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### **Market Behaviour under the New Zealand Emissions Trading Scheme**

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#### **Abstract**

The New Zealand Emissions Trading Scheme is one of the first national-level greenhouse gas trading schemes outside Europe. It is also unique in its design and comprehensive sectoral coverage, including forestry. This paper provides an ex-post assessment of market behaviour in the NZ ETS in its first phase (2008-2012). Findings are based on quantitative evidence on prices and units, as well as qualitative information from interviews and questionnaires of key market participants and authorities. The analytical approach is based on the entire set of flexibilities granted to obliged parties to reduce greenhouse gas emissions cost-effectively i.e., access to Kyoto units, range of eligible measures, banking provision, market engagement of non-obliged parties, and trading as such. Findings reveal that market behaviour responds to the unique design of the NZ ETS, in particular to the access and price of Kyoto units.

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## 1. Introduction

The New Zealand ETS (NZ ETS hereafter) is unique in being the first mandatory national-level emission trading scheme (ETS) outside of Europe. The NZ ETS was implemented in 2008 and is currently in its transitional phase. The NZ ETS also has unique design features (details in Section 3), for instance, the lack of an absolute ‘cap’, account holders having nearly full access to Kyoto Units, and the inclusion of the forestry sector. Beyond these fundamental features, not much is known about the actual performance of the NZ ETS. We found several ex-ante evaluations of the NZ ETS, but still most focus on the 2008 legislation before significant amendments in 2009 [1-4]. Aside from a review by an independent panel appointed by the New Zealand Government in 2011 [5], the very few ex-post evaluations identified tend to have a limited focus on legal issues [6], environmental aspects [7, 8] or specific sectors (e.g. forestry) [9].

With a very limited scope, a handful of studies address —only to some extent— business and economic perspectives about the scheme (e.g. impacts on fuel prices, firm’s awareness about the scheme, role of forestry sector). For example, Covec Consultancy [10] provides an analysis of the effects of the NZ ETS on energy/fuel prices, power generation capacity, and the forestry sector (this report was subsequently relied upon by the 2011 NZ ETS Review Panel). However the study acknowledges that findings were generated too soon after industries entered the scheme and insufficient data prevented further analysis. A study for the Ministry of Economic Development [11] provide evidence about attitudes, industrial awareness about scheme, and expectations about future emission prices, among other aspects. However, both studies provide no insights about banking, trading or market engagement of parties. From a governmental point of view, efforts have been devoted to primarily report surrendered types of carbon units [12]. No official ex-post evaluation has been undertaken so far.

Regarding market behaviour as such, there is basically no knowledge about the development of the NZ ETS. To the best of our knowledge, there is yet no study addressing the dynamics and evolution of the full set of ‘flexibilities’ that parties can use to meet cost-effective emission reductions (details in Section 3), which is the focus of the paper at hand. One has to bear in mind that not only trading but more flexibilities are often given to market actors in any ETS: a) the set of eligible measures that parties can use to reduce emissions; b) the number of eligible end-use sectors that can participate and yield/trade carbon credits; c) banking provision for surplus of credits; and d) market engagement of (non) obliged parties. As in any ETS, it is the whole set of flexibilities that deserves analytical attention. To what extent an ETS achieves emission reductions cost-effectively depends on how obliged parties take advantage of all the flexibilities granted to reduce compliance costs (as well ensuring other relevant aspects like low transaction costs, etc.). Our literature review clearly suggests that market behaviour analysis for the NZ ETS has not yet been done because of a lack of empirical evidence, which this paper attempts to fill.

The objective of this paper is to provide an ex-post assessment of market behaviour under the NZ ETS. To that end, and building upon methodological approaches for the examination of other tradable mechanisms [13, 14], we analyse the full set of flexibilities given to parties under the NZ ETS to meet emission reduction cost-effectively. Our study focuses on the activity level of various flexibilities and whether policy design, carbon market conditions, and business aspects inhibit or encourage parties to take full advantage of such flexibilities. To meet the objective, the following research questions guided our study: How can the overall market behaviour under the NZ ETS be characterized? What are the key policy design aspects driving this market behaviour? To what extent are market agents using (nor not) the given ‘flexibilities’ to reduce emission cost-effectively? Further methodological details are provided in the next section.

Note that the research contained in this paper was mostly undertaken in mid-late 2012. This means that implications of the decisions made at the Doha UN Climate Conference in December 2012 were not possible to capture in full. As the reader may know, the New Zealand government decided not to take an emission reduction commitment under the Kyoto Protocol's second commitment period. In addition, international rules governing the access to Kyoto units for the second commitment period were revised in Doha. These decisions have relevant implications for the NZ ETS with rules around access, trading and banking of Kyoto units for NZ market participants very likely to change (details in Section 3 and 4).

The structure of this paper is as follows. Section 2 describes the analytical approach we used to carry out the study. Section 3 elaborates on the key aspects related to the policy design of the NZ ETS. In Section 4 we provide and analyse empirical evidence of market behaviour and to what extent parties have used given flexibilities to reduce emissions cost-effectively. Taking into consideration some critical policy objectives being pursued by the NZ ETS, Section 5 discusses the impacts on low-carbon investments and the environmental integrity of the scheme. Finally, conclusions are drawn in Section 6 and a brief outlook of the NZ ETS is provided in Section 7.

## **2. Methodology**

### **2.1. Analytical approach**

We perform the analysis taking the first phase (2008-2012) of the NZ ETS as the focal point. The analytical approach is based on the entire set of 'flexibilities' that are often given to parties under trading schemes for reducing emissions cost-effectively (i.e. at least possible cost). The analytical approach was proposed by Mundaca et al. (2008) [14] and builds upon Tietenberg [15]. Due to the 'trading' nature, there is often the tendency to focus on trading as the crucial flexibility in ETS. However, many more flexibilities are embedded and granted to parties to reduce emissions at least-possible costs.

In fact, the central argument for cost-effective emission reductions relies on how obliged parties take advantage of all the given flexibilities. For the particular case of the NZ ETS, our analysis focuses on the following 'flexibilities':

*Eligible measures for compliance and access to Kyoto carbon units.* Eligible measures for compliance under the NZ ETS include any type of measure to reduce emission intensity (and therefore reduce obligation for emissions); paying for NZ units from another participant who has reduced their emissions intensity; purchasing NZ units from foresters or directly investing in domestic forestry offsetting opportunities like carbon leasing of forests; or offsetting emissions by purchasing eligible units from, or directly investing in, Kyoto Flexible Mechanisms (i.e. CDM and JI). Other options for meeting obligations do not necessarily represent emission reductions or removals; these are units from free allocation and those purchased for the fixed price.

Unlike other ETS (e.g. the EU ETS), the NZ ETS has no quantitative restrictions on the amount of overseas carbon credits coming from the Clean Development Mechanism (so-called 'Certified Emission Reductions', CERs), Joint Implementation (so-called 'Emission Reduction Units', ERUs) and Carbon Sink Activity (so-called 'Removal Units, RMUs) that can be surrendered for obligations. While CER, ERU and RMU credits are allowed into the scheme with no restriction on volumes, there have been some restrictions on the type allowed. The access to Kyoto carbon units has implications for the price and surrender of units, further examined in our findings.

