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Lessons Learned from the New Zealand Emissions Trading Scheme

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Abstract

The New Zealand Emissions Trading Scheme (NZ ETS) was launched in 2008 following more than a decade of policy deliberation on how emission pricing could support New Zealand's contribution to international climate change mitigation efforts. Reflecting the unique emissions and economic profile of New Zealand, New Zealand's regulatory culture, and lessons learned from earlier environmental markets, including within New Zealand, it pioneered many ETS features. Examples include design for coverage of all economic sectors and major greenhouse gases (GHGs); an upstream point of obligation in the energy sectors with opt-in by major downstream users; output-based free allocation to eligible emissions-intensive, trade-exposed activities where the firms involved were not necessarily points of obligation; zero free allocation to energy-sector participants in recognition of the fact that they could pass on emission prices; and a monitoring, reporting and verification system based on self-assessment with audits and penalties to deter non-compliance. From 2008 to mid-2015, the NZ ETS operated without a cap on domestic emissions but instead was nested within the international Kyoto Protocol cap, enabled by buy-and-sell linkages to the Kyoto market. Legislative amendments to moderate the system's impact combined with an oversupply of units in the international market contributed to low domestic emission prices in recent years, and policy uncertainty has obscured the system's long-term price signal. While the NZ ETS may have had a small impact on the forestry sector, officials have found no evidence that it has contributed significantly to domestic mitigation. From 2012 through to mid-2015, participants predominantly met their NZ ETS obligations by purchasing overseas Kyoto units at low cost. The NZ ETS did enable the government to meet New Zealand's international obligations for the first commitment period of the Kyoto Protocol (2008–2012) with a substantial unit surplus. In 2015, the NZ ETS delinked from the Kyoto market and it currently operates as a domestic-only system. The government is reviewing the system in 2016. The system requires changes to align with New Zealand's Intended Nationally Determined Contribution (INDC) under the 2015 Paris Agreement and to effectively support New Zealand's decarbonisation pathway.

JEL codes

Q28, Q54, Q55, Q57, Q58

Keywords

New Zealand Emissions Trading Scheme (NZ ETS), Emissions trading, linked tradable permit market, Kyoto units, Certified Emission Reductions (CERs), Emission Reduction Units (ERUs), greenhouse gas, carbon markets.

Summary haiku

A pioneer scheme.
The foundation for much more
Lessons learned? Perhaps.

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1 Introduction

When it was introduced in 2008, the NZ ETS was the first emissions trading system in the world designed to cover all sectors of the economy (with phased entry) and the six major GHGs. Over time, the features have been adjusted to reduce the price – and emissions – impact of the system. However, the system has successfully established a functional domestic carbon market and offers a foundation for more ambitious mitigation efforts.

Reflecting New Zealand's distinctive emissions and economic profile (particularly relative to other members of the OECD), its distinctive regulatory culture, and lessons learned from earlier environmental markets in New Zealand and abroad, it pioneered many ETS features. Examples of this include design for coverage of all economic sectors and major GHGs; an upstream point of obligation in the energy sectors with opt-in by major downstream users; output-based free allocation to eligible emissions-intensive, trade-exposed activities where the firms involved were not necessarily points of obligation; zero free allocation to energy-sector participants in recognition that they could pass on emission prices; and a monitoring, reporting and verification system based on self-assessment with audits and penalties to deter non-compliance. From 2008 to mid-2015, the NZ ETS operated without a cap on domestic emissions but instead was nested within the international Kyoto Protocol cap, enabled by buy-and-sell linkages to the Kyoto market. These innovations, the reasons they evolved and experience with them, could offer valuable lessons for others creating or reforming ETS in their own distinctive local circumstances.

