits market alone.

Additionality

The market co-habitation between a projects-type regime and a permit regime can occur more easily if we are relieved of the idea of additionality. In a Kyoto environment, additionality is not of necessity. Kyoto is largely about permits and national entities are only concerned with absolute quantities. The AAU is a permit and as such, there is no need for additionality in a permit regime, only allowance.

The transformation of a compliance unit through cancelling, converting, or attaching it to a voluntary market unit should leave the New Zealand Government, at worst, in a neutral position in any voluntary market trade it endorsed through this cashless transformation, provided the reductions are real and verifiable and most importantly, have a high probability of translating into reductions in the Kyoto inventory.

Summary of actions

In the table below we have summarised our thoughts about the suite of possible actions that the New Zealand Government could take and show a ranking of recommended actions. While the strategy includes many different possible interventions, there are some that we believe could develop voluntary markets in the New Zealand agricultural and forestry sector faster than others.

These are listed in the table below and explained in the balance of this report.

Table 1: Weightings of possible actions MAF could take to develop New Zealand agricultural and forestry voluntary carbon markets

Action	Rank
Improve certainty in the market environment - Ensuring costs and benefits are directly ascribed to emitters and abaters in the compliance market through resolution of the Points of Obligation mechanisms, sooner rather than later.	**1**
Create investment price signals on emissions- Ensuring costs and benefits are directly ascribed to emitters and abaters in the compliance market through the early definition of acceptable methodologies that will enable farmers to make investment decisions based on anticipated future outcomes.	**2**
Link registries – New Zealand already boasts two such registries where linkages would make voluntary market users more able to track attached compliance units.	**3**
Make the ETS compliance regime available – This will be particularly relevant for post 1989, pre CP1 foresters.	**4=**
Work with existing standard providers to develop methodologies that are appropriate to New Zealand - The government could work with project developers to develop CDM methodologies which would then be eligible under the Voluntary Carbon Standard or Joint Implementation in the event of price parity.	**4=**
Promote New Zealand reduction units to local buyers - Given the conclusion that double counting does not occur where projects and retirement are in the same Kyoto country, it would be beneficial for the New Zealand Government to promote the local market.	**6**
Create rewards for removals through the conversion of an AAU to an ERU under the JI Track 1 – Our preference, should a projects-type mechanism be used. Provides great flexibility within the JI framework.	**7=**
Create rewards for removals through the cancelling of an AAU – Similar to the above, should a projects-type mechanism be used.	**7=**
Create rewards for removals through the issue of a CP1 NZU – Least preferred for a projects-type mechanism.	**9**
Promote participation through education – This will help reduce search costs and improve the operation of the market.	**10**
Promote New` Zealand standards – Overall we believe there is limited appetite for more complexity in the voluntary market.	**11**
Create price signals in input goods – Making price signals as transparent as possible will foster improved decision-making.	**12**

2 Introduction

This report outlines research work undertaken as part of the New Zealand Ministry of Agriculture and Forestry's (MAF) Sustainable Land Management and Climate Change Plan of Action.

This report is a collaboration between The Karo Group Limited, a private New Zealand carbon practice, and Ecosystem Marketplace, a project of Forest Trends based in Washington DC. Ecosystem Marketplace produces the annual State of the Voluntary Carbon Markets report.

Commentary has also been provided by Peter Lough and James Wallace-Stevenson from the Ministry of Agriculture and Forestry and some of that may appear as text in this document.

The focus of our research work is "*Carbon markets - Identification and analysis of voluntary carbon market opportunities for agriculture and forestry sectors in New Zealand given current rules and New Zealand's policy settings and implications for these opportunities under future scenarios*".

Our research effort and resources are allocated around three key research activities: creating an inventory of opportunities (approx 40%); assessing those opportunities in a global market context (approx 40%); and suggesting ways in which MAF may best guide these opportunities (approx 20%). These activities are outlined below.

2.1 Objective 1 New Zealand land-based voluntary carbon market products

We have outlined the size and location of voluntary carbon market opportunities around the world and the practices associated with them. This work involved the creation of an approximate carbon value chain inventory to determine what products are possible and their size and significance. We have used the Kyoto framework provided by the UNFCCC to assess greenhouse gas (GHG) value chains.

In our language we refer to a *product* as a voluntary carbon instrument, regardless of which programme or standard it came from. In the voluntary carbon offset markets the majority of credits originate from specific emission reduction projects.

It is also helpful to describe a standard and a programme. A standard is a term of *assurance* whereas a programme is a *market infrastructure* capable of delivering that standard within a project environment. In most of the cases we have examined these two concepts are combined.

As part of a standard or programme, one can find *protocols or methodologies* that define the project standard for particular emitting-activities. We have created a matrix of standards and protocols used in international voluntary carbon markets.

With our inventory we have mapped these voluntary carbon market standards to New Zealand land-based systems to identify the currently product range, its size and significance, and assess the potential for development of projects and methodologies that might apply specifically to New Zealand agricultural and forestry systems.

We have used a possible forestry standard currently being considered by representatives of the New Zealand forestry industry to assess its potential designs and its market acceptability/demand.

We have commented on additionality, permanence and measurement, and how the use of voluntary market standards might be applied in the New Zealand agricultural and forestry sector. There are several other administrative issues that we have highlighted including leakage and ways to avoid double counting.

Double counting is an area of some importance as the current practice amongst standards providers makes the creation and sale of any New Zealand voluntary products on the international market virtually impossible to achieve. That is not to say that a domestic projects mechanism can not be a useful policy tool for these sectors but that discussion is reserved for Objective 3.

Part of this discussion is the interaction between voluntary and compliance markets and this will be most easily seen in the way units generated from post-1989 forests under the New Zealand Emission Trading Scheme (ETS) may be accepted into voluntary carbon markets. Throughout the report we have assumed that the ETS legislation, as drafted on June 16th, will be passed into law.

Finally, we have provided an updated summary of the potential costs to project developers of meeting the various standards – a factor said to vary widely between standards and which is one of the many potential factors affecting the final price of offsets.

2.2 Objective 2 The global market for units generated from New Zealand land-based emission reductions/ removal activities

In this objective we have drawn from earlier unpublished work of Ecosystem Marketplace to estimate the current market for New Zealand and Australian land-based voluntary products. This analysis uses the analytical frameworks developed by Ecosystem Marketplace in their annual survey of suppliers in the voluntary carbon market.

This market research includes descriptions of product types and project types, their affect on pricing, and sources and reasons for demand. It describes current market practices and the way in which the value chain is constructed.

We have used this information, and the information gathered from the inventory of opportunities in Objective 1, to undertake what will be a first for New Zealand by polling market participants on their intentions and perceptions with specific emphasis on New Zealand products than can be sold in voluntary carbon markets.

Our survey enquired of selected participants (who were also polled in producing the State of the Voluntary Carbon Markets 2008 report) about New Zealand-based products. Perceptions amongst buyers of agricultural and forestry based products and also New Zealand products were obtained.

We have described the way in which the survey was conducted and the supporting information that accompanied it.

2.3 Objective 3 Identifying the core issues that would encourage participation of New Zealand land-based carbon emission reduction products in global markets

We have used the work from the first two Objectives to assess and advise on the potential market for New Zealand land-based voluntary carbon products and the primary issues that that will affect its realisation.

Part of this assessment involved consideration of establishing appropriate New Zealand standard methodologies, and/or improves overseas methodologies, and/or incorporates new methodologies.

In particular our attention was attracted to the issue of double counting, which on the face of it, could prevent trade from developing in a New Zealand voluntary market. Opportunities within and around this constraint are discussed.

Our analysis focused on those processes and interventions available to MAF to encourage active participation by New Zealand agriculture and forestry businesses in global voluntary carbon markets.

Analysis has been undertaken on the policy environment with regard to the transformation of AAUs by the New Zealand Government in response to projects specifically aimed at emission reductions/removal activities in voluntary carbon markets.

Compliance and voluntary market interfaces have been discussed and how compliance systems could be used to facilitate voluntary markets has been examined. A range of possible interventions by MAF have been suggested.

We have considered our conclusions against three future carbon market scenarios that are based on the existence of an international trading framework and of cap instruments within that framework.

Our assessment has also included commenting on the risks involved in the market development strategy.

In much of the report the reader may be uncertain of the meaning of certain terms or acronyms. In such cases we suggest reference to the following web page: http://www.carbonpositive.net/viewarticle.aspx?articleID=44.

3 OBJECTIVE 1: Establish an inventory of voluntary carbon market business opportunities

3.1 Global voluntary carbon markets[2]

3.1.1 Overview

Voluntary carbon markets exist to allow private organisations, individuals, or products, to offset their emissions. As the name implies, the voluntary carbon markets include all carbon offset trades that are not required by regulation. While the voluntary carbon markets may not be as large or profitable as their regulated brethren, they have proven themselves to be innovative, nimble and controversial. They represent consumer demand for action on climate change and have the potential to be an immediate resource as the international community struggles to implement a fully effective climate change framework.

It is worth noting that in some cases the voluntary carbon markets are even setting the stage for future developments in the regulated markets. For example, voluntary markets have been transacting deals in avoided deforestation since before 1990, while the Kyoto carbon markets are just now beginning to consider how they may eventually deal with the issue of avoided deforestation.

At the broadest level, the voluntary carbon markets themselves can be divided into two main segments: the voluntary, membership-based cap-and-trade system that is the Chicago Climate Exchange (CCX), and the broader, non-binding, over-the-counter (OTC) offset market.

CCX is a structured and closely monitored cap-and-trade system that organisations join voluntarily. Outside of CCX, one finds a wide range of voluntary transactions that are not driven by an emissions cap, and do not, for the most part, trade on a formal exchange.

Throughout the report we refer to transactions outside of CCX as the over-the-counter (OTC) market. Because this OTC market transacts on a highly fragmented deal-by-deal basis, it is extremely difficult for stakeholders to both track and navigate. One of the most complete studies on the OTC market is Ecosystem Marketplace's annual State of the Voluntary Carbon Markets report, Forging a Frontier: State of the Voluntary Carbon Markets 2008, which was produced in partnership with New Carbon Finance.

3.1.2 The Chicago Climate Exchange

The CCX is a structured and closely monitored cap-and-trade system that organisations join voluntarily. Its unit of trade is the Carbon Financial Instrument (CFI), which represents 100 million tonnes of carbon dioxide

[2] Parts of this section are pulled from Ecosystem Marketplace's State of the Voluntary Carbon Markets 2008.

equivalent (tCO_2e). CFIs can be either allowance-based credits, issued by emitting members in accordance with their emission baselines and the exchange's reduction goals, or offset credits generated from qualifying emissions reduction projects. Offset based credits can only be used to offset 4.5% of members' total emissions to meet the required cap reductions, so the vast majority of credits traded on the CCX are allowance-based.

All projects must be verified by a CCX-approved entity and then undergo a review of the verification report by Financial Industry Regulatory Authority (FINRA), a non-governmental organisation that regulates securities firms doing business in the United States.

Only a certain percentage of the credits exchanged on the CCX are project-based credits. The CCX does not separate out the number of project-based credits from allowance-based credits exchanged and the CCX has not been able to provide insight into the numbers behind the transactions. It was therefore impossible for Ecosystem Marketplace in its report, *Forging a Frontier: State of the Voluntary Carbon Markets 2008* (hereafter referred to as the report) to determine the volumes of offset based credits actually *sold* on the CCX. However, we do know that 25 MtCO2e of offset credits were *issued and registered* by the CCX before December 2007.

While all CCX credits are transacted voluntarily, the exchange briefly had links to the regulated markets. In 2006, for instance, at least 1,000 European Union Allowances (EUAs) were transferred into the CCX by a multi-national member (only one transaction of this kind has been publicly disclosed). However, at the end of 2006, EUA prices for 2007 contracts plummeted, and this link between the two markets was suspended in 2007. In addition to EUAs, CCX members can also use CERs for compliance. However, given that secondary CER prices are currently trading at much higher prices than CFIs on the CCX, this option has not been exercised.

The CCX has continued to see its volume increase rapidly, but because of the explosion in OTC volume, its overall market share dropped from 40% of the total voluntary carbon markets volume in 2006 to 35% in 2007.

3.1.3 The Over-The-Counter Market

Outside of the CCX, one finds the wide range of voluntary transactions that make up a voluntary market not driven by any sort of emissions cap. Because this market is not part of a cap-and-trade system where emission allowances can be traded, almost all carbon offsets purchased in this voluntary market originate from project-based transactions. Because it does not operate via a formal exchange, Ecosystem Marketplace has labelled it as the voluntary Over-the-Counter (OTC) market. This OTC market is also often referred to as the voluntary offset market. However, it is important to note that offset credits also exist on the CCX.

Credits sourced specifically for the OTC market are often generically referred to as Verified (or Voluntary, depending on the source) Emission Reductions

(VERs), or simply as carbon offsets. However, OTC voluntary buyers may also purchase credits from the compliance markets or the CCX. Because the OTC market demand is not driven by a cap, especially in the retail market, the demand curve for offset purchases has as much in common with the markets for Fair Trade or organic cotton as it does with the regulated carbon markets. Buyer motivations include wanting to manage their climate change impacts; an interest in innovative philanthropy; public relations; the need to prepare for (or deter) upcoming regulation; and/ or plans to resell credits at a profit.

3.2 Size and location of voluntary carbon market opportunities around the world

3.2.1 Voluntary Carbon Markets Growth, Size, and Prices

In the report, Ecosystem Marketplace, in partnership with New Carbon Finance, tracked 42.1 million tonnes of carbon dioxide equivalent ($MtCO_2$-e) transacted on the OTC market in 2007. Combined with the 22.9 $MtCO_2$-e transacted on the CCX in 2007, they were able to confirm a total volume of 65.0 $MtCO_2$e transacted in the voluntary carbon market in 2007.

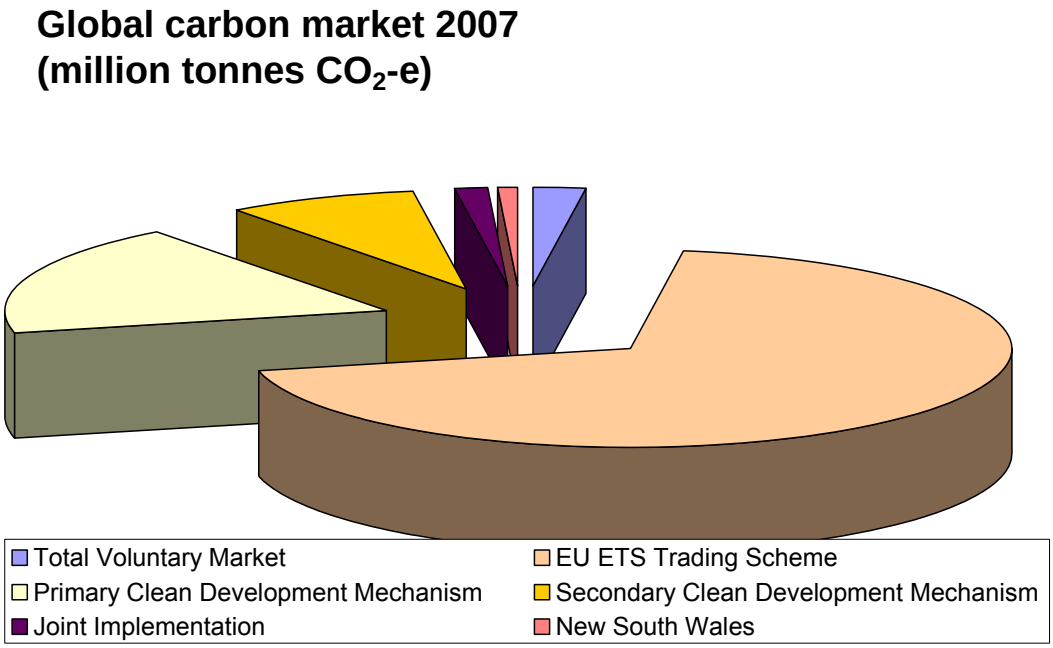
Relative to the volumes observed in 2006, this represents a tripling of transactions on the OTC market (from the 14.3 $MtCO_2$e traded in 2006), and more than doubling of volumes on the CCX. Because this report is entirely based on completed and confirmed transactions, these volumes should be considered conservative. In actuality, the volume of credits transacted in the voluntary markets is without a doubt higher than these amounts.

Table 2: Transaction Volumes and Values 2006 and 2007

Markets	Volume ($MtCO_2$e)		Value (US$ million)	
	2006	2007	2006	2007
Voluntary OTC Market	14.3	42.1	58.5	258.4
CCX	10.3	22.9	38.3	72.4
Total Voluntary Markets	24.6	65.0	96.7	330.8
EU ETS	1,044	2,061	24,436	50,097
Primary CDM	537	551	5,804	7,426
Secondary CDM	25	240	445	5,451
Joint Implementation	16	41	141	499
New South Wales	20	25	225	224
Total Regulated	1,642	2,918	31,051	63,697
Total Global Market	1,667	2,983	31,148	64,028

Source: Ecosystem Marketplace, New Carbon Finance, World Bank

Figure 2: The global voluntary carbon market in perspective



The figure above illustrates that the voluntary market is only a small part (about 2%), of global volume turnover which according to the World Bank [3] was 2,918 $MtCO_2e$ in 2007. Nevertheless, it is an important market as an outlet for demand in the absence of regulated compliance regimes, such as occurs in much of the United States.

Between 2006 and 2007, the average price of a credit sold on the OTC market rose from US$4.10/$tCO_2e$ to US$6.10/$tCO_2e$. (Note: All monetary figures in this analysis are expressed in US dollars unless otherwise stated.) According to the price and volume data collected in the survey, Ecosystem Marketplace estimated the international OTC market to be worth $258 million in 2007.

Together with the CCX, which was valued at $72.4 million, the global voluntary markets were worth a total of $331 million in 2007. This value is approximately 240% greater than their 2006 market value ($97 million, revised upwards from $91 million as a result of data received this year), and represents more than a tripling of the market size from 2006 to 2007.

Across the market, the lowest price Ecosystem Marketplace found was $1.8/$tCO_2e$ and the highest about $300/$tCO_2e$. This high price, which was charged for Gold Standard-certified Te Apiti wind farm credits transacted on the New Zealand-based marketplace TradeMe, is an anomaly in the marketplace.

The most expensive offset credits generally came from native and plantation reforestation/afforestation projects, where prices averaged $6.80 and $8.20 per tCO_2e, respectively. This is not surprising given that these projects are

[3] http://carbonfinance.org/docs/Carbon_Trends_2007-_FINAL_-_May_2.pdf

often relatively expensive to develop. Renewable energy credits, or RECs, also tended to garner a higher price, $8.70/tCO$_2$e. This is likely because RECs are most often transacted at the retail level in units of tCO$_2$e, whereas when they are sold in the REC market in terms of kWh, they are generally sold at lower prices.

The lowest-priced credits tended to originate from industrial gas projects and geological sequestration: $3.70 and $2.50/tCO$_2$e respectively. This is not surprising, for a number of reasons. Due to the high global warming potential of industrial gases, they are a highly cost-effective means of generating credits. Likewise, geological sequestration is a high volume, low-cost means of creating carbon credits for the voluntary carbon markets. (Note: Geological sequestration is not a project type under the CDM). Pricing is influenced both by the cost of generating a credit and willingness to pay for a credit.

In 2007, on average, the highest-priced credits originated in Africa. This is likely due to the high transaction costs still associated with implementing projects in this region of the world. After Africa, the second highest average prices recorded came from credits generated by projects in Australia/New Zealand, Latin America and the Middle East.

In last year's survey, credits originating in the European Union were about 32% more expensive than those originating in Australia, for example. However, results from Ecosystem Marketplace's 2008 survey showed that credits from projects in the EU and US were the least expensive of any region in 2007– a major shift from 2006.

On average, EU credits were only slightly more expensive than US credits, despite the dollar's decline in value. This conflicts with the common assumption that it is less expensive to generate credits in developing countries, but may indicate that projects undertaken in developing countries obtain a premium value.

3.2.2 Voluntary OTC Market Project Types, Locations

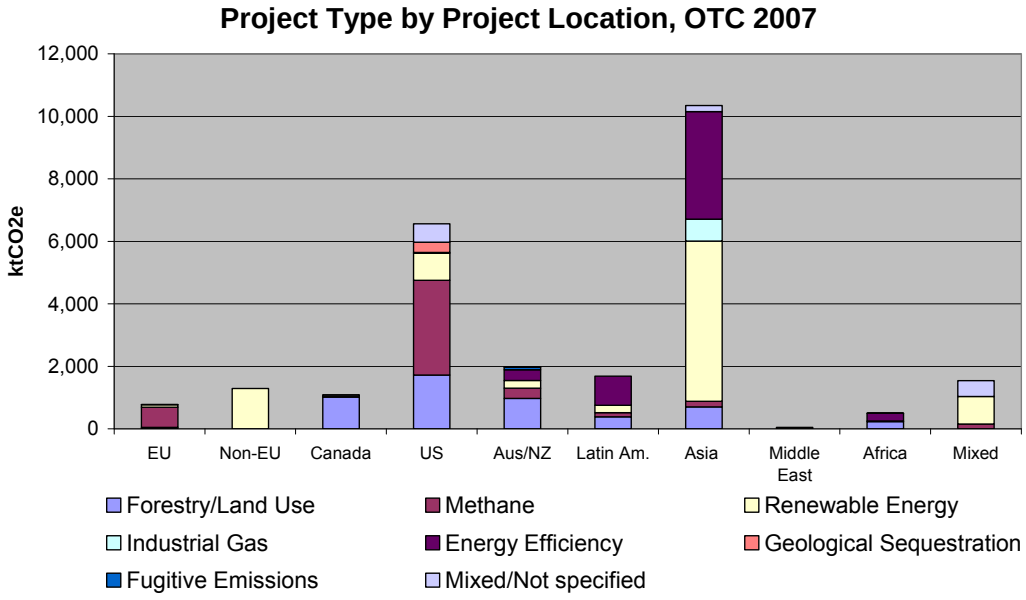
The sources of offset credits in the voluntary markets are extremely diverse, with numerous project types holding important slices of market share. The figure below shows the share of different project types selling credits into the OTC market in 2006 and 2007. In the 2007 OTC market, renewable energy (31%), energy efficiency (18%), methane destruction (16%), and forestry projects (15%) were the most dominant project types in 2007. This is somewhat different than 2006 when the top three project types were forestry (37%), renewable energy (32%), and industrial gas projects (20%).

Generally, OTC market consumers are orienting to less-controversial and charismatic project types that have public appeal. However, not all OTC market consumers are driven by these motivations. Some companies (representing 29% of the volume supplied in 2007), particularly those in the United States, are also investing in carbon offsets with the hope of potentially selling them for compliance purposes.

In 2007 there was a major shift in the primary location of project activity in the OTC market. The number of credits originating in Asia, Europe (including Russia) as well as New Zealand and Australia increased. North America and Latin America maintained the number of credits sold and the number of credits coming out of Africa actually decreased. Asia's share of projects has increased to 39%, up from 22% in 2006, Europe's has risen to 13% from just under 6% in 2006, and Australia has increased from 3% to 7%.

Meanwhile, while producing the same number of credits, North America's share has fallen from 43% to 27% and Latin America's from 20% to 7%. In some cases, this shift reflects a move in 2007 to originate VERs from projects waiting to be approved under the Clean Development Mechanism (CDM), but which have already begun operations and are generating emission reductions. As most CDM project activity is based in Asia, in particular China and India, the pre-CDM VER origination route has followed this pattern.

Figure 3: Voluntary carbon market breakdown, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance.

In summary, despite rapid growth, the global voluntary carbon market is only a fraction of the size of the regulated markets (about 2%), and is only slightly larger than New Zealand's net annual emissions. That said, the voluntary markets did experience a higher (volume) growth rate of 165% compared to 71% in the regulated markets.

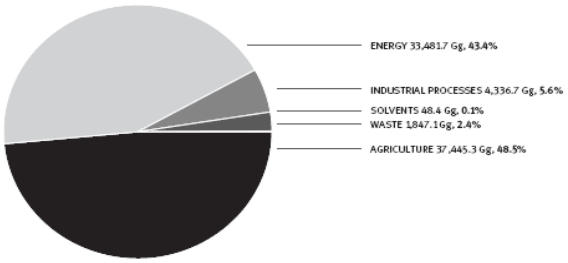
The market is an important outlet for non-compliance demand and is also a possible test-market for the introduction of new offset methodologies or protocols associated with New Zealand's unique emission profile. We examine this in the next section before considering what current methodologies may be appropriate for that profile, and where further work may be necessary.

3.3 Approximate carbon value chain inventories for New Zealand agriculture and forestry

3.3.1 New Zealand's Emissions Profile

Because New Zealand is a land-based economy its greenhouse gas emission profile is quite different to most other Kyoto signatories.

Figure 4: New Zealand's emission profile



Agriculture, particularly methane emissions from livestock, represents over half of all emissions. Because about 65% of electricity generation is from renewable sources of energy this sector represents less than 20% of total emissions. Likewise, emissions from industrial processes (from only about 200 facilities) produce only about 5%. Transport is the second largest source of emissions, due to New Zealand's large land area and sparse population, and accounts for about 30%. [4]

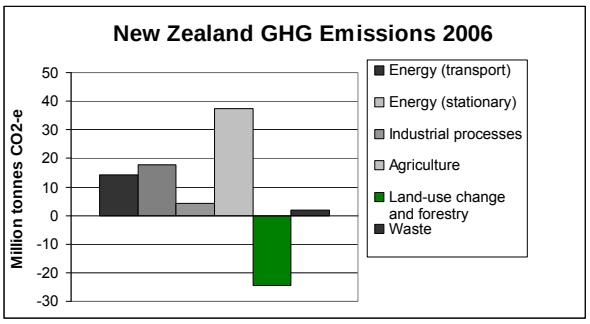
These emissions are partially offset by forestry plantings, predominantly of radiata pine which grows very well in New Zealand. About 682,000 hectares of forestry has been planted since 1990. These forests are predicted to sequester between 64.2 and 107.3 Mt CO2e over the first commitment period, with a 'most likely' estimate of 84.1 Mt CO2e.

Table 3: Sectoral emissions of greenhouse gases in 2006

Sector	M t CO2-e
Energy	34.07
Industrial processes	4.23
Solvent and other products	0.04
Agriculture	37.67
Land-use, land-use change and forestry (incl. all forests)	-22.75
Waste	1.86
Nett	55.12

Source: New Zealand National Inventory Report

Figure 5: Sectoral emissions



New Zealand has 309.5 million Kyoto Assigned Amount Units over the first Commitment Period. Estimates from earlier this year were that New Zealand faces a Kyoto deficit of approximately 22 Mt CO_2-e during this period. [5]

[4] A detailed description of the New Zealand's GHG Kyoto inventory can be found at: http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-overview-apr08/html/index.html

[5] http://www.mfe.govt.nz/publications/climate/net-position-report-projected-balance-emissions-may08/index.html

These sectoral numbers do not represent the entire agricultural and forestry value chains. In particular they do not include 'farm to processing to transport to foreign markets' and so understate the role of these sectors in carbon emissions.

Dairy processing, timber milling and pulp and paper are energy intensive and these emissions are counted under 'energy'. This study is concerned primarily with the 'on-farm' and 'in-forest' activities of the sector. There is already a substantial body of research available and accepted by the market on projects and methodologies that directly relate to energy usage in downstream processing and sale of agricultural/forestry products.

This research focuses more particularly on the market for output from projects related to the 'Agriculture' and 'LULUCF' components of the UNFCCC national inventory. The table below shows the nature of these emissions by these UNFCCC sub-categories.

Table 4: UNFCCC emissions accounting and reporting framework

	CH_4	**N_2O**	**CO_2**
Agriculture			
Enteric fermentation	The fermentation of pasture plants in the rumen of ruminant livestock.		
Manure management	Occurs when manure decomposes in the absence of oxygen, and methanogenic bacteria producing CH4. Includes all Animal Waste Management System (AWMS) categories.	Derives from the nitrogen content of feed being excreted. Includes AWMS categories "Anaerobic lagoon", "Solid storage", "Drylot", and "Other".	
Agricultural soils			
Direct N_2O		Adding nitrogen in the form of synthetic fertilisers, animal waste, biological fixation in crops, inputs from crop residues and sewage sludge.	
Indirect N_2O		From nitrogen lost from the field as NO_3, NH_3 or NOx.	
Direct N_2O		Derives from nitrogen content of feed being excreted. AWMS category is "Pasture, Range and Paddock Manure".	
Note that "Rice cultivation", and "Prescribed Burning of Savannah" and "Field Burning of Agricultural Residues" are considered not to be material to this study.			
LULUCF			
Forest land			Uptake from plant photosynthesis and release from respiration, and the decomposition of organic material derived from woody vegetation.

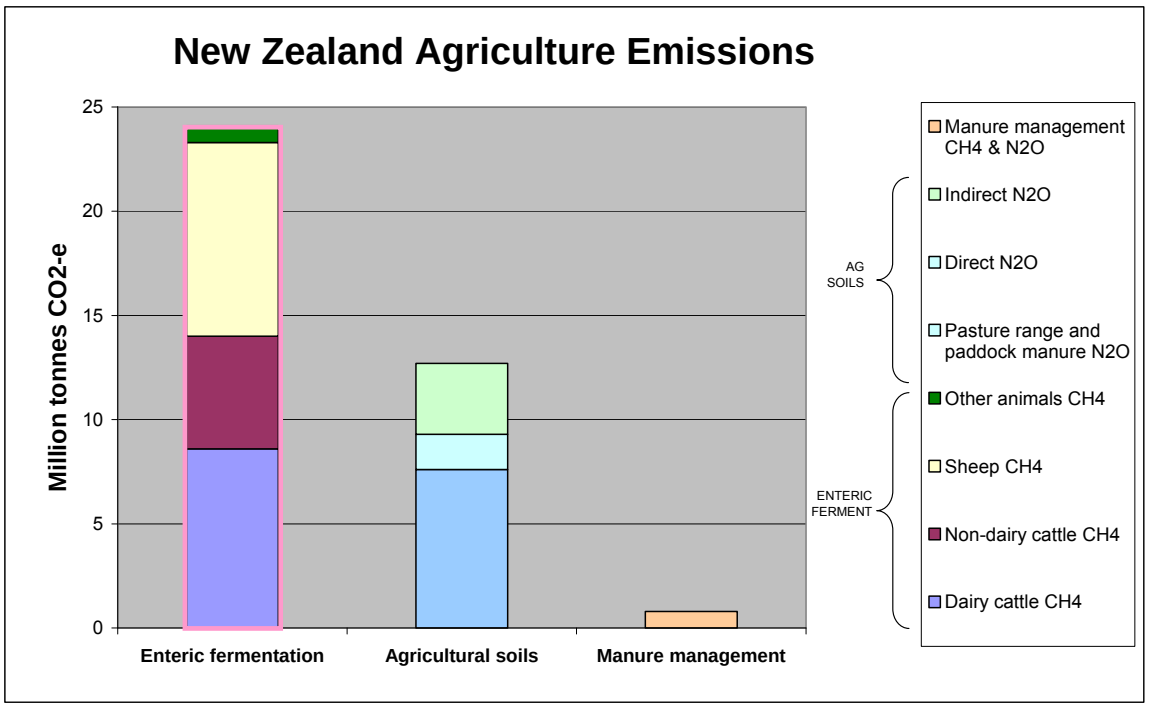
Cropland			Uptake from plant photosynthesis and release from respiration, and the decomposition of organic material derived from arable and tillage land, and agro-forestry systems.
Grassland			Uptake from plant photosynthesis and release from respiration, and the decomposition of organic material derived from rangelands and pasture land that are not considered as cropland.
Other			Application of Limestone $CaCO_3$
Note that "Wetlands" and "Settlements" and "Other Lands" are considered not to be material to this study.			

The following section outlines the emission profile in greater detail. Some of the text is drawn from the National Inventory Report described above.

3.3.2 Agriculture

Agricultural emissions in New Zealand come from two main sources; methane produced inside ruminant farm animals (enteric fermentation) and nitrous oxide from the excretion of nitrogenous material by all farm animals. Methane and nitrous oxide from manure management represents the next largest category.

Figure 6: New Zealand agriculture emissions



3.3.2.1 Enteric fermentation

The predominant source of methane in New Zealand is the fermentation of pasture plants in the rumen of ruminant livestock. Methane is a by-product of digestion in ruminants, e.g. cattle and some non-ruminant animals such as swine and horses. Ruminants are the largest source of CH_4 as they are able to digest cellulose. Methane is synthesised from H_2 and CO_2 at the end of the microbial digestion chain by the methanogenic archaea microorganisms.

The amount of CH_4 released depends on the type, age and weight of the animal, the quality and quantity of feed and the energy expenditure of the animal

This is New Zealand's highest single emissions category, contributing 31% (24.1 Mt CO_2-e) of total emissions in 2006 and 64% of all emissions from agriculture.