*Trading activity.* Another type of flexibility in the NZ ETS is trading as such. As in any ETS, a key argument is that any allocation of emission reduction units is not likely to be cost-effective due to asymmetric information between regulators and obliged parties [16] Thus, this initial allocation always provides an incentive for trading. However, one has to note that trading is subject to transaction costs (e.g. search for information, legal advice, negotiation with partners, etc.), familiarity with trading

mechanisms, knowledge about the regulatory framework, etc.[14, 17, 18]. Critical aspects for analysing the trading component in ETS are volume of trades, number of buyers and sellers, and price dispersion [19]. Whereas the eligibility and trading of domestic emission units (i.e. NZUs) is fully guaranteed, rules about access to and trading of Kyoto units are different. At the time of writing, parties still could access and trade Kyoto units generated under the first commitment period (CP1) until 2015-2016 (i.e. the end of the so-called 'true-up' process). However, parties could not purchase or transfer any Kyoto units generated under the second commitment period (CP2), with the exception of primary CERs [101].

*Market engagement of eligible and non-eligible participants.* The larger the group of eligible end-use sectors in which eligible measures can be implemented, the more options obliged parties have for reducing their emissions cost-effectively. The extensive sectoral coverage of the NZ ETS brings about more than 250 obliged parties and even a larger number of potential emission reduction measures. The NZ ETS differs from other ETS in its inclusion of all sectors of the economy except agriculture (though again, it should be noted that exclusion of this sector means that just over half of emissions are actually covered). To increase the liquidity of the market and the number of parties managing their ETS costs directly, the NZ ETS allows a number of voluntary participants. Having more parties with different, possibly lower, marginal costs at similar levels of emission reductions increases the cost-effectiveness of the scheme.

*Banking provision.* Eligible unit holders are allowed to carry-over or save surplus of units (subject to their eligibility in the scheme) for future commitment periods. The banking option can hamper or inhibit trading, and is sometimes denoted as 'inter-temporal trading' [14]. It can also be seen as an 'inter-temporal flexibility' for mitigating the costs of over investment [13]. Note that at the time of writing, there were no restrictions on the amount of surplus to be banked in the NZ ETS, including Kyoto Units. However, and due to the decisions made at the Doha UN Climate Conference, the New Zealand

government was already in need of determining regulatory aspects regarding the carry-over of Kyoto Units under the NZ ETS, but has indicated that banking Kyoto units beyond the ‘true-up period’ in 2015 will be unlikely for individual participants (the New Zealand Government will still be able to carry over a small percentage of these units as per Kyoto rules).

## **2.2. Analytical methods and data collection**

Intervention theory [20] was also used comparing the design of a policy to the actual policy performance when implemented. This involved reconstructing the causal linkages between actors, inputs, outputs, and outcomes in the intervention through mapping out an ‘implementation chain’. The mapping out of the intervention theory can help highlight what, where and from whom data needs to be collected[21]. Empirical checks were then performed to determine if the policy is performing as designed and what effects have been observed.

Our research was based on a review of official documentation and related studies, collection and analysis of quantitative data available from the NZ Emission Unit Database [101] and government reports as well as 36 semi-structured interviews with market key stakeholders including government officials, political leaders, industry/business representatives, carbon traders and banks, and academics/researchers in New Zealand. Of these interviews, 16 were conducted with representatives from direct market participants and obliged participants representing large emitters in the industrial processes and stationary energy sectors as well as large companies participating in the forestry sector. Additionally, an online questionnaire was circulated among obliged parties, which was answered by an additional 7 companies representing large emitters in the liquid fossil fuels (transport) and industrial processes sectors.



### 3. The NZ ETS

In 2002, New Zealand ratified the Kyoto Protocol through the adoption of the Climate Change Response Act of 2002 (CCRA). New Zealand contributes only 0.2-0.3% to the global CO<sub>2</sub>e emissions; however, its per capita emissions are the 5th highest in the OECD [102]. In addition, the profile of emissions distinguishes New Zealand from other OECD countries, with a significant amount (about 45%) of its emissions generated from agriculture [103]. While a carbon price mechanism had been discussed in New Zealand since the mid-1990s, the ETS was not legislated until 2008 and was amended in 2009. The NZ ETS is the country's primary policy for addressing climate change and meeting its obligations under the Kyoto Protocol (for the first commitment period, New Zealand's target was to return to and/or maintain 1990 level of emissions; the country has not opted for a second commitment period target).

The NZ ETS was implemented in 2008 and it has completed a full policy cycle (i.e. policy formation, design, implementation, and review). The general policy purpose of the NZ ETS is threefold: (i) to help New Zealand do its "fair share" by meeting its international obligations under the UN Framework Convention on Climate Change and the Kyoto Protocol by reducing New Zealand's net emissions of those gases to below business-as-usual levels). In addition, the NZ ETS should do this in (ii) a cost-effective manner while (iii) promoting long term economic resilience [5]. The Ministry for the Environment also states: "The Government has chosen the ETS as the least-cost way of putting a price on emissions and creating an incentive for all of us – especially businesses and consumers – to change our behaviour"[104].

The NZ ETS is not a cap-and-trade nor a credit-based scheme, but a system of mandatory surrender of carbon credits issued by the government to cover emissions. Some sectors receive free allocation of units up to 90% of their emissions obligations (more details are explained in the next sections), while other sectors must either reduce emissions or purchase units to cover emissions from

other emitters, foresters who earn units for sequestration, or the international carbon market. An intensity-based allocation system without a cap on the volume (see key term 'allocation') and unrestricted import of eligible international units allows absolute emissions covered by the scheme to continue to rise. Thus, this represents a significant difference between cap-and-trade in theory, in which the amount of emissions is known and the price varies (as opposed to a tax where the price is known and the emissions amount may vary). It is also different from a 'credit-based' tradable mechanism (e.g. like the CDM under the Kyoto Protocol), in which the baseline for certificate trading is determined by current (or business-as-usual) technology-based standards (i.e., credit-based mechanisms need to provide more incentives for emission reductions than the ones provided by the historical or current technology standards). In the New Zealand ETS, both the volume of emissions and the price vary. Among several aspects (e.g. transaction costs), the price is influenced not only by domestic supply on the market and demand, but also the price and availability of international units that are also eligible for compliance under the NZ ETS.

The absence of an absolute cap on the volume of emissions—a key missing design element, we would argue—needs to be contrasted with the fact that the NZ ETS should also help the country to reach its long term target of 50% (net) reduction of 1990 GHG levels by 2050. The 2012 amendments have proposed auctioning within a cap on NZ allowances only, the implications of this and the changes to access to the international market are further explored in section 7 of this article.

The NZ ETS covers all the six Kyoto GHGs and is the first ETS to directly cover pre-1990 forestry and, in principle, the agriculture sector. Sectors are covered through a mix of upstream and downstream points of obligation. The timing for entry into the scheme depends on the sector under consideration. Forestry was the first sector that entered into the scheme (January 2008). It was followed by stationary energy, liquid fossil fuels (transport), and industrial processes in July 2010 and waste in January 2013.