This paper seeks to build on earlier studies that have reviewed and evaluated aspects of NZ ETS design (e.g. Kerr 2009; Kerr and Chapman 2009; Jiang, Sharp, and Sheng 2009; Bertram and Terry 2010; Cameron 2011; Bullock (2012); Mundaca and Richter 2013; Richter and Mundaca 2013; Kerr and Duscha 2014; Richter and Chambers 2014; Afriat et al. 2015; Ministry for the Environment 2016; Diaz-Rainey and Tulloch 2016). The paper focuses on the history of the government policy-making process, rather than the significant role played by stakeholders and the experience of NZ ETS participants.[1] It provides updated information on the system design and operation and offers a longer-term perspective on how actual outcomes have compared to expectations that were driven by key assumptions. It also seeks to identify lessons learned from earlier stages of the NZ ETS that can help to inform future policy-making on emissions trading in

[1] Many businesses and non-governmental organisations as well as researchers and members of the general public engaged actively during the development of New Zealand's climate change policy and the NZ ETS. Their important contributions, which ranged from technical and economic analysis to social and political influence, and their respective experiences with NZ ETS design and implementation are beyond the scope of this paper. The documentary *Hot Air* provides one account of how New Zealand stakeholder groups engaged with officials on climate change from 1998 to 2008. See http://www.hotairfilm.co.nz/.

New Zealand and other countries in the evolving context following the 2015 Paris Agreement. The paper begins with a brief overview of how emissions trading works in New Zealand and then discusses the context for and history of the NZ ETS, summarises key outcomes and assesses some of the lessons learned to date.

More detailed information on the history of the NZ ETS, including key policy milestones, is available through Motu's *Timeline for the New Zealand Emissions Trading Scheme* (Leining 2016a) which is available online.

2 How emissions trading works

Internationally, governments have recognised the necessity and urgency of reducing GHG emissions to avoid dangerous human interference with the climate system. In the 2015 Paris Agreement,[2] countries agreed to limit temperature rises to well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts for a limit of 1.5 degrees Celsius. Achieving this objective will require a global transition to net zero emissions of long-lived GHGs by the end of the century, reductions in short-lived GHGs, and peaking of global emissions in the near term.

Greenhouse gas emissions carry a cost to the environment which traditionally has been ignored in economic transactions, leading to market decisions which do not account effectively for this cost. Putting a price on GHG emissions to incentivise and enable emission reductions has been identified internationally as an important part of global strategy for mitigating climate change (Stern 2007; Garnaut 2008; Garnaut 2011; Nordhaus 2013; Edenhofer et al. 2014; Global Commission on the Economy and Climate 2014; Partnership for Market Readiness and International Carbon Action Partnership 2016).

An ETS transforms a regulatory limit on emissions into an emissions price set by the marketplace, enabling and creating economic incentives for producers, consumers and investors to choose lower-emission alternatives without losing competitiveness. Under conventional ETS design, the government imposes a limit (cap) on the total emissions in covered sectors of the economy, and issues a number of tradable emission units equal to the level of the cap. Each unit corresponds to one tonne of emissions. The regulated participants must surrender emission units to cover the emissions for which they are liable. In a domestic-only system (with no offsets or removals), total emissions in capped sectors are no more than the cap.

Participants may receive free emission units from the government (based on some combination of past emissions, output and/or performance standards), earn them for eligible removal activities, purchase them from the government (generating government revenue which

[2] See FCCC/CP/2015/L.9/Rev.1, available from https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

can be recycled into the economy), or purchase them from other market participants. They may also be able to use domestic or international credits (offsets) or units from other ETSs. Participants that hold units in excess of their obligation to surrender can sell them or bank them for future use.

The cap on units and establishment of a trading market generate a price on units. Constraining unit supply relative to demand raises emission prices and reduces emissions. Mechanisms can be applied to manage emission prices and support market operation. Market integrity is safeguarded through systems for monitoring, reporting and verification of participants' emissions; enforcement of penalties for non-compliance; and market oversight. An ETS can be linked to another ETS through direct trading of ETS units or indirectly via joint acceptance of international credits. While linking can support least-cost mitigation and market liquidity, it can also introduce administrative and political complexities.

Each ETS can apply a customised design to support local objectives and circumstances, and should undergo continuous review and improvement as experience is gained and the broader context evolves. Over the past decade, ETSs with different design features have been implemented by a diverse range of jurisdictions at multinational, national, regional and municipal scales (Partnership for Market Readiness and International Carbon Action Partnership 2016).