3.3.2.2 Manure management

The manure management category estimates emissions from decomposition of animal waste held in manure collection and management systems. Manure management includes methane from the actions of methanogenic bacteria when manure decomposes in the absence of oxygen, and nitrous oxide emissions from the anaerobic lagoon, solid storage and dry-lot and other animal waste management systems.

Apart from dairy cattle at the time of milking, New Zealand livestock is not generally held on pads that allow faecal matter to be collected. Emissions from the "pasture, range and paddock" animal waste management system are reported in the "Agricultural Soils" category.

In 2006, emissions from manure management were 2% (0.8 Mt CO_2-e) of total agriculture emissions.

3.3.2.3 Agricultural soils

Emissions of agricultural nitrous oxide are associated with the application of nitrogenous fertilisers, crop residues, animal wastes, cultivation of peat soils, and the use of nitrogen fixing crops.

The addition of nitrogen to soil in any form results in increased nitrous oxide emissions. Emissions can come directly from the soil or indirectly through atmospheric deposition, leaching and run-off. The UNFCCC categorises these emissions in three ways:

- Direct from synthetic fertilisers, animal manure applied to soils (not deposited there by the animals), N-fixing crops, crop residue, and cultivation of Histosols (a soil comprised primarily of organic materials);
- Indirect N_2O from nitrogen lost from the field as NO_3, NH_3 or NOx through leaching and runoff;

- Direct N_2O emissions from nitrogen in the excrement from animal production (under the pasture, range and paddock animal waste management system).

The two most significant inputs of nitrogen to the soil are excreta deposited during animal grazing and the application of nitrogen fertilisers. The bulk of the nitrogen added to New Zealand soils comes from the excreta of animals. New Zealand animals grazing grass-legume pastures do not utilise the nitrogen they ingest efficiently. On average only 10.5% of the nitrogen in grass, silage or other feedstuff is converted into milk, meat, eggs or wool and the remainder is excreted in dung and urine.

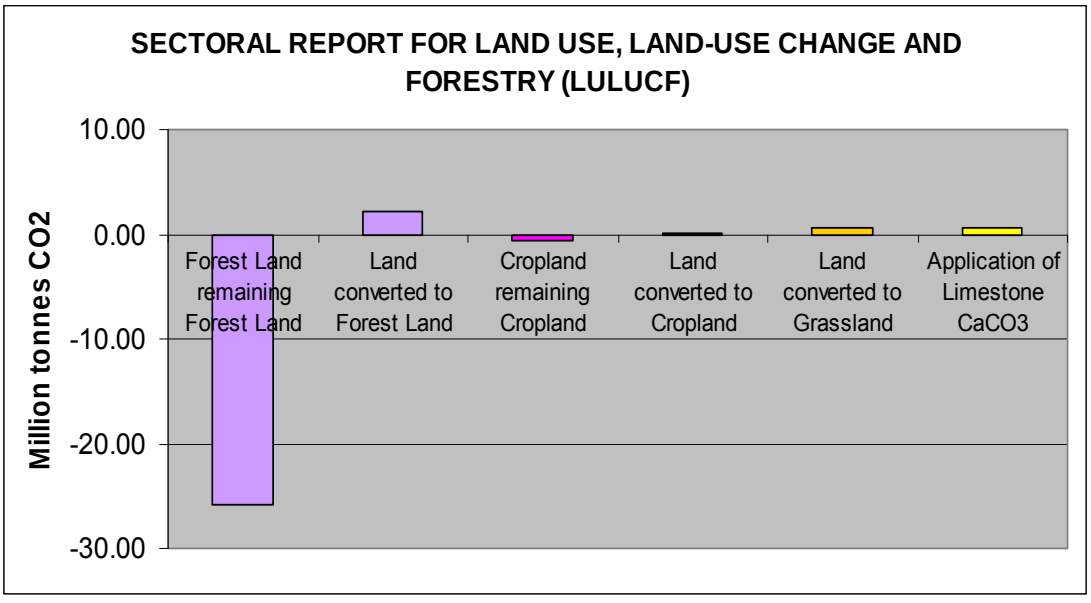
Agricultural soils contributed 34% (12.7 Mt CO2-e) of all agricultural emissions in 2006 and 16% of New Zealand's total emissions.

3.3.3 Land Use, Land-use Change and Forestry

The predominant emissions and removals in the IPCC land-use, land-use change, forestry (LULUCF) sector relate to carbon dioxide from plant photosynthesis and release from respiration and the decomposition of organic material. This activity arises primarily from the following sources:

- Forest land – all land with woody vegetation consistent with UNFCCC definitions, including vegetation expected to become a forest. Forests cover almost 40% of the land area of New Zealand. There has been considerable afforestation since 1990, while deforestation has been small in comparison.
- Cropland – arable and tillage land, and agro-forestry systems where vegetation falls below the national definition used for forest land.
- Grassland – rangelands and pasture land that are not considered as cropland and areas of vegetation that are not expected to exceed national definitions of forest land.
- Other – This refers primarily to the application of lime across all land-use categories.

Figure 7: New Zealand LULUCF emissions



The table above shows this emissions profile by UNFCCC sub-category (Note this table has colour codes that are consistent with project types described below). A negative in the above chart refers to a removal activity. In New Zealand, the LULUCF sector acts as a net carbon sink. Net removals for 2006 are 22.7 Mt CO2-e or 29% of New Zealand's total emissions.

3.3.3.1 Plantation forestry

The definition of forest that New Zealand has adopted under the UNFCCC is a minimum area of 1 hectare, a height of 5 metres and a minimum crown cover of 30%. All of New Zealand's forests, both those planted for timber production and natural forests managed for conservation values are considered managed forests.

Table 5: New Zealand plantation forest estate

Species	Area (Hectares)	(%)
Radiata pine	1,603,000	89%
Douglas-fir	112,000	6%
Eucalypt	31,500	2%
Other	53,500	3%
	1,800,000	

New Zealand has a substantial estate of planted forests, around 90% Pinus radiata (created specifically for timber supply purposes) and typically grown over 28 year rotations. These forests are usually composed of stands of trees of a single age class and all forests have relatively standard silviculture regimes applied. The total area, shown in the table, is estimated to be a total of 1.8 million hectares.

Planted forests can contain either native and/or exotic species. Most – around 97% of the planted forests in New Zealand are exotic. If planted on non-forest land since 1990, they are classified by New Zealand as "Kyoto forests" and will be accounted for under Article 3.3 of the Kyoto Protocol.

3.3.3.2 Afforestation and reforestation since 1990

Approximately one third of the New Zealand plantation estate was planted after 1990. Most of these 'Post 1989' foresters have small forest holdings. These forests are will be accounted for under Article 3.3 of the Kyoto Protocol as afforestation and reforestation activities.

Table 6: Details of the Post-89 forest ownership

Forest Size Class (ha)	Number of Owners (1)	Average Forest Area (ha)
0-10	5,973	10
10-40	4,096	25
40-100	582	70
100-500	374	300
500-1000	27	750
>1000	22	7,500
Total	11,074	

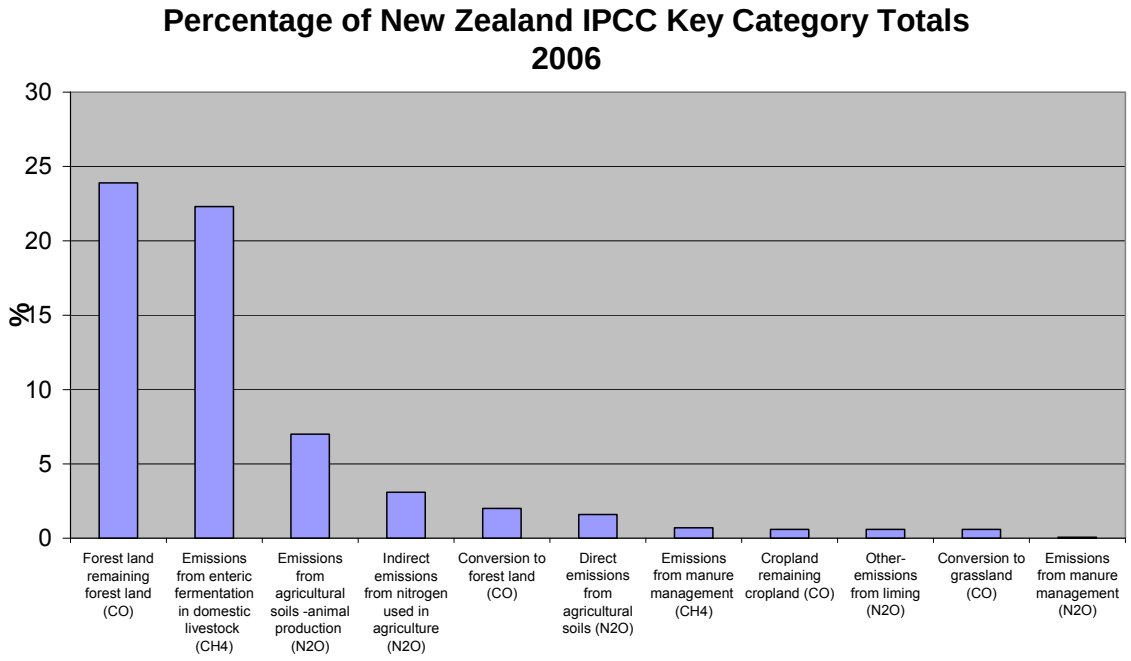
Source Ministry of Agriculture and Forestry publications

'Forest land remaining as forest land' is an important sink category for New Zealand. A planted forest carbon inventory based on country-specific parameters is being developed for New Zealand to increase the accuracy of its reported values. Carbon stocks for the biomass carbon pools will be modelled from these established values and separated into individual pools.

3.4 Possible greenhouse gas projects in the New Zealand agriculture and forestry sector

Table A1.3 of the National Inventory Report lists key emission categories (those collectively comprising 99% of New Zealand's total emissions and removals for New Zealand in 1990). The categories considered within the scope of this report include 62% of those key categories. These are shown in the chart below.

Figure 8: Key categories



3.4.1 Major abatement opportunities

The above data shows that the key to establishing the largest abatement market possible in New Zealand will be abatement projects targeted at:

- Maintaining or increasing carbon stock in forests (23.9% of the New Zealand's total 'key categories' under Kyoto accounting);
- Reducing methane from enteric fermentation (22.3%);

- Reducing nitrous oxide from animal excreta (about 10% including secondary effects) [6].

These three emission categories represent 83% of the combined Agriculture and LULUCF sector emission profile. However, projects related to enteric fermentation or nitrous oxide reduction from animal excreta are relatively unknown in the world voluntary carbon market.

Agricultural soils projects related mainly to soil carbon. Livestock projects tend to focus on manure management inn animal waste management systems. These categories are only minor key categories in New Zealand's agricultural emissions profile.

As far as the forestry sector, where only one CDM project has been registered, the share of credits in the voluntary market dropped in 2007 against the year earlier.

All three emission categories could be considered candidates as project types in an international market context. A project within that category would be representative within an abatement category of other projects in that category, subject of course to normal project tests (discussed further below).

In the latter category, confusion can be avoided if one makes a distinction between this category and manure management where both methane and nitrous oxide emissions occur. This is a small emissions category and relates primarily to animal waste management systems that capture manure.

Most of New Zealand's emissions related to animal excreta come from nitrous oxide emissions in the Paddock and Rangeland category, which includes pastoral grazing. Reducing emissions from animal excreta in this category will also affect manure management.

We examine abatement opportunities in each emissions category (or project type) below. Much of the discussion on agricultural emissions is drawn from a technical summary paper on abatement possibilities in agriculture [7].

3.4.1.1 Maintaining or increasing carbon stock in forests

Abatement technologies leading to carbon emission reductions are not entirely relevant for forestry. Abatement of CO_2 emissions in New Zealand agriculture has several promising possibilities even though the science is

[6] This includes the original source of emissions for indirect emissions and Volatized N from fertilisers, animal manures and other N from fertilisers, animal manures and other that is lost through leaching and run-off, as well as from other direct sources.

[7] Abatement of Agricultural Non-Carbon Dioxide Greenhouse Gas Emissions. A Study of Research Requirements, Peter O'Hara, John Freney and Marc Ulyatt, 2003. http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/climate/abatement-of-agricultural-greenhouse-gas-emissions/abatement-of-agricultural-greenhouse-gas-emissions.htm

relatively recent. ‘Abatement’ in forestry refers to increasing carbon sinks or reducing deforestation (which represents a carbon emission).

A key feature of possible New Zealand forestry projects in the voluntary carbon markets generating offset units through afforestation or increasing sinks is the introduction by the New Zealand Government of an Emissions Trading Scheme (ETS).

The ETS will introduce an industry-wide carbon market infrastructure.

It will likely require advanced measurement technology such as use of GIS shape files to confirm the forestry area, measuring the trees using plots (if look up tables are not used), sophisticated analysis of measurement data and estimation of the carbon stock. It will also require the completion of carbon stock returns, management of units gained, and verification undertaken by MAF.

The New Zealand ETS should provide foreign buyers with a high level of confidence that double counting or leakage will not exist. This issue is discussed further below.

Avoided deforestation is usually associated with undertakings to maintain land use in forestry for a certain period of time. The ETS introduces a strong incentive to maintain land in forest. Even though the sanction is purely a financial penalty and no other obligation involved, it does act as a strong disincentive to deforest.

3.4.1.2 Reducing methane from enteric fermentation

Abatement possibilities fall into three main categories; improvement in animal efficiency, feed additives, and immunisation against methane-causing bacteria.

Over the long-term the most promising may be an improvement in animal efficiency. This includes both improvements in the animals feed efficiency (methane emissions per unit of output are lower at higher feed efficiencies) as well as selection of lower-emitting stock for breeding. Likewise, it may be possible to alter the genome of the methanogens the cause the emissions.

In the short-term, improvement in animal efficiency may focus on an improvement of feed intake. This includes reduced cell wall carbohydrates and increase soluble carbohydrates, as well as the increased protein and lipid content in feed.

Feed additives may also be useful to reduce the activity of methanogens. These include a number of different chemicals such as hydrogen acceptors, halogenated methane analogues, antibiotics, defaunating agents, probiotics, and bacteriocins. Many have been tried over a long period of time but concerns about toxicity and other factors have not been promising.

Immunisation against methanogens offers encouraging possibilities, especially with an understanding of the methanogen genome. This work is well underway but solutions still remain distant possibilities.

3.4.1.3 Reducing nitrous oxide from animal excreta

Nitrous oxide abatement possibilities include capturing animal excrement for treatment, improving feed, and improving livestock efficiencies.

Because of New Zealand's pastoral grazing, most excrement is deposited on 'Paddocks and Rangeland'. If means to capture excrement existed it could be treated in animal waste management systems. This might involve for example housing animals or overwintering them on pads.

In general only 10.5% of the nitrogen fed to animals is utilised by them and the balance is excreted. This offers significant opportunities as even small overall productivity gains can translate into significant reductions in nitrous oxide.

The types of pastures and grasses can also have an effect on the composition of animal excreta. Using forage cultivars that provide an energy-to-protein ratio based on the animal's state would improve nitrogen efficiency, as would feeding water soluble or high sugar carbohydrates.

Improving drainage and preventing soil compaction can also reduce nitrous oxide emissions. Reduced or no-till arable farming can reduce nitrogen mineralisation into nitrous oxide. This reduces compaction, which has been shown to be strongly associated with nitrous oxide emissions. Overwintering livestock on pads will reduce compaction from stock as well as reduce emissions from excrement.

As is the case with enteric fermentation, the livestock themselves offer significant project opportunities through improving efficiencies. For example, over the past decades, while sheep numbers have reduced marketable output has not, and nitrous oxide emissions have tended to follow sheep numbers. In the long-term, improving nitrogen efficiencies of animals through selective breeding also remains a possible solution.

Manipulating the diet of animals offers more immediate gains. This may involve lowering the crude protein content of the diet, increasing carbohydrates (as above) and condensed tannins in the diet. These methods are likely to require a diet delivery system. This can also include the improvement of the pasture that animals forage on.

3.4.2 Other abatement project opportunities

Apart from the three project types described above there are other projects that are possible for New Zealand in international voluntary carbon markets. These are discussed below.

3.4.2.1 Manure management

Manure management projects are amongst the most well known in the marketplace. Livestock farming systems elsewhere in the world tend to rely on housing animals far more and capturing the manure for management in a waste management system is in turn, easier.

These projects generally use abatement technology applied to the capture and conversion of methane from manure management systems into carbon dioxide which has a much lower global warming potential. Small amounts of nitrous oxide can be reduced also.

These projects usually require a lagoon or the similar to capture excrement, which under anaerobic digestion, can be converted to methane which can be burned as biogas with additional energy benefits.

In New Zealand the biggest opportunities are the management of dairy effluent from milking sheds. However, it is estimated that only about 5% of excrement is deposited in this way. Another opportunity lies in the farm management of piggery and poultry excrement, which both involve animal housing in their farming systems.

3.4.2.2 Reducing nitrous oxide from direct application of synthetic fertiliser

Practices to improve the efficiency of uptake and use of synthetic nitrogen fertiliser will reduce nitrous oxide emissions relative to both input and output.

This includes better matching of nitrogen supply with crop demand through better testing and application when plants have rapid uptake. These practices exist already but can still be improved through more specific application of the knowledge available.

Similarly, ensuring that over-supply does not occur by tightening nitrogen flow cycles between animal and cropping cycles will improve overall nitrogen productivity in the farming systems. Advanced fertilisation techniques such as delivery through irrigation or foliar sprays create opportunities to deliver nitrogen fertiliser at an optimal time.

One of the most promising project possibilities includes the use of nitrification inhibitors to prevent both nitrification and denitrification by maintaining the nitrogen held in soil in the ammonium form. One of the most promising inhibitors is dicyandiamide (DCD) but there are a number of other promising chemicals.

The use of nitrification inhibitors can have quite different effects at a local level due to the wide difference in soil types but in general have shown very positive results.

3.4.3 Projects not considered for this study

There are possible projects within the agricultural and forestry sector but outside New Zealand's accounting under the Kyoto Protocol. These may be important avenues for further investigation because double counting issues do not arise. Some suggested areas for further investigation include:

- Bioethanol from plantation forests (radiata pine);
- Biodiesel / bioethanol from algae;
- Wood products used as a carbon storage mechanism;
- Bioethanol from sustainable cellulose sources as a GHG offset mechanism;
- Fuel switching to less carbon-emitting fuel sources for dairy processing and pulp and paper plants e.g. coal seam or coalbed methane gas supply in Waikato and Southland and/or geothermal heat directly in Bay of Plenty;
- Biochar and soil carbon storage;
- Avoided deforestation incentives and other similar activities under Article 3.4 of the Kyoto Protocol [8].

3.4.4 Project measurement methodologies available

A key component of every carbon reduction project involves the ability to measure changes from a business-as-usual case. This involves two key parts; measurement and additionality.

Additionality is discussed further in a later section. It means taking an action that reduces greenhouse gas emissions that is something that would not have otherwise occurred in the absence of the incentive (as defined by various tests) provided by the greenhouse gas project mechanism. An action is not additional if it was going to happen otherwise and so will not qualify for credits. These will vary on a project by project basis.

At an emissions category level, measurement methodologies become quite important. As mentioned above, voluntary carbon markets are immature markets and as such measurement methodologies in general are also immature. However, much science is currently being devoted to this task, not just in New Zealand but also amongst its Kyoto partners.

New Zealand undertakes an inventory as part of its obligations under the UNFCCC. It is logical therefore to look at what methodological foundations could be useful in promoting accounting frameworks for voluntary markets

These methodologies are discussed in further detail in Annex 1 and some of the issues associated with measurement are discussed in a later section below. [9]

[8] Article 3.3 deals with 'Kyoto' forests created since 1990, while article 3.4 deals with management practices for forests established before 1 January 1990. See http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/climate/sinks-working-paper/sinks-working-paper-02.htm

3.4.5 Projects considered in this study

From the range of possible projects considered for this study, a smaller selection was focused on for two reasons.

Firstly, this study involved a survey of voluntary market participants and only a small number of projects could be projected into that survey. Secondly, some projects with application overseas may be less relevant to New Zealand, or they would be hard to measure, or additionality very hard to prove.

This study has not taken the view that it is investigating a pathway to market for specific projects. In general, the voluntary carbon market is still quite young and the nature of the projects particular to New Zealand are not common at all. The market is used to thinking in terms of project types as discussed above.

The table below shows the projects that were considered. For the agricultural sector these are largely based on the work of Peter O'Hara, John Freney and Marc Ulyatt, 2003. The column of comments shows reasons projects were eliminated from this study. A more detailed discussion on each selected project, which are shown in blue italics in the table, can be found below.

Table 7: Projects considered

	Project	Comments
1.	**Agriculture**	
1.a.	**Methane mitigation**	
	1. Reduction of livestock numbers	Excluded. This would be the wrong outcome for comparatively low-emitting New Zealand livestock sector.
	2. Improving efficiency - feed intake, diet manipulation towards soluble carbohydrates	Excluded. This is similar to diet manipulation for nitrous oxide reductions. As such it will be covered below. It should be noted though there may be co-benefits also available through methane abatement and these are quantified in the section below on project significance.
	3. Animal genetic improvement	Excluded. Not likely prior to end of CP1.
	4. Feed additives - inhibitors	Included. This is likely to require a delivery system and is restricted to dairy cattle, swine and horses only.
	5. Naturally occurring inhibitors	Excluded. Additionality and establishing a project baseline will be difficulty to prove.
	6. Immunisation	Included. While technologies may be distant, the effect may be substantial and worth considering.

[9] Much of this section is taken directly from the supporting documentation to New Zealand's GHG Kyoto inventory 2006 which can be found at: http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-overview-apr08/html/index.html

7 Manure biogas control of methane emissions through anaerobic digester.	Included through 9, 10and 11 below. This is a 'Manure Management' category.
8. Farm-scale abatement systems.	Excluded. Hard to measure on a project basis and effects likely to be small.
9. Farm management of dairy effluent	Included. Excrement collection mechanism is required.
10. Farm management of piggery effluent	Included. As above.
11. Farm management of poultry waste	Included. As above.

1.b. Nitrous oxide mitigation

1. Animals - diet manipulation	Included but likely to require a diet delivery system. Benefits can be sold based on volumes supplied to the animal.
2. Animals - reduce nitrogen in excreta or shift the balance between dung and urine in favour of dung	Excluded. This would be hard to measure, particularly in establishing a baseline position against which emissions reductions can be assessed against.
3. Feed livestock on pads in winter	Included. Part of the 'Manure Management' category.
4. Soil structure - optimise tillage, prevent compaction to mitigation nitrous oxide	Included. Although this may be hard to measure as soil types vary so much, it would benefit from regional baselines being established and there are already similar projects in international markets. Note that there are also soil carbon benefits.
5. Manage soil water - irrigation, drainage	Excluded. Additionality difficult to prove as investments in such technology may occur anyway.
6. Manage soil pH so that nitrogen is emitted as N2	Excluded. Additionality difficulty to prove as many other benefits exist.
7. High sugar grasses	Excluded. Covered above.
8. High condensed tannin grasses	Included. Considered similar to incorporation of improved pasture into pastoral farming systems.
9. Optimise nitrogen use by plants	Excluded. Hard to measure as it will also depend upon soil type. Additionality difficulty to prove as many other benefits exist.
10. Fertiliser timing, rates of application, tighten flow cycles	Excluded. As per number 9.
11. Nitrification inhibitors	Included. Because there is not always a crop yield benefit. Benefits can be sold based on volumes applied. Regional baselines are likely to be necessary.
14. Run-off management, riparian zones, drainage ditches, reed beds.	Excluded. Hard to measure as it will be difficult to measure the baseline case on a project basis

1.c Carbon dioxide mitigation

1. No-till / zero tillage (soil carbon)	Excluded. Not as material a level as cropping areas are relatively small. The multi-cropping regime practiced in the New Zealand arable sector means baseline establishment would be difficult.
2. Strip, ridge or other non-conventional tillage (soil carbon)	Excluded. As above.
3. Grass(land) planting or conversion	Excluded. Relevance in New Zealand is limited to land moving from cropping to pasture for reasons likely to make proving

	additionality difficult.
4. Grazing land management (sustainable stocking and rotational grazing)	Excluded. Rotational grazing already happens in the fenced New Zealand farming systems. Not relevant to New Zealand

2. LULUCF

2.a. Forest management

1. Pre-1990 forest management (e.g. pest management - control of possums, deer etc. in indigenous forests, longer rotations in exotic forests, etc.)	Included These projects would increase the removal of carbon dioxide from forests. While this can occur in all forests (especially pests in indigenous forests), it is assumed more relevant for pre 1990 forests because they are managed, and unlikely to have difficulty proving additionality.
2. Compliance-issued deforestation right (surrender of pre 1990 free allocation)	Excluded. This is where a pre 1990 ETS free allocation is sold on the voluntary market. Prices are however assumed to be greater in the compliance market.
3. Increase rotation period	Excluded. As above. Even though relatively simple to measure with standard forest inventory practices, with current log prices so low some growers are practicing this already.
4. Enrichment planting	Excluded. Additionality difficulty to prove.
5. Replace low productivity with high productivity forests	Excluded. Additionality will be difficult to prove as it will involve the move to something a landowner would be expected to do anyway.

2.b Afforestation, Reforestation and Revegetation (ARR)

1. Sequestrating land as forest reserve or native bush or wetlands	Included. Covered in number 6 below.
2. Improve efficiency of timber mills (greater percentage of wood turned into longer lived wood products)	Excluded. Additionality is likely to be difficult to prove.
3. Plantation forestry 2008 – 2012 established post-1989 consistent with Article 3.3 under the Kyoto Protocol	Included. This is where a post 1990 ETS allocation is sold on the voluntary market. This is a project in parallel with the compliance market and would involve the cancelling of an AAU or the sale of an NZU/AAU into the voluntary market. The ability to trade forestry emissions and sinks in the ETS will begin from 1 January 2008, with an initial compliance period running for two years ending in December 2009. The entitlement to units of the owners of post-1989 forest will be based on a carbon stock assessment certified by a Registered Carbon Certifier, using carbon accounting methodology that will be finalised during an initial compliance period.
4. Plantation forestry 1990 - 2007 established post-1989 consistent with Article 3.3 under the Kyoto Protocol	Included. This would create the same project unit as above but be for an earlier vintage.
5. Permanent forestry	Included for both pre 1990 forests and post 1989 forests. Voluntary carbon forestry

		markets have suffered particularly from the difficulty associated with proving that emission reductions from a project will be permanent. Various mechanisms can address this; one being http://www.maf.govt.nz/forestry/pfsi/.
	6. Regeneration of native scrub with QE II Trust covenant (http://www.qe2.org.nz/)	Included. Currently the main source of supply into the voluntary market.
	7. Species with longer maturity (e.g. Redwood)	Excluded. Even though longer-lived species are not typically established in New Zealand, it will hard to establish a baseline at the project level as it will depend on views of relative future values.
	8. Reduced thinning and pruning	Excluded. This is possible though additionality will still be difficult to prove because silvi-cultural practices vary from site to site.
	9. On degraded, erosion-prone land (e.g. Cyclone Bola, East Coast)	Excluded. This type of forest planting is likely to be undertaken, and indeed there are numerous incentives through existing projects. As a consequence additionality may be more difficult to prove. In any event, they are likely to be picked up in number 1 above.
	10. Native species reforestation	Excluded. Covered in number 3 in 2.b. above.
	11. Reforestation for landscape restoration	Excluded. Covered in number 3 in 2.b. above.
3.	Savannah burning	Excluded. Not relevant to New Zealand
4.	Burning of agricultural residues	Excluded. Not relevant to New Zealand

This filtering process yielded the following projects:

3.4.5.1 Enteric fermentation projects

1. Feed additives - inhibitors
2. Immunisation against methanogens

3.4.5.2 Manure management projects

3. Farm management of dairy effluent
4. Management of piggery effluent
5. Management of poultry waste
6. Feed livestock on pads in winter

3.4.5.3 Agricultural soils projects

7. Diet manipulation
8. Management practices that increases soil carbon in cropland and grazing land
9. High condensed tannin grasses
10. Nitrification inhibitors

3.4.5.4 Forestry projects

11. Pre-1990 forest management
12. Kyoto Plantation forestry 2008 – 2012
13. Kyoto Plantation forestry 2008 – 2012 - Permanent

14. Pre 1990 Plantation forestry 2008 – 2012 - Permanent
15. Kyoto plantation forestry 1990 - 2007
16. Regeneration of land under QE II Trust covenant

A description of each of the sixteen projects is outlined in Table 8 below. The colour scheme of the gases involved is based on the emission descriptions in Table 4 above. The categories themselves are based on UNFCCC descriptions.

Table 8: Project descriptions

Project	GHG	Likely project action
Enteric fermentation projects		
1. Feed additives - inhibitors	CH_4	Adding chemicals to animal feed to reduce methogenesis.
2. Immunisation against methanogens	CH_4	Similar outcomes as feed additives but delivered through immunisation.
Manure management projects		
Farm management of dairy effluent	CH_4	Capturing effluent and converting methane to carbon dioxide through combustion.
Management of piggery effluent	CH_4	Capturing effluent and converting methane to carbon dioxide through combustion.
Management of poultry waste	CH_4	Capturing effluent and converting methane to carbon dioxide through combustion.
Feed livestock on pads in winter	N_2O	Moving stock to concrete pads in the winter where excreta can be collected and utilised as fertiliser later in the year and/or the methane combusted.
Agricultural soils projects		
Diet manipulation	N_2O	Altering the feed content of animals to result in less nitrogen being excreted in the urine and less nitrous oxide emission.
Management practices that reduce nitrification or denitrification in cropland and grazing land	N_2O	Improving drainage and preventing soil compaction.
High condensed tannin grasses	N_2O	Adding commercial tannins to silage or growing plants containing elevated concentrations of condensed tannins for animals to graze on.
Nitrification inhibitors	N_2O	The application of a nitrification inhibitor with the nitrogen fertiliser to maintain nitrogen in the ammonium form.
Forestry projects		
Management of forests that existed as at 1990	CO_2	Human interventions such as the control of possums, deer etc. in forests and the use of longer rotations in exotic forests.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (2008-2012 vintage)	CO_2	The annual increment of sequestration which may be verified on an annual basis. This project creates a voluntary forest unit using the carbon measurement infrastructure developed as part of the

		New Zealand ETS or sells a NZU/AAU directly to the voluntary market. Consistent with the Kyoto Protocol forestry will generate units in the NZ ETS from 1 January 2008. The entitlement to units of the owners of post-1989 forest will be based on a carbon stock assessment. These units are permanent, bankable and may be converted to AAUs for international trading. To manage permanence, forest owners are liable for carbon stock decreases. This is backed up with significant penalties for lack of compliance.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (2008-2012 vintage) - permanent	CO_2	This project is the same as that immediately above except that all forest projects will be secured by an easement that dedicates permanently the project land area to forest use. That is, it has both additionality and permanence.
Pre 1990 plantation forestry – permanent	CO_2	This project will mirror the project above but trees may also be established prior to 1990. The easement that dedicates permanently the project land area to forest use will prevent deforestation and be additional for preservation (much land is being converted to dairy farming currently) even if additionality at the time of afforestation can not be determined.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (1990-2007 vintages)	CO_2	This is an earlier vintage of the 'Kyoto Plantation forestry 2008 – 2012' project as described above. That is, it has additionality but for earlier vintages.
Regeneration of land under QE II Trust covenant	CO_2	There will be land that is under native scrub that could be left to revert and placed under a covenant. This covenant exists under law and details can be found at www.qe2.org.nz. This project includes both existing land placed under permanent trust, as well as new land yet to be placed under covenant. In both instances the land would be left to regenerate to mature bush from low native scrub.

3.4.6 Size and significance of identified projects

Table 9 below shows the possible quantity of emission reductions if projects were considered to be at a national level. It is based on estimates of the effect of the project at a national level and these assumptions or references are outlined below the table.

It must be emphasised that these estimates are very raw and taken from a high level review of the abatement literature available. They are provided so that relativities and orders of magnitude may be observed.

Further economic work to create an abatement 'merit order' is recommended.