Regarding agriculture, albeit a considered sector, note that the entry date was pushed back by the 2009 amendments to the Act and dates have been removed entirely by the 2012 amendments. Additionally, the ETS obligation for synthetic gases, which was meant to begin in 2013, has been changed to a levy obligation by the 2012 amendments.

The first phase (2008 to 2012) was planned as a 'transition phase' for the NZ ETS, enabled by the 2009 amendments. During this phase, cost containment measures have been in place, including the fixed price that operates as a 'safety valve' and the so-called 'one-for-two' rule. The former, also known as 'price cap' (of NZ\$25), was introduced as an option to reduce possible high compliance costs under the scheme. A maximum price is argued to enhance political acceptance of a scheme [22], and this was the case in New Zealand because it provided more price certainty for businesses [23], and ensured the NZ ETS does not move too far ahead of other nations with pricing carbon in its economy [5]. The 'one-for-two' rule allows one NZU to be surrendered for two tonnes of CO<sub>2-eq</sub> (known as 'progressive obligation'). This amendment was originally considered as an alternative to free allocation in the 2008 ETS design but it was finally introduced as an element in addition to the free allocation in 2009. Not surprisingly, the obliged parties overwhelmingly supported the one-for-two rule [23]. The rule applies to all sectors except forestry. The 2012 amendments extended the transition phase, and thus both the one-for-two rule and fixed price, indefinitely, albeit subject to another review in 2015.

Regarding the allocation of carbon units, the rules under NZ ETS differ among sectors. In the forestry sector, pre-1990 foresters were allocated NZUs in two tranches. The total allocation was 60 units per hectare, with the first tranche dispensing 38% of the total for CP1. The amount of allocation was determined to compensate foresters for loss of land value due to their deforestation liability. The second tranche dispensing the remaining credits was withheld until after 2012 when international offsetting rules would be clearer. In 2012/2013 the government allocated the second tranche in full,

provided the forester does not offset [104]. Post-1989 forest owners are not obligated to participate in the scheme but may opt in to the scheme to earn NZUs for any net increase in the carbon stocks over each 5 year period. These foresters also then become liable for any net decrease as well, but only up to the amount of the units received.

When it comes to industrial processes, the 2009 amendments to the legislation changed the original 'grandfathering' allocation method to an 'intensity-based' allocation method using a New Zealand specific baseline of the average emissions intensity for the activity derived from 2007-2009 data. Free allocation was given to industries satisfying "trade exposed criteria" and industrial activity intensity level tests. Currently, activities are considered to be trade exposed unless they are in electricity generation, an activity where there is no international trade of the output, or it is not economically viable to import or export the output [24] Examples of high emissions intensive, trade exposed (EITE) industries that receive 90% free allocation included aluminium smelting, steel production and lime production [105]. In addition, allocation to industries is based on a [New Zealand](#)-specific baseline using an average emissions intensity for the activity and including an electricity allocation factor (EAF) of 0.52 tonnes of CO<sub>2e</sub> emissions per megawatt hour of electricity to compensate for the estimated increase in electricity prices as result of the NZ ETS [25][17]. Free allocation was due to be phased out at 1.3% points per annum from 2013 (this rate equates to a 90 year phase out), but with recent 2012 amendments extending the transition period, the start of the phase-out is delayed and will be reviewed in 2015. As with other ETS, the rationale for free allocation to emissions intensive, trade exposed activities was to minimise loss of competitiveness, carbon leakage and ensure a smoother transition to a low carbon economy [17]. A list of allocated NZUs at the completion of each obligation year is made available from the Ministry of Environment [106].

The direct participants in the liquid fossil fuels (transport) sector, the waste sector, and stationary energy sector are not eligible for free allocation. However, it should be noted that downstream electricity and fuel users are still eligible for free allocation if they satisfied the intensity and trade-exposed criteria. For example, downstream activities without direct obligations in the scheme include energy intensive pulp and paper industries and horticulture (e.g. tomato growers) [105] By contrast, the upstream sector participants must meet their obligation through emissions reductions and/or purchase of eligible units. NZU New Zealand Units (NZU = 1 tonne CO<sub>2</sub>-eq , NZ AAU, Emission Reduction Unit [ERU], and Certified Emission Reduction [CER] - subject to ban of certain CERs – details below) can be surrendered by obliged parties to meet their obligation. NZ carbon units (NZUs) can be held by obliged parties, voluntary participants, and trading brokers.

**Table 1:** Obligated parties under the NZ ETS

<b>Sector</b>	<b>Activities under obligation</b>	<b>#</b>
Forestry	Deforesting pre-1990 forest land	20
Transport	Supplying fuel covered by the ETS	5
Energy	Importing coal	3
	Mining coal	20
	Importing natural gas	2
	Mining natural gas	42
	Using geothermal fluid	11
	Combusting used or waste oil, tyres or waste	4
Industry	Producing clinker or burnt lime	6
	Producing glass	2
	Importing hydro-fluorocarbons or perfluorocarbons	10
	Producing iron or steel	4
	Importing/manufacturing synthetic fertilisers containing nitrogen	12
	Slaughtering ruminant animals, pigs, horses, or poultry	43
	Dairy processing of milk or colostrums	15
	Exporting from NZ live cattle, sheep or pigs	11
	Producing aluminium	1
Waste	Operating a disposal facility	33

Data source: New Zealand Emission Unit Register [101]

As mentioned in the previous section, the NZ ETS allows a number of voluntary participants. One group of voluntary participants are downstream emitters (e.g. in the energy and transport sectors) that do not bear any direct obligation in the ETS but participate in the NZ carbon market, either by opting in

and directly managing obligations or by applying for free allocation to cover costs passed on from upstream. Another group of voluntary participants unique to the NZ ETS are post-1989 forest owners, who opt in to the scheme to earn NZUs for any net increase in the carbon stocks over each 5-year period, also assuming a deforestation liability up to the amount of units they receive. This limited liability serves the purpose of encouraging greater voluntary participation, which benefits the government, which would otherwise be covering all the liability for deforestation [9]. Lastly, investors, banks and trading brokers may also hold eligible units and participate in the market without participating in the ETS directly. As of 1 March 2013, there were 7630 holding accounts in the NZ ETS market register (this includes direct, voluntary and non-ETS participants).

As far as the administration and enforcement of the scheme is concerned, there are a number of public institutions involved. All holding accounts are held by the New Zealand Emission Unit Registry (NZEUR) maintained by the EPA and all transactions must also go through the register. The Ministry of Primary Industries (MPI) manages the forestry sector within the ETS (and will manage agriculture when and if it enters the scheme). The Ministry for the Environment (MfE) administers the regulatory framework and manages related policy development.

Finally, the regulatory framework establishes a number of (financial) penalties in case of non-compliance. First, there is a fine up to NZ\$24,000 for failure to comply with supplying emissions data or other information. Second, there is also fine up to NZ\$50,000 and/or 5 years in prison for knowingly submitting false or misleading information. Lastly, failing to surrender units when required to or surrendering less than required, incurs a penalty of \$30 for each unit in addition to also surrendering the required amount. There is, however, some level of leniency in first year of sector compliance and if errors are voluntarily reported.