3 Key features of the New Zealand Emissions Trading Scheme

This section provides an overview of the key features of the NZ ETS as of April 2016. It addresses sector coverage and point of obligation; monitoring, reporting, verification and compliance; unit supply; unit obligation; free allocation; price management; and linking. More detailed information on how legislation around these features has evolved over time can be found in Leining (2016b).

3.1 Sector coverage and point of obligation

The NZ ETS was designed to cover all sectors of the economy and the six major GHGs[3] over time. In the 2012 amendments, unit obligations for biological emissions from agriculture were deferred indefinitely but emission reporting obligations were retained, and ETS obligations

[3] The six gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

were replaced with a levy for synthetic GHGs in imported goods. Sectors entered the system as shown in the following table.

Table 1: Sector entry into the New Zealand Emissions Trading Scheme

Sector	**Voluntary reporting**	**Mandatory reporting**	**Unit obligations**
Forestry		1 January 2008	1 January 2008
Liquid fossil fuels	1 January 2009	1 January 2010	1 July 2010
Stationary energy		1 January 2010	1 July 2010
Industrial processes		1 January 2010	1 July 2010
Synthetic gases	1 January 2011	1 January 2012	1 January 2013
Waste	1 January 2011	1 January 2012	1 January 2013
Agriculture	1 January 2011	1 January 2012	Deferred indefinitely

The point of obligation for ETS reporting and unit obligations was selected for individual sectors in order to support system effectiveness while minimising administrative costs. In the energy sector, for example, the primary point of obligation typically applies upstream at the point of fuel production or import, ensuring broad coverage with the minimum number of ETS participants. However, major users of coal, natural gas, or obligation fuel can opt in as points of obligation, with a carve-out of the upstream obligation (for further discussion of this issue, see Kerr and Duscha [2014]). In the energy sector, quantity thresholds apply to exclude *de minimis* sources. In other sectors, the point of obligation applies at the point of emission or removal where feasible, or is assigned to a reasonable proxy such as the point of import or equipment operation. In the agriculture sector, the legislation specifies a processor-level point of obligation for both nitrogenous fertilisers and animals (or animal products), with the option to change to a farmer-level obligation by Order in Council.

The following table summarises the point of obligation in each sector. It shows that as of 30 June 2015, there were 329 mandatory participants and 2,207 voluntary (mostly forestry) participants (Environmental Protection Authority 2015a). The Ministry for the Environment reported that since 2008, the NZ ETS has cost the government $38.9 million to implement and administer. The annual cost to the government of implementation and administration in the 2014–15 financial year was $6.4 million (Ministry for the Environment 2016).

Table 2: Sectoral points of obligation and participants in the NZ ETS

Sector	**Point of obligation**	**Number of participants**[4] (as of 30 June 2015)
Forestry	• Owner of forest land • Possibility to transfer the obligation to the forest owner with the agreement of the landowner	• Deforesting pre-1990 forest land: 88 • Owning post-1989 forest land: 2,062 • Holders of post-1989 forestry right: 89 • Holders of post-1989 forestry lease: 37
Liquid fossil fuels	• Owner of obligation fuel at the time the obligation fuel is removed for home consumption or otherwise removed from a refinery, other than for export • Large users of any obligation fuel can opt in	• Owning obligation fuel: 5 • Purchasing obligation jet fuel: 5
Stationary energy	• Point of fuel production or import for coal and natural gas • Point of use for geothermal fluid • Point of emission for combustion of waste products • Point of petroleum refining where the refining involves the use of intermediate crude oil products (for example, refinery fuels and gases) for energy or feedstock purposes • Point of use of crude oil or other liquid hydrocarbons (other than obligation fuel or as specified) • Large users of coal and natural gas can opt in	• Importing or mining coal: 24 • Importing or mining natural gas: 50 • Using geothermal fluid: 12 • Combusting used or waste oil, tyres or waste: 4 • Using crude oil: 4 • Purchasing natural gas: 3 • Purchasing coal: 3
Industrial processes	• Point of production • Producers of products with embedded substances can opt in	• Producing iron or steel: 2 • Producing aluminium: 1 • Producing clinker or burnt lime: 4 • Producing glass using soda ash: 2 • Importing or manufacturing synthetic fertilisers containing nitrogen: 12 • Producing products with embedded substances: 1

[4] Source: (Environmental Protection Authority 2015a).