Table 9: Total emissions/reductions from projects considered

Project	GHG	Current level of emissions or removals (tonnes CO_2-e)	Notes
Enteric fermentation projects			
1. Feed additives - inhibitors	CH_4	8,655,964	1
2.Immunisation against methanogens	CH_4	24,110,672	2
Manure management projects			
3. Farm management of dairy effluent	CH_4	386,728	3
4. Management of piggery effluent	CH_4	150,203	4
5. Management of poultry waste	CH_4	65,556	5
6. Feed livestock on pads in winter	N_2O	5,453,050	6
Agricultural soils projects			
7. Diet manipulation	N_2O	2,936,377	7
8. Management practices that increases soil carbon in cropland and grazing land	N_2O		8
9. High condensed tannin grasses	N_2O	7,805,637	9
10. Nitrification inhibitors	N_2O	4,832,716	10
Forestry projects			
11. Pre-1990 forest management	CO_2	626,633,903	11
12. Kyoto plantation forestry 2008 – 2012	CO_2		
13. Kyoto plantation forestry 2008 – 2012 – permanent	CO_2		
14. Pre 1990 plantation forestry - permanent	CO_2		
15. Kyoto plantation forestry 1990 - 2007	CO_2	163,533,482	12
16. Regeneration of land under QE II Trust covenant	CO_2	17,132	13

Notes on abatement potential

1 Some problems with abatement because it needs a delivery system.
2 Still subject to scientific investigation .
3 See http://www.lic.co.nz/pdf/dairy_stats/DS-2.pdf
4 Seehttp://www.bioenergy.org.nz/documents/WSL2007piggeries_finalrev1.pdf
http://www.stats.govt.nz/NR/rdonlyres/3F754575-44BD-47C2-8368-72256C4D216D/0/02PigHSGrpsTA.xls
5 As above.
6 Has good potential for dairy only.
7 See O'Hara, Freney and Ulyatt
8 This includes soil carbon, which is subject to scientific investigation, and nitrous oxide.
9 Clark et al 2001

10 See http://www.maf.govt.nz/climatechange/slm/inhibitors/page-05.htm. Table 2: Summary of the mass of NO3-N leached, the percentage reduction in NO3-N leaching when DCD was used.
11 See http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/climate/sinks-activities/sinks-activities-in-nz-04.htm#P194_40682
12 See http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/climate/sinks-activities/sinks-activities-in-nz-04.htm#P170_38131
13 Average annual covenantors at average land parcel size, and proportion of scrub only.

The size of the forestry effects stands out. These projects differ from methane or nitrous oxide emission reduction projects because of the large effect they have already had on New Zealand's emission profile since 1990, or the size of the effect if they are deforested.

If we exclude them, we can then see the size of the potential of these selected emission reduction projects. It should be stressed that these are not point estimates but nevertheless could be used to provide guidance as to the amount of resource effort directed to different projects.

If one were to list the projects by size and likelihood of implementation (including passing additionality and other project tests, ability to measure effects etc), one could categorise the following projects as reference projects for a subsequent market survey and investigation:

- Over-wintering of cattle on concrete pads;
- Nitrification inhibitors;
- Feed additives for dairy cows;
- Immunisation of all cattle;
- Improved management of pre 1990 forests;
- Post 1989 forestry (including pre CP1 sequestration)..

At present however, there are no technologies available for mitigating ruminant methane. While research is continuing on various options such as feed additives and immunisation, these technologies are not currently available for on-farm application. These projects have nevertheless been included in the market survey to gauge perceptions, anticipating a time when they become available technologies but will be excluded from the market development strategy outlined in Objective 3.

3.5 Voluntary market standards relevant to New Zealand agriculture and forestry projects

3.5.1 Primary standard providers

In this section we examine the emergence of standards and registries which was one of the most noticeable trends in the voluntary carbon markets in 2007. We will undertake an inventory of the standards that have evolved and identify those that are likely to be of most relevance to New Zealand agricultural and forestry projects.

In 2007, concerns about the quality of offset credits transacted on the voluntary carbon markets were a key issue in the Ecosystem Marketplace survey. A range of articles in the mainstream press highlighted various quality issues (in particular, the importance of additionality) in the market. In response, suppliers embraced a range of tools for producing high quality credits and proving their legitimacy.

Ecosystem Marketplace has not been able to obtain information on verification to a specific standard in a large percentage of transactions, but believes that as much as 50% of the transactions conducted in 2007 involved credits verified to a specific third party standard. These standards are described in more detail below, with existing comments from Ecosystem Marketplace's annual survey in quotation.

In the analysis below, a broad sweep of all standards and agricultural and forestry emission categories was first undertaken. The Voluntary Carbon Standard, CDM, CCX, VER+ and Gold Standard were cited as the most frequently used standards in Ecosystem Marketplace's 2008 study of the market. The standards examined in this study include:

- Voluntary Carbon Standard (VCS)
- Chicago Climate Exchange (CCX)
- Gold Standard (GS)
- Californian Cliamte Action Registry (CCAR)
- VER+
- Others, including the Clean Development mechanism (CDM).

Annex 2 highlights the relevance of each of these standards for major New Zealand emission reduction projects.

The first shows the treatment of the standards described above for each UNFCCC emitting or sink activity in the agriculture and LULUCF sectors.

The second table shows the same process at a lower level to determine whether differences exist at a project level. The presence of approved project methodologies relevant to New Zealand agriculture and forestry projects was noted.

For completeness, the third table shows projects from other parts of the agriculture and forestry sector that were not considered in this study as coming outside the emission or activity scope.

3.5.1.1 Voluntary Carbon Standard (VCS)

The Voluntary Carbon Standard [10] is one of the most utilised standards for the voluntary carbon markets and is supported by The Climate Group, the International Emissions Trading Association, the World Economic Forum, and the World Business Council for Sustainable Development.

The VCS aims to standardise, increase fungibility, and stimulate innovation in the voluntary offset market. Credits certified via the VCS are called Voluntary Carbon Units (VCUs). "Version 1" of the VCS was released in March 2006, as both a consultation document and a pilot standard for use in the market. The final version of the standard was launched in the fall of 2007. Projects verified to the pilot version were grandfathered into the 2007 system.

The VCS 2007 incorporates protocols established by the ISO (14064 and 14065) and the World Resources Institute (GHG Protocol for Project Accounting). We believe this is a critical standard to examine.

Currently, the voluntary carbon standard has released a guidance document for 'Agriculture, Forestry and Other Land Uses' (AFOLU) which covers four categories of projects:

- Agricultural Land Management (ALM)
- Afforestation, Reforestation and Revegetation (ARR
- Improved Forest Management (IFM)
- Reducing Emissions from Deforestation (RED)

However, it is critical to note that currently no VCS-specific methodologies have been approved by the VCS Board. However, the VCS does accept all methodologies approved methodologies already approved under the Clean Development Mechanism (CDM) or Joint Implementation (JI).

If a methodology does not exist for the project type the project proponent must submit a new methodology to the VCS Board. While the Voluntary Carbon Standard has released a AFOLU guidance document, currently no specific AFOLU methodologies have been accepted. The VCS plans to approve methodologies for a range of activities. It should be noted that we believe the VCS will be relevant for a huge range of non- AFOLU project types.

The text below is pulled directly from the AFOLU Guidance Document.[11]

[10] See http://v-c-s.org

[11] http://www.climateregistry.org/tools/protocols/project-protocols.html

3.5.1.1.1 Afforestation, Reforestation and Revegetation (ARR)

“Eligible activities in the ARR project category consist of establishing, increasing or restoring vegetative cover through the planting, sowing or human-assisted natural regeneration of woody vegetation to increase carbon (C) stocks in woody biomass and, in certain cases, soils.

Due to differences in the respective risk profiles of agriculture and forestry, revegetation practices involving woody vegetation (e.g., orchards, agroforestry) should be considered under Agricultural Land Management (ALM) guidelines if the main commodities produced are agricultural in nature (e.g., fruit, animal fodder). Similarly, forest management practices such as enrichment planting and liberation thinning should be considered using the criteria specified for Improved Forest Management (IFM) projects.

Revegetation activities that primarily target woody biomass production should be considered using the ARR guidelines that follow. ARR project activities planning to harvest timber are not excluded because harvesting practices will simply be incorporated into the risk analysis process surrounding the issue of non-permanence and must account for the carbon losses due to harvesting.

Examples of envisaged VCS ARR activities include the: reforestation of forest reserves; reforestation or revegetation of protected areas and other high priority sites; reforestation or revegetation of degraded lands; and rotation forestry with long harvesting cycles.”

3.5.1.1.2 Agricultural Land Management (ALM)

“Land use and management activities that have been demonstrated to reduce net greenhouse gas (GHG) emissions on cropland and grassland (see IPCC 2006 GL for AFOLU) by increasing carbon (C) stocks (in soils and woody biomass) and/or decreasing CO_2, N_2O and/or CH_4 emissions from soils are eligible for certification under the VCS as ALM projects.

Three broad categories of activities are included: (A) improved cropland management; (B) improved grassland management and, (C) cropland and grassland land-use conversions. Land conversions of cropland or grassland to forest vegetation are considered ARR activities and are not discussed here. Projects developed for agricultural biofuel production as a way to generate VCUs as fossil-fuel offsets are NOT included in the AFOLU section of the VCS guidance and are thus not addressed here.”

3.5.1.1.3 Improved Forest Management (IFM)

“Activities related to improved forest management are those implemented on forests remaining as forests (see IPCC AFOLU 2006 report). Various forest management activities can be changed that could increase carbon stocks and/or reduce GHG emissions, but only a subset of these activities make a measurable difference to the long-term increase in GHG benefits compared to business-as-usual practices.

The following improved forest management practices, in both upland forests and wetland forests (e.g. peat-swamps, mangroves, etc.), qualify as eligible activities under the VCS:

- Conversion from conventional logging to reduced impact logging
- Conversion of logged forests to protected forests
- Extending the rotation age of evenly aged managed forests
- Conversion of low-productive forests to productive forests"

3.5.1.1.4 Reducing Emissions from Deforestation (RED)

"Activities that reduce the conversion of forestland to cropland, grassland, wetland, peatland, settled areas and/or other land uses are creditable under the VCS according to the guidance provided in this Reduced Emissions from Deforestation (RED) section. Activities that reduce forest degradation are included within the Improved Forest Management (IFM) VCS project category and so are not discussed under this RED section. Similarly, activities that restore forest cover on deforested land are included within the Afforestation, Reforestation and Revegetation (ARR) section and are not considered here."

3.5.1.2 Gold Standard (GS)

The Gold Standard seeks to define the high-end market for carbon credits arising from renewable energy and energy efficiency projects that contribute significantly to sustainable development. The standard specifically excludes forestry and land-use projects.

The Gold Standard was an initiative of the World Wildlife Fund (WWF) and developed with a variety of other NGOs, businesses and governmental organisations who believed that the CDM did not adequately screen projects for their contribution to sustainable development. While the Standard was originally created to supplement CDM projects, it now also certifies voluntary offset projects. In 2008, the Standard joined forces with the private firm APX to develop and manage the Gold Standard VER registry.

The Gold Standard is supported by the Swiss-based Gold Standard Foundation.[12]

It is important to recognise that the standard only includes renewable energy and energy efficiency projects. The Gold Standard also has a major focus on sustainable development benefits, which is an additional layer of criteria which should be considered.

It should be noted that only "ecologically sound" biomass is currently accepted. Industrial process could fit under the "Industrial Energy Efficiency" category but environmental and social co-benefits are critical to consider. In addition, Gold Standard only recognizes the renewable energy, not methane destruction, GHG reductions from bio-digester projects.

[12] See www.cdmgoldstandard.org.

3.5.1.3 Chicago Climate Exchange (CCX)

As noted in Section 3.1.2, CCX is a membership based cap and trade system. The internal CCX offset screening process can be considered a type of standard. In the CCX projects must undergo a standardised certification procedure before receiving offset credits, which consists of approval by the CCX Offsets Committee, verification by a third party verifier and verification report review by the Financial Industry Regulatory Authority (FINRA), and registration on the CCX Registry. In addition, projects involving less than 10,000 $tC0_2e$ must be registered and sold through an Offset Aggregator. CFIs are issued on a retrospective basis, with the CFI vintage corresponding to the year in which the GHG reduction took place.

3.5.1.3.1 Forest and agriculture sector and project protocols

The Chicago Climate Exchange has developed rules and contracts for agricultural methane, agricultural soil carbon, forestry, and renewable energy [13].

Since the CCX generally has more flexible additionality criteria it could be a useful model for already developed projects in New Zealand. However, currently the CCX does not accept credits from Annex 1 countries with Kyoto obligations.

3.5.1.4 California Climate Action Registry (CCAR)

The California Climate Action Registry (CCAR) was established by California statute as a non-profit voluntary registry for GHG emissions. Over the last four years, CCAR has also begun to develop project protocols that allow for the quantification and certification of GHG emission reductions. These protocols now serve as a "verifiable" quasi-standard for voluntary carbon offsets. CCAR currently has approved reduction protocols for livestock and landfill methane projects in the US and forest carbon sequestration in California.

The Californian Climate Action Registry recently launched the Climate Action Reserve[14] which is a Californian programme that 'tracks and registers voluntary projects that reduce emissions of GHGs'). The General Reporting Protocol 3.0 details how the Californian Registry quantifies, monitors, and reports GHG emissions. [15]

Separate project protocols for forestry and livestock have also been created. [16] Unlike the World Resources Institute's GHG Protocol, the Californian Climate Action Registry provides guidance for accounting for the carbon stored in wood products.

3.5.1.4.1 Forest and agriculture sector project protocols

Because it is likely that projects verified to the CCAR will be legitimate sources of credits in a California cap and trade system, we believe that this is a critical

[13] Inter alia www.chicagoclimatex.com/content.jsf?id=23.
[14] See www.climateregistry.org.
[15] See www.climateregistry.org/resources/docs/protocols/grp/GRP_V3_April2008_FINAL.pdf.
[16] See www.climateregistry.org/tools/protocols/project-protocols.html

standard to examine. A limited number of Protocols currently exist, but several new ones are in the pipeline. The CCAR currently has only three approved protocols: Landfill, Livestock, and Forest project protocols. However, the Livestock Protocol is only for "Capturing and combusting methane from manure management systems. [17]

3.5.1.5 VER+

In May 2007, project verifier TÜV SÜD announced the launch of its VER+ Standard, which will certify both carbon neutrality and carbon credits from voluntary offset projects. The standard will be based on CDM and JI methodology. TÜV SÜD describe the standard as "streamlined" Kyoto. In tandem with VER+, TÜV SÜD also created the Blue Registry, which aims to be a platform for managing verified emission reductions from a variety of other standards, including the CCX and Voluntary Carbon Standards.

3.5.1.6 CDM methodologies applicable (general, afforestation / reforestation, small scale)

There is only one LULUCF projects approved under the CDM and 7 different LULUCF approved methodologies.
Finding approved methodologies is a matter of reviewing the CDM approved methodologies website. [18] These methodologies are described further in a section on methodologies below.

3.5.1.7 DEFRA Code of Best Practice for Carbon Offset Providers

The UK Department for Environment, Food, and Rural Affairs (DEFRA) released in February 2008 a draft code of best practice to cover Kyoto-compliant Certified Emission Reductions (CERs) [19].

It is not a standard for project developers but rather a code for offset suppliers selling to United Kingdom consumers.

The DEFRA code states that Kyoto based credits are the only eligible credits under the Code. There is some possibility that the DEFRA code may be expanded in future to cover VERs.

The key opportunity here is if the code only allows Kyoto-units then this is an important opportunity for units generated from New Zealand reduction projects because they will be able to sell AAUs or other compliance units generated from projects into this market.

In Australia, the ACCC has also just issued a paper on carbon offsets.[20]

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[17] See http://www.climateregistry.org/resources/docs/protocols/project/livestock/CCAR_Livestock_Project_Reporting_Protocol_June_2007.pdf

[18] See http://cdm.UNFCCCc.int/methodologies/PAmethodologies/approved.html.

[19] See www.defra.gov.uk/environment/climatechange/uk/carbonoffset/codeofpractice.htm.

[20] See http://www.accc.gov.au/content/index.phtml/itemId/807902

3.5.2 Other standards

Other standards in the voluntary carbon markets include the Voluntary Offset Standard (VOS), Climate Community and Biodiversity Alliance Standards (CCB standards or CCBS), Plan Vivo System, ISO 14064 and 14065, and GHG Protocol.

The Voluntary Offset Standard (VOS) currently recognises VER credits based on the Gold Standard (although other standards may be recognised in future) – for the purposes of Annex 2 we treat the VOS to be the same as the Gold Standard.

The CCB standards (CCBS) do not generate VERs in themselves, but are a set of voluntary standards 'to help design and identify land management projects that simultaneously minimize climate change, support sustainable development and conserve biodiversity' [21]. Currently four projects have been audited and approved, and these include reforestation for landscape restoration and native species reforestation.

Plan Vivo 'is a system for managing the supply of verifiable emission reductions from [very poor] rural communities in a way that promotes sustainable livelihoods' [22]. Its three projects are located in undeveloped countries. The system is unlikely to be of interest in New Zealand, with the exception perhaps of native forestry projects involving low decile rural Maori communities in the Far North or East Coast.

The International Organisation for Standardization (ISO) has developed a set of protocol standards for the project and organisational quantification, monitoring, and reporting of GHG emission reductions, validating and verifying GHG assertions, and accreditation. These protocol standards have been incorporated into the procedures of accreditation standards such as the VCS 2007.

Similarly, the GHG Protocol[23] is an international accounting protocol and framework developed by the World Resources Institute and used to quantify GHG emissions. For projects, the important protocols are the GHG Protocol for Project Accounting[24] and the Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting[25], although the latter relates mostly to carbon and forestry and not methane / nitrous oxide and agriculture

3.5.3 Registries

Cancellation and Retirement refers to the "invalidation" of a carbon credit, making it no longer saleable or tradable.

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21 See www.climate-standards.org/index.html.
22 See www.planvivo.org.
23 See www.ghgprotocol.org.
24 See www.ghgprotocol.org/files/ghg_project_protocol.pdf.
25 See www.ghgprotocol.org/files/lulucf-final.pdf.

Retirement or cancellation occurs at the end of the carbon emission reduction's life on the market. A credit or offset is retired when it is no longer sold or traded. Somewhat abstractly, you could say it is the "fulfilment" of the carbon offset because it represents a final reduction. Both Kyoto credits and voluntary offsets can be retired, but in the voluntary markets retirement is less certain than in the compliance markets because not all voluntary offsets are tracked on registries.

Like the standards themselves, an increasing, but still limited, number of suppliers and standards have begun using carbon credit registries. This allows the tracking of retired credits and is important because it represents the impact of the market from an atmospheric perspective and the fundamental demand behind the market. When a carbon credit offsets an emission it should be retired and no longer available to the market.

The majority of credits transacted, according to Ecosystem Marketplace's 2008 report, were not listed in OTC registries but rather were registered under the CDM and the CCX. The Blue Registry, which was created by TÜV SÜD, a certifying and verifying organisation (see VER+ above), was cited as the most frequently utilised OTC registry.

This study will not consider registries further, though notes that they are a necessary part of the market landscape.

3.5.4 Project methodologies

The discussion below focuses on methodologies appropriate to New Zealand agricultural and forestry voluntary carbon products. We describe current methodologies as well as the process for the development of new methodologies in more detail in Annex 5 and 6.

3.5.4.1 Voluntary Carbon Standard

Currently the VCS has only accepted methodologies approved under the CDM. Annex 5 lists the methodologies under each project type that are already approved by the CDM and described under the VCS [26].

The Voluntary Carbon Standard is also considering accepting all Californian Climate Action Registry protocols. The VCS Board is also planning to approve VCS-specific methodologies and as started this process with its Guidance Document for Agriculture (specifically agricultural land management—not livestock management) Forestry and Other Land Use Projects.

3.5.4.2 Clean Development Mechanism

Because several major voluntary standards, including the VCS, Gold Standard, and VER+ currently are based on CDM methodologies, approved LULUCF methodologies are outlined in more detail in Annex 3.

[26] See http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

3.5.4.3 Gold Standard [27]

The Gold Standard currently only accepts energy projects, and therefore there are no accepted methodologies land use projects. Eligible projects are renewable energy including biomass, biogas, liquid biofuels for electricity, heat, cogeneration, and transport [28].

3.5.4.4 California Climate Action Registry

Particular attention should be paid to the California Climate Action Registry (CCAR) due to the geographical limitations and thus similarity with the New Zealand case. These restrictions enable a standard and set of protocols that are contextually specific, as would be the case for any New Zealand standard.

The CCAR does not have 'approved methodologies'. Rather they have a system of protocols that outline the procedures by which members can measure, verify and report their emissions [29]. Protocols exist for landfill, livestock, and forestry activities. No specific methodologies are outlined. The project developers themselves are responsible for creating their own methodologies. Further detail can be found in Annexes 5 and 6.

The California Climate Action Registry has issued an RFP for new GHG reduction project "typologies" (i.e., methodologies for new project types). CCAR has internally identified ten potential project types on which contractors are invited to develop issue papers. [30]

3.5.4.5 Chicago Climate Exchange

New Zealand agricultural and forestry projects would most likely be eligible to generate "Carbon Financial Instruments" (CFI)s under four of the eight CCX offset project categories: agricultural methane, agricultural soil carbon, rangeland soil carbon management, and forestry. Basic project eligibility requirements for these four categories are outlined in Annex 5 [31].

As with CCAR, there are no approved methodologies. Rather there are a set of specific protocols for acceptable projects. Each project type has standardised rules for issuing tradable CFI contracts (i.e. credits). Project types are as listed in Annex 5 [32].

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[27] Note: The GS website is in the process of transferring their database of projects to a new registry that requires a member registration process. This process entails submission to the GS offices and can take up to 30 days. For the purposes of this search, the older database that is available online was used.

[28] See http://cdmgoldstandard.org/uploads/file/GS-VER_Proj_Dev_manual_final%20.pdf.

[29] See http://www.climateregistry.org/tools/protocols/project-protocols.html.

[30] See http://www.climateregistry.org/resources/docs/job-opportunities/rfp-for-issues-papers-063008-finalv3.pdf

[31] For the full set of information on the eligibility requirements of all project types, please visit the Offsets section of the CCX website, http://www.chicagoclimateexchange.com/.

[32] Key references: http://www.chicagoclimatex.com/content.jsf?id=23
http://www.chicagoclimatex.com/docs/offsets/General_Offsets_faq.pdf

3.5.4.5.1 Agriculture

Projects relevant to New Zealand that may qualify under this category include controlling methane emissions through anaerobic digesters, combustion of dairy and piggery effluent and poultry waste, and farm-scale abatement systems involving covered lagoons. Eligible projects include covered anaerobic digesters, complete-mix, plug flow digesters, and covered lagoons.

Other methane abatement projects that involve methane-source reduction - not collection or combustion - are not currently approved by CCX. These latter projects include livestock reduction, animal diet manipulation, genetic manipulation, and immunization of livestock against methanogens.

The agricultural soil category concentrates on soil carbon. Continuous conservation tillage, grass planting, sustainable stocking rates, rotational grazing, and seasonal use on eligible locations of grazing land. Projects relevant to New Zealand that may qualify for CFIs under this category include restricting livestock grazing to pads in the winter season, reduction of livestock numbers to sustainable stocking rates, and rotational grazing.

3.5.4.5.2 Forestry

Sequestration projects that maintain or increase forest area, increase stand- and landscape-level carbon density, and increase off-site carbon stocks of wood products as well as enhance product and fuel substitution are eligible to generate CFIs. These include afforestation, reforestation, and RED projects; long-lived wood product production projects; and forests managed sustainably.

$C0_2$ sequestration projects that have been proposed in New Zealand and which may qualify to generate CFIs include longer rotations of trees with high sequestration potential, pest management, reforestation, and other sustainable forestry management practices that maintain or enhance the carbon sequestration of forests and forested wood, including wood products.

3.5.4.5.3 Energy

Eligible renewable energy projects include wind, solar, hydropower and biofuel that are not being used to meet obligations established by state or local mandates (e.g., state renewable portfolio standards).

3.5.4.6 VER+

VER + accepts only projects that use CDM approved methodologies. These have been outlined in more detail in Annex 3.

3.5.4.7 Joint Implementation

JI projects utilise CDM approved methodologies for Track 2 and are optional for Track 1.

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http://www.chicagoclimatex.com/docs/offsets/CCX_Rulebook_Chapter09_OffsetsAndEarlyActionCredits.pdf.

Under JI more LULUCF activities than Afforestation/Reforestation are eligible, under the condition that they are included in the national accounting system in the relevant commitment or year [33]. LULUCF activities include Afforestation, Reforestation, Deforestation, Revegetation, Forest Management, Cropland Management and Grazing Land Management. However, JI generally refers to emissions reductions or the enhancement of removals, therefore carbon conservation activities are excluded.

3.5.5 Requirements for developing new methodologies

3.5.5.1 Clean Development Mechanism

The process for the approval of afforestation and reforestation methodologies under the CDM is outlined in Annex 6. [34] The application is made through a designated operational entity which validates and then requests registration of a project. These entities also act as verifiers of projects.

For CDM project requirements, please see Annex 6.

3.5.5.2 Voluntary Carbon Standard

To date no methodologies have been proposed to the CDM executive board specifically for use under the voluntary market. Rather, we have seen voluntary market projects adapting to utilise already existing methodologies. This is due to the high costs and long time lapse for methodology approval under the CDM.

3.5.5.3 Gold Standard

All methodologies must be CDM approved. However, there are a number of additional steps that must be taken to utilise methodologies under the Gold Standard and become certified [35]. This includes conventional project cycle elements and additional steps, and these are outlined in Annex 6.

3.5.5.4 California Climate Action Registry

Under the CCAR, a project must meet a specific set of criteria to be eligible for reporting and certification in the Registry. Much of these criteria have been required specifically by the California legislature [36].

As there are no specific methodologies but only a set of guidelines and protocols, the CCAR provides a pre-screening option, allowing project developers to submit preliminary information about a project for determination of eligibility for certification by the Registry [37]. This is detailed more fully in Annex 6.

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[33] Please see: UNFCCC: Home > Methods and Science > Land Use, Land-Use Change and Forestry (LULUCF). http://unfccc.int/methods_and_science/lulucf/items/1084.php.

[34] See reference: http://cdm.unfccc.int/Projects/pac/ar_howto/New_AR_Methodology/index.html

[35] See: http://cdmgoldstandard.org/uploads/file/GS-VER_Proj_Dev_manual_final%20.pdf

[36] For information on this see California Senate Bill 812.

[37] See http://www.climateregistry.org/tools/protocols/project-protocols.html.

3.5.5.5 Chicago Climate Exchange

The CCX sector committees review and approve projects on a case-by-case basis. All projects must first be assessed by a third party verifier prior to submission to the CCX. Methodologies can utilise other certification standards, or can be project specific, and therefore projects with new methodologies can be submitted to the CCX at any point in time. These methodologies must adhere to the broad specifications indicated in Annex 6. [38]

3.5.5.6 Joint Implementation [39]

To be involved in JI projects, countries need to establish a Designated Focal Point (DFP) for project approval. In addition, national guidelines and procedures, including the consideration of stakeholders comments, as well as monitoring and verification need to be communicated to the UNFCCC.

"If a host Party is considered to fulfil all the eligibility requirements a "simplified" JI procedure ("Track 1") may be applied, i.e. the "host Party may verify reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks from an Article 6 project as being additional to any that would otherwise occur, in accordance with Article 6, paragraph 1 (b). Upon such verification, the host Party may issue the appropriate quantity of ERUs in accordance with the relevant provisions of decision 13/CMP.1" (paragraph 23 of the (JI guidelines)." [40] New Zealand is a Host Party country and MFE is the Designated Focal Point. [41]

3.5.6 Assessing a New Zealand voluntary market forestry standard

As mentioned, generally methodologies are not created for a specific region with the exception of the CCAR. A case study in further exception to this is considered in regard to New Zealand plantation forestry.

In particular, this will relate to plantation forestry that may sell its removal units or NZU/AAU in either the compliance market or the voluntary market. In the compliance market, consistent with the Kyoto Protocol, this forestry will generate units in the New Zealand ETS from 1 January 2008. The entitlement to units of the owners of post-1989 forest will be based on a carbon stock assessment. These units are permanent, bankable and may be converted to AAUs for international trading

Why then would New Zealand want to create its own standard? There are several reasons why this might be the case:

- Because it would like to go above and beyond current standard requirements (e.g. VCS) and add further credibility. While unlikely, this

[38] See http://www.chicagoclimatex.com/content.jsf?id=23.

[39] See the JI site http://ji.unfccc.int/index.html

[40] See http://ji.unfccc.int/Eligibility/index.html

[41] Seehttp://www.mfe.govt.nz/publications/climate/guidelines-track1-joint-implementation/index.html

could arise where the value of compliance units are less than the value of the voluntary market, such as could arise in the face of a huge influx of 'hot air' AAUs;

- The forests that are not registered and generating units through the New Zealand ETS may not meet VCS additionality requirements. Approximately one third of the New Zealand plantation estate was planted after 1990. Most of these 'Post 1989' foresters have small forest holdings. These forests will be accounted for under Article 3.3 of the Kyoto Protocol as afforestation and reforestation activities.
- Because New Zealand foresters disagree with the VCS or other forestry standards structures altogether

3.5.6.1 Potential designs of a New Zealand voluntary market forestry standard

A key question here will be how a standard may differ from the NZ ETS regulatory system's means of certifying forest units—as well as other standards on the market.

A second important question is if there is a type of forest which might not be able to earn credits under the major existing voluntary carbon market standards or in the NZ ETS but in which there may be potential to support for other reasons such as conservation benefits.

This could include the use of a national 1990 baseline that provides post 1989 growers with additionality under Article 3.3 of the Kyoto Protocol and pre-1990 forest owners with additionality from placing their land into a non-deforestation covenant. One is an avoided deforestation product and the other a sequestration product.

The New Zealand ETS deals with the matter of permanence (discussed more fully below) through placing a financial liability on the landholder registering it on the title. In contrast standards like the CCAR forestry standard, and indeed the Permanent Forest Sink Initiative (PFSI) [42] introduced in New Zealand in late 2007, operate on the basis of strict land-use covenants against titles. A financial liability can be met by surrendering almost any form of Kyoto unit.

In such an environment, it may be advantageous for New Zealand forestry removal units to be sold into the voluntary [projects] market, together with a cancelled AAU.

In general, we do not see this scenario happening. Nor do we believe that there are any clear faults in the standards as currently proposed or administered by the standard providers discussed above.

Rather than create a new standard, we believe it would be preferable to work with existing standard providers to incorporate methodologies that are appropriate to New Zealand forestry. The VCS is an obvious place to start.

[42] See http://www.maf.govt.nz/forestry/pfsi/.

3.6 Other Matters to Consider

3.6.1 Double counting

3.6.1.1 What is double counting?

One key concern for developing New Zealand based VERs is the question of 'double counting.' In both the voluntary and regulated markets, when an emissions reduction credit has been generated, only one entity is legally able to claim ownership rights to the reduction, and in order to do so, the credit must be retired and only accounted for by a single entity's inventory (whether personal, company-wide, regional, or national). Double counting occurs when two entities 'take credit' for a single emission reduction, or when the same entity claims an emission reduction twice.

Double counting can occur in a variety of circumstances. This section is focused on the concern the VERs generated specifically for the "Over the Counter" voluntary carbon markets in New Zealand (an Annex 1 country) would lead to emissions reductions that are also accounted for nationally and hence would make more Assigned Amount Units (AAUs) available.

To address this issue, most voluntary standard providers have stated that issuing voluntary units for activities covered under Kyoto accounting constitutes 'double counting' because the underlying reductions in emissions mean the country has a surplus of allowances that can be traded and so equivalent emissions are allowed elsewhere. They require units to be cancelled (and hence not help countries meet their Kyoto commitments), rather than be retired (which does help countries meet their Kyoto commitments). [43]

While some stakeholders have taken a clear stance on the double counting question. Others argue that the issue is not so clear cut and that putting such limitations on the voluntary carbon markets with limit incentives for reducing GHG emissions [44] For example, Murray Ward has argued that generating VERs in New Zealand could result in "double beneficiaries" but not a "double count" of the credit. The VER project developer has rights to the emission reduction credits and at the same time the nation benefits by, in theory, having fewer emissions in its inventory, but does not actually generate a second set of credits. [45]

[43] Private Sector Leadership Group on Carbon Neutrality and the Voluntary Carbon Market in New Zealand Briefing Paper 1: The Place of Carbon Neutrality and the Voluntary Carbon market in Climate Change Poliocy and How This Differs From, and Can Be Complementary To, Compliance carbon Markets' Prepared by Murray Ward, GtripleC, February 2008

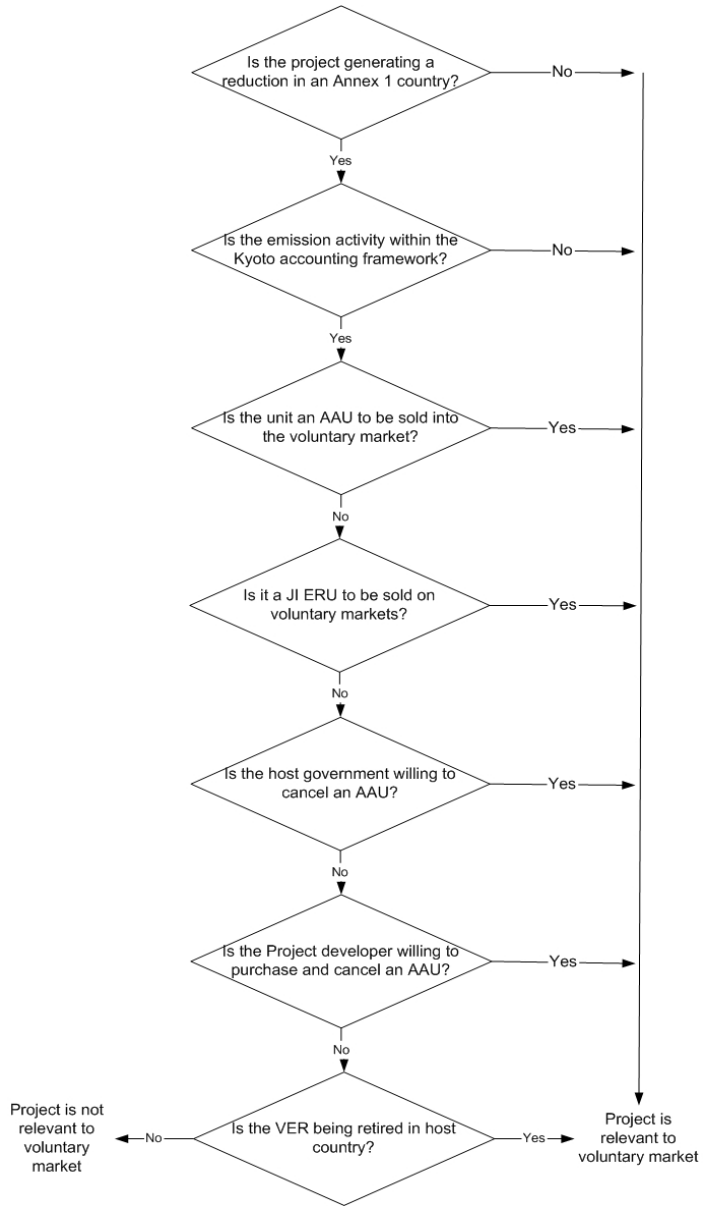
[44] Private Sector Leadership Group on Carbon Neutrality and the Voluntary Carbon Market in New Zealand Briefing Paper 1: The Place of Carbon Neutrality and the Voluntary Carbon market in Climate Change Poliocy and How This Differs From, and Can Be Complementary To, Compliance carbon Markets' Prepared by Murray Ward, GtripleC, February 2008

[45] Ward, Murray. GtripleC. "Private Sector Leadership Group and Carbon Neutrality and the Voluntary Carbon Market in New Zealand Briefing Paper." February 2008.