## **4. Results**

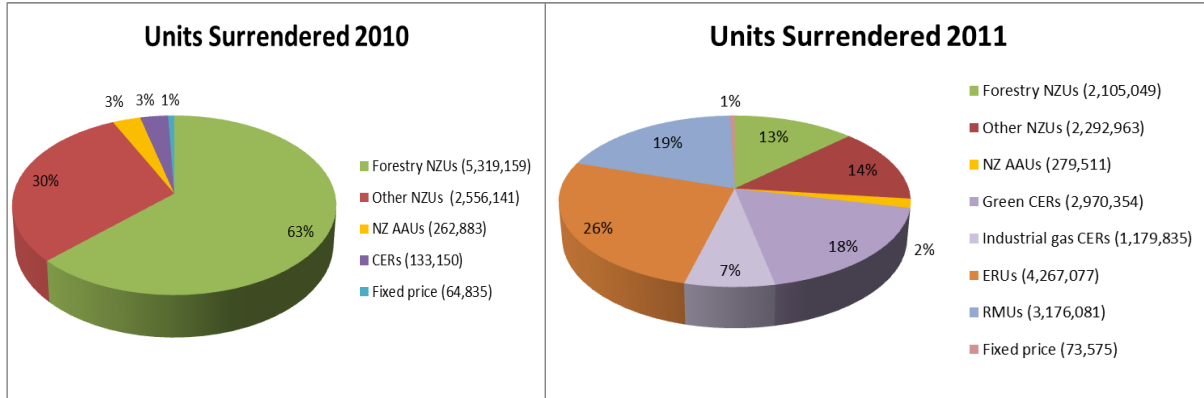
This section contains the findings of how the flexibilities outlined in Section 2 are actually utilised by market participants and key evidence of the market behaviour under the NZ ETS from 2009-2012.

### **4.1. Credits surrendered for compliance and access to Kyoto units**

As mentioned in the previous section, the NZ ETS is a system of mandatory surrender of carbon credits to cover emissions (and not a cap-and-trade scheme). The NZ ETS is designed to allow a wide variety of units (and related eligible measures), both domestic and international to be surrendered for compliance. The government introduced a ban on 'Industrial gas CER' imports on December 2011 (designated as "grey CERs" in Figure 1); however, forward contracts that were submitted or introduced before that specific date can convey such CERs into the scheme until June 2013. In addition, the government also banned some 'hydro CERs' as well as some ERUs again in December 2012 in response to the criticism against not restricting the volume of overseas units [101]. It should be noted that these restrictions are qualitative. By contrast, quantitative restrictions were recommended by the 2011 Review panel and Parliamentary Commissioner for Environment but have not been incorporated in the scheme.

Most of the surrendered credits in 2010 came from domestic carbon units (forestry NZUs in particular) (Figure 1). This can largely be explained by the market price of carbon credits: domestic units were roughly \$NZ 3-5 cheaper than Kyoto units (see Figure 2). By contrast, the mid-late 2011 witnessed a huge participation (and purchase) of international emission reductions from CDM projects (CERs) and joint-implementation projects (ERUs) rather than domestic NZUs. The share of surrendered Kyoto units reached nearly 70% (Figure 1). During 2011, Kyoto units were slightly cheaper than domestic carbon units and pushed the domestic price of NZUs to a similar level (Figure 2). In 2012 prices of eligible

international units continued to fall (with ERUs prices falling below NZ\$0.20) while the NZU price remained above NZ\$2.00 as suppliers (mostly foresters) refused to sell.



**Figure 1:** Surrendered units (a) July-Dec (half year) 2010 and (b) for the full year in 2011. “Green” CERs refer to CERs bought or sold after the New Zealand government banned industrial gas of “Grey” CERs.

Data source: Ministry for the Environment [12]

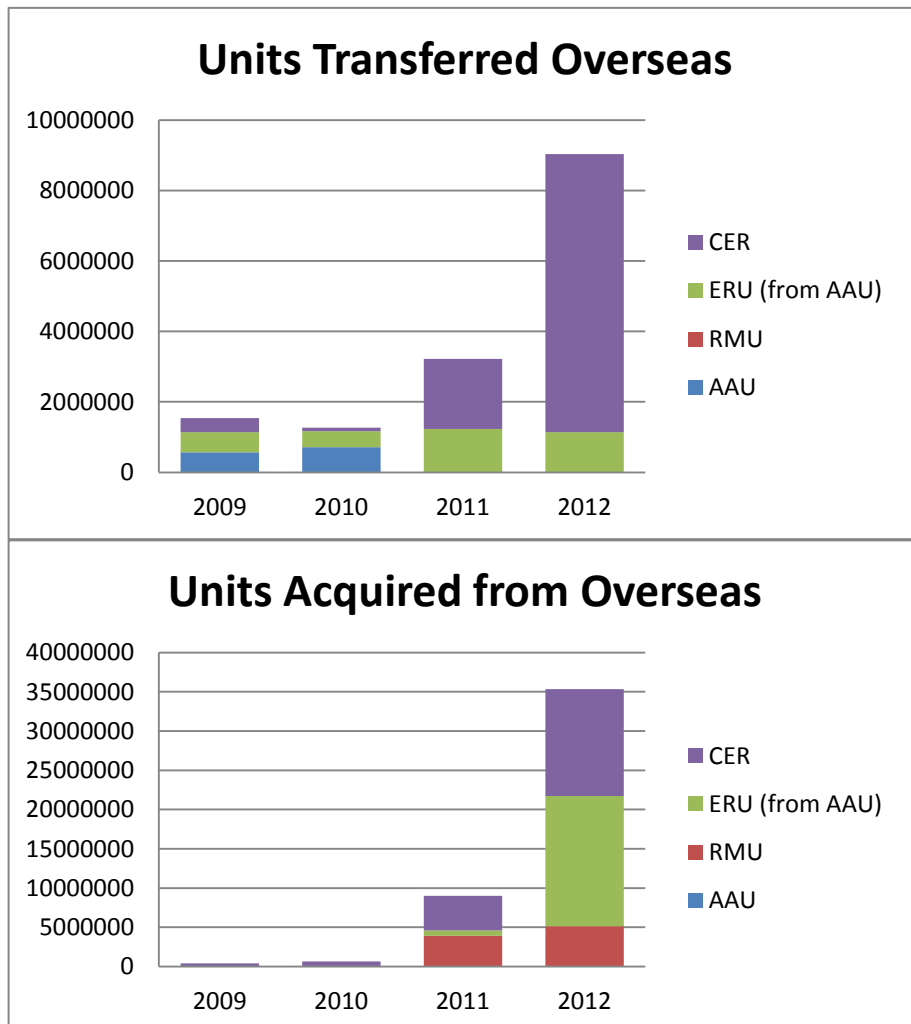




**Figure 2: Price of NZUs and CERs on the spot market (in New Zealand Dollars, NZ\$)**

Data sources: CO2 New Zealand (data collected from May 2010-May 2012), OM Financial [107], Carbon Match [108], Carbon News [109] and Point Carbon [110] published figures used to indicate prices May 2012-January 2013.