Sector	Point of obligation	Number of participants[4] (as of 30 June 2015)
Synthetic gases	• Point of import, manufacture, or equipment operation	• Operating electrical switchgear that uses SF_6: 6 • Importing HFCs or PFCs: 13 • Exporting HFCs or PFCs: 7
Waste	• Landfill operator	• 34
Agriculture	• Default: Processor • Alternative by Order in Council: Farmer	• Slaughtering ruminant animals, pigs, horses or poultry: 43 • Dairy processing of milk/colostrum: 13 • Exporting from New Zealand live cattle, sheep or pigs: 12

3.2 Monitoring, reporting, verification and compliance

Under the NZ ETS, participants follow a "self-assessment" model for emissions monitoring, reporting and verification that is modelled on the New Zealand tax system. No independent third-party verification is required of emission reports, but the government's power to audit reports combined with substantial fines and civil/criminal penalties act as a deterrent against non-compliance. To safeguard the environmental integrity of the system, failure to surrender emission units results in a requirement to surrender those units plus a financial penalty per unit. Failure to comply with data collection, record-keeping, reporting, registration or notification requirements also carries a fine. Knowingly providing false information carries a larger fine and/or a prison term. Table 3 shows strong rates of surrender compliance with NZ ETS obligations over the period 2008 through June 2015, with a notable rise in reporting failures starting in 2012.[5] During 2016 consultation for the NZ ETS review, an official from the Ministry for Primary Industries[6] indicated that the rise in reporting failures starting in 2012–13 was attributable primarily to forestry-sector participants.

[5] Reporting failures can include late filings.
[6] Peter Lough, Manager Climate Change Operations at the Ministry for Primary Industries provided this information during a stakeholder meeting in April 2016.

Table 3: Compliance with NZ ETS reporting and unit surrender obligations

Financial year from July through June	Participants failing to submit emissions returns	Participants failing to surrender units	Participants failing to repay units
2008–09	N/A	N/A	N/A
2009–10	N/A	N/A	N/A
2010–11	2	1	0
2011–12	4	3	1
2012–13	239	10	0
2013–14	297	1	0
2014–15	118	38	2

Note: Failures were revealed during the financial year but may not relate to that period.
Source: Ministry for Economic Development 2009; Ministry for Economic Development 2010; Ministry for Economic Development 2011; Environmental Protection Authority 2012; Environmental Protection Authority 2013; Environmental Protection Authority 2014; Environmental Protection Authority 2015a.

3.3 Unit supply

The government issues New Zealand Units (NZUs) as the primary domestic unit of trade. Each NZU represents one metric tonne of carbon dioxide equivalent (t CO_2eq). Unit issuance is guided by considerations specified in legislation, including with regard to New Zealand's international climate change obligations and effective operation of the system. To date, NZUs have been issued to satisfy requirements for free allocation (discussed further below) and for eligible removal activities in the forestry and industrial sectors. Under the initial design, each NZU had to be backed by a Kyoto unit, but this requirement was removed (with retrospective application) in the 2012 amendments.

The system was not designed to place its own quantity limit on domestic emissions and does not include a conventional cap. From inception, it was designed to operate nested within the international Kyoto cap, and use the Kyoto market as a major source of unit supply. From January 2008 through May 2015, it offered participants access to international Kyoto units (CERs – certified emission reduction units, ERUs – emission reduction units, and RMUs – removal units) with no quantity limits but with some restrictions on unit sources (discussed further below).