Lack of clarity around VER/AAU "double counting" is due to several factors. First, credit accounting and registries in the voluntary and regulated markets are not currently linked. Second, the voluntary and regulated markets have different criteria in defining a legitimate offset or emissions reduction credit and therefore national governments have not been willing to retire assigned amount units (AAUs) when VERs are generated.

Hence, some stakeholders argue that double counting between the voluntary and compliance arenas is, in fact, not an issue because the credits are not, in fact, accounted for twice. We believe the crux of determining the validity of this argument is whether or not an emission reduction that generates a VER also enables a country to have an extra AAU to distribute. This is discussed later.

Figure 9: Assessing project potential



In addition to this AAU accounting question, there are several key issues to untangle when considering potential overlaps in accounting between the voluntary carbon markets and national Kyoto compliance.

Figure 9 is one potential framework used to determine if an offset credit could be double counted.

When determining if double counting between national accounting and the voluntary carbon markets is an issue, and assuming that the project is located within an Annex 1 country such as New Zealand, then the first question to consider: Is *the project type one that is included in national GHG accounting?*

3.6.1.1.1 Kyoto accounting

If a voluntary project is based in a country with Kyoto or national emissions reductions obligations but is not included in the national GHG accounting, there is no issue of double counting between the regulated

and voluntary markets. These kinds of activities include projects developed in sectors that will not enter into the New Zealand ETS in the planned future or projects that generated VERs before 2008.

If the project generating voluntary credits is a type of activity that is regulated by national or international law and including in national GHG accounting, issues of double counting could arise. In this case, the retirement of an equivalent number of AAUs is one means of avoiding double counting.

3.6.1.1.2 Is the project a JI project?

The JI is a projects mechanism that deals with reductions in Annex 1 countries. Therefore any JI unit (an ERU or RMU) is able to be sold into voluntary markets and should be certifiable by a standard provider.

To be involved in JI projects, countries need to establish a Designated Focal Point (DFP) for project approval. The Ministry for the Environment is New Zealand's such designated entity.

New Zealand has fulfilled the eligibility requirements outlined in the "Guidelines for the implementation of Article 6 of the Kyoto Protocol" and so can apply a "simplified" Track 1 procedure, a bilateral approach allowing party-verification of real, measurable and additional emissions reductions. New Zealand already has a JI framework governing the verification of Track 1 projects which was used for its earlier Projects to Reduce Emissions scheme.

3.6.1.1.3 Is the government willing to retire AAUs?

Currently, an Annex 1 country that wishes to generate voluntary offsets into the international markets for Kyoto-eligible activities has only two options in order to be eligible for verification by standard providers. It can either cancel a Kyoto Assigned Amount Unit (AAU) equal to the amount of carbon equivalent (tC02e) reduced by the offset sold into the international voluntary markets, or it can purchase its own AAUs (or NZUs if they are fully backed by AAUs) and effectively "cancel" them through means of retirement.

As noted earlier, within the voluntary carbon markets most major carbon offset verification standards have rules for avoiding double counting in Annex 1 countries. Cancelling AAUs, or avoiding projects in Annex 1 countries, is the most common suggestion for avoiding double counting. The table below provides a brief overview of different standards' requirements for avoiding double counting for projects occurring in Annex 1 countries (i.e. developed countries with Kyoto obligations).

While most standards require retiring an equivalent number of AAUs (along with simply not generating VER credits in Annex 1 countries with Kyoto commitments) as a means to avoid double counting, to date no government has yet cancelled

AAUs for the sake of counting voluntary emissions reductions towards its greenhouse gas inventory. [46]

However, the Canadian government has suggested that it is in process of undertaking these steps, and Switzerland is working on a post-2012 plan to allow domestic offsets.

Table 10: Various Standards' double counting rules for Annex 1 countries* [47]

Standard	Rules to avoid double counting for projects in Annex 1 Countries
Gold Standard	Retirement of corresponding allowances in capped countries
VCS	Retirement of corresponding AAUs
VER+	Retirement of corresponding AAUs (for projects carried out in commitment period) or if applicable: statement of country that AAU shortage exists not allowing International Emissions Trading or statement of project participant that VER+ will not be transferred out of country
Chicago Climate Exchange	CCX does not allow for the registration of projects in Annex 1 countries during the Kyoto period that might be counted under the country level inventory (as AAUs).
California Climate Action Registry	Not applicable, as the US does not currently have Kyoto commitments

*Note: Only those standards most applicable to NZ agriculture and forestry voluntary market projects have been included in this table.

3.6.1.2 How do ownership rights, intention and location of VER buyers influence double counting?

Another issue to consider is how the location of the final buyer and if purchasing an offset really led a voluntary buyer to emit an extra unit of GHG emissions.. Market players have not reached consensus on these issues and several arguments should be considered.

One hypothesis is that even if a national government is not willing to retire equivalent AAUs, if a credit is purchased and retired by a buyer in the same country it is generated, we believe there would not be an issue of double counting since the emission reduction claims would remain in country and would not have been counted twice in the national inventory. [48]

[46] Anja Kollmus et. al, *Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards*, March 2008: Stockholm Environment Institute and World Wildlife Fund and conversation with Edwin Alders, Voluntary Carbon Standard, July 2008.

[47] Kollmuss et, al, 2008.

[48] Several experts interviewed agreed with this point, but others did not.

The buyer of an emissions reduction credit owns the rights to the reduction. If the emission reduction was retired in the same country it was generated it should be accounted for under national accounting. Others argue that buyer location is irrelevant.

3.6.1.3 Effect of double counting

The issue of double counting is expected to have a significant effect on the potential market for New Zealand agricultural and forestry voluntary carbon credits. If the voluntary market is being rapidly standardised, and those standards essentially preclude, New Zealand reductions, how else can a New Zealand project find a market?

3.6.2 Additionality

The term additional is used by voluntary carbon standard providers that create credits, to mean in general, something that would not have otherwise occurred in the absence of the incentive provided by the market mechanism. An action is not additional if it was going to happen otherwise and so will not qualify for credits. This is interpreted through various tests that a project must pass in order to qualify for generation of carbon credits.

Across the carbon markets, project-based additionality evaluation, which assesses individual projects on a case-by-case basis, can include a number of tests:

- Regulatory test—whether the actions undertaken as part of the project are required by regulations or industry standards.
- Investment or financial test—whether the project is "profitable" without offset sales and so would have been undertaken without the additional financial incentive provided by the sale of the offset.
- Barriers test—whether there are barriers to reducing emissions that are overcome by the project and so the project is considered additional.
- Common practice test—whether the project employs technologies that are commonly used and so might not be additional or, alternatively, goes beyond those practices and so would be considered additional.

For Annex 1 Parties, the Kyoto Protocol requires accounting for afforestation, reforestation and deforestation. Under Article 3.3, allowable sink activities were limited to afforestation, reforestation and deforestation, with the "since 1990" and 'human-induced' conditions added to address the issues of scale and additionality. The rules established for Post-1989 forests in the New Zealand ETS and PFSI forests are consistent with these rules established under Article 3.3.

3.6.2.1 Additionality tests by standard provider [49]

3.6.2.1.1 VCS

[49] All information in this section comes directly from certification websites accessed June 2008

The Voluntary Carbon Standard utilises several different additionality tests, a can be verified through a Project Test, Performance Test, or Technology Test.

According to the Voluntary Carbon Standard, "The Project Test requires the execution of an investment barrier analysis, a technological barrier analysis, or an institutional barrier analysis. In the investment analysis the project proponent has to prove that he/she has or can overcome financial constraints; in the technology barrier analysis the project must demonstrate it has overcome technological barriers to acquire its increased carbon income; and in the institutional analysis the project must prove it has overcome organisational, cultural or social barriers. Finally, the project proponent must give evidence that his/her activities are not common practice.

The Performance Test requires an approved methodology by the VCS. Up to the publication of this document no methodologies have as yet been approved.

The Technology Test is the third opportunity to test additionality. The VCS Program is currently developing a list [50] which approves project types and areas as being additional. With the VCS, only ex-post credits are generated." [51]

3.6.2.1.2 Gold Standard

The Gold Standard for VERs has the same basic requirements as the CDM:

- The project would not have occurred without project being a GS voluntary offset project
- goes beyond the business as usual scenario
- greenhouse gases are lower with the project than without
- In addition
    - measurability of emissions reductions
    - introduction of technology and/or innovation to the host country
    - previously announced projects are not eligible
    - compliance with UNFCCC's Additionality Tool
    - project should not employ Official Development Assistance (ODA) for purchasing of VERs

3.6.2.1.3 California Climate Action Registry

To prove additionality for land use related projects, the following general requirements must be met:

- The project area has been out of forest cover for a minimum of ten years at the time of project initiation. For purposes of this protocol, out of forest cover means less than 10% tree canopy cover.
- The project area was historically under forest cover

[50] http://www.v-c-s.org/methodologies.html

[51] Comparison of Carbon Offset Standards for Climate Forestation Projects participating in the Voluntary Carbon Market. A comparison of Climate, Community & Biodiversity Standard (CCBS), CarbonFix Standard (CFS), Plan Vivo Systems and Standard, and AFOLU Voluntary Carbon Standard (VCS). Eduard Merger & Alwyn Williams, University of Canterbury, Christchurch, New Zealand, May 2008.

- No mandatory statutes or regulations require reforestation of the project area at the time of baseline initiation
- Describe the practices (or absence thereof) that would continue in the project area over time, based on the previous activities that have kept the area out of forest cover.

Specific additionality requirements for forestry projects include:

Conservation-based Forest Management: A forest management project must demonstrate that it is additional by showing that the planned project activities exceed the applicable mandatory forest management laws used to characterize the project baseline. Such additional activities may include watercourse buffer strips that are wider than legal requirements, greater basal area retention, or older rotation ages.

Reforestation: After characterizing the baseline, a project developer undertaking a reforestation project must prove that its project activity, reforesting, would be additional. This would be done by demonstrating that the project area had been out of forest cover for at least ten years and that governing land use statutes and regulations do not require the project area to be reforested.

Conservation: A forest conservation project demonstrates its additionality initially by showing that, but for its act of protecting the project area, the project area would have been converted to a non- forest use.

3.6.2.1.4 VER +

Under the VER+ Standard a project's additionality shall be sustained and tested according to corresponding tools and guidelines as defined for project activities under the Kyoto Protocol.

According to VER+, "For the proof of additionality the following options exist:

- if an approved CDM methodology is applied which includes specific guidance on additionality, then these specific indications shall be followed
- in all other cases, the most recent version of the CDM Additionality Tool shall be applied."

3.6.3 Measurement, establishment of baselines, and verification

To provide verifiable products at the project level, measurement techniques will need to be developed at that level. This is the level at which a 'Baseline' may be established. A baseline is a projection of business-as-usual emissions. It follows that if emissions can be measured sufficiently to establish such projections then that is enough to constitute a 'project boundary'. It is not necessary that all entities inside a project also need to share common economic interests, or indeed ownership. In fact, a project may contain many separate enterprises, such as farms. The baseline defines the project boundary and vice versa.

Baselines can be established at a national level (e.g. such as the national Inventory under UNFCCC). It could be that a 'regional' or agro-ecosystem characteristic, such as soil type, provides an additional capability to demarcate effectiveness of a technology. In such cases it is possible to build a project around that activity on that soil type.

Commonly, baselines are established that aggregate enterprises that share common characteristics, particularly at the level of the individual enterprise.

The table below provides a framework to consider.

Table 11: Project boundary framework

	Economic level			
	National level	Agroecosystem level	Project level	Enterprise level
Mitigation	Not available	Not available	Yes, if real, verifiable and additional	Available if part of a project
Measurement	Aggregated or extrapolated data	Most knowledge is focused here	Some	Very little to date
Policy issues	Counting voluntary market reductions under Kyoto accounting	Reducing the cost of free-riders	Proof of reduction	Preferred economic unit

Because both measurement and mitigation knowledge is increasing significantly, as is the case for methane from enteric fermentation and nitrous oxide from agricultural soils in particular, it is logical to expect project boundaries to also reduce as technologies find their effectiveness being delivered at smaller and smaller scales.

Consider how this might apply to a specific project, such as nitrification inhibitors.

This might for example involve a project that "set up a central unit that consists of, for example, 200 farms with the same soil type and the same regime applied. For arguments sake, one or two farmers could be appointed to become the project manager.

These farmers will be responsible for checking all the other farmers to make sure they have the same soil type/apply the same nutrient balancing regime. The farmer will be responsible for visiting all of these farms and collecting in-house emissions and regime data, as well as checking new farms wishing to join the scheme.

Then, a third-party verification entity would perform the verification by asking the central unit project managers to show him how the other farms meet the requirements of the methodology. The verifier would visit a small number of farms to verify that the project manager's data is consistent with the verifier's

findings. If all is consistent, the verifier would likely approve the emissions reductions.

However, if there is a discrepancy because one or two of the farmers operate on a totally different soil type, or with a different regime, all of the farms will stand to lose because the data on the whole will have lost credibility. It will cost the farmer time and money to have to revisit all of the farms, then apply for verification again, and the farmer may have to consider reducing project size to more easily manage the credibility of the data." [52]

There are clearly going to be potential differences between firm and national beneficiaries. At the moment many of the measurement techniques are undertaken at the national level using parameters involving the national herd size for example. To create a project within the voluntary market these parameters will likely need to be applied at the firm or industry level.

The treatment will depend upon the level of the project baseline. It may be possible to establish national or regional baselines but this is not common practice.

If such projects were also generating the cancellation/retirement of an AAU to avoid double counting, that may provide even more comfort to standard providers and address the issue of double counting.

The UNFCCC methodologies are therefore a useful starting point for creating voluntary products provided they can be adapted to measure the effect of behaviour at the enterprise or project level. The discussion and table below provide comments on the economic levels at which a voluntary market project could possibly operate.

3.6.3.1 Enteric fermentation - measurement methodology

This measurement will need a project to specify the methane produced per unit of feed intake, measured as dry matter intake (DMI). In turn this needs the following;

- the energy required to meet the levels of animal performance and dividing this by;
- the energy concentration of the diet consumed.
    - algorithms chosen to include methods for field-grazing animals.
        - level of productivity (e.g. milk yield and liveweight gain),
        - physiological state (e.g. pregnant or lactating) and the
        - stage of maturity of the animal.

There will be variations from one animal to the next if project developers believed they differed from a national baseline emissions from grazing cattle and sheep they could monitor their own herd using the SF^6 tracer technique. This is likely to be difficult at a project level and regional or national baselines preferred.

[52] One standard provider suggested this as a management approach for such a methodology

3.6.3.2 Manure management – methane measurement methodology

The general approach relies on an estimation of the total quantity of faecal material produced and partitioning this between that deposited onto pastures and that stored in anaerobic lagoons, multiplied by specific New Zealand emission factors. This is likely to be able to be measured easily at a project level.

3.6.3.3 Manure management – nitrous oxide measurement methodology

This calculation is based on the nitrogen excreted per head per year multiplied by the livestock population, the allocation of animals to animal waste management systems and a nitrous oxide emission factor for each animal waste management system. This is likely to be difficult at a project level and regional or national baselines preferred.

3.6.3.4 Agricultural soils – Direct emissions

The calculation of N_2O that is emitted indirectly through synthetic fertiliser and animal waste being spread on agricultural soils is based on three New Zealand-specific factors/parameters. This is likely to be difficult at a project level and regional or national baselines preferred.

Direct N_2O emissions from organic soils are calculated by multiplying the area of cultivated organic soils by an emission factor. This is likely to be difficult at a project level and regional or national baselines preferred.

Direct emissions from faecal material deposited directly onto pastures is found by multiplying the quantity of feed eaten by the dry matter digestibility of the feed, minus the feed retained in product. This is likely to be difficult at a project level and regional or national baselines preferred.

3.6.3.5 Agricultural soils – Indirect emissions

Nitrogen leaching is determined by the amount of nitrogen in fertiliser, dairy farm effluent and that excreted in urine and dung by grazing animals. The latter is calculated from the difference between nitrogen intake by grazing animals and nitrogen output in animal products, based on inputs of stocking rate or production and information on the nitrogen content of pasture and animal products. This is likely to be difficult at a project level and regional or national baselines preferred.

3.6.3.6 Planted forest

For all forestry voluntary projects, the same carbon measurement infrastructure developed as part of the New Zealand ETS is likely to be available. This includes physical or photographic observation at forest level, including sample plot regimes, and geo-spatial mapping of forest area and strata.

Stem wood volume yield tables are able to be compiled for combinations of species, silvicultural regime and location using the C_change model, based on wood density and management assumptions appropriate to the species, regime and region. This is likely to be able to be measured easily at a project level but for smaller growers regional or national baselines are likely to be preferred.

Table 12 below shows suggested methodologies for the various projects examined in this study.

Table 12: Selected project methodologies

Project	GHG	Likely methodology
Enteric fermentation projects		
1. Feed additives - inhibitors	CH_4	At farm input supplier point of sale. Benefits may be aggregated by this supplier or retailer, or more likely by the manufacturer wherever product differences occur.
2. Immunisation against methanogens	CH_4	Similar outcomes as feed additives or certification by vets.
Manure management projects		
Farm management of dairy effluent	CH_4	Physical or photographic observation at farm level.
Management of piggery effluent	CH_4	Physical or photographic observation at farm level.
Management of poultry waste	CH_4	Physical or photographic observation at farm level.
Feed livestock on pads in winter	N_2O	Physical or photographic observation at farm level.
Agricultural soils projects		
Diet manipulation	N_2O	At point of sale aggregating benefits.
Management practices that reduce nitrification or denitrification in cropland and grazing land	N_2O	Physical or photographic observation at farm level.
High condensed tannin grasses	N_2O	Point of sale (when used as a feed additive). Physical or photographic observation at farm level or via seed suppliers (forage).
Nitrification inhibitors	N_2O	At the point of sale where benefits can be aggregated.
Forestry projects		
Management of forests that existed as at 1990	CO_2	Carbon measurement infrastructure developed as part of the New Zealand ETS. Physical or photographic observation at forest level. Geo-spatial mapping.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (2008-2012 vintage)	CO_2	Carbon measurement infrastructure developed as part of the New Zealand ETS. Physical or photographic observation at forest level. Geo-spatial mapping.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (2008-2012 vintage) - permanent	CO_2	Carbon measurement infrastructure developed as part of the New Zealand ETS. Physical or photographic observation at forest level. Geo-spatial mapping. Title searches.
Pre 1990 plantation forestry - permanent	CO_2	Physical or photographic observation at forest level. Geo-spatial mapping. Title searches.
Plantation forestry established post-1989 consistent with Article 3.3 under the Kyoto Protocol (1990-2007 vintages)	CO_2	Physical or photographic observation at forest level. Geo-spatial mapping.
Regeneration of land under QE II Trust covenant	CO_2	Physical or photographic observation at forest level. Title searches. Geo-spatial mapping.

3.6.4 Permanence

As mentioned above, forestry projects in general have been constrained by ways in which offset buyers can be assured that the forest will continue to sequester or hold carbon and not be deforested.

These concerns have largely been allayed through the use of buffer stocks. Under this approach, buffer stocks are established, depending upon the risks of deforestation/degradation on failure of a given project. The buffer creates carbon 'stocks' can not be traded for an extended period.

"These stocks can then be used, if necessary, to compensate for shortfalls in the volume of carbon (that might occur due to various factors, such as forest fires, lower than projected tree growth rates, etc.) specified in forest-carbon offset contracts. If the stocks are not required to compensate for any shortfalls, or only a portion of the stocks are drawn upon, the (remaining) stocks are sold at the end of the contractual period.

The VCS, VER+, Plan Vivo/Earth Charter and Chicago Climate Exchange systems have all recently adopted this approach". [53]

3.6.5 Leakage

Leakage occurs when an action does not have a net effect of reducing emissions because the emitting activity is simply transferred elsewhere.

The problem is more relevant to developing countries where national baselines are not well established.

In forestry the presence of a national accounting level means in-country leakage will be picked up, even if at a project by project level it is very difficult to account for it.

In agriculture it could become an issue in regard to nitrogen fertiliser e.g. by moving from usage of three types of fertilisers to more intensive use of just two types of fertilisers.

The situation where it may become a greater issue is where voluntary units are generated both in New Zealand and overseas, such as increased investment in dairying in South America by New Zealand farmers. We do not believe that such investment could be driven by any carbon market influences in the near future.

[53] A report to the World Bank's PROFOR on "A summary of interviews with experts on payments for ecosystem services regarding the potential for forest-based PES combined with sustainable forestry and agroforestry ", April, 2008, Forest Trends

4 OBJECTIVE 2: Identify global markets and the way they operate

4.1 Region-Wide Analysis of Voluntary Carbon Markets

4.1.1 Potential for agriculture and forestry sectors in these markets

In early 2008, Ecosystem Marketplace collected data from 150 different carbon offset suppliers in the voluntary carbon markets for our *State of the Voluntary Carbon Markets 2008* report. The following section highlights New Zealand specific data shared by survey respondents. In some cases Australia and New Zealand were combined in a single category and hence some of the analysis below highlights region-wide trends.

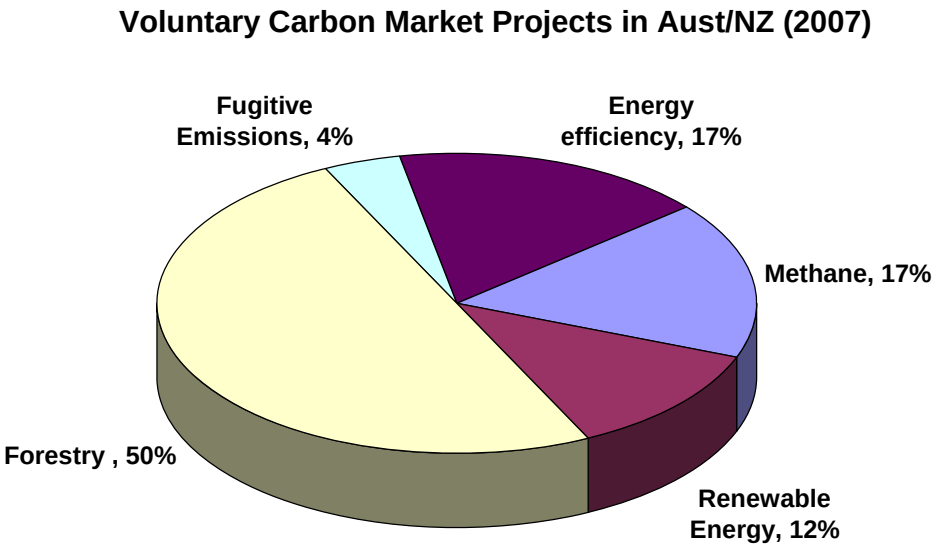
Ecosystem Marketplace tracked 2.0 $MtCO_2$-e originating in Australia and New Zealand on the OTC market in 2007. Last year's report only tracked 0.22 $MtCO_2$-e coming from projects in the region. The number of organisations in Australia and New Zealand sharing data for the survey more than doubled, from 8 last year to 18 this year.

The increase in credit sale volumes from Australia and New Zealand in 2007 matches a major increase in customers from this region (1% in 2006 to 7% in 2007). Forestry projects make up about half of all project types based in the region. Energy efficiency and methane/landfill were the second and third most common project types. The chart below illustrates breakdown of Australia and New Zealand based projects by project-type.

It should be noted that the graph below includes organisations whose headquarters are outside of the region but have projects based in the region. In fact, over a third of the organisations that have projects based in Australia or New Zealand are headquartered elsewhere.

In addition, some of those organisations sell few or zero credits to customers based in the region. This suggests there is demand from outside the region for credits originating from Australia and New Zealand. For example, UK-based Correct Carbon proudly displays a New Zealand based Wind Farm on its website and sells credits derived from that Wind Farm over the internet to a wider customer base.

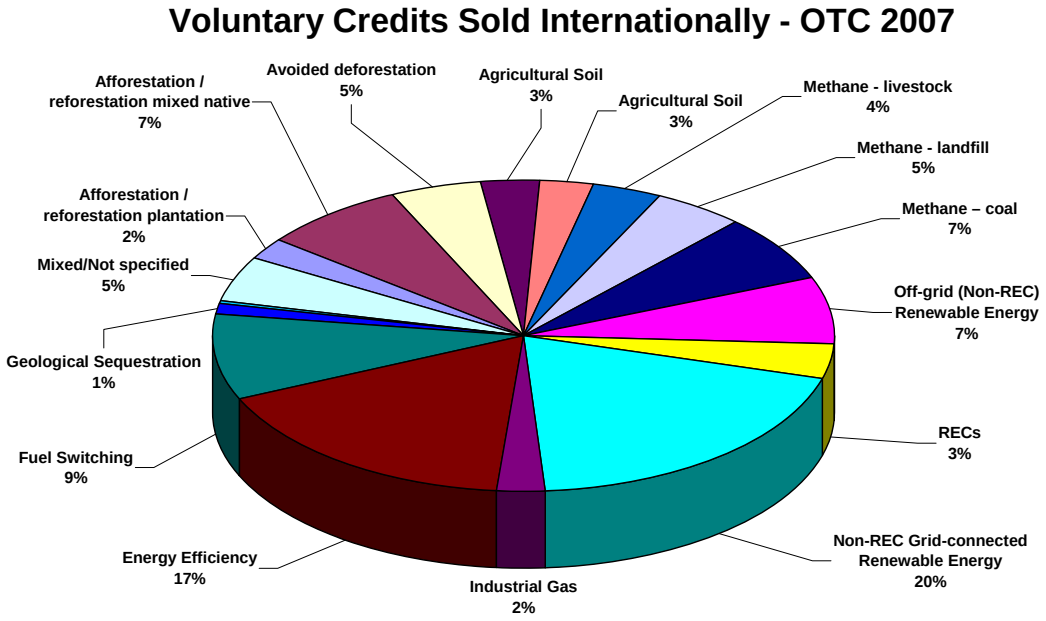
Figure 10: Projects (by type) based in Australia and New Zealand; OTC 2007



Only one Australian organisation engaged in forestry projects in the Australia and New Zealand region disclosed transaction volume to Ecosystem Marketplace for its 2008 report. Therefore, the volume of credits derived from forestry projects depicted in the above graph is a conservative estimate. The customer base of said organisation sells all of its credits within the region.

There are at least five organisations engaged in forestry projects in the region, and all of them except for one sell the vast majority of their carbon credits within the region. The above graph shows that half of the projects based in the region are forestry projects, which is a much higher share than the percentage of the OTC market occupied by forestry projects (see the figure below).

Figure 11: Project types; voluntary credits sold internationally; OTC 2007



Only 15% of worldwide OTC transactions in 2007 involved credits generated from forestry projects. This suggests that either there is more capacity to generate carbon credits from forestry projects in Australia and New Zealand; that supply is simply meeting demand for carbon credits produced by forestry projects in Australia and New Zealand; or – most likely - that the limited information supplied to Ecosystem Marketplace from Australia and New Zealand-based suppliers is not reflective of the actual breakdown of forestry projects generating credits in the region.

Credits derived from projects based in the region sell at an average of $8.60 a credit, about 40% higher than the market-wide average of $6.10 a credit.

4.1.2 New Zealand based suppliers

As noted above, Ecosystem Marketplace's population survey of carbon suppliers in the voluntary carbon markets revealed five New Zealand-based organisations currently selling credits into the OTC and CCX markets: two wholesalers, one project developer, one retailer, and one consulting firm.

Only two of these five organisations disclosed transaction volume for the year 2007. Overall, 15,366 tCO_2e were transacted by these two organisations. Three of the five organisations based in New Zealand disclosed 2007 price information. New Zealand suppliers sold credits at substantially higher prices than the market-wide average of US$6.10, selling at $20, $10.30, and $27.

The lower-end price of $10.30 may be due to that organisation's membership in the Chicago Climate Exchange (CCX). That particular organisation sells about a fourth of its credits on the CCX. In 2007 the average price for credits selling on the CCX was $3.15, pushing down the average price per credit for said organisation.

The higher-end prices observed—$20 and $27—are likely because those credits were Gold Standard certified. Gold Standard credits typically sell at a premium price because they are generally considered the highest quality credits in the voluntary markets, and also because their certification costs are high relative to other certification services.

New Zealand based carbon offset providers that supplied data to Ecosystem Marketplace sold carbon credits generated from the following project types: off-grid (non-REC) renewable energy, methane/ landfill, and energy efficiency. One particular New Zealand organisation engaged in energy efficiency and methane/landfill projects sold 80% of its credits outside of the region (Australia and New Zealand.

Another interesting aspect of our findings regarding New Zealand offset suppliers is the lack of forestry projects. There may have been some forestry projects based in New Zealand that our survey was unable to capture due to the way our questions were phrased (i.e. by referring to Australia and New Zealand as a

region, not by the individual countries) [54]. Nevertheless our survey did not track a single New Zealand-based organisation engaged in forestry projects in New Zealand.

Despite limited information supplied by New Zealand-based suppliers to Ecosystem Marketplace for its 2008 report, the recent emergence of two new New Zealand-based marketplaces for carbon offsets—coupled with a rising number of New Zealand firms requesting certification of greenhouse gas reductions—demonstrates strong momentum toward voluntary market growth in New Zealand.

TZ1 and the online auction house TradeMe both launched carbon trading exchanges in 2007. TZ1 also operates a registry and hopes to expand its geographic scope to the entire Asia-Pacific region in the near future. Trade Me's registry 'Regi' is operated by electricity market operator M-Co.

4.1.3 New Zealand's demand for offsets

Demand for offsets from New Zealand-based firms is high relative to supply. As of early June 2008, sixteen New Zealand-based companies were registered with the UN Environmental Program's Climate Neutral Network, and another ten were in the process of registration. Members of the network pledge to make dramatic cuts in their greenhouse gas emissions, and some have pledged to go entirely carbon neutral.

Additionally, the website of New Zealand-based certification service CarboNZero (launched in 2001) asserts that it is working with over 100 companies requesting certification of their emissions reductions [55].

Among the sixteen New Zealand organisations registered in the Climate Neutral Network are electricity providers, a vintner, a consulting firm, and an airport (Meridian Energy, The New Zealand Wine Company, Sempre Avanti Consulting, and the Christchurch International Airport, respectively) to name a few.

Some New Zealand-based companies not registered on this Network but have also pledged to go carbon neutral include law firms, such as Bell Gully and Lowndes Associates, courier Urgent Couriers and even the meal manufacturing company Pitango.

In addition to companies going "green," recent New Zealand events have also purchased offsets toward the goal of being carbon neutral. These include the country's largest international tourism industry event, TRENZ (in both 2007 and 2008) and PURE LUXURY 2008, an event hosted for the luxury travel industry.

[54] An example could be http://www.ebex21.co.nz/.