The effects of international carbon pricing on surrendered carbon units can also be seen when looking at the volume of carbon units being exported or imported from the NZ ETS (Fig 3). Whereas we do not have yet information on surrendered units for 2012, the volume of Kyoto units being imported suggest that they are likely to play a critical role once official figures are released by the Ministry for the Environment in its yearly report released in August 2013. By 2012, the volume of imported units (ERUs in particular) grew by a factor of 4 compared to the units acquired from overseas in 2011 and represented nearly half the amount of units being traded.



**Figure 3: (a) Exports and (b) imports of carbon units**

Data source: New Zealand Emission Unit Register [101]

The variety of international units allowed has supplemented the domestic supply of NZUs and increased the liquidity of the market overall, however the market for NZUs itself remains illiquid. The government announcement to delay the entry of agriculture has been seen negatively by stakeholders who want to see a more liquid market and equitable treatment of all sectors in at least facing some level of obligation in the scheme.

As can be seen in Figure 1, in 2011 the profile of units being surrendered changed dramatically from the previous year, prompting the call for a restriction on overseas units by foresters (who sought to increase demand for their units), environmentalists (who wanted more domestic reductions) and some carbon traders (who wanted a higher price and demand for NZUs as well). This was a major issue in the consultation of the government's 2012 amendments, and the decision not to incorporate this restriction was not met favourably by these groups [23].

To meet the mandatory surrender of carbon, our research has also found that some emitters have chosen to pay the NZ\$25 fixed cap price instead of implementing their own measures or despite the price of compliance units available for significantly less. This is indicative of market inefficiencies and that one or more of the information prerequisites of the intervention is not working effectively. One respondent to our questionnaire stated that their business paid the NZ\$25 because that is what they were charged for electricity and they were not allowed to directly pass their allocated units upstream to their electricity provider. This response suggests that some businesses may still lack adequate information to take advantage of the significantly lower costs of purchasing units in the market.

## 4.2. Trading activity

Findings about this specific flexibility are hampered by a lack of data. While the NZ Emissions Units Registry (NZEUR) aggregates data for the year on total volume and types of units transferred to and from overseas registries, it does not publicly display volume data for domestic transactions and no price data are collected. This makes analysis of the trading activities very difficult, and such information is valuable in itself. For example, trading data were once displayed publicly by the trading platform 'Carbon Match', but now this information is private to its customers as it is a competitive advantage in an illiquid NZU market (L. Chambers, Carbon Match, personal communication, 17 July 2012) This is in contrast to the EU market, where historic price and volume data are more easily available [26]. In fact, a lack of liquidity and transparency were also observed early in the NZU market [9]. While this has improved somewhat in the last two years, it continues to display such signs of an immature or incomplete market.

That said, there are still a number of empirical aspects we found about volume, price and transactions. When it comes to the *volume* of units being traded, the quantity has increased (see Figure 3) as have the number of platforms for trading and the variety of products available related to carbon, i.e. futures, "green" CERs, forestry NZUs from carbon farming investments, etc. The aggregated volume of different types of transactions reported in the registry for the period 2010-2012 can be seen in Figure 4. The volume of units being traded has increased dramatically, from 7 million units approximately in 2010 to nearly 65 million units by the end of 2012, with a much higher proportion of Kyoto units being traded internally over time. The emitters' buying strategy has tended to be 'gradual', meaning they buy as needed and are regularly in the market. They rarely buy very large volumes of units. Even then, as one interviewee put it, there are not a lot of units being demanded by the big emitters (i.e. not more than 3 million units).



**Figure 4:** NZEUR traded volumes (note these figures include trades to and from brokers)

Data source: New Zealand Emission Unit Register [101]

As far as *price* is concerned, some issues deserve our attention. First, due to the linking of the NZU market to the international market with the allowance of CERs, the price of the NZU has largely followed the price of CERs and ERUs. As mentioned before, as emitters entered the scheme in 2010, the NZUs were cheaper than international units and emitters were buying domestic offset units from the forestry sector and some were investing in carbon forestry. Then towards the end of 2010 the spread between NZUs and international units closed up and subsequently flipped in 2011. That was mainly due to more supply coming from the international market and the EU financial crisis—that reduced emissions and EU domestic demand for offsets and lead to a resulting excess of supply of unused carbon credits.

Second, as the price of international offsets fell, it became cheaper to purchase any needed units from the international market than domestic NZUs. Also as the market price fell, so did the supply of domestic NZUs, as foresters increasingly refused to sell at the low prices—very much the case still at the time of writing this article. Many emitters have bought cheaper international offsets to surrender

for the next few years and have banked NZUs for use after 2014—this is related to the terms of the CP1 true up period and CP2 (see also section 4.4). Some participants have also used the spread between NZUs and the cheaper offsets as an opportunity to sell freely allocated domestic NZUs and purchase cheaper international offsets to meet their obligation. The larger the spread between the NZUs and international offsets, the larger the windfall profits that can be realised from this strategy.

Regarding *transactions* as such, the first phase of the ETS can be characterised as rather limited, these were initially few with forestry the only sector under obligation until 2010. In 2009, a large forestry company, Ernslaw One gained attention for trading 50000 units (at around NZ\$20) domestically and 520,000 units (at around NZ\$21-22) to Norway [9]. It should be noted that while cost containment measures are in place, only the forestry sector is able to convert NZUs to AAUs to sell overseas. Other trades that have been publicly reported in newspapers or other publications are in Table 2. The reported prices per unit generally match the price data plotted in Figure 2. The last trading activities (at the time of writing) on the spot market (February 2013) publicly reported exemplifies how the lack of domestic demand and excess of supply (mostly ERUs) are keeping credits at record low levels (between NZ\$1.45 and 2.45).

**Table 2:** Publicly reported transactions in NZ ETS

	Date (announced)	NZ Units	Price NZD	Value \$ NZD	Buyer
<b>Ernslaw One</b>	9/1/2009	50,000	\$20.00	\$ 1 mil	Domestic
<b>Ernslaw One</b>	9/1/2009	520,000	21 to 22	\$10.9-\$11.4 mil	Norwegian Government
<b>CO<sub>2</sub> Group Limited, (ASX:COZ) joint venture</b>	23/12/2010	over 2.5 million	\$17-21	\$42.5 mil - NZ\$52.5 mil	
<b>Mackenzie District Council</b>	2010	14,000	\$18.00	\$250,000	n/a
<b>Dunedin City Forests</b>	2010			\$10 million spot, \$7 million futures	n/a
<b>Dunedin City Forests</b>	5 July 2010	150,000		\$3 million	n/a
<b>IFS Growth (Forest)</b>	May 2010	750,000	\$20.00	\$15 million	n/a