Once the system de-linked from the Kyoto market as of 1 June 2015, the government has served as the sole source of new unit supply in the domestic market. However, as discussed further below, market participants hold a substantial bank of NZUs. The 2012 amendments introduced an explicit power for the government to auction units within a cap that would bind the sum of auctioning plus free allocation but not bind free allocation. This option has not yet been exercised.

3.4 Unit obligation

The core obligation is for participants to surrender one unit for each tonne of emissions. In the 2009 amendments, this obligation was changed in the stationary energy, liquid fossil fuel and industrial process sectors to a progressive unit obligation under which one unit was surrendered for two tonnes of emissions through December 2012. In the 2012 amendments, the progressive obligation for non-forestry sectors was extended indefinitely and applied to the sectors entering the system in 2013 (waste and synthetic GHGs). In March 2016, the Minister for Climate Change Issues, Hon Paula Bennett, confirmed the government's intention to remove the progressive obligation (*Carbon News* 2016).

3.5 Free allocation

Legislation provides for free allocation to the following sectors: forestry, industrial production, agriculture (once obligations apply), and fishing. Fixed pools of free allocation were provided to the forestry and fishing sectors on the basis of compensation for loss in asset value. Output-based free allocation is provided annually to eligible trade-exposed and emissions-intensive producers in the industrial sector to support their international competitiveness and prevent leakage of production and emissions offshore. The emission factors used for industrial free allocation relate to both direct stationary energy and industrial process emissions and indirect emissions from purchased electricity. Highly emissions-intensive industrial activities receive 90 percent of the allocative baseline as the starting point, whereas moderately emissions-intensive activities receive 60 percent. As of 2014, 26 industrial activities were eligible to receive free allocation (Environmental Protection Authority 2015b; *Climate Change (Eligible Industrial Activities) Regulations* 2010). If it assumed unit obligations, the agriculture sector would also receive free allocation on an output basis starting at a rate of 90 percent of the allocative baseline.

Pursuant to the 2012 amendments, while the one-for-two progressive obligation remains in place, free allocation to eligible industrial (and agriculture) participants is similarly halved (see sections 84A and 85B of *Climate Change Response Act* [2002]). Once full unit obligations apply to the industrial and agriculture sectors, free allocation will be phased out by reducing the level of assistance by one percentage point on a straight-line basis (see sections 81, 85 and 85A of *Climate Change Response Act* [2002]).

When the NZ ETS was first established in 2008, the total amount of free allocation to the industrial and agriculture sectors was limited to a fixed pool defined at 90 percent of 2005 emission levels, with no free allocation for new entrants. Free allocation was to have been phased out at a linear rate from 2019 to 2029, reaching zero by 2030. In the 2009 amendments,

the methodology for free allocation to industry and agriculture was changed to an output-based approach. With goals of harmonising regulation for firms operating in both New Zealand and Australia, and easing later linking, the details largely followed the methodology developed in Australia for application to industrial participants in its Carbon Pollution Reduction Scheme. From 2009 until the amendments in 2012, free allocation was to have been phased out at 1.3 percent of the previous year's amount starting in 2013 for industry and 2016 for agriculture.

As of 2016, free allocation meets only a very small percentage of unit demand across the NZ ETS. In 2014, the government freely allocated 4.48 million NZUs to the industrial sector and 0.04 million NZUs to owners of pre-1990 forests, whereas NZ ETS participants surrendered 29.8 million units for compliance. The government issued 10.08 million NZUs for forestry removals and 1.47 million NZUs for other removal activities (Environmental Protection Authority 2015b). Other demand was met through the purchase of international units, an option no longer available as of 1 June 2015.

3.6 Price management

The NZ ETS was initially introduced with no price cap or floor. In the 2009 amendments, the government added a price cap of NZ$25 per tonne by enabling the fixed-price sale of NZUs with immediate surrender (i.e. with no potential for banking or trading). This was originally intended to apply through the end of 2012, but was extended indefinitely under the 2012 amendments.