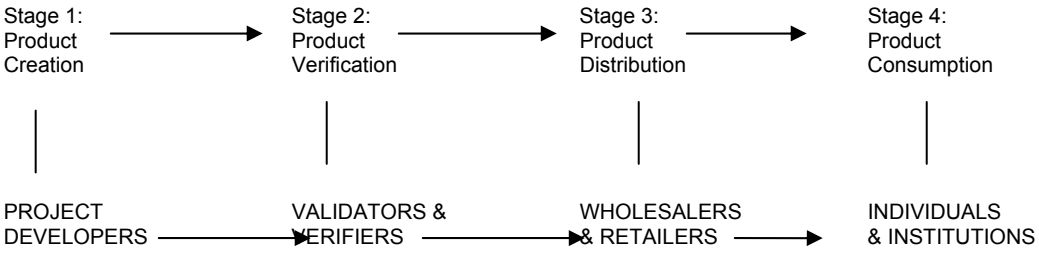
[55] CarboNZero discloses its participant organisations on its website http://www.carbonzero.co.nz.

4.2 The supply chain and ways the global market works[56]

Institutions and individuals acquire offsets in a number of ways, but a simplified model of the voluntary carbon market's supply chain includes the following elements: a project or project idea is generated, the resulting emissions reductions are verified to some standard to create carbon credits, the credits are sold to an intermediary, and the intermediary sells them on to businesses and individuals.

Brokers and exchanges may assist in the distribution of offsets by facilitating transactions between buyers and sellers, but they usually do not buy or sell credits. In some cases, project developers may skip stage two and/or three of this sequence, selling either verified or unverified credits directly to consumers.

Figure 12. Simplified supply chain of the retail carbon market [57]



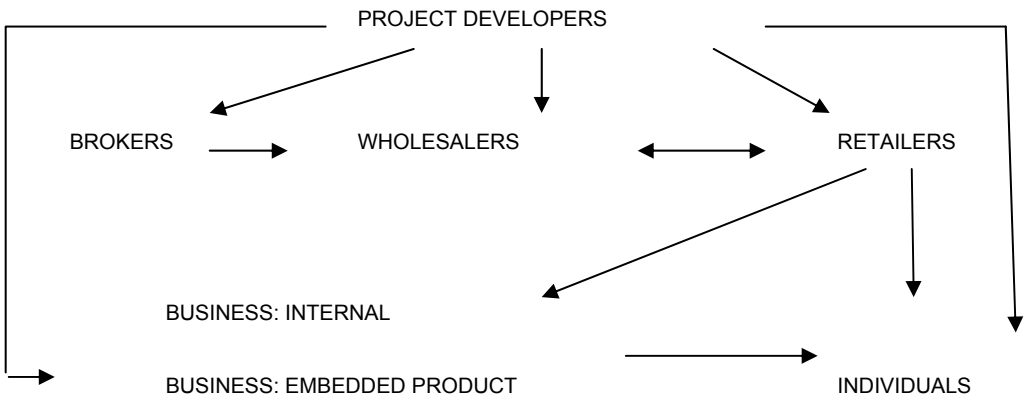
While the simplified supply chain pictured in Figure 11 is useful in understanding how carbon credits generally get to market, it should be noted that it is difficult to depict the market properly using a linear supply chain because a single participant can occupy more than one role.

In and before 2006, it is likely that most credits were purchased directly from project developers or were retired and sold by retailers who purchased them from project developers.

However, in 2007 it appears that supply chains became increasingly complex. The model in Figure 12 below gives a more realistic sense of how the voluntary carbon markets currently function.

[56] Text from this section is taken from Ecosystem Marketplace's book: Voluntary Carbon Markets: A Business Guide to What They are and How They Work (2006).
[57] Source:Bayon, R et Al. Voluntary Carbon Markets: A Business Guide to What They are and How They Work (2006).

Figure 13: A model of common types of transactions in the voluntary carbon market



Suppliers: Suppliers in the offset market include retailers selling offsets online, conservation organisations hoping to harness the power of carbon finance, developers of potential JI or CDM projects with credits that - for a range of reasons - cannot currently be sold into the regulated markets, project developers primarily interested in generating VERs, and aggregators of credits. Depending on their position in the supply chain, sellers can be categorised into four major types:

Project developers: Develop GHG emissions reduction projects and may sell carbon to aggregators, retailers, or final customers.

Aggregators/Wholesalers: Only sell offsets in bulk and often have ownership of a portfolio of credits.

Retailers: Sell small amounts of credits to individuals or organisations, usually online, and have ownership of a portfolio of credits.

In some cases VERs also pass through **brokers**, who do not own credits but facilitate transactions between sellers and buyers.

Within the voluntary OTC market, these definitions are often blurred, and organisations frequently operate in more than one category type. Many suppliers, for instance, are also engaged in business activities other than selling VERs.

For example, most major brokerage firms dealing in VERs also transact in the regulated markets or in other emissions markets. Alternatively, for several major non-profits supplying offset credits, the voluntary carbon market is only one of numerous finance streams enabling conservation projects.

The general price increase is reflected across the supply chain, except in the case of brokers, whose average credit transaction was priced at $6.00 in 2006 and declined to $5.40 in 2007.

The general price increase in the average volume-weighted credit price is reflected across the supply chain, except in the case of brokers, whose average credit transaction was priced at $6.00 in 2006 and declined to $5.40 in 2007. This lower brokerage price obtained from this year's survey seems to be more realistic compared to last year, as brokers are generally involved in transactions between project developers and wholesalers or retailers, so their quoted prices should therefore be in between these two price points.

In last year's survey, brokerage prices were above the average price of wholesalers/aggregators. The average project developer price rose from $3.88/tCO$_2$-e to $5.00 /tCO2e. Likewise, the average retailer price rose from $8.04/tCO$_2$-e in 2006 to $11.3/ tCO$_2$-e in 2007.

As in the supply chain for most consumer products, carbon offset consumers generally pay more for a small batch of carbon credits purchased from a retailer than they would if making a bulk purchase or contacting the project developer directly. Hence, it makes sense that consumers purchasing directly from a project developer paid the lowest price while customers purchasing smaller batches of credits online in the comfort of their homes from a retailer paid the highest price.

These price increases may highlight a number of trends. It seems increased demand for voluntary credits has significantly increased, as illustrated by the volume figures in the first section, and demand has moved beyond the relatively inexpensive — low-hanging fruit of the industrial gas sector, towards the more expensive methane and renewable energy sectors. At the same time, buyers are increasingly seeking highly additional credits that have been verified to a third party standard, which means these credits are more costly to produce.

4.2.1 Buyers

There are two basic types of buyers in the voluntary carbon market: consumers and intermediaries. Put simply, consumers buy credits in order to use them to offset the emissions associated with an action, event, or product. Middlemen, on the other hand, purchase credits and then sell them on to consumers without making any offset claims of their own.

At the coarsest level, it is fair to say that for-profit middlemen acting as wholesalers or retailers of carbon credits are driven by profit motivations, while their not-for-profit counterparts are generally driven by environmental and sustainable development aims. It should be noted, however, that many of the for-profit organisations operating within this sphere also have philanthropic aims, but believe that a private-sector model provides the most sustainable vehicle for driving change.

Within the consumers category, one can further separate buyers into institutions and individuals. And within the institutions category, it is possible to distinguish between buyers from the private, public and social sectors. Since it is the purchasing behaviour of end-consumers that ultimately drives the market, we will

look at the motivations that individual and institutional consumers have for buying carbon credits on the voluntary carbon markets.

A clear trend in Ecosystem Marketplace's analysis of the OTC market in 2007 was that customers are becoming increasingly savvy about offsets and are getting more specific about the type of offset credits they want to purchase. Additionally, a clear trend in 2007 and 2008 is that an increasing number of OTC customers, especially those in the US and Australia, prefer to buy offsets from projects close to home.

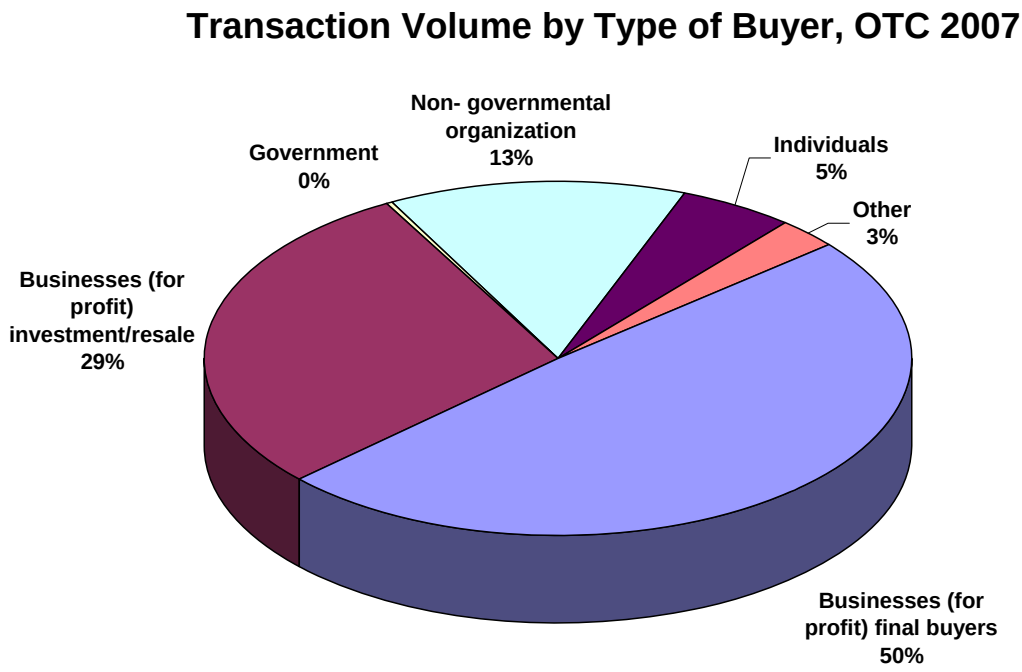
This goes counter to the common thinking of carbon markets as achieving economies of scale – the bigger the market, the greater the efficiencies --- i.e., thinking globally. In reality, a seemingly growing trend in the voluntary carbon marketplace may be turning this "global think" on its head, instead heeding the classic environmental mantra to "think globally" but "act locally."

In 2007, NGOs stepped up demand from 2% to 13% of credits transacted. This increase in demand matches NGOs' desire to "walk the talk" by offsetting emissions from airline travel, electricity use, and other activities. Demand from governments decreased between 2006 and 2007 (from 12% to 0.4%), a somewhat perplexing trend, as it is known that numerous government agencies began their offset purchases in 2007.

In 2007 individuals purchased 5% of credits on the OTC market. While their market share may be small, the number of credits purchased by individuals equals a relatively large number of transactions. This is because the credit size of individual purchases tends to be relatively small.

Companies are also increasingly starting to offer carbon offsets to individual customers bundled with other goods, or as an incentive to purchase goods from a specific supplier. For example, in 2007, California´s Pacific Gas & Electric Co (PG&E) launched its ClimateSmart program, which gives customers the option to pay extra to offset their electricity emissions.

Figure 14: Transaction volume by type of buyer, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance

Compliance costs for various VER providers vary from one standard provider to another. Set out in Annex 4 is a comparison of estimated compliance costs by standard.

4.3 A survey of international carbon market participants

To better identify the potential global markets for New Zealand agricultural and forestry carbon credits, we undertook a survey of market participants and dialogued with standard providers, which was obtained through dialogue.

4.3.1 Survey description

4.3.1.1 Survey objective

In addition to analysing data collected from 150 suppliers in the voluntary carbon markets, we executed a more in depth survey, focused on issues specific to New Zealand, of international carbon market participants, including brokers, developers, consultants, retailers, other intermediaries, traders, and final buyers.

The survey participants were asked a two-part series of survey questions that seek to investigate the processes and appetite for various carbon project methodologies and protocols with specific reference to the New Zealand project environment.

4.3.1.2 Methodology

The survey consisted of a series of questions separated into two tiers. Tier One focused first on general perspectives on demand and supply in the voluntary carbon markets, by project type and project location. The rest of Tier One investigated the global voluntary market demand for New Zealand land-based carbon credits and other New Zealand-specific questions.

Tier Two focused on the desirability for and interest in specific agriculture and forestry project types ranging from afforestation to livestock emissions to energy efficiency. For the first section of Tier Two, respondents were asked to rank agricultural project desirability from 1 to 5 (1 being most favoured, 5 being least favoured). Annex 7 shows a copy of the survey.

The surveys were conducted in one of two ways, as a slight change was made after the interviews had begun to streamline the process. The original survey structure consisted of circulating the Tier One survey via email and following up with phone interviews.

The Tier Two survey was intended to be circulated via email to those respondents demonstrating a willingness to answer additional and more specific questions after the phone interviews. Information sheets, outlined in Annex 8 and 9, were also provided to respondents seeking further clarification of the projects being discussed.

About halfway through the interview process, it became clear that phone interviews were successful and respondents were largely willing to continue the conversation into the Tier Two questions. For the second half of surveys, rather than conducting the Tier One portion of the survey over the phone and Tier Two via email, both tiers were conducted through verbal interviews and dialogue when possible, though some were conducted via email when phone conversations proved difficult.

4.3.1.3 Survey participants

Over forty different organisations from the United States, Australia, New Zealand, Brussels, The Netherlands, and the United Kingdom were contacted with Ecosystem Marketplace's participation request. Respondents, however, were predominately from international organisations (17), followed by New Zealand organisations (3). Annex 7 shows a list of participating companies.

The survey participants represent a broad range of perspectives and levels of expertise. With feedback from vice presidents and organisation founders down to graduate student interns, participants came from major international intermediary buyers and investors, international final buyers (purchasing credits to offset their emissions), New-Zealand based intermediary and final buyers, and knowledgeable consultants for the global and New Zealand-specific markets.

4.3.2 Survey Results

Ecosystem Marketplace's research team spoke at length with over twenty carbon market experts and buyers possessing a range of familiarity with domestic U.S. and international regulatory and voluntary markets. Not all participants responded to each question. From these conversations, the following information and results concerning perspectives and opinions on the pre-established survey questions have been derived.

4.3.2.1 Company information/market perspective

When asked about current primary sources of carbon credit supply, the answers were varied in terms of project type and geography. Overall, in terms of project location, the answers were split between projects sourced from developing and developed nations.

Three respondents stated that their organisation would not consider any credits not generated in a developing nation. Latin American-based projects were mentioned most as dominant for developing countries, especially for forestry, whereas the U.S., specifically projects under CCAR, and New Zealand were top choices for developed nations (it is important to note that the three respondents that stated New Zealand as a supply source where New Zealand-based firms).

Answers regarding project type varied considerably. Landfill and agricultural methane, voluntary international reforestation, California-based forestry; REDD, and international renewable energy credits (RECs), and pre-CDM/VERs projects were all mentioned. General consensus indicates that forestry-based carbon projects are a rapidly growing area of interest and investment.

Much of this interest is directed toward afforestation and reforestation projects, but projects that reduce emissions from deforestation and degradation (REDD) and avoided deforestation (AD) also generated interest.

Conversely, one corporate final buyer stated that his firm was "staying away from forestry, largely due to negative press" that it had received and that, due to uncertainty about what will happen to forestry-based credits under the New Zealand ETS, it was easier and safer to buy credits generated by other project types, such as landfill gas capture, renewables, or small projects diverting waste from landfills for composting.

Perspectives on primary sources of demand varied as well. Intermediary firms have seen a growing demand from investment banks, financial funds, corporate offsetting. The founder of a carbon consulting firm found that the market demand had shifted in the last two years, shifting to small and medium businesses (credit unions, small production entities, etc).

However, now large aggregators are becoming quite active in market – banks, brokers and financial houses are amassing offsets. Another expert stated that demand largely outstrips supply, but thinks that a significant portion of this is due to mostly financial speculators.

Geographically, much demand emanates currently from the U.S., for general carbon projects but also for boutique credits that also generate social and/or other co-benefits. Quite a few U.S.-based respondents stated that some U.S-based buyers seek U.S.-based credits. Allstate, for example, is conducting pilot projects in the states of Colorado and Ohio.

One underlying sentiment received from respondents is that some buyers seemingly care less about the project type and more about the project location. An example of this is JetBlue, which is seeking projects that are located near the airline's service cities (such as a methane-based project in New York). Nonetheless, some clients want diverse portfolio, so they specifically seek a blend of domestic and international sources to meet that objective.

Currently, there are a growing number of global as well as niche voluntary carbon market standards. Beyond a doubt, survey participants largely favoured the Voluntary Carbon Standard. Over half the respondents currently use VCS (most do so in conjunction with other standards as well), and two others mentioned intent to use it in the near future. One stated benefit of using VCS is that it includes CDM methodologies. Six use the Gold Standard, four utilise CCAR, four CCBS, and two PRE. Other standards mentioned were, CCX (2), ISO14064-2 (1), and Greenhouse Friendly in Australia (1).

When asked for their preferred standard of choice, quite a few respondents stated that they have no favoured standard overall but rather a preferred standard dependant on project type. One participant said that "as different certifications exist for different project types (for example: CCBS for Forestry), [he] prefer[s] the best or highest quality in each area."

Nonetheless, of those that chose one out of all the standards, the preferred standard utilised by survey participants was definitively VCS (about 60%). One respondent stated "VCS is most desired" in the market whereas another found that VCS has great traction and believes that this trajectory will continue, despite its deficiency concerning temperate deforestation.

Three participants like CCBS best overall, especially for forestry. Interest in CCBS is "extremely high, and gaining ground", largely due to its emphasis on social and environmental co-benefits. Three participants also like CCAR as their preferred standard. Gold Standard was chosen by one respondent but he also stated that he is "getting a bit sceptical of them because they're so slow and understaffed." Lastly, CDM received two supporters as their preferred standard.

4.3.2.2 Experience with New Zealand-based offsets

A small number of survey respondents had experience working with or buying NZ-sourced carbon credits. Of the four that stated in the affirmative to this question, three had worked with a wind farm project while the other had worked through PRE (project type not disclosed). Specifically, one participant had bought emissions reductions generated from a fairly large wind farm project in

2006 and 2007, one had bought a volume of 220,000 in 2007 from a wind farm, and the third could not disclose this information.

When these buyers were asked about the benefits of NZ-based credits, one response affirmed that such credits were another international opportunity for projects (diversification) and another said that the projects tend to consist of very small parcels/volumes (<100,000 tCO_2-e). It was also noted that the latter point could also be a drawback. One respondent offered the perspective that New Zealand-based credits would be less likely to slide into a U.S. compliance market.

Over two thirds of respondents had not purchased New Zealand-based credits. Most answered that they either have a regional focus elsewhere (Africa, North America, etc.) or that they only work in or buy from developing nations. Four affirmed that they would be willing to buy New Zealand-based credits, but would first seek to have certain assurances, such as more certainty in the forestry sector and clarification between voluntary and compliance credits to avoid double-counting. Also, one carbon executive had mentioned hearing that prices from New Zealand were high, which "might be good for internal trading, i.e. within New Zealand or within Australia/ New Zealand], but not the global market."

Though numerous participants had not yet bought New Zealand-sourced credits, they were able to identify various potential benefits of doing so. Some found comfort in that New Zealand has a good reputation as a source of credits, and because of its predictable regulatory/ social/ economic risks and clear land rights. One respondent was drawn to the "strong support for and expertise in forestry" and another thought it "helpful they [New Zealanders] speak English!" Lastly, the copious amounts of sheep set the stage for ample opportunities for credits derived from methane reduction.

The predominant drawback stated was cost-based: many participants believed that the cost would be prohibitive, especially on the international markets. Credits must be clearly in the voluntary market sand thus outside the national regulatory accounting system (to avoid double-counting). One respondent stated that this may engender a limited supply of voluntary credits and thus higher prices.

Another drawback is that many U.S. and other international buyers are becoming more interested in buying locally-generated offsets. Others mentioned that their clients are interested in credits that are based in developing nations and that simultaneously produce social benefits (and sellers like the resulting premium often associated with those co-benefits).

"In the voluntary market, at least in Europe, people hesitate to buy projects from developed countries because they don't have as much "bang for the buck" as buying from developed countries. People feel better giving the money to projects in developing countries, for reasons of social and development co-benefits. This is why it is harder to sell Kiwi, American, Australian credits."

Additionally, participants underscored that regulatory uncertainty of the ETS as it stands limits interest in New Zealand-based offsets at the present time. A related concern is the limited understanding of forestry in the cap-and-trade context as opposed to more established offset mechanisms.

4.3.2.3 Livestock emissions: methodologies, opportunities, and concerns

A little more than half of the organisations that responded deal with writing new methodologies, with involvement ranging from the primary activity to very peripheral participation. One entity is actually "developing a new methodology for ruminant emissions, so hearing that this is such a big problem down there [in New Zealand] is really interesting to us."

All participants (not solely those working on methodologies) were asked about the key issues they would consider when purchasing carbon credits originating from New Zealand agricultural methane or nitrous oxide management.

The answers indicated a general sentiment that if well-developed, verified, and scientifically sound, many survey participant firms would be happy to work with New Zealand-based agricultural methane or nitrous oxide management projects. Numerous respondents said they would certainly be interested in these projects if under some sort recognised framework, such as VCS 2007.

This would allay some of the most pressing concerns which were related to price (including opportunity cost), additionality, permanence, baselines, credits being real, and personal understanding of project parameters. One person noted that if projects met these criterion then they would buy the credits whereas another stated that they would still stay away from such projects as they don't know enough about these project types.

Also identified as a concern was the perceived lack of social and environmental (e.g. water quality, hedging eutrophication) co-benefits, size of parcel, accreditation and verification, customer acceptance of uncertainty level of abatement and potential global warming potential changes.

As one respondent put it, he sees the "dual purpose of a high quality testing ground for developing a potential new source of voluntary and regulatory offsets and also doing work in voluntary sector that can make a better cap-and-trade system." The same carbon consultant found it exciting as a professional to help develop a new system, especially one using functional ecosystems, and also thought it great to see other agricultural aspects, like feed management (as opposed to no-till practices).

There seemed to be mixed sentiments on the specific project types. One market analyst stated that there was not much of a market for N_2O but there was for agricultural methane, as it was more fungible. Another respondent asserted that his organisation had supported agricultural projects in the past, but was not yet involved with N_2O though they would be interested to learn more about specific projects, financial risks, etc.

Yet another participant believed that N_2O might be more likely for his firm, as their sourcing strategy is to address all GHGs not just Carbon. This would depend on a price comparison with other projects as well as a CDM-quality or better standard test for additionality. Lastly, one sceptical respondent stated that the "key issue is demand, and at this stage the demand isn't immediately obvious" and hence they wouldn't be interested.

4.3.2.4 Tier two ranking results for livestock emissions

Four agriculture and nitrous oxide project areas were included in the ranking portion of Tier Two, along with a few more specific questions. Agriculture projects included non-forest based land restoration (excluding soil carbon) and nitrous oxide (excluding livestock diet manipulation). Methane projects included livestock enteric fermentation with rumen based animals and livestock methane destruction.

Of the four, methane destruction from livestock received the most support. Respondents seemed most unfamiliar with methane enteric fermentation but nonetheless received moderate support. Only six respondents stated familiarity or prior experience with enteric methane. The most consistent answer among these project areas was "Not Applicable", largely due to unfamiliarity with the project types or lack of organisation focus on such issues.

Relative to rankings on other project types such as energy or forestry, agricultural methane and nitrous oxide feedback was largely mixed, ranging across the 1 (preferred) to 5 (least preferred) spectrum. As a group, they ranked the same as or below forestry-based projects (afforestation/reforestation and REDD) and far below energy-based projects such as efficiency and renewables. Desirability for nitrous oxide projects fell largely in the middle of the ranking, and support for non-forest based land restoration fell almost evenly from 2 to 5.

More specifically, there was a general consensus of concern about purchasing agricultural enteric methane carbon credits from feed additives (inhibitors) and immunisation against methanogens. One concern stated was that there doesn't exist an international standard for these project types (the same person said that if one existed, then they would support such credits). Another participant stated they were interested in these projects but would have to learn more how changing the feed additives would influence the core goal of reducing greenhouse gases.

Half of the respondents stated experience with or awareness of the issues around agricultural nitrous oxide emissions. When asked if they would consider purchasing agricultural nitrous oxide carbon credits from projects ranging from diet manipulation to livestock effluent management to land management practices, farm management of dairy and piggery effluent and poultry waste received the most support. Nonetheless, there remained a high level of concern about all the projects. A couple participants did suggest anaerobic digesters as a possible option.

4.3.2.5 Forests: methodologies, opportunities, and concerns

Survey respondents were asked about their interest in purchasing pre-2008 vintage forestry credits in light of the New Zealand ETS baseline year of 1990, after which forestry projects would be eligible to earn carbon credits. Two-thirds of the respondents who answered this question stated that they might be interested in pre-2008 forestry credits, and one-third indicated that forest credits generated under these conditions would not be appealing.

Of those eight who expressed some interest in pre-2008 forestry credits in light of the post-1989 national baseline, five qualified their interest based on verification according to a credible methodology. The other three respondents who said they might be interested suggested that extending the baseline as far back as 1989 was unnecessary, though they recognized the appeal of an older forest being able to generate credits right away.

Instead, two of these three suggested an alternate baseline year of 2005 or 2006, stating that even 2005 vintage forestry credits are difficult to sell because buyers are looking for credits where the "vintages match the use." In the event that New Zealand does decide to offer projects with older vintages into the voluntary market, survey participants suggested that prospective buyers be informed about why the credits are still additional.

Survey participants who stated that they would not be interested in forestry credits under these conditions cited several a handful of reasons: additionality, leakage, permanence, perception of low need for international finance to protect forests in a country with strong forest regulation, and buyer preference for credits where the vintage year matches the use.

Additionality was the most common reason cited, with the vast majority of respondents expressing at least some concern about additionality. Some respondents stated that additionality would be difficult to prove if initial funding had already been provided to forest owners through incentives or through the New Zealand ETS.

Others suggested that the international appeal of New Zealand forest offsets would be limited because of the country's strong existing forest regulation (national parks, anti-deforestation legislation) and developed country status. More specifically, several survey participants cited that there would be relatively weak international appeal for New Zealand forestry projects to buyers due to the perceived urgent need to protect rapidly deforesting land in developing countries in Indonesia, the Congo Basin, and the Amazon.

Addressing the national baseline specifically, a couple of respondents suggested that it would be difficult to prove that these still-standing forests with older vintages would have been forested without the revenue generated by the offsets.

With regard to the creation of a new New Zealand-specific forestry standard, slightly more than half of respondents said they might be interested in such a

standard if clear parameters were established to ensure quality. These parameters include setting a clear baseline, rigorous quantification of carbon stock, extending certification to forests in other countries as well, and consistency with existing leading voluntary standards.

Specifically, respondents suggested that acceptance by or linkage with the California Climate Action Registry (CCAR) would be advantageous, as would a clear articulation of the standard's value to the carbon markets given the existing standards, especially the Voluntary Carbon Standard (VCS) and CCAR. Two suggestions to increase the appeal of a New Zealand standard were to package the social co-benefits to the Maori people and to stress the appeal of being a source of high quality forestry credits rather than New Zealand-based credits.

Those to whom a New Zealand standard did not appeal cited the already complex web of standards in the marketplace. Many respondents expressed their perception of an international desire for developing one global benchmark rather than "a bunch of niche diverse segments." One respondent foresaw a detrimental international precedent if foresters were to adopt the standards most suitable to their markets regardless of potentially higher quality voluntary standards.

Another suggested that pursuing Forestry Stewardship Council certification would be more beneficial to the success of New Zealand-based forestry credits than the creation of a new standard.

4.3.2.6 Tier two ranking results for forest carbon

Six forest project types were included in the ranking portion of Tier Two, along with a few questions specific to forestry. Almost all respondents who provided rankings by project stated that they had experience with or were aware of the issues surrounding forest carbon sinks. Survey participants were asked to rank their comfort level in trading credits from six project type (See Annex 7 for explanation of project types):

- pre-1990 forest management;
- post-1989 Kyoto plantation forests generating 2008-2012 vintages;
- post-1989 Kyoto plantation forests backed by permanent easement generating 2008-2012 vintages;
- pre-1990 Kyoto plantation forests backed by permanent easement generating 2008-2012 vintages;
- pre-1990 Kyoto plantation forests back by permanent easement generating 1990-2007 vintages;
- and regeneration of native scrub land to mature bush under the QE II Trust covenant.

Of these project types, respondents expressed the most interested in purchasing post-1989 and pre-1990 Kyoto plantation forests credits generating 2008-2012 credits. There did not seem to be a significant preference for these credits to be backed by a conservation easement.

However, it is worth noting that despite expressing the most comfort purchasing offsets from these project types, respondents also expressed concern for additionality, permanence, and measurement in these types. Survey participants expressed moderate support for Kyoto plantation forest credits with 1990-2007 vintages. All respondents were the least comfortable purchasing credits generated by pre-1990 forest management projects, primarily for reasons of additionality.

When asked about the additional value derived from co-benefits, more than two-thirds stated that bundling environmental benefits and biodiversity would confer a premium in the voluntary marketplace. When asked about the potential social co-benefit value of income for beneficiaries from the Maori community, most respondents stated that at least a small value would be added. One respondent believed that this would be a strong selling point for US voluntary market buyers.

Responses were more mixed to the questions of the value of Forestry Stewardship Council certification and treating pests (i.e. Australian-originated possums) in indigenous forests as the basis for a new methodology for generating credits. With regard to the perceived value of FSC certification to credit price, a few participants believed it would add substantial value to forest credits, a few said only a little, and the remaining were unsure or believed that no value would be added.

Regarding pest prevention, most respondents expressed at least some degree of interest. Two respondents stated full support for the idea. Others expressed limited support, citing the need to demonstrate the real risk posed by the Australian possums, to base a methodology on a scientifically robust baseline (e.g. how many acres per possum), and to educate the public on the benefit of possum prevention in New Zealand forests.

4.3.3 Dialogue with standard providers

4.3.3.1 Overview

Discussions were also held with three major standard providers deemed most relevant for New Zealand: the Gold Standard, the Voluntary Carbon Standard, California Climate Action Registry and VER+ . The discussion focused on several points that we believed were important for developing the market potential of New Zealand agricultural and forestry offset credits in world voluntary carbon markets.

Amongst a wider sweep of topics this dialogue included discussion on the way in which double counting is treated in voluntary markets, their methodologies relevant to New Zealand or new methodologies in the pipeline, their approach to project boundaries and on some of the possible agricultural offset projects, and harmonising forestry standards.

A summary of the key outcome of the dialogue follows.

4.3.3.2 Double counting

As noted in Section 3.6.1., in general, most voluntary standard providers require the cancellation or purchase-then-retirement (effective cancellation) of AAUs or national compliance units if a country wishes to count a domestic offset project's emissions reductions towards its national inventory.

The exception is the CCX, which does not permit voluntary offsets for Kyoto-regulated activities that might be counted under a country's inventory. As of February 2008, CCBS was in the process of developing rules for dealing with double counting, but seeing as it is not an actual standard (though it is considering developing a verification mechanism), NZ should treat the CCBS as a premium certification once it has received verification from a different standard.

Therefore, at the present time, New Zealand can overcome the double counting issue by demonstrating proof to a standard provider that a corresponding amount of AAUs or national compliance units have been cancelled, or purchased-then-retired, for any voluntary offset activity that falls under the Kyoto regulatory scope i.e. is eligible to be accounted for on the national greenhouse gas registry.

Thus, "the host country (which has ratified the Kyoto Protocol and assumed a reduction target) shall confirm that an equivalent amount of AAUs is set aside in the national account (registry) and is not used." The same guidance on scheme-wise double counting applies to any of the mandatory emissions trading / reduction regimes.

To address this double counting concern, one standard, the Voluntary Carbon Standard, is considering developing a new methodology for issuing credits based on the intended use of the credit by the buyer. Under this scenario, projects could generate two kinds of VCUs – one for voluntary credits that are generated in a country with a cap obligation, but for an activity that does not fall within the list of activities reflected on the national registry; and the other for voluntary credits generated by activities that could count toward the national inventory (if a corresponding amount of national compliance units were cancelled).

When asked if they would be interested in partnering with the New Zealand government to create a regional certification project, the Gold Standard don't have a firm stance on this and it is not new for them to have this discussion on it, on a case by case basis.

4.3.3.3 New Project Methodologies

In addition to considering means of addressing potential double counting issues, the Voluntary Carbon Standard plans to approve methodologies other than the currently accepted CDM methodologies. Of particular relevance is an initiative led by Avoided Deforestation Partners and Climate Focus to write a set of forest carbon methodology "modules" for the Voluntary Carbon Standards that could be combines to serve a variety of different forest carbon projects.

The Gold Standard is in the process of updating their development document where they have a list of approved project types. In general any CDM methodologies that meet their criteria are likely to continue to be accepted. They have also approved methodologies specifically for the VCM; a small scale biodigester and a cook stove with a handful more renewable energy and energy efficiency methodologies being submitted. However, they don't publish methodologies and keep them private until the first project is registered

The CCAR Protocols in progress include an urban forest project reporting protocol and (now available for public comment)[58]. CCAR would also like to consider, and recently released a request for proposal for methodologies around: bus rapid transit, N_2O reduction in acid plants, tidal wetland restoration, blended cement restoration, methane avoidance from composting, truck stop electrification, boiler efficiency, bus fleet upgrades and soil sequestration in crops.