<b>Aggregator)</b>					
<b>Carbon Market Solutions (aggregated 21 foresters)</b>	28/7/2010	186,107	n/a	n/a	Europe
<b>Carbon Market Solutions (representing large NZ forester)</b>	2/8/2011	200,000	n/a	n/a	Large domestic emitter
<b>Westpac Bank estimate</b>	Whole Year 2011	27 million NZUs	\$17.00	US\$351 million	n/a
<b>Simple Trade</b>	7/2/2013	120,000	\$2.45	\$294,000	n/a
<b>Point Carbon</b>	1/3/2013	150,000	\$1.45	\$217,500	n/a

Data sources: [27, 28, 108; 109]

Within trading, a particular ‘sub-flexibility’ noted in interviews and by some questionnaire respondents was the ability to pass compliance units upstream to fuel and energy providers. With the additional allowance in the electricity allocation factor to compensate emissions intense industries for increased energy prices, they may have more units than necessary for direct obligations. Additionally, it was noted earlier that some EITE downstream activities are eligible for free allocation but do not have a surrender obligation under the NZ ETS. This presents the opportunity to either sell these units to offset the increased costs in energy or to directly offset these costs through an arrangement with the energy supplier. For example, an aluminium producer who is performing better than the average used for the allocative baseline or tomato grower who has no direct obligation but receives units, could arrange to give these additional units to their energy supplier (who do have direct obligations to surrender units) to offset the price of the energy. Both trade exposed companies interviewed as well as energy companies found this arrangement normal and feasible. The arrangement is not specified in the design of the ETS, and thus requires negotiation between the business and the energy supplier. However, not all energy providers have been willing to accept units from downstream customers (or at least not all customers) as evidenced by the experience of one respondent to the questionnaire and in several submissions to the ETS Review panel [29]. This has given rise to disputes, especially in the case where the prices being

passed on by the upstream participants are higher than the market price for units. The incident of higher passed on costs was well documented anecdotally as the carbon price began falling in 2011 [5, 29, 30], but in February 2013, this issue also became the subject of a court hearing between an energy supplier and a downstream company [31].

#### **4.3. Market engagement of eligible and non-eligible participants**

Heavily dominated by foresters, the number of voluntary participants in the ETS by the end of 2012 was above 2,500 – more than ten times the number of the obliged parties (see Table 3). Voluntary participants in other sectors tend to be larger downstream companies (like Fonterra and Air New Zealand for example) who participate in the market and prefer to manage their carbon costs with direct control rather than having them passed from upstream. Other voluntary participants include investors such as a carbon leasing and investment companies seeking opportunities for new forestry planting.

**Table 3:** Voluntary participants in the NZ ETS (as of December 2012)

Sector	Activities under obligation	#
Forestry	Owning post-1989 forest land	2,519
	Holder post-1989 forest land 36	104
	Holder post-1989 forestry lease	25
Industry	Producing a product with embedded substances	1
Transport	Purchasing obligation jet fuel	4
Energy	Purchasing natural gas	3
	Purchasing coal	2

Data source: New Zealand Emission Unit Register [101]

The ‘all sectors’ approach of the NZ ETS seems that it would have more options available to participants. In terms of supply of NZUs, this is true, with the inclusion of the forestry sector and thousands of individual participants in this sector. Inclusion of this sector is unique and has allowed offsetting through direct trading within the scheme itself. However, while foresters were relatively active market agents in 2010, their interest in trading has been hampered by low carbon prices. We found that foresters have had little incentives since the end of 2011 to sell (and thus supply to the market) forestry NZUs—as mentioned previously.

As described in Section 3, post-1989 forest owners are not obligated to participate in the scheme but may opt in to the scheme to earn NZUs and receive credits for their forests. Many non-obliged foresters who have entered the scheme have been encouraged in government workshops to do so as it represents an opportunity with little risk. By opting into the scheme and receiving units, the foresters have the option to sell the units for cash or to bank the units to cover their liability when deforesting. Only if they sell do they face the risk that the costs of units to cover their liability will be more than what they gained from selling units. Foresters have been encouraged to opt in to the scheme before the deadline for registration at the end of 2012 “because you can’t play the game if you’re not in it” (P. Weir, Ernslaw One Ltd., personal communication, 25 July 2012). Being in the scheme does not require the foresters to participate in the market, and with low prices, they do not have the incentives to do so unless purchasing units for deforestation.



Originally, estimates of how many foresters would voluntarily participate varied widely from 25%-80% [9]. In July 2010 when other sectors entered the scheme, participation was around 22% [32]. In May 2012 we found this to be around 51%, an estimate confirmed by the Ministry for Primary Industries. While individual foresters who register are entered in the NZEUR, it still remains a question as to how many NZUs they are likely to be receiving and selling, and thus the potential of forestry NZUs for the market.

Low prices and the 2012 amendments extending transitional cost-containment measures and delaying agriculture indefinitely have not been met favourably by post-1989 foresters, who wanted to see an increased demand for their forestry units. As units from forestry are not allowed in the EU ETS market, there are limited opportunities overseas for these participants, particularly smaller foresters who rely on banks and brokers to aggregate their units to meet demand for a certain volume. Foresters also have the option of surrendering their units and opting out of the scheme. This will likely be attractive to many if prices stay low and if their transaction costs are high (e.g. if they have over 100ha and must do field measurements). The 90% collapse in price of NZUs has also meant that some post-1989 foresters who sold units early in the scheme when the price was over \$20, are now buying the cheaper offsets to surrender for their deforestation liability and exiting the scheme with the profit [33], 110]. As of 1 March 2013, according to information from the EPA, 136 foresters had left the scheme, 94% since the price of NZUs became more expensive than international offsets, and 54% in the 4 months following the government announcements not to place quantitative restrictions on international units.

Like the foresters, low prices and the recent government announcements mean less interest from investors in forestry. As one interviewee put it, “sustained low prices may see the company exit the ETS”. The carbon investment companies and some banks have participated through buying and selling

units themselves, but additionally, all these participants have helped to increase market liquidity through supply of market information and services. Several specialized brokering firms have developed and large financial institutions like Westpac Bank and OM Financial were among the first to offer carbon services in addition to their general services.

The upstream points of obligation in fuel and energy sectors mean that there are less actual participants in these sectors than, for example, in the EU ETS. These sectors represented the main emitters buying compliance units. Though this represents an opportunity to dominate the market, interviewees indicated that this was not happening (at least up to mid 2012) because the volumes in the NZ market were still very low. Participants in the industrial processes sector have also bought in the market, but many have received free allocations and passed units upstream, limiting their participation in the market. Agriculture was due to enter the scheme in 2015 and would have represented a significant increase in the demand in the market. The decision to indefinitely delay the entry of the sector results in roughly half of the potential emissions being exempted.

#### **4.4. Banking provision**

Many participants interviewed indicated a strategy of buying units at spot prices as they were needed and have not utilised the banking options yet. However, interviews with carbon brokers and banks revealed that several participants had bought more units in anticipation of the expiry of the one-for-two rule in 2013 and increased obligations (as per the original legislation). As this increased obligation did not eventuate, the companies were left with an option to sell the excess units or bank them. With the increasing volume of imported international offset units, it is expected that many participants will now use these offsets to surrender in the next couple of years and bank NZUs for surrender after 2015. Foresters, particularly those who intended to deforest in the future, have already been utilising banking features. Many post-1989 foresters are opting in simply to 'have the option' to sell but given a low

carbon price, many foresters have preferred to bank their units to await higher prices or meet deforestation liabilities in the future (e.g. in the 2020s when many are due to harvest and intend to change land use out of forestry). This observation provides an explanation for the lack of forestry NZUs being supplied in 2012.