3.7 Linking

The NZ ETS was conceived as a system with full buy-and-sell linkages to the Kyoto market. The buy linkage with the Kyoto market was subject to some restrictions on unit sources (e.g. nuclear certified emission reductions (CERs), nuclear emission reduction units (ERUs), temporary CERs (tCERs), and long-term CERs (lCERs) were prohibited) but not on unit quantities. Imported assigned amount units (AAUs) were to be excluded unless subsequently provided in regulation. The government had powers under the legislation to approve or restrict use of overseas units.

The sell linkage with the Kyoto market initially included no limits on exports and enabled international sales of NZUs from all sectors via exchange with Kyoto units (subject to the Kyoto Commitment Period Reserve). When the government introduced the price cap in 2009, it retained the sell linkage only for forestry NZUs during the period 1 July 2010 to 31 May 2013 (again subject to the Kyoto Commitment Period Reserve).[7] This restriction was extended in the 2012 amendments when the price cap was extended.

[7] At the time the price cap was introduced, international emission prices were expected to increase and domestic deforestation had virtually stopped. The government identified the potential for arbitrage at government expense if

New Zealand actively explored options for linking bilaterally to other ETSs. Officials in the European Union supported linking conceptually and in the lead-up to the 2009 Copenhagen Climate Change Conference had called for OECD-wide linking of ETSs by 2015. However, they considered that some of the design features of the NZ ETS would preclude linking to the EU ETS in the short term (particularly allowing unlimited access to overseas units,[8] trading units associated with domestic forestry and agriculture activities, and – after 2009 – applying a price cap).

The most promising candidate for linking to the NZ ETS was Australia. The development of emissions trading in New Zealand and Australia followed a "leapfrog" process, with both countries progressing efforts concurrently and building on each other's experience. Harmonising key ETS design features across the two countries was viewed as desirable to facilitate compliance by firms operating in both countries, linking of the two markets to support liquidity, and political acceptance. Official discussions of trans-Tasman linking of ETSs began early in the process of NZ ETS design, and were supported by the establishment of formal working groups (Smith 2009; Groser 2011). However, the initial beacon of an Australian ETS became a shadow as Australia struggled politically to implement an ETS, chose in late 2012 to modify some of the design features of the Carbon Pricing Mechanism and link it to the EU ETS, and finally abandoned its ETS in 2014.

As international climate negotiations progressed slowly and the future of the Kyoto carbon market remained uncertain, New Zealand adjusted its linkages to the Kyoto carbon market. Through regulations, it first removed participants' access to some Kyoto units with environmental integrity concerns: CERs and ERUs from industrial gas destruction and large hydro projects (see sections 8A and 8B of the *Climate Change [Unit Register] Regulations* 2008). These had been banned in the ETS in Europe and Australia and their inclusion would have been a barrier to future linking as well as an ongoing reputational risk.

Once the government decided in 2012 to take New Zealand's emission reduction commitment for 2013–2020 under the UNFCCC rather than the Kyoto Protocol, it lost access to the Kyoto market as of 1 June 2015 (the end of the true-up process for the first Kyoto commitment period). Participants were not allowed to surrender international units for NZ ETS

recipients of industrial free allocation could use $25 fixed-price units to meet their NZ ETS obligations and sell their free allocation at a higher price overseas. The arbitrage risk in the forestry sector was perceived as relatively low, as that sector was expected to be a net seller of NZUs and could benefit New Zealand by selling those units at higher prices overseas. Therefore, the government blocked the overseas sale of NZUs by non-forestry participants as long as the $25 price cap remained in place (Ministry for the Environment 2009; New Zealand Cabinet 2009).

[8] From inception, the NZ ETS barred imported AAUs unless approved under regulations; no such regulations were ever enacted. In the case that this did occur, the legislation also prohibited the carry-over of any imported AAUs after the first commitment period. This was done to facilitate post-2012 linking with the EU ETS or other systems which prohibited those units.

compliance after that date (see sections 11A, 11B and 11C of the *Climate Change [Unit Register] Regulations* [2008]). The NZ ETS now operates as a domestic-only system.