VER+ is completely based on CDM methodologies, so is not considering any other types of methodologies than those approved, or that will be approved by the CDM Executive Board.

We also suggest keeping an eye on two upcoming studies undertaken by the University of Canterbury and Caisse de Depots, which are surveying standard providers and project developers about the various features of their verification of climate forestation projects. The University of Canterbury released a study in May 2008 comparing voluntary standards relevant to climate forestation projects, but from a buyer's perspective. It's upcoming study will tackle the issue from a project developer's perspective.

While the most important decision in a project is often the choice of the methodology, following which is the definition of the boundary.

It was considered plausible to devise a methodology that quantifies the emissions reductions of a group of farms, united by the same soil type. It appears that the idea of using soil type as the defining characteristic of a project boundary presents more management rather than methodological issues.

However, one standard provider suggested the following as a management approach for such a methodology:

"..Set up a central unit that consists of, for example, 200 farms with the same soil type and the same regime applied. For argument sake, appoint one or two farmers to become the project manager. These farmers will be responsible for checking all the other farmers to make sure they have the same soil type/apply the same nutrient balancing regime.

[58] http://www.climateregistry.org/tools/protocols/protocols-in-progress.html

The farmer will be responsible for visiting all of these farms and collecting in-house emissions and regime data, as well as checking new farms wishing to join the scheme.

Then, a third-party verification entity would perform the verification by asking the central unit project managers to show him how the other farms meet the requirements of the methodology. The verifier would visit a small number of farms to verify that the project manager's data is consistent with the verifier's findings. If all is consistent, the verifier would likely approve the emissions reductions.

However, if there is a discrepancy because one or two of the farmers operate on a totally different soil type, or with a different regime, all of the farms will stand to lose because the data on the whole will have lost credibility. It will cost the farmer time and money to have to revisit all of the farms, then apply for verification again, and the farmer may have to consider reducing project size to more easily manage the credibility of the data…"

4.3.3.4 New Zealand voluntary agricultural offset projects

In addition to discussing methodologies in the pipeline, much like in the interview survey of suppliers and experts, we also asked standard organizations their perceptions of different key emission reduction project types in New Zealand.

Biodigesters and methane flaring were already in place in the world and not a contentious project type. Only the Gold Standard noted that it did not accept credit generated from methane destruction.

Immunization against methanogens could be contentious for the same reason as genetically modified organisms were. One major international buyer and one standard provider suggested that this may not be well-received internationally, especially among European buyers.

On the other hand diet manipulation seemed to offer a relatively simple approach that farmers have utilised for other reasons in the past, without much public opposition. The primary concern of one standard provider was how much of an emissions reduction could actually be achieved by diet manipulation. There would also be a monitoring issue. However, its appeal resides in its simplicity.

A key concern for generating carbon credits from ruminant emission reductions is measurability. For example, one project developer recently submitted a ruminant emission reduction methodology to the CDM. The methodology was rejected primarily due to measurement concerns.

In general, it was accepted that new products would be feasible only if New Zealand complies with double counting requirements as indicated above. If this is followed and consistency with national reporting achieved then a product should be acceptable in the voluntary market.

4.3.3.5 New Zealand forestry offset standards

The EU ETS is still very hesitant to accept forestry offsets, but there is some demand for forestry offsets in Europe. One standard provider said that forestry offsets are complicated for "emotional" reasons, namely concerns about permanence by people who do not understand the mechanisms for risk management against a *force majeure* or other breach of permanence.

It will be very important for New Zealand foresters to devise a credible "insurance" mechanism to allay the permanence concerns of standards and providers. One way to achieve this would be to utilise a "buffer" approach, whereby a forester would keep an extra area of forest to utilise as "spare credits" in the event of a breach of permanence.

5 OBJECTIVE 3: A market development strategy

5.1 Preliminary conclusions

5.1.1 Market infrastructure

5.1.1.1 Standards

The work in Objectives 1 and 2 showed us that a standards infrastructure is already developed in global carbon markets. In fact, there is already significant confusion around the numerous standards in the marketplace, and many traders are generally more interested in only a handful of standards to ensure increased fungibility in the marketplace. The value added from further standards or a new standard should be carefully considered.

5.1.1.1.1 Afforestation/Reforestation

Currently Voluntary Carbon Standard AFOLU Guidelines and California Climate Action Registry Forestry Protocol (limited currently to California forests) are the most relevant guidelines for New Zealand agro-ecosystems.

5.1.1.1.2 Livestock projects

This could be a particularly exciting area for New Zealand voluntary carbon markets because the means of reducing emissions from livestock, other than by manure methane destruction, is an area that has not been fully understood. There are significant opportunities for new emission reduction methodologies.

5.1.1.2 Measurement and project methodologies

We learned in Objective 2 that many methodologies in the voluntary market are based on the Clean Development Mechanism. It is logical that these will conform with the UNFCCC accounting and reporting system.

The measurement methodologies used in New Zealand's UNFCCC national inventory may provide measurement methodologies that could be used, or adapted for use, in voluntary markets. The literature suggests that New Zealand is playing a leading role in defining the UNFCCC methodologies that measure those emissions which the country is most exposed to: methane enteric fermentation; nitrous oxide from animal excreta; and carbon stock in forests.

We also learnt in Objectives 1 and 2 that many of the baselines and project boundaries for the emission reduction projects listed in this study could be best established at a national or at a regional level across similar agro-ecosystems and that these are likely to be simplified in the ETS through the establishment of Points of Obligation.

With the exception of feed additives, immune agents, and nitrification inhibitors, it appears that much of the research work (on both inventories and abatement) undertaken on potential emission reduction projects has been by the public sector. Given the earlier point on baselines, this is not unexpected. Many of the

projects we have identified have project baselines best administered at the regional or national level.

For those projects where benefits can be tracked to the project or enterprise level, emission reduction behaviour is unlikely to be optimised while project benefits are unable to be delivered to those that create them.

5.1.1.2.1 Forestry standard

We considered the creation of a new forestry standard for New Zealand plantation forestry. Survey respondents expressed positive feedback if clear parameters are established. These parameters include setting a clear baseline, rigorous quantification of carbon stock, extending certification to forests in other countries as well, and consistency with existing leading voluntary standards. Additionality was the critical issue.

Specifically, survey respondents suggested that acceptance by or linkage with the California Climate Action Registry (CCAR) would be advantageous, as would a clear articulation of the standard's value to the carbon markets given the existing standards, especially the Voluntary Carbon Standard (VCS) and CCAR.

5.1.1.3 Verification

The work in Objectives 1 and 2 also showed us that a third party verification infrastructure is already well developed in global carbon markets. The nearest CDM verifiers are currently based in Sydney however.

5.1.1.4 Double counting

New Zealand projects can only overcome the double counting issue by demonstrating proof to a standard provider that a corresponding amount of AAUs or national compliance units have been cancelled, or purchased-then-retired, for any voluntary offset activity that falls under the Kyoto regulatory scope i.e. is eligible to be accounted for on the national greenhouse gas inventory.

5.1.1.4.1 Inventory risk

Inventory risk occurs in the situation where AAUs are relinquished by the New Zealand Government, but where a related reduction is not recognised in New Zealand's inventory. This may be due to a timing difference between when methodologies are recognised, or a permanent difference due to non-recognition of methodologies.

As a counter to this risk, it seems clear from the literature that New Zealand is a leader in the development of measurement mechanisms in the areas covered by the report and provided those advances can be recognised in New Zealand's inventory then symmetry would exist for the New Zealand Government.

The risk is further reduced where the same accounting system is used, as would be the case if there was close alignment between accounting systems used in the ETS and that used by MFE's UNFCCC accounting system.

5.1.2 Potential demand

In the first two Objectives of this study we learned about the market, its size, how it works, and about the possible supply of products from emission reduction projects in the New Zealand agricultural and forestry sector.

In summary, despite rapid growth, the global voluntary carbon market remains only a small fraction of the size of the regulated markets (about 2%), and only slightly larger than New Zealand's net annual emissions. It is however, experiencing a higher (volume) growth rate than regulated markets and an important outlet for non-compliance demand.

Buyers are primarily located in Annex 1 countries subject to UNFCCC accounting and reporting rules through Kyoto accounting. This means that the standard provider rules around double counting will present a large challenge to generating a significant market volumes.

A clear trend in Ecosystem Marketplace's analysis of the OTC market in 2007 was that customers are getting more specific about the type of offset credits they want to purchase and, especially those in the US and Australia, prefer to buy offsets from projects close to home.

Demand in 2007 came from NGOs (13% of credits transacted), governments (<1%), individuals (5% of credits on the OTC market), and the balance from companies. The latter's demand increasingly comes from offering carbon offsets to individual customers bundled with their goods as well as in offsetting their own inventory.

Ecosystem Marketplace, in partnership with New Carbon Finance, tracked 42.1 million tonnes of carbon dioxide equivalent ($MtCO_2$-e) transacted on the OTC market in 2007 which together with 22.9 $MtCO_2$-e transacted on the CCX in that year indicated a total volume of 65.0 $MtCO_2$e transacted in the voluntary carbon market in 2007. This represented about US$330 million in turnover.

5.1.3 Potential supply

Our examination of the domestic emissions profile showed us that the key to a large abatement market in New Zealand will be abatement projects targeted at:

- Maintaining or increasing carbon stock in forests (23.9% of the New Zealand total);
- Reducing methane from enteric fermentation (22.3%);
- Reducing nitrous oxide from animal excreta (about 10% including secondary effects).

These three emission categories represent 83% of the combined Agriculture and LULUCF sector emission profile but all three are of relatively lesser importance in the world voluntary carbon market, apart from suffering from double counting issues.

No reports of projects related to enteric fermentation or nitrous oxide reduction from animal excreta were received during the market survey. Livestock projects tend to focus on manure management in animal waste management systems. In forestry, where only one CDM project has been registered, the market-share of credits traded in the voluntary market has actually dropped. Much of the focus has been on indigenous forest conservation in developing countries.

The first two emission categories are new project types in an international market context and forestry units are patchy, multi-sector, and suffer geographic boundary constraints.

We have made a preliminary selection of projects identified in scientific publications and that possessed characteristics that could make them of interest to voluntary carbon markets.

Based on a subjective assessment we concluded that the following projects looked interesting from a voluntary market perspective:

- Over-wintering of cattle on concrete pads, with an attached Kyoto unit;
- Nitrification inhibitors, with an attached Kyoto unit;
- Afforestation projects, especially post 1989, pre CP1, where no double counting issues exist;
- Improved management of pre 1990 forests (Kyoto Article 3.4 activities) where no double counting issues exist.

This market-driven assessment focused on the potential value available in the selected emission reduction projects. We have not factored in any project costing or established a possible 'merit order'.

5.1.4 Potential pricing and market value

The project analysis undertaken earlier suggested that emerging technologies could reduce New Zealand's Kyoto obligations by a significant amount. The potential reduction however, is a huge proportion of a total world market of 65 million tonnes identified earlier, particularly as we found that buyers are increasingly looking for local projects.

Despite its large size in relation to the global voluntary market, the potential volumes in a domestic voluntary market would still be significantly smaller than the likely size of the New Zealand ETS which could amount to 35 million tonnes per year by 2012.

Furthermore, relative to the compliance market, the prices of VERs and VCUs and other voluntary credits are very low. This is very significant for it is that differential that causes double counting to be an issue for voluntary market development.

Assuming there was price parity between the voluntary and compliance markets, then provided compliance costs and benefits are ascribed to the emitter and abater directly, then both emitter and abater will be indifferent about using an NZU, AAU, or ERU to access the voluntary market.

If voluntary market prices are less than compliance market prices then it is unlikely a unit holder will choose to forgo income in the more lucrative compliance market to sell certified reduction units in the voluntary market.

If parity did exists however, the size of the total market for compliance units will be greater and this will be a good thing for the New Zealand Government's climate change policies. Other things being equal, promoting price parity is a source of benefit to the New Zealand Government.

In the absence of price parity between the markets however, it is hard to see why resources should be diverted from developing the compliance market to develop the voluntary market.

5.1.5 High level conclusions

The conclusions from Objectives 1 and 2 are summarised below. They include several key characteristics directed at the issue of double counting:

- Unless a New Zealand project is outside of Kyoto accounting, or has locally generated and locally retired VERs, or is accompanied by confirmation of a relinquished compliance unit, then it will have limited appeal to the voluntary carbon market. The key voluntary carbon market opportunities are therefore in sectors that are:
    - Not covered by New Zealand's accounting under the Kyoto Protocol and not under the ETS. Examples include;
        - management of pre-1990 forests to increase carbon uptake;
        - post 1989 forestry in the period until 2008;
    - Have an AAU associated with them, either cancelled or attached;
    - Can qualify for JI. This assumes that JI Track 1 will be made available to agricultural and forestry firms;
- The sale of compliance units from the New Zealand ETS into the voluntary carbon market is a similar opportunity;
- New methodologies are likely to be necessary for any agricultural projects;
- The effect of the proposed ETS for forestry is such that we believe there is unlikely to be price parity and so the likelihood of a market situation where AAUs will be cancelled in order to trade offsets in the voluntary market is low.
- The convergence of voluntary and CDM compliance markets is occurring through the methodologies that are used;
- In terms of market structure, the JI and the voluntary markets have the potential for convergence as they are both projects-based markets.

5.2 Government intervention

How then can MAF best help realise the potential of the voluntary carbon market? If the voluntary market is being rapidly standardised, and those standards more often than not preclude New Zealand reductions from being traded internationally, how can a New Zealand project find a market?

The issue of double counting stamps itself all over the potential for development of the New Zealand voluntary market. There are very few projects that lie outside of the double counting framework; post 89, pre CP1 forests and emission removals in pre 1990 forests are two that come to mind. There are likely to be others not considered in this report. The recommendations below apply to them equally.

These projects are however, unlikely to come from agriculture where the Kyoto accounting overlap is more universal. It is hard to therefore recommend effort be spent on developing a voluntary market other than;

- Facilitating the above projects;
- Ensuring costs and benefits are ascribed to emitters and abaters directly in the compliance market.

Where voluntary market price parity is achieved with the compliance market, then the set of recommendations would be framed differently. The discussion below should be considered in the context of those projects outside the Kyoto framework and/or the situation where price parity exists.

5.2.1 A suite of possible actions to facilitate voluntary market projects

5.2.1.1 Improve certainty in the market environment

The New Zealand government can help by clarifying Points of Obligations, methodologies for estimating liabilities, and procedures that clarify if double counting is occurring and the means available to avoid double counting. The section above on the strategic environment outlines some key points in this regard.

5.2.1.2 Create price signals in input goods

Farmers already receive a number of significant incentives to reduce greenhouse gas emissions and create sinks prior to 2013 as a result of the ETS. These include the price on energy and transport emissions from 2009-10, which will encourage energy efficiency and efficient use of other inputs which are impacted by the flow-on of this price (e.g. Nitrogen fertiliser).

5.2.1.3 Create early price signals on emissions

The creation of acceptable methodologies that will reduce an entity's inventory will enable farmers to make investment decisions based on anticipated future outcomes. For example, the impending price on agricultural methane and nitrous

oxide emissions, through the ETS, will influence long-term capital investment decisions in agriculture, such as in animal housing and cropping machinery.

5.2.1.4 Promote New Zealand Units to buyers

Market New Zealand offsets to buyers to try to increase demand. Given the likelihood that double counting does not occur where projects and retirement are in the same Kyoto country, it would be beneficial for the New Zealand Government to promote this market, especially as it will likely lead to liability reductions under Kyoto. This will be particularly important for post-1989 forests where the absence of monetary value under Kyoto for pre-CP1 removals may not discourage deforestation upon harvest, albeit in the distant future.

5.2.1.5 Promote New Zealand standards

In general, we believe New Zealand-specific standards are best developed if there are clear faults in the standards as currently proposed or if it is administered by the standard providers discussed above.

Rather than create a new standard, we believe it would be preferable in the first instance to work with existing standard providers to develop methodologies that are appropriate to New Zealand. The VCS and CCAR Protocols are obvious places to start.

5.2.1.6 Promote methodologies specific to New Zealand

The Government could work with project developers to develop CDM methodologies which would then be eligible under the Voluntary Carbon Standard or Joint Implementation. It will be developing methodologies under the ETS in any event. Co-ordination with standard providers at the time methodologies are developed will help their acceptance in voluntary markets.

Consider the situation under a processor Point of Obligation. Emitters will seek to opt out where they believe they have fewer emissions than the allocation they are receiving from the Point of Obligation or free allocation. To opt out they will need to prove, using acceptable methodologies, that their claim is correct. To have a methodology accepted that provides them with that proof will require them invest substantial sums in testing and verification. This is likely to be repeated from one enterprise or Point of Obligation to another.

At the end of the day, the party they will most need to convince is likely to be MAF, as agent of the Government. We understand the Government are developing acceptable methodologies and any Point of Obligation or enterprise complying with this methodology could be rewarded with an increased proportion of free allocation (by reducing the free allocation available to non-abaters).

These methodologies could be registered under the Voluntary Carbon Standard and then, potentially under the Clean Development Mechanism, putting New Zealand abaters in an improved position to sell credits to the voluntary carbon markets or under Joint Implementation.

5.2.1.7 Promote participation through education

Education of possible market participants will help reduce search costs and improve economic arbitrage. Communications strategies should focus on the lack of understanding (or misunderstanding) of how the ETS interacts with the voluntary carbon market.

An education strategy could identify key messages to promote New Zealand opportunities, suggest how this information should be disseminated, and identify who the target audience is.

5.2.1.8 Link registries

Facilitating direct links between Kyoto and voluntary market registries will facilitate the tracking of units of both genre and assist avoiding double counting. This will enable voluntary market users to track the Kyoto unit that is attached to the voluntary unit they are transacting.

The costs of undertaking this work should be minimal and New Zealand already has two such candidates in TZ1 and Regi. Ensuring a seamless link for users between the New Zealand Kyoto registry and voluntary market registries would assist development of the voluntary market.

5.2.1.9 Allow access to the ETS compliance regime

In the forestry sector, the same carbon measurement infrastructure developed as part of the New Zealand ETS could be made available to the voluntary market. This includes inventory assessment and measurement, unit issuance, registry holding, compliance regimes and administration.

This could assist both pre 1990 projects that are not related to deforestation (e.g. forest management), as well as post 1989 voluntary participants where MAF lookup tables and market infrastructure could be used by post 1989 pre CP1 forests.

In effect this is what happens under the PFSI. It possesses all the characteristics of an afforestation project in the voluntary market, especially strong additionality. These PFSI AAUs are very likely candidates for sale in the voluntary market, especially in the presence of price parity

Allowing foresters to access the ETS compliance regime for verifying pre CP1, post 1989 forests and Article 3.4 activities should involve no extra effort, other than a marginal one that could be recovered through fees. The latter may simply involve access to the regime for all but Emission Returns, which could also be recovered on a marginal cost basis.

There are currently about 46 million tonnes of carbon that were sequestered in post 1989 forests prior to CP1. This represents significant unrealised value in that they have contributed, through positive action, to reducing carbon dioxide concentrations in the atmosphere and yet do not accrue any value in the Kyoto environment.

Conversely, the Eastern European AAUs did not result from positive action that led to reductions in emissions in the period 1990-2007 and yet do attract value under Kyoto. Accordingly, they are also the Kyoto units most likely to converge in price with the voluntary market. The post 1989 pre CP1 forestry units are therefore a natural counter-product to these AAUs.

It is possible that these AAUs could be greened using New Zealand post 1989 forestry, particularly the pre CP1 units that have no Kyoto value, and sold in the voluntary market with the AAU attached or cancelled. [59] In this case, verification and rigour around permanence could be provided through the same compliance framework as that used in the ETS.

5.2.2 Ascribing the costs and benefits of emissions and abatement directly in the allocation of compliance permits

There is a natural symmetry between an emitters reduction in costs and an abaters increase in revenue. Theoretically, in an ETS regime there is no difference between reducing emission penalties and increasing abatement revenue; an abatement is the same as a cost reduction, and such reduction becomes revenue to the abater.

Provided the allocation of capped units is ascribed directly to emitters then an abatement market will exist through the sale of surplus compliance units.

There are however several circumstances where this conclusion may not apply, and these may represent opportunities to use the voluntary market to achieve reductions. The circumstances include;

- Where Points of Obligation do not coincide with abatement behaviour;
- Where penalty reductions are not the same as abatement revenue;
- Prior to the introduction of the ETS.

5.2.2.1 Where points of obligation do not coincide with points of abatement

The clarification of the Points of Obligation and methodologies will assist abaters understand where they might apply to receive a reward (either a penalty reduction from a Point of Obligation or free units to account for their abatement).

The use of a processor Point of Obligation transfers the discussion around recognition of abatement to the processor. Enterprises will apply to the Point of Obligation to accept methodologies that will allow recognition of an inventory reduction. It is possible in this situation however, that potential abatement will not be recognised by the Point of Obligation and, perhaps for administrative reasons, abatement activities not promoted.

[59] There is also a strong case that the 'greening' of these AAUs for use in the New Zealand compliance market could be achieved using post 1989 pre CP1 forestry units.

This would be particularly damaging where the level of free allocation is greater than is required to provide a marginal signal. Given an ETS regime where emission reduction is possible over the next decade the presence of a 90% free allocation can be limiting.

That all of agriculture will remain protected above 10% reductions is likely to limit the potential of targeted emission reductions to that number because abaters will not be compensated beyond these levels through abatement recognition by the Point of Obligation.

A logical response will be for abaters, either individually or in a group together, to make a case. This circles back to the Government in turn as the dialogue is the same as that between the Point of Obligation and the Government over recognition of methodologies. Indeed, the same forces will be at work in both a permit-based ETS and a credit-based projects mechanism.

The conclusion here is that in circumstance where there is a disconnect between Points of Obligation and the reward of emission reduction or abatement and more than 10% of potential emission reductions are possible in the next 10 years, then a mechanism to attract abatement through provision of revenue to abaters (a projects-type mechanism) is a logical policy choice in addition to an ETS, and such a mechanism is already in place through Track 1 JI.

5.2.2.2 Where penalty reductions are not the same as abatement revenue

Currently 'projects' type mechanisms create revenue to a mitigator or project developer. Under a permit regime, mitigation activity leads to a cost reduction to the emitting enterprise.

Under the ETS emphasis is on reducing penalties. Methodologies are used to determine this. Yet, is there a difference between abatement revenue and emitting penalties? Is a reduction in an emission penalty the same as an increase in revenue to an abater? The answer is yes, unless there is a difference in the way in which methodologies are put together.

For example, if a methodology needs to be more specific, e.g. for a specific product (e.g. a proprietary chemical that inhibits nitrification) then either is fine. If a methodology is general, then a user is less likely to initiate a process if they believe others will be free riders. They will be more inclined to wait to see if other parties initiate a methodology that they can free ride on.

This situation is more likely to occur in a regime that rewards abatement through penalty reduction (which rewards the abater through cost-savings to the emitter) than a regime that rewards abatement through revenue. The link between action and reward is likely to be stronger in the latter.

The conclusion here is that a projects-type mechanism is likely to be more appealing where methodologies are general, and where they are more likely to result in diluted benefits to the abater if delivered via a cost saving to an emitter.

5.2.2.3 Prior to the introduction of the ETS

Because agriculture is currently not included in the ETS until 2013, as it stands currently there is no incentive on emitters to reduce emissions until then.

A 2005 baseline has however already been established to determine the total quantum available for free allocation to the agricultural sector. While emitters will assume that any reductions prior to their entry into the ETS will benefit them through a need to surrender less NZUs when they are in the ETS, they are unlikely to take mitigation action now given the uncertainties around Points of Obligation and the means of devolving liabilities.

A projects-type mechanism, discussed below, may promote early reductions but a better approach is to treat the cause of the uncertainty and resolve the Points of Obligation and the methodologies for determining liabilities so that individuals who undertake early voluntary emissions reductions before 2013 are not penalised, and those who grow their emissions before 2013 are not rewarded in some way through the allocation of NZUs.

With the existence of such information, abaters may seek a reduction to be recognised. Determining the validity of such claims need not be resource intensive but considered as part of the free allocation process, much like a negative Point of Obligation.

5.2.3 Targeting the free allocation

We have concluded that the key to a large abatement market in the New Zealand agriculture and forestry sector will be abatement projects targeted at:

- Maintaining or increasing carbon stock in forests;
- Reducing methane from enteric fermentation;
- Reducing nitrous oxide from animal excreta.

We have also concluded that it is very important to properly ascribe costs and benefits to emitters and abaters under the ETS and for those allocation plans to be made as quickly and as transparently as possible.

However, in the presence of constraints to this being achieved, we believe that a case can be made, as

CASE STUDY: Agricultural projects-type mechanism

Timing
The scheme can be phased by project. Eligibility of projects can be incrementally increased based on the 'merit oder' established around the marginal cost of abatement. Such a mechanism could be run in conjunction with the allocation of free units. It need not involve the establishment of a full PRE-type of infrastructure, but rather eliciting project proposals from the non-Government sector that would result in emission reductions.

Points of obligation
The projects would be indifferent to the point of obligation and need only be at the measurement level.

Free allocation
Distributing AAU/NZUs to agriculture should be subtracted from the 90% of 2005 emissions pool after 2012. This will encourage early reductions and promote intra-sector monitoring. Furthermore, the ETS Act provides for the development of an allocation plan, which will be informed by the work of the Agriculture Technical Advisory Group (agTAG) and is open for public consultation.

outlined in the points above, for the New Zealand government considering a projects-type of market in it's agricultural sector. The forestry sector is less suitable for a projects-type mechanism because post-1989 forests are already fully in the ETS and the ETS now covers deforestation also.

A projects-type mechanism is based on allowing the abatement supply function to express itself through the offer of abatement in exchange for a Kyoto unit. This does raise the question as to where the units would come from, especially in the presence of a free allocation to emitters.

The conclusion is that project allocations should be made out of the existing free allocation. The idea is to reduce the overall inventory. Further, any inter and intra sector equity issues associated with the use of the free allocation can be determined in the same way in which the free allocations will be.

If a party receives a free allocation as part of the ETS and reduces their emissions they can sell part of that free allocation because they don't need it anymore and if they also sell a standard-certified voluntary market unit for that same emission reduction, then this would avoid double counting if the free allocation was attached.

At its simplest this can take the form of an abatement tender, compliant with ETS methodologies, that would lead to a portion of the free allocation awarded to winning tenderers. At its most complex, it would involve an elaborate scheme similar to the PRE programme that New Zealand already has experience in and through which many learnings obtained [60].

At the time the Minister invites applications for a free allocation in agriculture, he or she could also invite applications for some of that allocation to be awarded to abatement projects.

The New Zealand Government should be indifferent or better off to this provided it manages its inventory risk well. Perhaps the most significant factor, emitters will begin to adopt reduction behaviours; they will be introduced to a carbon regime that brings benefits not just costs. Their later introduction into the ETS, at the point where revenues to some become costs to others, should be made a little less painful.

It will help by creating baselines, establishing Points of Obligation (or the equivalent opposite), developing techniques for the measurement of project reductions at enterprise level, and finding other ways in which benefits can flow to those creating them.

[60] Lessons Learned from the NZ PRE Scheme, Prepared for Ministry for the Environment by Ecofys UK and Global Climate Change Consultancy (GtripleC), 30 January 2007. A difficulty with the PRE scheme was that additionality relied almost entirely on what ones view of the forward price path and discount rate were. This is not the situation in agriculture where emission reductions can be more easily observed by behaviour at the enterprise level and not based on expectations of industry behaviour.

The New Zealand Government is the party with the greatest interest in releasing the potential emission reductions available. For every tonne of CO_2-e reduction, the New Zealand Government stands to benefit one to one through a reduction in its Kyoto liability.

There are several ways in which reduction projects could then be sold into voluntary carbon markets.

This can also occur through either the cancellation of an AAU, the issue of a CP1/CP2 NZU [through the free allocation], or the conversion of an AAU into an ERU under the JI Track 1. Under JI Track 1, verification by third parties is not necessary and additionality requirements are also less stringent, allowing the host party to convert AAUs to ERUs in a more flexible way than Track 2 or the CDM. This creates a better opportunity to develop fungible units in both the Kyoto and the voluntary market.

5.2.3.1.1 Cancel AAUs

A voluntary market sale by an agricultural abater could be underpinned by the cancellation of a New Zealand AAU. Such action should leave the New Zealand Government indifferent or better off in regards to its Kyoto liability.

5.2.3.1.2 Issue ERUs under JI Track 1

Selling JI credits into the international voluntary market is one means of simplifying these accounting and double counting issues. However, the existence of JI after 2012 should also be considered.

The voluntary and compliance markets converge through JI Track 1 in developed countries. This is the area of overlap between projects and permits in a market dominated by Kyoto accounting. It is likely that JI Track1 will become the default proxy for a carbon unit that is fungible in both the compliance market and the voluntary projects market.

5.2.3.1.3 Issue NZUs

Another option would involve the issue of a new NZU. This would not be a free allocation. Rather than reducing the Point of Obligation of AAUs it would dilute the value of the existing NZUs in circulation. However, we believe that the fairer way would be to issue an NZU from the free allocation.

The New Zealand Government would not be any worse off in such a situation, provided the reductions were reducing New Zealand's inventory and were real and verifiable. This is more likely to have no double counting issues where New Zealand reductions are retired in New Zealand. Note that they would not need to be additional. This is discussed further below.

5.2.3.1.4 Does the reduction behaviour need to be additional?

In a Kyoto environment, additionality is not necessary. Kyoto is about permits. National entities are only concerned with absolute quantities. The AAU is a permit. There is no need for additionality in a permit regime, only allowance.

The voluntary market is about reductions. The Projects market is where offsets and permits merge. We see that most easily in the JI Track 1, which until now has been largely illiquid.

The JI states that the acquisition of ERUs shall be supplemental to domestic actions for the purposes of meeting commitments under Article 3. However, additionality is not a concept that needs measure in a permit-based world.

It is possible for the New Zealand Government to take unilateral action and cancel AAUs if it feels that it has achieved a reduction in its national inventory. Such certified units can be issued to parties who can demonstrate real, and verifiable reductions.

There is however a fiscal consideration. If a government is paying for a reduction that is going to occur anyway as part of business as usual then this is wasteful expenditure. The opposite however is also true. If an abatement is not recognised by the Government they do become cash benefits to the Government because it is in a deficit situation and will need to expend less cash to meet its Kyoto obligation. It does not seem right that the Government would be prepared to accept the benefit of abatement in terms of its own Kyoto liabilities but not be prepared to pay for it.

The conclusion about not requiring additionality is based partly on the difficulty of proving when it does not occur, and partly because excluding abaters from benefiting simply because they might have done it anyway, particularly when such abatement will benefit the Government, does not appear consistent.

5.2.3.2 A key test is whether the Kyoto accounts are affected negatively

In any of the situations described above there is still a need to ensure the project serves to reduce the national inventory. This point is quite critical. The Government should otherwise be neutral to any intervention that reduces its Kyoto obligation and theoretically it should be prepared to allocate benefits to the proponents of such reductions by way of the cashless allocation of cap units.

A Point of Obligation (or a project being granted a relinquishment of a compliance unit) is likely to be provided ETS methodologies that are acceptable for cancelling/converting of an AAU. This will be based on the likelihood of that emission reduction occurring and that reduction being recognised in New Zealand's Kyoto accounting.

5.2.3.2.1 Verification of Projects

Verification could occur in the same way by third party verifiers as exists under the Joint Implementation Track 2 currently, or the New Zealand Government has the ability under Track 1 to verify itself. In the scenarios where an AAU is cancelled or under JI, the Kyoto position is likely to be affected. This is appropriate for two reasons;

- The New Zealand Government stands most to lose from poor verification;

- most knowledge of inventories and project reductions are already held in public hands, meaning that the New Zealand Government will be in the best position to manage its own liability.

5.2.3.2.2 Pros and Cons

There are many pros and cons of a projects-type mechanism for New Zealand agriculture, involving the relinquishing of a compliance unit by the Government.

On one hand, provided the allocation of capped units is ascribed directly to emitters, then an abatement market will exist through the sale of surplus compliance units and a projects-type mechanism will not add anything.

On the other hand, there are several circumstances where this conclusion may not apply, and these may represent opportunities to use a projects-type mechanism and the voluntary market to achieve reductions. The circumstances include;

- Where Points of Obligation do not coincide with abatement behaviour;
- Where penalty reductions are not the same as abatement revenue;
- Prior to the introduction of the ETS.

The merging that such a market would have with the permit-based Kyoto regime suggests that additionality is not necessary in such a projects mechanism, provided the project serves to reduce the New Zealand's Kyoto liability.

An implementation strategy could focus on the Joint Implementation Track 1 which provides the New Zealand Government with enormous flexibility in what it allows in regard to using its Kyoto units.