At the time of writing this article, there was uncertainty among market players regarding the carry-over of Kyoto Units. This was driven by the decision of the New Zealand Government at the Doha UN Climate change Conference (December 2012) to not join the Kyoto Protocol's second commitment period. Parties still can access and trade Kyoto units generated under the first commitment period (CP1) until 2015-2016 (i.e. end of the so-called 'true-up' process). However, the government still needs to determine rules for the carry-over of all CP1 carbon units remaining in the NZEUR account by the end of 2015-2016 [101]. Companies expecting that the government may limit the use of Kyoto units after 2015 are the ones buying and banking domestic NZUs.

## **5. Discussion**

This section further discusses the main issues with the design of the NZ ETS and the function of the market that were brought up in the interviews and questionnaire.

### **5.1. Investment dynamics and dilemmas**

The previous section outlined a range of flexibilities to comply with NZ ETS obligation cost-effectively. In addition to this, the NZ ETS has objectives of environmental effectiveness (i.e. meeting Kyoto commitments and reducing emissions below business as usual levels) and a long term economic resilience objective that includes incentivising low carbon and abatement technologies.

Some submissions to the 2011 Review Panel stated that the NZ ETS and carbon price had a general impact on their investment decisions because it raised the return of investments for energy

efficiency and the use of renewable energy [29]. However, the Review Panel not only read 162 submissions, but held consultations with stakeholder groups, concluding that the “business and industry representatives noted the ETS had not had a significant impact on investment decisions and competitiveness. Most submitters noted the ETS had not yet incentivized behavioural changes nor had it resulted in significant reductions in domestic emissions.” [5]. A Ministry of Economic Development business survey in 2009 also found that the majority of businesses surveyed (just before the scheme was implemented in the energy and industry sectors) thought the NZ ETS was unlikely to have a marked effect on costs such that they would have to reduce their energy consumption or emissions [11]. It should also be noted that both these reviews were collecting responses when the price of units was higher than it was for 2012, when we were collecting data for this research.

Moreover, the findings from the interviews and questionnaires in this research suggested that the NZ ETS obligation and carbon price has not been a significant factor in the responses of obliged parties in the NZ ETS. Respondents representing agriculture, fuel, and pulp and paper, as well as the energy companies interviewed, said that while the carbon market was now a consideration within the company, until the costs increased this did not make a material difference. Some businesses investing in technology were already doing so before the scheme was implemented, others (particularly in energy) explained that renewable energy projects were profitable in New Zealand without the carbon price factor. Yet another questionnaire respondent wrote that “[w]e are not able to include ambitious carbon prices in investment decisions and therefore low carbon initiatives are unable to be economic and cannot get approval to go ahead.”

Carbon traders interviewed noted that there are ‘sophisticated’ participants in the NZ ETS market who can see many opportunities in the NZ ETS. However, in some ways the amount of options available to participants may be a disadvantage to less sophisticated participants. Many choose an inappropriate strategy for compliance as evidenced by the company in our survey paying the \$25 fixed

price. Their stated reason was that this was the price passed on by their electricity provider; yet this still does not explain why they would pay this price to the government as well instead of taking advantage of the cheaper units available from the international offset market. Additionally some of the small businesses interviewed and in our survey had not sold or passed their free allocation units upstream to cover their increased electricity costs (they had no direct surrender obligation under the ETS). They claimed the price of the units on the market was far less than the prices they were passed on by their electricity suppliers and were unsure of an appropriate strategy to use the units to recoup the costs. Carbon traders also noted some smaller forestry participants were now desperately selling units to pay for the field measurements needed to comply with the scheme.

So while the government is correct in stating that the NZ ETS has successfully implemented a price on carbon in the New Zealand economy [22], it seems that the price does not necessarily incentivise longer term investments in the resilience of the economy. Indeed, even investment in domestic forestry offsets, seen as the least costly investment in reducing net emissions, is not incentivised at NZU prices below NZ\$10-15 according to our interviews and other sources [34, 35]. Moreover, the trading itself does not necessarily signify domestic emissions reductions. This is not only due to free allocation, as many industries still face liabilities if they are above the industry benchmark, but the ability to use international offsets also presents questions about the scheme meeting its environmental performance objectives.

## **5.2. Domestic versus international credits**

Our analysis also noted a tension between the flexibilities allowed. Noting the primary use of the NZUs for obligation in 2010, Climate Minister Nick Smith said that this “dispels concerns New Zealanders through the ETS would be paying money overseas” [36]. However, with the significant influx of international offset units since 2011, this situation has changed and as mentioned, increased opposition and criticism from certain groups. With international offset prices below NZ\$1 (\$.50 for CERs and \$.20

for ERUs on 1 March, 2013), the foresters have continued to bank rather than sell their units, further contributing to NZU illiquidity issues. As found, many foresters have indeed also left the scheme.

While the government has made qualitative restrictions on international units to ensure the integrity of the scheme, many of these were made several months after similar restrictions were made in other ETS. In addition, if contracts had been made before the government announced the restrictions, then these units have been allowed for surrender. This gave businesses certainty, but also means that units known to be of dubious environmental integrity have been surrendered.

While from an economic point of view, it does not matter whether reductions take place within New Zealand or overseas, there are trade-offs in cost effectiveness achieved by access to international units and environmental effectiveness achieved within New Zealand. Not restricting overseas units raises the question of the risks to achieving obligations under the Kyoto Protocol - complementarity in particular - and New Zealand's economic resilience involved in using international offsets rather than domestic abatement approaches. Former Minister for Climate Change Issues Nick Smith questioned if "the policy of international units being of equal value to taking domestic action is in fact correct." (N. Smith, personal communication, 1 August 2012) The concept of complementarity, stated in Article 17 of the Kyoto Protocol, reads: "The Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article" [37]. As such, domestic efforts and commitments can be severely questioned when a country heavily relies on international carbon credits to meet Kyoto obligations.

Additionally, this approach could pose risks of higher future costs in any international commitments because it further delays domestic action to curb emissions, which might be needed to meet future commitments. New Zealand is projected to meet its Kyoto obligation under CP1, but this is primarily due to removals by forestry and international offset purchases than by gross emission reductions. Many of

the domestic removals are from forests planted in the early 1990s and due to be harvested in the 2020s. This so-called “Wall of Wood” has a significant impact on projected emissions, with noteworthy potential liabilities [1, 9], influencing New Zealand’s decision not to sign up to a second Kyoto commitment [38] and highlighting that the use of forest sinks may only be a temporary solution for mitigation [1, 7]. While earlier predictions of deforestation showed the ETS having an impact as a disincentive towards deforestation, the latest survey of deforestation intentions, considering the low NZU price, has predicted a deforestation scenario similar to not having an ETS at all [39].