4 The context for the NZ ETS

4.1 New Zealand's emission profile

New Zealand's emissions profile is unique among developed countries, with 48 percent of emissions consisting of methane (CH_4) and nitrous oxide (N_2O) from the agriculture sector, and the remainder dominated by fossil fuel emissions for transport, electricity generation and industrial heat. Renewable energy sources account for a very high percentage of New Zealand's electricity generation (about 80 percent in recent years). New Zealand also has extensive forest land, which currently serves as a net carbon sink, and significant potential for reforestation.

In 2013, New Zealand's gross GHG emissions (excluding forestry) were 81.0 million tonnes of carbon dioxide equivalent (Mt CO_2eq). This is an increase of 14.2 Mt CO2eq (or 21.3 percent) from the 1990 level of 66.7 Mt CO_2eq. Net emissions (including forestry) were 54.2 Mt CO_2eq, an increase of 42.4 percent above 1990 levels of 38.1 Mt CO_2eq. Between 1990 and 2013, agriculture emissions increased by 14 percent and emissions from the energy sector increased by 32 percent (Ministry for the Environment 2015c). In 2012, New Zealand's total gross emissions per person were the fifth highest among industrialised countries, at 17.2 tonnes CO_2eq per person, but its emissions of CO_2 were twentieth highest at 8.3 tonnes CO_2 per person. The difference is predominantly driven by biological emissions from agriculture (Ministry for the Environment 2015d). Under current policies, New Zealand's gross emissions are projected to rise to 24 percent above 1990 levels by 2020 and 29 percent by 2030. Net emissions are projected to rise to 54 percent above 1990 levels by 2020 and 96 percent by 2030 (Ministry for the Environment 2015e).

4.2 New Zealand's emission reduction commitments

As a Party first to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and then to the first commitment period of the 1997 Kyoto Protocol (2008–2012), New Zealand assumed obligations to contribute to global emission reductions. For the period 2013–2020, New Zealand made an emission reduction commitment under the UNFCCC.[9] In 2015, New Zealand announced an Intended Nationally Determined Contribution for the period

[9] New Zealand subsequently ratified the Doha Amendment to the Kyoto Protocol for the second commitment period, but its commitment for the period 2013–2020 remains under the UNFCCC, which is not legally binding.

2021–2030 (New Zealand Government 2015). This commitment will become legally binding after ratification and entry into force of the 2015 Paris Agreement.

In all cases, New Zealand has assumed "responsibility targets" which can be met through a combination of domestic mitigation and investment in overseas mitigation. New Zealand has also adopted the Kyoto Protocol's forestry accounting conventions for Annex I (industrialised) countries.[10] The following table summarizes New Zealand's emission reduction commitments.

Table 4: New Zealand's emission reduction commitments

Period	Emission reduction commitment
2008–2012	**Kyoto Protocol:** Reduce average annual emissions over the period to 1990 level
2013–2020	**UNFCCC:** Unconditional: Reduce 2020 emissions to 5 percent below 1990 level; this equates to an average annual reduction of 3.2 percent over the period Conditional: Reduce 2020 emissions to 10–20 percent below 1990 level
2021–2030	**Paris Agreement:** Reduce 2030 emissions to 30 percent below 2005 level (11 percent below 1990 level)
1990–2050	**Domestic policy:** Reduce 2050 emissions to 50 percent below 1990 level

5 A brief history of the NZ ETS

5.1 Initial consideration of emission pricing

Consideration of emissions trading in New Zealand began in the early 1990s (Rive 2011).[11] Emissions pricing was always a key policy option in New Zealand because it devolves responsibility for (and potentially benefits from) climate mitigation to private markets. In October 1999, the National-led government identified emissions trading as its preferred policy for the period from 2008 (Hodgson 2005). During 2001–2002, the Labour-led government consulted broadly on mitigation policy options as part of its deliberation on ratification of the Kyoto Protocol.[12] At the time, the government projected ongoing growth in gross domestic

[10] This means that: New Zealand's base-year emissions are calculated excluding forestry, and target-year emissions are calculated including forestry (referred to as "gross-net" accounting); New Zealand accounts for net removals (or emissions) during the target period for post-1989 afforestation/reforestation, and for deforestation of pre-1990 forest; from 2013, New Zealand measures net removals (or emissions) from forest management activities relative to a Forest Management Reference Level representing a projection of business-as-usual activities; from 2013, New Zealand has adopted forestry accounting provisions for harvested wood products (New Zealand Government 2015a; New Zealand Government 2011).