5.3 Recommended actions for a market development strategy

5.3.1 Focus

The conclusions we reach for a market development strategy are that it should focus on projects that are;

- outside of UNFCCC reporting, or;
- inside it but outside Kyoto CP1 obligations, or;
- is a JI project, or;
- has locally generated and locally retired VERs, or;
- on projects that can produce real, verifiable reductions to the national inventory.

These are the only situations we believe the market development strategy should be targeted towards.

The issue of double counting stamps itself all over the potential for development of the New Zealand voluntary market. This is particularly so because of the large difference in reward for a compliance unit when sold in the compliance market

compared to when used to attach to an emissions reduction in the voluntary market. [61]

In the presence of double counting it is hard to therefore recommend effort be spent on developing a voluntary market other than;

- Facilitating the above projects;
- Ensuring costs and benefits are directly ascribed to emitters and abaters in the compliance market.

We conclude that resolving the agricultural Points of Obligation and the methodologies for determining liabilities is needed sooner rather than later.

Should this process lead to a situation where costs and benefits can not be directly ascribed to emitters and abaters in the compliance market, then we conclude that a projects-type mechanism would be a useful market development tool and in particular believe that a JI Track 1 offers the greatest policy flexibility.

In the table below we have summarised the discussion in Section 5.2.2 above about the possible actions that the New Zealand Government could take and included a ranking. This is to show that while the strategy includes many different possible interventions, there are some that we believe could develop voluntary markets in the New Zealand agricultural and forestry sector faster than others.

Table 13: Weightings of possible actions MAF could take to develop New Zealand agricultural and forestry voluntary carbon markets

Action	**Rank**
Improve certainty in the market environment	1
Create price signals in input goods	12
Create investment price signals on emissions	2
Promote New Zealand reduction units to buyers	6
Promote New` Zealand standards	11
Work with existing standard providers to develop methodologies that are appropriate to New Zealand	4
Create rewards for removals through the cancelling of an AAU.	7=
Create rewards for removals through the conversion of an AAU to an ERU under the JI Track 1.	7=
Create rewards for removals through the issue of a CP1 NZU.	8=
Promote participation through education	10
Link registries	3
Make the ETS compliance regime available	4

[61] Where voluntary market price parity is achieved with the compliance market, then the set of recommendations above may be framed differently.

5.3.2 Supporting the strategy through further research

Several areas discussed in this paper would benefit from improved information. Below are listed several such areas:

- A cost-benefit study on the costs associated with implementation of the projects-type mechanism should be undertaken. Such costs include;
  - establishing baselines that provide at least the same degree of certainty as UNFCCC baseline and measurement methodologies;
  - on-going measurement costs;
  - the cost of verification, compliance, and administration;

- This study should also consider the time it could take to implement such a mechanism and what the ideal configuration of the mechanism would be;

- Identification of any sectors that will not enter the NZ ETS until 2013 or later that could be sources of VERs without double counting;

- Investigation of whether different project types are more prone to double counting than others.

- Further economic work on abatement technologies is recommended. Project candidates can be established in a 'merit order' starting with that project believed to have the lowest marginal costs of abatement. This economic study could continue to draw on specific technical expertise provided by the Pastoral Greenhouse Gas Research Consortium which is looking at measures to reduce ruminant methane and nitrous oxide emissions in the agriculture sector [62];

- The funding of the enteric fermentation research work in particular is likely to be of interest to emitters and project developers and thought could be given to exposing it to further public funding through, for example, a special purpose public vehicle, provided of course that the intellectual property around abatement technologies can be protected and benefits will fall to the consortium;

- The identification of social co-benefits for Maori as being a component of a project unit was potentially attractive to some market participants and could be explored further;

- Survey respondents expressed conditional support for New Zealand forestry standards if its parameters (including a clear baseline, rigorous quantification of carbon stock, and unit issuance and tracking) were extended through certification to forests in other countries as well. This is a matter worth considering further, both in the voluntary and

[62] See http://www.pggrc.co.nz/.

compliance markets, as New Zealand's lead in carbon forestry is acknowledged internationally. While matching emissions with same-year reductions is becoming increasingly important, buyers are still buying ex-ante forests credits - and indeed limited supply is a major issue in the marketplace.

5.3.3 Future-proofing conclusions

5.3.3.1 Cap and trade

The market development strategy is based on the existence of Kyoto units or those of it's successor, assuming such an arrangement will involve a cap and trade regime. There are three plausible outcomes that we have considered in future-proofing our recommendations.

5.3.3.1.1 No Kyoto successor, no AAU

In this scenario, the New Zealand ETS will continue to operate but there will be no linking to international permits. AAUs and ERUs would not be relevant.

In the absence of an international cap, standard providers are unlikely to see double counting occurring between the New Zealand ETS and local voluntary market units because there will be no national obligations, especially where projects units awarded reduce free allocations.

In this scenario the possibility for the Government to cancel or issue NZUs remains as a valuable market development tool. The voluntary market is likely to be a more significant part of the reduction effort. Recommendations around methodologies, increasing participation and price transparency would remain valid.

5.3.3.1.2 Kyoto successor but no AAUs

In this scenario, there is an international cap or targets but no traded international permit. There may exist linking and mutual recognition of regional ETS's but the operation of inventories and measurement methodologies would occur at the national level.

In this scenario the cancellation or issue of NZUs would provide an effective tool to develop project reductions. The voluntary market is likely to be a significant part of the reduction effort, but not to the extent it would in the scenario above. Recommendations around methodologies, increasing participation and price transparency would remain valid.

5.3.3.1.3 Kyoto successor using AAUs

This is the business-as-usual scenario and so the strategy would apply as for the present. How projects are treated once agriculture becomes fully linked to the international permit market, even at the margin, is an important consideration.

The extent to which this will occur in CP2 and beyond will be subject to technological development and the respective propensities to take up mitigating technology under either a revenue or cost-reduction basis. The important point we make here is that the tool should not be eliminated through an emphasis on permits alone.

5.3.4 Risks involved in the market development strategy

We believe the components of the development strategy related to methodologies, standards, and participation all contain very low risk in the event of failure. The risks are largely centred on issues around double counting, inventory risk, and the active encouragement of project reductions through management of compliance units.

Of these, perhaps the greatest risk is inventory risk where the risk is that reductions awarded compliance units are not recognised in New Zealand's Kyoto accounting.

5.3.4.1.1 Inventory risk

If, in retrospect, we find that the number of AAUs cancelled (via a cancellation of the AAU permit) is actually greater than what should have been the case, then actual emissions are less than anticipated emissions and a windfall gain accrues.

Conversely, if, in retrospect, we find that the number of AAUs cancelled is actually less than what should have been the case, then emissions are greater than anticipated and reduction behaviour has been obtained at a lower than marginal cost.

Table 14 below shows the scenarios where risk is apparent; where Kyoto accounts differ to where they were anticipated to be, and where projects reductions vary from where they were anticipated to be. It shows that the worst case also has symmetrical possible benefits.

The important point to note is that the New Zealand Government is in the best position to manage this risk through the voluntary project methodologies it will be prepared to accept for the transformation of compliance units. As discussed earlier, these need not be additional but they should be real and verifiable and most importantly have a high probability of translating into reductions in the Kyoto inventory.

Table 14: Inventory risk and a projects-type mechanism

	Actual AAUs required are less than anticipated	*Actual AAUs required are greater than anticipated*
Project reductions greater than AAUs cancelled	Benefit from unanticipated surplus AAUs from both projects and overall position	Cost in AAUs from overall position mitigated by windfall gains from projects
Project reductions less	Cost in AAUs from	Cost in AAUs from

than AAUs cancelled	projects mitigated by windfall gains in overall position	projects as well as cost of shortfall in overall position (worst case)

5.3.4.1.2 Delivery risk

There is also the risk that administrative and development effort is exercised and projects do not deliver on that effort. The Projects to Reduce Emissions (PRE) offers some guidance as to how a projects approach could be applied in the New Zealand agricultural sector.

The underlying project risk was minimised under PRE because projects had to address a wide range of risks in their proposals. Credits were only provided to a project when the project's performance is verified. Project agreements were used to outline which risk would be borne by each of the parties.

There are many costs that might be incurred in the New Zealand government instituting a domestic projects-type mechanism including;

- establishing baselines that provide it with at least the same degree of certainty as the UNFCCC baseline and measurement methodologies;
- on-going measurement costs;
- the cost of verification, compliance, and administration of the scheme

We have suggested a study examine the costs of establishing such a mechanism.

5.3.4.1.3 Administrative risks

The January 2007 review of the PRE scheme cited the Cabinet paper "Climate Change: The Projects Mechanism – Details of Model Project Agreements" (2003) which sets out how various risks are shared between the government and project developers. This framework can be used in the design of a voluntary agricultural projects-type mechanism.

The Cabinet paper states that the government will bear the risks that are under its control, i.e. issuing or cancelling units from the New Zealand registry and that future governments are deemed to be bound by the project agreement. Risks allocated to the project developer were regulatory risk beyond the life of the ETS or successor to the Kyoto Protocol and carbon credit price uncertainty.

The paper shows that many of the issues associated with a projects-type mechanism already have an administrative architecture right through Government. The probability of successfully implementing a projects-type mechanism, using some of this infrastructure, should be high.

ANNEX 1: Methodologies used to calculate the New Zealand National Inventory Report

Enteric fermentation - measurement methodology

The amount of CH_4 emitted is calculated using CH_4 emissions per unit of feed intake, measured as dry matter intake (DMI). DMI was estimated for dairy cattle, beef cattle, sheep and deer by calculating the energy required to meet the levels of animal performance and dividing this by the energy concentration of the diet consumed. Energy requirements are calculated using algorithms chosen to include methods for field-grazing animals. The method estimates a maintenance requirement and a production energy requirement – influenced by the level of productivity (e.g. milk yield and liveweight gain), physiological state (e.g. pregnant or lactating) and the stage of maturity of the animal.

The most important parameter in the model is CH_4 emissions per unit of feed intake. Since 1996, New Zealand scientists have been measuring CH4 emissions from grazing cattle and sheep using the SF6 tracer technique. This involves the integrated horizontal flux technique and the flux gradient technique to measure CH_4 flux above a dairy herd. New Zealand now has one of the largest such data sets in the world. Sufficient data is available to obtain values for adult dairy cattle, sheep more than one year old and growing sheep (less than one year old).

For the measurements made of this factor, the standard deviation divided by the mean is equal to 0.26. This uncertainty is predominantly due to natural variation from one animal to the next. Uncertainties in the estimation of energy requirements, herbage quality and population data are much smaller (0.005–0.05).

Manure management – methane measurement methodology

The general approach relies on (1) an estimation of the total quantity of faecal material produced; (2) the partitioning of this faecal material between that deposited directly onto pastures and that stored in anaerobic lagoons; and (3) the development of specific New Zealand emission factors for the quantity of methane produced per unit of faecal dry matter deposited directly onto pastures and that stored in anaerobic lagoons.

Manure management – nitrous oxide measurement methodology

The calculations for the quantity of nitrogen in each animal waste management system (anaerobic lagoon, solid storage and dry-lot and other) are based on the nitrogen excreted per head per year multiplied by the livestock population, the allocation of animals to animal waste management systems and a nitrous oxide emission factor for each animal waste management system.

Agricultural soils – Direct emissions - measurement methodology - from synthetic fertilizers, animal manure applied to soils, N-fixing crops, crop residue, and cultivation of Histosols

The N_2O emissions from "direct N_2O emissions from agricultural soils" category arise from synthetic fertiliser use, spreading animal waste as fertiliser, nitrogen fixing in soils by crops and decomposition of crop residues left on fields. Some of the nitrogen contained in these compounds is emitted into the atmosphere as NH3 and nitrogen oxides NOx through volatilisation.

The calculation of N_2O that is emitted indirectly through synthetic fertiliser and animal waste being spread on agricultural soils is based on three New Zealand-specific factors/parameters.

The calculation for animal waste includes all manure that is spread on agricultural soils except for emissions from the pasture range and paddock animal waste management system (described below).

Direct N_2O emissions from organic soils are calculated by multiplying the area of cultivated organic soils by an emission factor.

Agricultural soils – Direct emissions - measurement methodology - faecal material deposited directly onto pastures

The quantity of faecal dry matter produced is obtained by multiplying the quantity of feed eaten by the dry matter digestibility of the feed, minus the feed retained in product. These feed intake estimates and dry matter digestibilities are those used in the enteric methane inventory, e.g. 95% of faecal material arising from dairy cows is assumed to be deposited directly onto pastures. The quantity of methane produced per unit of faecal dry matter is obtained from New Zealand studies.

Agricultural soils – Indirect emissions - measurement methodology – indirect emissions from nitrogen used in agriculture

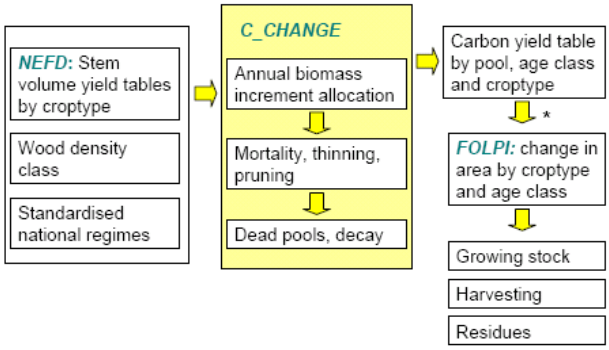
Nitrous oxide is emitted indirectly from nitrogen lost from agricultural soils through leaching and runoff. This nitrogen enters water systems and eventually the sea, with quantities of N_2O being emitted along the way. The amount of nitrogen that leaches is a fraction of that deposited or spread on land.

In pastoral systems, nitrogen leaching is determined by the amount of nitrogen in fertiliser, dairy farm effluent and that excreted in urine and dung by grazing animals. The latter is calculated from the difference between nitrogen intake by grazing animals and nitrogen output in animal products, based on user inputs of stocking rate or production and information on the nitrogen content of pasture and animal products.

Planted forest - measurement methodology [63]

Compared to many forest ecosystems, total biomass and carbon stocks in New Zealand's planted forests are relatively straightforward to estimate.

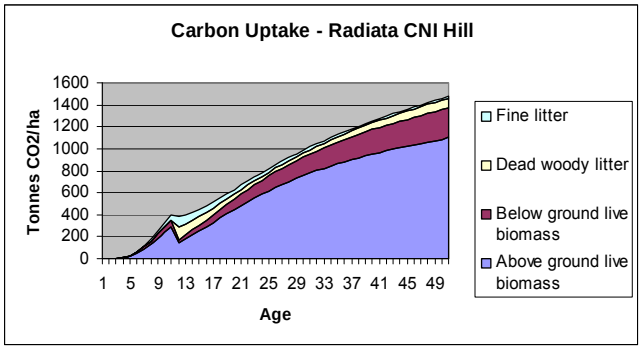
Figure 5: C_change model



Stem wood volume yield tables are compiled periodically for combinations of species, silvicultural regime and location.

The C_change model is used to derive forest biomass and carbon from stem volume yield tables by creating a corresponding carbon yield table for each wood volume yield table, based on wood density and management assumptions appropriate to the species, regime and region.

Figure 6: Carbon uptake



The population for sampling is based on: (a) the latest area estimates provided by the National Exotic Forest Description (NEFD); (b) an estimate of the area to be planted during the year; and (c) an estimate of area harvested during the year.

The LUCAS Project, which is being implemented under the direction of the Ministry for the Environment, will be undertaking detailed forestry inventories for the national inventory. It involves the digital geo-spatial mapping and categorisation of the entire national forest estate. [64] It will be used for accounting purposes under the Kyoto Protocol.

Natural forests

Natural forests are considered to be approximately in steady-state, that is emissions and removals from these forests are assumed to be equal.

[63] See the following website for information on carbon sequestration in New Zealand forests. http://www.maf.govt.nz/climatechange/forestry/ets/sequestration/

[64] See http://www.mfe.govt.nz/publications/climate/looking-at-lucas/index.html

ANNEX 2: Voluntary carbon market standards and the UNFCCC framework

	AFOLU project activities under VCS 2007 [65]				Gold Standard (GS) [66]	Chicago Climate Exchange (CCX) [67]	Californian Action Climate Registry [68]	VER+ [69]	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
CREDITING PERIOD	Minimum of 20 years up to a maximum of 100 years ALM projects focusing on methane and nitrous oxide reductions can have shorter project periods								
AGRICULTURE									
Enteric methane emissions	Not listed under the VCS "Guidance for AFOLU Projects"					Possible but not currently listed	The Livestock Protocol is ONLY for "Capturing and combusting methane from manure managemen		

[65] Voluntary Carbon Standard 2007: http://v-c-s.org. There project website is currently 'under development'.
[66] Gold Standard: http://goldstandard.apx.com/. There are currently 10 projects comprising 7 wind, 2 small hydro, and 1 biodiesel (used cooking oil) projects.
[67] Chicago Climate Exchange: www.chicagoclimatex.com/. An overview of the types of offsets projects included in the program is available at www.chicagoclimatex.com/content.jsf?id=23
[68] California Climate Action Registry / Climate Action Reserve: www.climateregistry.org/offsets.html. There are currently 2 listed projects on their website, both of which are conservation forests that incorporates some sustainable economic usage.
[69] VER+: www.netinform.de and www.netinform.net/BlueRegistry/Projects.aspx. The developer of the VER+ standard, TÜV SÜD (http://www.tuev-sued.de/technical_installations/energy_and_environmental_services/environmental_services/climate_change/offset-projects) claim to audit VER+ forestry projects and manage them on their BlueRegistry; however there are currently only 9 projects listed on their website, almost all related to 'green' energy.

	AFOLU project activities under VCS 2007 [65]				Gold Standard (GS) [66]	Chicago Climate Exchange (CCX) [67]	Californian Action Climate Registry [68]	VER+ [69]	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
							t systems.		
Manure management	The VCS already accepts manure management methodologies approved under CDM—these methodologies do not fit under AFOLU					YES	YES		
Anaerobic lagoons							YES	YES	
Pasture, range and paddock, Solid storage and dry lot, and Other systems (poultry without bedding and swine deep litter)	NOT CURRENTLY						POSSIBLE BUT NOT YET	POSSIBLE BUT NOT YET	
Agricultural soils None distinguish between Indirect emissions from nitrogen lost from the field as NO3, NH3, NOx or direct N2O emissions from agricultural soils as a result of adding nitrogen synthetic fertilisers.	YES but overall "Improved cropland management activities" are included in the AFOLU guidelines. However, only currently CDM/ JI methodologies have been approved						POSSIBLE BUT NOT YET	YES	

	AFOLU project activities under VCS 2007 [65]				Gold Standard (GS) [66]	Chicago Climate Exchange (CCX) [67]	Californian Action Climate Registry [68]	VER+ [69]	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
Soil Carbon and Agricultural Tillage	YES					YES			
Prescribed burning of savannah	Overall "reducing fire frequency and/or intensity" is included under the Improved Grassland management section of ithe AFOLU guidelines. However, currently CDM/JI methodologies have been approved								
Field burning of agricultural residues	YES								
LAND USE, LAND USE CHANGE, and FORESTRY								YES	
Annual cropland	YES								
Above ground biomass, Belowground biomass, Dead wood, Litter, Soil organic matter	NOT CURRENTLY								
Perennial cropland	YES								
High producing grassland	YES								

	AFOLU project activities under VCS 2007 [65]				Gold Standard (GS) [66]	Chicago Climate Exchange (CCX) [67]	Californian Action Climate Registry [68]	VER+ [69]	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
Settlements	YES								
Plantation forests	YES (in the case of Orchards or AgroForestry)	YES	YES			YES	YES	YES	WRI GHG
Other Afforestation, Reforestation, Revegetation		YES				YES	YES		CCBS, PV
Avoided Deforestation				YES		YES	YES		CCBS
Wood Products		YES				YES	OPTIONAL (non-certifiable Step 5 i Forest Project Protocol 2.1)		

Projects related to energy and other UNFCCC categories, considered in the above analysis but excluded from the survey and further study, can be found below.

Voluntary carbon market standards and specific project frameworks

	AFOLU project activities under VCS 2007				Gold Standard (GS)	Chicago Climate Exchange (CCX)	Californian Action Climate Registry	VER+	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
AGRICULTURE									

PROJECTS TO REDUCE NITROUS OXIDES	YES					POSSIBLE BUT NOT YET	POSSIBLE BUT NOT YET		
1. Animals - diet manipulation									
2. Animals - reduce nitrogen in excreta or shift the balance between dung and urine in favour of dung									
3. Farm management of dairy effluent	The VCS already accepts manure management methodologies approved under CDM so these methodologies do not fit under AFOLU								
4. Farm management of piggery effluent	As above								
5. Feed livestock on pads in winter									
6. Soil structure - optimise tillage, prevent compaction									
7. Manage soil water - irrigation, drainage									
8. Manage soil pH so that nitrogen is emitted as N2									
9. High sugar grasses									
10. High condensed tannin grasses									
11. Optimise nitrogen use by plants									
12. Fertiliser timing, rates of application, tighten flow cycles									
13. Nitrification inhibitors									
14a. Run-off management, riparian buffer zones, drainage ditches, reed beds.									
14b. Replant riparian buffers in appropriate forest		YES							

Projects to reduce methane	YES					POSSIBLE BUT NOT YET	The Livestock Protocol is ONLY for "Capturing and combusting methane from manure management system"		
1. Reduction of livestock numbers									
2. Improving efficiency - feed intake, diet manipulation	Not listed under the VCS "Guidance for AFOLU Projects"								
3. Animal genetic improvement	Not listed								
4. Feed additives - inhibitors	Not listed								
5. Naturally occurring inhibitors	Not listed								
6. Immunisation	Not listed								
7. Manure biogas control of methane emissions through anaerobic digester – also refer Renewable Energy	The VCS already accepts manure management methodologies approved under CDM—these methodologies do not fit under AFOLU					YES	YES		
8. farm scale abatement systems									
Soil Carbon and Tillage (examples)	YES								

1. No-till / zero tillage						YES			
2. Strip, ridge or other non-conventional tillage						YES			
3. Grass(land) planting or conversion						YES			
4. Grazing land management (sustainable stocking & rotational grazing)						YES			
Prescribed burning of savannah									
Less applicable in NZ									
Field burning of agricultural residues									
Refer renewable energy									
LAND USE, LAND USE CHANGE, and FORESTRY									
Annual cropland									
Perennial cropland									
High producing grassland									
Settlements									
Afforestation									
1. Plantation forestry with AAU retired 2008 - 2012			YES			YES			WRI GHG
2. Plantation forestry 1990 - 2007			YES			YES			WRI GHG
3. Regeneration of native scrub with QE II Trust covenant (http://www.qe2.org.nz/)			YES			YES			WRI GHG
4. Species with longer maturity (e.g. Redwood)			YES			YES			WRI GHG
5. Increase rotation period			YES			YES			WRI GHG
6. Enrichment planting			YES			YES			WRI GHG
7. Reduced thinning and pruning			YES			YES			WRI GHG
8. Replace low productivity with high productivity forests			YES			YES			WRI GHG
9. On degraded, erosion-prone land (e.g. Cyclone Bola, East Coast)		YES				YES	YES		CCBS

10. Native species reforestation		YES				YES	YES		CCBS, PV
11. Reforestation for landscape restoration		YES				YES	YES		CCBS
Avoided Deforestation (examples)									
1. Pre-1990 forest management (e.g. pest management - control of possums, deer etc. in indigenous forests, longer rotations in exotic forests, etc.)			YES			YES			WRI GHG
2. Compliance-issued deforestation right (surrender of pre 1990 free allocation)			YES			YES			WRI GHG
3. Sequestrating land as forest reserve or native bush or wetlands				YES		YES	YES		WRI GHG
4. Wood Products (examples)						YES	OPTIONAL		Not WRI GIG
5. Improve efficiency of timber mills (reduction in harvest that is classed as 'immediately decayed')						MAYBE	MAYBE		

Non-agriculture and forestry projects not considered

	AFOLU project activities under VCS 2007				Gold Standard (GS)	Chicago Climate Exchange (CCX)	Californian Action Climate Registry	VER+	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
ENERGY EFFICIENCY							YES	YES	
Agriculture	While this does not fit				YES				VOS

	AFOLU project activities under VCS 2007				Gold Standard (GS)	Chicago Climate Exchange (CCX)	Californian Action Climate Registry	VER+	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
	under AFOLU VCS will be approving methodologies for such project types								
Fisheries					MAYBE				MAYBE
RENEWABLE ENERGY							YES	YES	
Biogas					YES	Not explicitly listed as an approved Renewable Energy offset project type		LIKELY	VOS
Biomass					YES	YES		LIKELY	VOS
Geothermal					YES	Not explicitly listed as an approved Renewable Energy offset project type		LIKELY	VOS
Solar Thermal					YES	YES		LIKELY	VOS
Wind					YES	YES		LIKELY	VOS
INDUSTRIAL PROCESSING & PACKAGING									
Meat					YES			LIKELY	VOS
Dairy					YES			LIKELY	VOS
PROJECTS CONSIDERED									
ENERGY EFFICIENCY									

	AFOLU project activities under VCS 2007				Gold Standard (GS)	Chicago Climate Exchange (CCX)	Californian Action Climate Registry	VER+	Other Standards
	Agricultural Land Management (ALM)	Afforestation, Reforestation and Revegetation (ARR)	Improved Forest Management (IFM)	Reducing Emissions from Deforestation (RED)					
1. Fishing companies collaborate to economise on required boats/trips					MAYBE			MAYBE	MAYBE
RENEWABLE ENERGY (examples)									
1. (Manure) biogas capture and utilisation					YES	YES	LIKELY	LIKELY	VOS
2. Biomass residue power					YES	YES		LIKELY	VOS
3. Geothermal energy for dairy processing					YES	YES		LIKELY	VOS
4. Geothermal energy to heat greenhouses (instead of diesel)					YES	YES		LIKELY	VOS
5.. Solar Hot Water (e.g. on dairy sheds)					YES	YES		LIKELY	VOS
INDUSTRIAL PROCESSING & PACKAGING (examples)									
1. Improved meat/dairy plant wastewater treatment to reduce GHG emissions					YES			LIKELY	VOS
2. Capturing waste gas (i.e. methane) and reusing as fuel					LIKELY			YES	VOS

ANNEX 3: Summary of relevant CDM Land Management methodologies

Methodology	Applicable areas (baseline)	Project conditions	Baseline approach
AR-AM0001 Reforestation of degraded land	• Lands to be reforested are severely degraded with the vegetation indicators (tree crown cover and height) below thresholds for defining forests, and the lands are still degrading; • Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation;	• The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity; • Lands will be reforested by direct planting and/or seeding; • Site preparation does not cause significant longer term net emissions from soil carbon; • Plantation may be harvested with either short or long rotation and will be regenerated either by direct planting or natural sprouting; • Carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more due to soil erosion and human intervention or increase less in the absence of the project activity, relative to the project scenario; • Grazing will not occur within the project boundary in the project case;	(a) existing or historical changes in carbon stocks
AR-AM0002 Restoration of degraded lands through afforestation/reforestation	• Lands to be reforested are severely degraded (due to such agents as soil erosion, land slides, or other physical constraints as well as anthropogenic actions) and the lands are still degrading; • Environmental conditions or anthropogenic pressures do not permit significant encroachment of natural tree vegetation;	• The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity; • Grazing will not occur within the project boundary in the project case;	(a) existing or historical changes in carbon stocks

AR-AM0003 Afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of animal grazing	• Degraded land which is subject to further degradation or remains in a low carbon steady state • Environmental conditions or anthropogenic pressures do not permit the encroachment of natural tree vegetation that leads to the establishment of forests according to the threshold values of the national definition of forest for CDM purposes;	• The project activity can lead to a shift of pre-project activities outside the project boundary, e.g. a displacement of grazing and fuelwood collection activities, including charcoal production; • Lands will be afforested or reforested through promotion of natural regeneration and or direct planting or seeding; • Site preparation does not cause significant longer term net decreases of soil carbon stocks or increases of non-CO2 emissions from soil;	(a) existing or historical changes in carbon stocks
AR-AM0004 AR of land currently under agricultural use	• Degraded lands • May contain strata with shrubs and/or trees • Environmental conditions and human pressures prevent forest encroachment; Carbon stocks in litter and dead wood lower than in project scenario • No AR in the baseline • Accounts for activity displacement (leakage): croplands, grazing, fuelwod collection	• AR by assisted natural regeneration, tree planting, or control of pre-project grazing and fuelwood collection (including insite charcoal production) • Site preparation doesn't cause significant longer-term net emissions from soil organic carbon pool; Soil drainage and disturbance insignificant; • No Flood irrigation • N-fixing species insignificant	(a) existing or historical changes in carbon stocks

AR-AM0005 Afforestation and reforestation project activities implemented for industrial and/or commercial uses	• Grasslands that are unmanaged or under extensive management, with low soil carbon content (compared to the expected soil carbon content under the project activity) because of soil degradation, or because climato-edaphic conditions naturally lead to thin, infertile soils with low carbon content. Natural regeneration is not expected to occur in the project area because of the absence of seed sources or because land use practices do not permit the establishment of tree vegetation; With 2 baseline scenarios: 1. Maintenance of the present land uses as unmanaged extensively managed grassland, and 2. Afforestation or reforestation activity undertaken intermittently in small amounts in the periods prior to the A/R CDM project activity;	• Carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more or increase less in the absence of the project activity during the time frame that coincides with the crediting period of the project activity, relative to the baseline scenario. Lower soil carbon under grassland compared to plantations or secondary forests can be expected under tropical conditions1; it cannot necessarily be expected under non-tropical conditions2; evidence has to be provided that the exclusion of soil organic carbon is conservative for the project case through, e.g. representative scientific literature; • Grazing will not occur within the project boundary once the project commences; the total number of grazing animals is not increased compared to the pre-project conditions and thus non-CO2 emissions from displaced livestock are not accounted as leakage in accordance with decision EB22, Annex 15, item 1.b3. To test this applicability condition, evidence shall be provided that the total number of animals is not increased as a consequence of the project activity (e.g. with records from slaughtering); potential effects on carbon pools outside the project boundary are accounted for as leakage from activity displacement; • Flooding irrigation is not permitted; • Soil drainage and disturbance are insignificant, so that non CO2-greenhouse gas emissions from this these types of activities can be neglected; • The amount of nitrogen-fixing species (NFS) used in the A/R CDM project activity is not significant, so that greenhouse gas emissions from denitrification can be neglected in the estimation of actual net greenhouse gas removals by sinks; • A Geographical Information System (GIS) is required for the management of spatial data (e.g. for (ex-post) stratification).	(c) changes in carbon stocks at project start

AR-AM0006 AR with trees supported by shrubs on degraded land	• Severely degraded land • Environmental conditions and human pressures prevent forest encroachment; • Steady-state low or decreasing soil carbon in a long term; litter and dead wood • No activitiy/goods displacement	• AR by direct planting and/or seeding with shrubs/trees • Plantation: short/long rotation; regenerated by planting • Allow agricultural intercropping, forage production • Allows N-fixing species • Site preparation: no burning; Site preparation and intercropping may cause significant long-term net emissions; • Carbon stocks in litter and dead wood lower than in project scenario • No grazing • All produced forage shall have a similar nutritional value and digestibility, and will support only a single livestock group with a single manure management system	(a) existing or historical changes in carbon stocks
AR-AM0007 AR of land currently under agricultural or pastral use	• Currently abandoned, pasture or agricultural land • Non-tree biomass steady-state or decreasing for all baseline uses; rotational land-uses: peak biomass constant or decreasing • Environmental conditions, human-induced degradation or on-going human activities prevent forest encroachment • No displacement of land-owners • No activitiy displacement: pre-project activities shall be terminated at project commencement	• AR by direct planting and/or seeding • Plantation: short/long rotation; regenerated by planting, sowing, coppicing or assisted natural regeneration • All of the plausible land use changes being part of the baseline scenario shall lead only to such changes in soil organic carbon stocks that the stocks can be expected to decrease more or increase less, relative to afforestation/reforestation of the project area. • No Flood irrigation • N-fixing species insignificant • no destocking of forested areas other than possible farming by displaced people (other than land-owners); no significant increase in nonCO2 emissions due to farming and pastoral activities undertaken by displaced people	(a) existing or historical changes in carbon stocks, i.e. only current land-uses as baseline alternatives

AR-AM0008 **AR on degraded land for sustainable wood production**	• Degraded lands • Non-tree biomass steady-state or decreasing • Environmental conditions and human-induced degradation prevent forest encroachment • No activitiy displacment (no leakage), i.e. the land continues to provide same goods and services • Wildfire uncommon • No drained wetland or organic soils (e.g., peatlands)	• Litter, dead wood and harvest residues left on-site • Site preparation: slash-and-burn only for non-tree vegetation, burning not to damage pre-exisiting trees; • Site preparation doesn't cause significant longer-term net emissions from soil organic carbon pool • No grazing	(a) existing or historical changes in carbon stocks
AR-AM0009 **AR on degraded land allowing for silvopastoral activities**	• Degraded grasslands • Non-tree woody and herbaceous biomass absent, declining or steady-state • Environmental conditions and human-induced degradation prevent forest encroachment • No activitiy displacment (no leakage), i.e. the land continues to provide same goods and services	• AR by assisted natural regeneration or tree planting • Silvopasture: allows grazing and manure (if staying as deposited) • Site preparation: no biomass burning, no removal of trees • No significant impact on soil organic carbon: apply "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities" • N-fixing trees less than 10% • No Flood irrigation or drainage of primarily saturated soils	(a) existing or historical changes in carbon stocks

AR-AM0010 **AR on unmanaged grassland in reserve/protected areas**	• Designated as a reserve/protected area • Unmanaged grassland • With steady-state or slowly regenerating woody cover of shrubs and/or scattered trees without potential to revert to forest; • Herbaceous biomass steady-state or declining due to woody species competition (assumed to oxidize at project start) • Includes AR at a non-CDM baseline forestry rate; if applicable only tCERS • There are no activities displaced by the project (no leakage), i.e. the land continues to provide same goods and services • Steady-state soil carbon at project start: no severe degradation within last 20 yrs or agricultural cropping within the last 3 yrs	• AR by direct planting and/or seeding • NO removals, i.e. no harvesting, selective logging, fuel gathering, removal of litter or deadwood; • Site preparation to to avoid levels of soil disturbance or soil erosion sufficient to significantly reduce the soil carbon pool over the project lifetime; • N-fixing trees less than 10% • Carbon stocks in litter and dead wood lower than in project scenario • No Flood irrigation or drainage of primarily saturated soils	(c) changes in carbon stocks at project start

ANNEX 4: Estimated costs to voluntary unit providers of meeting the various standards [70]

	New Methodology Submission Fee	Credit Registration Fee	Credit Issuance Fee (US$)	PDD Validation/ Credit Verification	Transaction/Trading fees	Registry Fees	Other
Voluntary Carbon Standard 2007 (VCS 2007)	N/A	€0.04 per credit issued.	N/A	N/A	N/A	VCS-approved registries have own account fees	
Gold Standard	$1,000 for micro-scale projects; $2,500 for small and large-scale projects	None	US$0.01 per CER; US$0.10 per VER	N/A	If >25,000 credits transacted, $0.01 charge for every credit traded above 25,000	$0.50 per VER issued and $250 per year for up to 25,000 credits transacted	US$0.01 Feasibility Pre-assessment fee per VER for already operational projects that wish to earn retroactive Gold Standard status [Min. fee: US$250]
Chicago Climate Exchange (CCX)	N/A	$0.15 per metric tonne (subject to change)	N/A	N/A	US$0.05 per metric tonne (subject to change)	For members: US$1,000-35,000 per year (depends on member size/type). Offset registration fees for Annex 1 countries:	
California Climate Action Registry (CCAR)	N/A	$0.15/tonne	Issuance Fee (per CRT issued: US$.015	N/A	Transaction Fee (per CRT traded): US$0.03 No fee for retirement	Project Submission Fee (per project): US$500 Account Maintenance Fee (annual): US$500	

[70] From: Kollmuss, A. et all. "Making Sense of the Voluntary Carbon Market: A Comparison of Offset Standards." March 2008 and the Californai Climate Action Registry website (

VER+	N/A			Total costs for validation, registration, and credit issuance charged by the auditing company usually fall in range of €5,000-15,000	€120 for 200 tonnes or less transacted; €700 for 10,000 tonnes or more	If verification performed by TUV SUD, credits can be registered on Blue Registry for no charge. For projects not verified by TUV SUD: €1,500-3,000	For projects not verified by TUV SUD: €550-1,100 one-time subscription fee
Clean Development Mechanism (CDM)	US$1,000 (adjustable in registration fee if methodology is approved or consolidated)	US$0.10 per CER for first 15,000 CERs issued in a year; US$0.20 for credits above 15,000 [Upper fee limit: US$ 350,000]. No registration fee charged if annual emissions <15,000 tonnes.	2% of CERs from each issuance	N/A	N/A	N/A	
Joint Implementation (JI)							
Community, Climate and Biodiversity (CCB)	N/A	Currently doesn't have a registry	N/A	€3,500-$10,000 per project (costs lower for projects co-validated by CDM)	N/A	N/A	

ANNEX 5: Project methodologies by standard provider

The discussion below focuses on methodologies where opportunities for New Zealand voluntary carbon products are currently most available.