## **6. Conclusions**

The objective of this paper was to provide an empirical analysis of market behaviour under the NZ ETS. We focused our analysis on market behaviour, or the interplay between and resulting outcomes of policy design (i.e. flexibilities) and actual business responses. Results suggest that the overall market behaviour has been relatively dynamic and slowly emerging, but the ETS has not encouraged the domestic market growth for emission reductions. Setting aside the identified design drawbacks, we conclude that parties are using, to some or to a large extent, all of the flexibilities granted under the NZ ETS. Findings reveal that market behaviour has responded to the unique policy design of the NZ ETS, in particular to the access and price of Kyoto units.

Over time, the abundant and unrestricted supply of cheap credits from the CDM and JI Kyoto Flexible mechanisms has dominated the market and reduced the attractiveness of domestic NZUs. In turn, this has been preventing foresters, the main suppliers of credits, to have a more active role. They have refused to sell credits at very low price levels and preferred to bank their offsets to cope with future deforestation or to sell later at higher prices while purchasing cheap offsets to cover liability. Overall, the findings indicate that parties were using trading primarily as a means of purchasing eligible

offset units, selling freely allocated units, and swapping eligible units rather than selling units that represented actual emission reductions in response to the ETS.

Pre-conditions for cost-effectiveness, such as common carbon price and trading between parties facing different costs are observed. The number of cost containment measures (e.g. free allocation, access to Kyoto units, one-for-two rule), which increased the political acceptability of the scheme, has played a key role to reduce the risks of high compliance costs. Taking into account an effective maximum emission price of NZ\$12.50/tonne as a benchmark (i.e. NZ\$25 price cap combined with the one-for-two rule), estimated cost savings would be in the proximity of \$10/tonne given the latest reported price data. Still, consideration must be given to unknown mitigation costs of the few companies who have taken their own emission reductions, market power exercised by some companies, and participants unfamiliar with trading choosing an inefficient strategy for compliance.

Cost containment measures and the lack of an internal cap—a concrete indication of incomplete policy design—have also had negative implications for domestic low-carbon investment and environmental effectiveness. Considering that credits are not issued based on deviations from a baseline (except for the industrial processes), the potential free-riding effect combined with Kyoto units decrease the environmental integrity of the scheme. The 2012 government amendments delaying the entry of agriculture indefinitely and extending all of the transitional cost containment features without a specific end date, is sending inadequate policy signals to market players who want to see a more liquid domestic market and equitable treatment of all sectors. The postponement maintains the current market structure, with the main participants being from the fuel and energy sectors. Until free allocation starts to phase out, the large industrial emitters receiving 90% are unlikely to participate in the market and instead continue the strategies of passing units upstream and cost minimisation that were observed in



our research. With foresters exiting the scheme, building support and trust for the ETS amongst this group is likely to be harder in the future.

Given uncertainties to access and carry-over Kyoto units, some companies have started to buy only domestic NZUs. In the long run, given the non-participation of New Zealand in the Kyoto Protocol, there seems to be the possibility to witness a more dynamic domestic carbon market if an ambitious cap is actually determined. Bipartisan support for a complete and ambitious policy design will be critical.

## **7. Future perspective**

The incomplete design of the NZ ETS and apparent policy trade-offs (political acceptability vs. environmental effectiveness) are likely to be heavily challenged in the very near future. The government decision not to sign up for Kyoto CP2 in Doha in November 2012 is has already had significant implications for the outlook of the NZ ETS. It was decided in Doha that countries not signed up to the second period would be unable to access the international offset market after the true up period (i.e. expected 2015). This lack of international access will necessarily put demand back on domestic NZUs. This may incentivise forestry investment, but it could also represent a shortage of NZUs to meet demand from emitters. Even before the Doha decision, the government has been working on the design of an auction of NZUs within a cap. The lack of future international unit supply has now made this the only supply of eligible units beyond forestry offsets, free allocation, and the units that participants have banked thus far. As there has been no indication yet about the design of this cap—key missing design element—and auction, there remains much uncertainty about the scheme’s outlook. An ambitious cap and the auction have the potential to raise the price of NZUs and foresters interviewed have welcomed the cut-off from the international market. Another important factor in how ambitious this cap is likely to be set as well as other design features of the scheme is the national election in 2014. The major opposition parties have been very critical of the 2012 amendments to the scheme and continued low

price in the market, as well as the decision not to take a second Kyoto commitment. A change of government could see these issues addressed with an aim to increase the stringency and environmental performance of the scheme.

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## **Key Terms**

**Allocation:** Distribution of emissions permits or allowances among greenhouse gas emitters to establish an emission trading market. The division of permits/allowances can be done through grandfathering method, an intensity basis and/or permit auctioning. Grandfathering refers allocating units based on a historic level of emissions while an intensity basis refers to allocating one unit for every tonne of CO<sub>2-eq</sub> emitted *per unit of activity or output*, and thus the number allocated can decrease/increase if the output increases/decreases.

**Cap:** This term in emissions trading most often refers to a quantitative restriction on the overall number of units (usually corresponding to a target for emissions reductions of the scheme). This is a key component of a cap-and-trade system like the EU ETS. The NZ ETS does not have an absolute cap on emissions.

**Energy Sectors:** Stationary energy includes fuels in generating electricity and in the direct production of power and heat. Liquid Fossil Fuels includes petrol, diesel, aviation gasoline, jet kerosene and fuel oil. The point of obligation in the NZ ETS for both of these sectors is upstream, i.e. with the suppliers and wholesalers of energy and fuel.

**First commitment period (or CP1):** The period from 2008 to 2012 under which the countries ratifying the Kyoto Protocol have to meet their emission limitation or reduction commitments. New Zealand's first commitment target was set at maintaining the 1990 level of emissions.

**Fixed price option** - During the transition phase, certain ETS participants have the option to buy New Zealand emission units from the Government for a fixed price of NZ\$25, which functions as a safety valve (alternatively referred to in literature as a 'price cap' or 'maximum price'). If the international price rises above NZ\$25, ETS participants can then opt to pay the NZ\$25 fixed price to purchase units from the government.

**Industrial activity intensity level** - Moderately intensive industrial activity is defined by the NZ ETS as an activity that is equal to or above 800 tonnes of CO<sub>2-eq</sub> per NZ\$1 million of revenue. Activities satisfying the criteria are eligible for 60% free allocation. A high emissions intensive industrial activity is equal to or above 1600 tonnes of CO<sub>2-eq</sub> per NZ\$1 million of revenue and is eligible for 90% free allocation.

**One-for-two obligation** - During the transition phase, certain ETS participants have to surrender one eligible emissions unit for every two tonnes of emissions. This is also referred to as the 50% progressive obligation.

**Surrender** - The transfer of a New Zealand unit (NZU), Kyoto unit, or other overseas unit (if applicable) from an individual account to the government's surrender account in the registry for the purpose of compliance. Surrendering an NZU will render it incapable of being further transferred, retired or cancelled. Once a Kyoto unit has been transferred to the government's surrender account, the government may retire it for compliance under the Kyoto Protocol.