Set out below is a description of current methodologies and methodologies in development under each of the six standards listed above and that are considered relevant to the project types listed above.

5.3.4.2 Voluntary Carbon Standard

At the current date, the VCS has only accepted methodologies approved under the CDM. However, the VCS Thus the methodologies listed below under each project type are those already approved by the CDM and described under the VCS [71]. The Voluntary Carbon Standard is also considering accepting all Californian Climate Action Registry protocols. The The VCS Board is also planning to approve VCS specific methodologies and has already created a specific Guidance Document for Agriculture (specifically agricultural land management—not livestock management)Forestry and Other Land Use Projects.

5.3.4.3 Clean Development Mechanism

Because several major voluntary standards, including the VCS, Gold Standard, and VER+ currently are based on CDM methodologies, the current section outlines methodologies listed in Table 7.

5.3.4.3.1 Agriculture

AM0006: "GHG emission reductions from manure management systems"

AM0016: "Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations"

AM0057: "Avoided emissions from biomass wastes through use as feed stock in pulp and paper production or in bio-oil production"
The methodology is applicable for project activities using agricultural wastes as feed stock for pulp and paper production or bio-oil production, where the end product is similar in characteristics and quality to existing high quality products in the market and does not require special use or disposal methods.

5.3.4.3.2 Land use, land use change and forestry

AR-AM0001: "Reforestation of degraded land"

[71] See http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

This methodology is applicable in cases where lands to be reforested are severely degraded with the vegetation indicators (tree crown cover and height) below thresholds for defining forests, and the lands are still degrading. Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation.

AR-AM0002: "Restoration of degraded lands through afforestation/reforestation"
This methodology is applicable where lands to be reforested are severely degraded (due to such agents as soil erosion, landslides, or other physical constraints as well as anthropogenic actions) and the lands are still degrading. Environmental conditions or anthropogenic pressures do not permit significant encroachment of natural tree vegetation.

AR-AM0003: "Afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of animal grazing"
This methodology is applicable on degraded land which is subject to further degradation or remains in a low carbon steady state. Environmental conditions or anthropogenic pressures do not permit the encroachment of natural tree vegetation that leads to the establishment of forests according to the threshold values of the national definition of forest for CDM purposes;

AR-AM0004: "AR of land currently under agricultural use"
Afforestation or reforestation of degraded land, which is subject to further degradation or remains in a low carbon steady state, through assisted natural regeneration, tree planting, or control of pre-project grazing and fuel-wood collection activities (including in-site charcoal production). The project activity can lead to a shift of pre-project activities outside the project boundary, e.g. a displacement of agriculture, grazing and/or fuel-wood collection activities, including charcoal production.

AR-AM0005: "Afforestation and reforestation project activities implemented for industrial and/or commercial uses"
This methodology applies to grasslands that are unmanaged or under extensive management, with low soil carbon content (compared to the expected soil carbon content under the project activity) because of soil degradation, or because climato-edaphic conditions naturally lead to thin, infertile soils with low carbon content. Natural regeneration is not expected to occur in the project area because of the absence of seed sources or because land use practices do not permit the establishment of tree vegetation;

AR-AM0007: "AR of land currently under agricultural or pastoral use"
Applicable for afforestation or reforestation activities undertaken on pasture, agricultural land or abandoned lands; land use change is allowed in the baseline scenario.

AR-AM0008: "AR on degraded land for sustainable wood production"
This methodology is applicable to afforestation or reforestation (hereafter, A/R) activities on degraded (or degrading) land, and may be applied only to projects that meet a number of specific conditions.

AR-AM0009: "AR on degraded land allowing for silvopastoral activities"
This methodology is applicable to the following afforestation or reforestation activities:

- Afforestation or reforestation of degraded land, which may be subject to further degradation or remains in a low carbon steady state, through assisted natural regeneration or tree planting;
- Project activities that include silvopastoral arrangements which:
  - Allow grazing within the project boundary;
  - Allow the manure from pasture and range grazing animals to lie as deposited, i.e. the manure shall not be collected, stored or burned.

AR-AM0010: "AR on unmanaged grassland in reserve/protected areas"
The methodology is applicable to the following categories of project activities:
Afforestation and reforestation implemented on unmanaged grassland in reserves or protected areas that are not likely to be converted to any other land use except forestry, and which have no potential to revert to forest without direct human intervention.

5.3.4.3.3 Renewable energy/manure management

AM0042: "Grid-connected electricity generation using biomass from newly developed dedicated plantations"

The following definitions apply for this methodology:

- Biomass is non-fossilized and biodegradable organic material originating from plants, animals and microorganisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.
- Biomass residues are defined as biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries. This shall not include municipal waste or other waste that contains fossilized and/or non-biodegradable material (small fractions of inert inorganic material like soil or sands may be included).

5.3.4.4 Gold Standard [72]

The Gold Standard currently only accepts energy projects, and therefore there are no accepted methodologies for agriculture or land use projects. Eligible projects are renewable energy including biomass, biogas, liquid biofuels for electricity, heat, cogeneration, and transport [73].

[72] Note: The GS website is in the process of transferring their database of projects to a new registry that requires a member registration process. This process entails submission to the GS offices and can take up to 30 days. For the purposes of this search, the older database that is available online was used.
[73] See http://cdmgoldstandard.org/uploads/file/GS-VER_Proj_Dev_manual_final%20.pdf.

Gold Standard project specifications are outlined below. These include:

- Three scales of project size;
  - Micro-scale: 0 – 5,000 tones CO2e per year
  - Small: 5,000 – 15,000 tonnes CO2e per year
  - Large: >15,000 tonnes CO2e per year
- Reporting and operations requirements for small and large scale projects are similar to the CDM;

Gold Standard CERs must be registered CDM credits. Gold Standard VERs do not need to be registered credits. Beside's CDM registration and issuance, the difference between Gold Standard CER versus VER credits is:

- "Simplified guidelines for 'micro'-projects delivering less than 5'000 t of emission reductions annually, significantly lowering transaction costs
- Broader eligibility of host countries
- lower requirements on the use of official development assistance (ODA)
- broader scope of eligible baseline methodologies
- no need for formal host country approval":

5.3.4.5 California Climate Action Registry

Particular attention should be paid to the California Climate Action Registry (CCAR) due to the geographical limitations and thus similarity with the New Zealand case. These restrictions enable a standard and set of protocols that are contextually specific, as would be the case for a New Zealand standard.

The CCAR does not have 'approved methodologies'. Rather they have a system of protocols that outline the procedures by which members can measure, verify and report their emissions [74]. Protocols exist for landfill, livestock, and forestry activities. No specific methodologies are outlined. The project developers themselves are responsible for creating their own methodologies.

5.3.4.5.1 Agriculture

The 'Livestock' Protocol concentrates on capturing and combusting methane from manure management systems. It provides guidance to account for and report GHG emissions reductions associated with installing manure biogas control systems. Guidance is provided on:

- Project definition
- Eligibility rules
- Project boundaries
- Calculation methods
- Monitoring
- Reporting

[74] See http://www.climateregistry.org/tools/protocols/project-protocols.html.

5.3.4.5.2 Forestry

Forest entities or third party independent project developers that implement forest projects within California in accordance with the Registry's forest project, sector and certification protocol criteria, can report forest projects to the Registry.

Rather than conform to a specified methodology, a forest project must meet a specific set of criteria to be eligible for reporting and certification in the Registry. Much of these criteria have been required specifically by the California legislature.

Within the forestry protocol there are three types of eligible projects:
Conservation-based Forest Management: Forest projects that are based on the commercial or non-commercial harvest and regeneration of native trees and employs natural forest management practices.

Reforestation: Forest projects that are based on the restoration of native tree cover on lands that were previously forested, but have been out of tree cover for a minimum of ten years

Conservation: Forest projects that are based on specific actions to prevent the conversion of native forests to a non-forest use, such as agriculture or other commercial development

5.3.4.6 Chicago Climate Exchange

New Zealand agricultural and forestry projects would most likely be eligible to generate "Carbon Financial Instruments" (CFI)s under four of the eight CCX offset project categories: agricultural methane, agricultural soil carbon, rangeland soil carbon management, and forestry. Basic project eligibility requirements for these four categories are outlined below [75].

As with CCAR, there are no approved methodologies. Rather there are a set of specific protocols for acceptable projects. Each project type has standardised rules for issuing tradable CFI contracts (i.e. credits). Project types are as listed below [76].

5.3.4.6.1 Agriculture

Eligible projects include covered anaerobic digesters, complete-mix, plug flow digesters, and covered lagoons.

Projects relevant to New Zealand that may qualify for CFIs under this category include controlling methane emissions through anaerobic digesters, combustion

[75] For the full set of information on the eligibility requirements of all project types, please visit the Offsets section of the CCX website, http://www.chicagoclimateexchange.com/.
[76] Key references: http://www.chicagoclimatex.com/content.jsf?id=23
http://www.chicagoclimatex.com/docs/offsets/General_Offsets_faq.pdf
http://www.chicagoclimatex.com/docs/offsets/CCX_Rulebook_Chapter09_OffsetsAndEarlyActionCredits.pdf.

of dairy and piggery effluent and poultry waste, and farm-scale abatement systems involving covered lagoons.

Other methane abatement projects that involve methane-source reduction - not collection or combustion - are not eligible to generate CFIs under this category and should sell offsets into the OTC market. These latter projects include livestock reduction, animal diet manipulation, genetic manipulation, and immunization of livestock against methanogens.

Agricultural methane concentrates on anaerobic digesters, plug-flow digesters, covered lagoons. Their specifications include:

- Methane collection/combustion projects started on or after Jan 1 1999
- Qualifying projects earn offsets 2003-2010
- Must demonstrate ownership rights of ERs due to methane destruction
- Selling energy allowable provided ownership of GHG attributes are retained
- Methane for electricity generation may also qualify for offsets from RE.
- Must be independently verified by CCX-approved verifier

The agricultural soil category concentrates on soil carbon. Continuous conservation tillage and grass planting are two project types that may qualify for CFI issuance. Protocols have been established for each. Specifications include:

- Conservation tillage: Minimum five year contractual commitment (2006-2010) to continuous no-till, strip till or ridge till on enrolled acres.
- Grass planting: projects initiated on or after January 1, 1999 in CCX eligible counties may qualify.
- Carbon sequestration projects must be enrolled through a CCX-registered Offset Aggregator.
- All projects must be independently verified by a CCX-approved verifier.

There is also a project category for rangeland soil carbon management. Eligible projects involve sustainable stocking rates, rotational grazing, and seasonal use on eligible locations of grazing land. Projects must begin on or after January 1, 1999; must commit to a minimum five-year contract; and must also occur within designated land resource regions.

Projects relevant to New Zealand that may qualify for CFIs under this category include restricting livestock grazing to pads in the winter season, reduction of livestock numbers to sustainable stocking rates, and rotational grazing. Specifications include:

- Minimum 5 year contractual commitment.
- Non-degraded rangeland managed to increase carbon sequestration through grazing land management that employs sustainable stocking rates, rotational grazing and seasonal use in eligible locations.
- Restoration of previously degraded rangeland through adoption of sustainable stocking rates, rotational grazing and seasonal use grazing practices initiated on or after January 1, 1999.
- Projects must take place within designated land resource regions.

- Offsets are issued at standard rates depending on project type and location
- Rates vary from 0.12 to 0.52 metric tons of CO_2 per acre per year.
- All projects must be independently verified by a CCX-approved verifier.

5.3.4.6.2 Forestry

Sequestration projects that maintain or increase forest area, increase stand- and landscape-level carbon density, and increase off-site carbon stocks of wood products as well as enhance product and fuel substitution are eligible to generate CFIs. These include afforestation, reforestation, and RED projects; long-lived wood product production projects; and forests managed sustainably.

The CCX accepts three project types under the land use category. The CCX Committee on Forestry reviews and approves of all projects on a case-by-case basis. Below are these protocols, along with a summary of the requirements and specifications for eligible projects:

- Afforestation: the planting of new forests on lands, which historically, have not contained forests
    - The project activity involves afforestation on or after January 1, 1990 on unforested or degraded land.
    - Eligible afforestation activity should not involve removal of tree biomass, including harvesting or thinning, during the CCX market period.
    - Landowners must sign a contract with their aggregators attesting that the land will be maintained as forest for at least 15 years from the date of enrolment in CCX.
    - Projects in the contiguous United States may quantify sequestered carbon using CCX carbon accumulation tables.
- Long lived woods: harvested wood that has existed for long period of time, in which it has served as a carbon sink
    - Entities may receive offsets for carbon stored in long-lived wood products equal to the fraction of carbon stored in long lived wood products in use and landfills at the end of 100 years.
    - Offset providers / aggregators must provide evidence that all of their forest holdings from which landowners wish to obtain offsets for carbon stored in long lived wood products are sustainably managed.
- Managed forest projects: projects that sustainably manage forests such that their growth in carbon stocks exceeds their harvest.
    - Eligible projects may earn offsets for the additional net carbon sequestered in their forest stocks from the previous year (i.e., carbon sequestered from additional forest growth less carbon lost due to harvesting activities).
    - Forest owners must provide evidence that all of their forest holdings are sustainably managed through certification from agencies or schemes endorsed by the PEFC Council or through other certification schemes that have been approved by the CCX Committee on Forestry.

- Projects must quantify sequestered carbon either using a growth-and-yield model or by calculating inventory on an annual basis.

$C0_2$ sequestration projects that have been proposed in New Zealand and which may qualify to generate CFIs include longer rotations of trees with high sequestration potential, pest management, reforestation, and other sustainable forestry management practices that maintain or enhance the carbon sequestration of forests and forested wood, including wood products.

5.3.4.6.3 Energy

Eligible renewable energy projects include wind, solar, hydropower and biofuel that are not being used to meet obligations established by state or local mandates (e.g., state renewable portfolio standards). Specifications include;

- Renewable energy systems activated on or after January 1, 1999 may qualify.
- Qualifying projects may earn Offsets during the years 2003-2010.
- Project proponents need to demonstrate clear ownership rights to the environmental attributes associated with the renewable energy production.
- The energy generated cannot be sold as "green".
- Environmental attributes, such as renewable energy credits (RECs) generated by qualifying systems must be surrendered to and retired by CCX in order to prevent double counting.
- All projects must be independently verified by a CCX-approved verifier.

5.3.4.7 VER+

VER + accepts only projects that use CDM approved methodologies. These have been outlined above under VCS and in more detail in Annex 3.

5.3.4.8 Joint Implementation

JI projects utilise CDM approved methodologies.

5.3.4.8.1 Forestry

Under JI more LULUCF activities than Afforestation/Reforestation are eligible, under the condition that they are included in the national accounting system in the relevant commitment or year [77]. LULUCF activities include, as defined by Decision 16/CMP.1: Afforestation, Reforestation, Deforestation, Revegetation, Forest Management, Cropland Management and Grazing Land Management. However, JI generally refers to emissions reductions or the enhancement of removals, therefore carbon conservation activities are excluded.

Under JI credits from LULUCF activities may be treated as permanent credits, since non-permanence would be taken into account by national accounting systems. However, there are several obstacles mainly related to the accounting for LULUCF JI credits and the rules governing the International Transaction Log (ITL).

[77] Please see: UNFCCC: Home > Methods and Science > Land Use, Land-Use Change and Forestry (LULUCF). http://unfccc.int/methods_and_science/lulucf/items/1084.php.

Credits for LULUCF activities may only be issued as Removal Units (RMUs). RMUs, including those created by JI projects or by other activities under Article 3.3 or 3.4 are therefore added/cancelled from the national assigned amount of emissions allowances.

While this strategy was supposedly meant to avoid leakage within the country and ensure additionality of RMUs, it also implies that achieved removals by LULUCF JI projects cannot be credited if a country generates net emissions from LULUCF on a national level and until RMUs are determined annually or by inventories at the end of the commitment period. Therefore, there is a huge uncertainty for project developers and investors whether the project will actually produce any tradable emissions reduction units.

ANNEX 6: Requirements for developing new methodologies

5.3.4.9 Clean Development Mechanism

The process for the approval of afforestation and reforestation methodologies under the CDM is as follows [78]:

- The project participant shall propose a new A/R methodology, through a designated operational entity or by submitting the CDM afforestation and reforestation project design documents
- The DOE, contracted by the project participants, shall determine whether the proposed project activity intends to use a new baseline or monitoring methodology for afforestation and reforestation project activities.
- The DOE shall check whether documents are complete and forward, without further analysis, the proposed new A/R methodology to the Board for its consideration and approval, if appropriate, using specified form
- The secretariat shall forward the documentation to the Executive Board and the working group on afforestation and reforestation after having checked that it " has been duly filled by the DOE and documentation provided by the DOE is complete. The date of transmission to the Executive Board is to be considered as the date of receipt of a proposed new A/R methodology by the Board.
- The secretariat shall make the proposed new A/R methodology publicly available on the UNFCCC CDM web site and invite public inputs for a period of 15 working days. Public inputs on a proposed new methodology shall be made. Comments shall be forwarded to the working group on afforestation and reforestation at the moment of receipt and made available to the public at the end of the 15 working day period.

There are currently no methodologies awaiting the approval process. The next round for proposed methodologies begins in August 2008. Therefore all forestry projects in the pipeline must adhere to one of the CDM AR approved methodologies outlined above.

Once a CDM accepted methodology has been accepted, the following steps indicate the procedure for acquiring VCS certification [79];

1. Project proponents submit documentation to verifier.
2. Verifier assesses the claim against VCS 2007 and produces a validation and verification report and a certification statement.
3. Project proponent submits a VCS project description, validation report, verification report and proof of title to a registry operator.
4. Registry operator checks documentation and submits it to the VCS project database.

[78] See reference: http://cdm.unfccc.int/Projects/pac/ar_howto/New_AR_Methodology/index.html
[79] See http://www.v-c-s.org/docs/Program%20Guidelines%202007.pdf

5. VCS Organisation checks that the project has not been previously registered, requests and receives VCS registration levy an issues the project with serial numbers.
6. Registry Operator issues VCUs into the account of the project proponent and places documents into a custodial service.

5.3.4.10 Voluntary Carbon Standard

For CDM AR project requirements, please see Annex 3 which outlines the conditions and requirements for forestry projects under the CDM.

To date no methodologies have been proposed to the CDM executive board specifically for use under the voluntary market. Rather, we have seen voluntary market projects adapting to utilise already existing methodologies. This is due to the high costs and long time lapse for methodology approval under the CDM.

5.3.4.11 Gold Standard

All methodologies must be CDM approved. However, there are a number of additional steps that must be taken to utilise methodologies under the gold standard and become certified [80]. This includes conventional project cycle elements and *additional steps under GS*

- Project ID
- Feasibility assessments
  - *Pre-baseline study*, *Pre-monitoring*
  - *Assessment of market value of CO2-credits*
  - *Assessment of whether project can qualify under GS*
- Project structuring phase
  - *Development of validation of baseline and monitoring plan*
  - *Carbon Reduction Purchase Agreement*
  - *Registration of the project as a GS-VER activity*
- Implementation phase
  - *Install monitoring facilities (if appropriate)*
- Operations phase
  - *M&V and Certification of ERs*

5.3.4.12 California Climate Action Registry

Under the CCAR, a forest project must meet a specific set of criteria to be eligible for reporting and certification in the Registry. Much of these criteria have been required specifically by the California legislature [81].

As there are no specific methodologies but only a set of guidelines and protocols, the CCAR provides a pre-screening option, allowing project developers to submit preliminary information about a project for determination of eligibility for certification by the Registry [82].

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[80] See: http://cdmgoldstandard.org/uploads/file/GS-VER_Proj_Dev_manual_final%20.pdf

[81] For information on this see California Senate Bill 812.

[82] See http://www.climateregistry.org/tools/protocols/project-protocols.html.

Once a project has been determined eligible, in addition to a detailed methodology and accounting system, the project must indicate ownership status including the following information:

- Owner(s) of the project's commercial/non-commercial trees; if more than one owner, the identity or proportionate equity share of ownership.
- If different from number 1, the owner/s of title on the land of the underlying project's trees and any proportional shares if more than one owner.
- Other external programs that will be (or are) registering the project's GHG reductions and respective ownership/s.
- If all or part of the GHG reductions resulting from the project have been, or will be, sold or transferred to another party, the identity the transferee and the amount transferred (or to be transferred).

Projects must then fall into one of two tracks:

5.3.4.12.1 Native forests

All forest projects are required to promote and maintain forest types that are native to the project area. This determination shall be based on the 1988 edition of the guide, "A Guide to Wildlife Habitats of California," (or its equivalent successor) which is published by the California Department of Fish and Game. To be "native" the forests should be classified in this edition and be composed of the forest types within the classification. The rationale for this requirement is to promote GHG emission reductions while also promoting the maintenance and restoration of California's native forests.

5.3.4.12.2 Natural Forest Management

In order for forest management projects to be eligible for the Registry, they must be based on natural forest management practices within the project area. In other words, these management practices must promote and maintain native forests that are comprised of multiple ages and mixed native species in the forest overstory and understory. Similar to the "native" requirement, this requirement is intended to create climate benefits that also promote healthy and diverse forests.

5.3.4.13 Chicago Climate Exchange

The CCX Committee on Forestry reviews and approves of all projects on a case-by-case basis. All projects must first be assessed by a third party verifier prior to submission to the CCX. Methodologies can utilise other certification standards, or can be project specific, and therefore projects with new methodologies can be submitted to the CCX at any point in time. For forestry projects, these methodologies must adhere to the broad specifications indicated above [83].

[83] See http://www.chicagoclimatex.com/content.jsf?id=23.

5.3.4.14 JI

To be involved in JI projects, countries need to establish a Designated Focal Point (DFP) for project approval. In addition, national guidelines and procedures, including the consideration of stakeholders comments, as well as monitoring and verification need to be communicated to the UNFCCC.

The achieved emission-reduction (or emission removal) are accounted as emission reduction units (ERUs), under the following conditions (Article 6):

- approval of involved parties;
- additionality of emission reductions;
- compliance with obligations under Article 5 and 7;
- The acquisition of ERUs shall be supplemental to domestic actions for the purposes of meeting commitments under Article 3.

The mechanism offers two different tracks, depending on the extent to which both investor and host country fulfill the six JI eligibility requirements, according to the "Guidelines for the implementation of Article 6 of the Kyoto Protocol" (so-called JI Guidelines):

- Kyoto Protocol is ratified
- national assigned amount is calculated and recorded
- national GHG accounting system is in place
- national registry is in place
- annual national inventory report is submitted
- supplementary information on assigned amount submitted and any additions to, and subtractions from, assigned amount are made.

Countries that fulfill all requirements can apply a "simplified" Track 1 procedure, a bilateral approach allowing party-verification of real, measurable and additional emissions reductions. Several qualified countries have now enacted specific laws and regulations governing the verification of Track 1 projects [84]

[84] UNFCCC. JI Website > Reference. http://ji.unfccc.int/Ref/index.html

- JISC Guidance on criteria for baseline setting and monitoring
- Relevant forms for the verification procedure under the JISC
- Decisions 15/CP.7, 16/CP.7, 9/CMP.1, 10/CMP.1, 2/CMP.2, 3/CMP.2, 3/CMP.3

ANNEX 7: Survey questions and participating companies

Tier one

Intro dialogue: This conversation will contribute to research for the New Zealand Ministry of Agriculture and Forestry. The New Zealand government is in the midst of building a nation-wide Emissions Trading Scheme, which will include both the agriculture and forestry sector. One question they are investigating is how New Zealand based sales into the voluntary carbon markets could complement this new regulatory system.

1. Respondent Information (*In general this can be filled out before interview*)
    a. Name
    b. Company
    c. Position
2. Company Information (*This can also be somewhat filled out before interview*)
    a. What are your company's primary sources of supply?
    b. What are your company's primary sources of demand (if an intermediary supplier)?
    c. Standards utilised
    d. Preferred standard
3. Have you ever purchased NZ based offsets?
    a. Yes
        1. If so, what were the type of credits purchased?
        2. Are you able to tell me the volume of NZ credits purchased?
        3. What do you see as the pros and cons of sourcing credits from NZ in general?
    b. No
        1. Why not? Would you consider purchasing credits?
        2. What do you see as the pros and cons of sourcing credits from NZ in general?
4. Greenhouse gas emissions from agriculture make up almost 50% of New Zealand's total emissions. New Zealand is currently the only country that has included agricultural emissions into the national trading scheme. However, the sector does not enter into the NZ ETS until 2013. During this time, there is a potential role for the voluntary carbon markets to test new methodologies (such as feed management) for this sector, or encourage companies to find means of reducing emissions before 2013.
    a. Does your company write new methodologies?
    b. What would be key issues you'd consider when purchasing carbon credits originating from New Zealand agricultural methane or nitrous oxide management? For more information, please see the attached Information Sheet.
5. Already New Zealand has incorporated its forestry sectors into its ETS. Under this system only forest owners who have established their forests post- 1989 can earn sequestration carbon credits. The New Zealand

government has created a national forestry baseline and agreed that forests planted after this time could earn carbon credits.

   a. How appealing are pre - 2008 vintage forestry credits deemed eligible using this national baseline to you?
   b. Do you have any concerns about additionality using this national baseline approach?

6. The New Zealand forest industry is considering creating its own voluntary forestry standard for credits generated by New Zealand forests (somewhat like the California Climate Action Registry's Forest Protocol.)
   a. What would make credits verified to such a standard appealing to your company?
   b. What do you think would be the pros and cons of such a standard?

Tier two

Please indicate your trading preference for VERs/VCUs by project type

Least Preferred More preferred

	5	4	3	2	1	N/A	Please rank a project's price relative to other
Afforestation/Reforestation Plantation							
Afforestation/Reforestation Restoration (Native)							
REDD/ Avoided deforestation							
Agriculture: - Non-forest based land restoration (ex. soil carbon)							
Agriculture: - Nitrous oxide (ex. Livestock diet manipulation)							
Methane: livestock enteric fermentation with rumen based animals (see below)							
Methane destruction: livestock							
Methane :landfill							
Methane: coal mines							
Industrial gas destruction							
Energy efficiency							
Renewable energy							
Fuel switching							

Methodology questions

Project target: Enteric Methane

1. Do you or your organisation have an awareness of the issues around rumen-based animals?
2. Would you consider purchasing agricultural enteric methane carbon credits from the following projects (see Information Sheet for more detail)?

PROJECT TYPE	ADDITIONALITY	PERMANENCE	MEASUREMENT	COMMENT
	Rank for comfort level in trading units from these project types where 1= Very comfortable, 2 = comfortable, 3 = concerned			Please make any relevant comments
Feed additives - inhibitors				
Immunization against methanogens				

Project target: Nitrous Oxide

- Do you or your organisation have an awareness of the issues around agricultural nitrous oxide emissions?
- Would you consider purchasing agricultural nitrous oxide carbon credits from the following projects (see Information Sheet for more detail)?

PROJECT TYPE	ADDITIONALITY	PERMANENCE	MEASUREMENT	COMMENT
	Rank for comfort level in trading units from these project types where 1= Very comfortable, 2 = comfortable, 3 = concerned			Please make any relevant comments
Diet manipulation - high starch diets and improved digestability				
Farm management of dairy effluent				
Management of piggery effluent				
Management of poultry waste				
Feed livestock on				

pads in winter				
Management practices that increases soil carbon in cropland and grazing land				
High condensed tannin grasses				
Nitrification inhibitors				

Project target: Carbon Dioxide

- Do you or your organisation have an awareness of the issues around forestry carbon sinks?
- Would you consider purchasing forestry sink carbon credits from the following projects?

PROJECT TYPE	**ADDITIONALITY**	**PERMANENCE**	**MEASUREMENT**	**COMMENT**
	Rank for comfort level in trading units from these project types where 1= Very comfortable, 2 = comfortable, 3 = concerned			Please make any relevant comments
Pre-1990 forest management				
Kyoto plantation forestry 2008 - 2012				
Kyoto plantation forestry 2008 – 2012 Permanent				
Pre 1990 plantation forestry 2008 – 2012 with easement				
Kyoto plantation forestry 1990 - 2007				
Regeneration of land under QE II Trust covenant				

- What additional value is derived from co-benefits?
  - Bundling environmental benefits and biodiversity
  - Eco-certification under the Forest Stewardship Council
  - Income for beneficiaries from Maori commonly held land

- Pests in indigenous forests - there are substantial emissions resulting from Australian-originated possums. Would you be willing to accept this as the basis for a new methodology around avoided deforestation?

Participating companies

The following organisations provided responses to the survey

EcoSecurities
Cantor CO2
Carbon Fund
MGM
Terra Global Capital
3c Company
3Degrees
TerraCarbon
EcoSecurities Consulting
Climate Focus
EKO Asset Management
Carbon Planet
CO2logic
CarbonNeutral Company
One Carbon
Environmental Defense
TrustPower
Carbon Market Solutions
NZCX
Virgin Blue
Jet Star
Air New Zealand
CO2 Group
TZ1