[11] Kerr (1995) was written as input to a government working group led by Tim Denne.

[12] Research during this period included consideration of the need for additional policies to induce efficient uptake of renewables in the presence of a carbon price (Kerr et al. 2002). Interestingly, the price assumptions given by government for this report were for a price between NZ$20 and $40 per tonne of CO_2 from 2008.

emissions driven by economic development and population growth, but anticipated a net Kyoto surplus from 2008–2012 of 35–60 Mt CO_2eq because of increasing forest sinks. Consultation revealed greater support for an emissions charge than emissions trading due to concerns about the latter's complexity, effectiveness and the potential for undue influence by overseas interests (New Zealand Climate Change Project 2001; New Zealand Climate Change Programme 2001; Ministry for the Environment 2002). The government's 2002 Climate Change Policy Package (New Zealand Cabinet 2002) included:

- A carbon tax on the energy and industrial sectors approximating the international emissions price but capped at NZ$25 per tonne CO_2eq, with revenue returned to the economy through the tax system;
- Exemptions from the carbon tax for emissions-intensive and trade-exposed companies that entered into Negotiated Greenhouse Agreements (NGAs) for reducing their emissions;
- An emissions crediting mechanism called "Projects to Reduce Emissions";
- A deforestation cap of 21 Mt CO_2 over the first Kyoto commitment period of 2008–2012 (CP1) below which the government would retain both liabilities and credits for Kyoto forests, paired with a mechanism for incentivising permanent forest sinks;
- Joint government and sector funding for mitigation of biological emissions from agriculture; and
- Separate management of synthetic GHGs through sector initiatives.

However, Cabinet still supported "retaining the option of private sector emissions trading if the international market is functional and the international price of carbon is reliably below the price cap, and the administration works of establishing such a market do not outweigh the benefits" (New Zealand Cabinet 2001).

From 2003 through mid-2005, the government proceeded with design and implementation of its policy package with the expectation that it would be regularly reviewed, including the potential for a first major review in 2005. From May to July 2005, the government consulted on the design of the carbon tax. During this period, thinking on ETS and its design continued to evolve.[13]

However, in June 2005, officials projected that because of economic growth and changes to forestry accounting, New Zealand would face a substantial emissions deficit, rather than surplus, over the first Kyoto commitment period, valued at NZ$307 million. This set the stage for a major government review of its climate change policies. Officials concluded that a carbon tax would be ineffective in the long term, given the exclusion of NGA firms and agricultural emissions. Officials also recommended that the government should change the mitigation goal it

[13] See for example Kerr, Brunton, and Chapman (2004) on policy for forestry carbon sequestration; and Sin, Kerr, and Hendy (2005) on the choice between taxes and permits.

had established in 2002: "To enable New Zealand to make significant greenhouse gas reductions on business-as-usual and be set towards a permanent downward path for total gross emissions by 2012" (Ministry for the Environment 2005). The general election in September 2005 returned Labour to power but with a different political landscape. In December 2005, lacking support from its coalition partners, the government decided not to proceed with the carbon tax.

5.2 Stages and milestones in NZ ETS policy development

Government policy for the NZ ETS emerged in a series of stages, some of which overlap. These are summarised in Table 5.

Table 6 identifies major milestones in NZ ETS design and implementation.

Table 5: Stages of NZ ETS policy development

Time period	**Stage of policy development**
December 2005 to August 2007	Assessment of mitigation policy options after the decision to abandon the carbon tax
April 2007 to September 2008	NZ ETS design and initial legislation for phased implementation over 2008–2013
November 2008 to November 2009	First NZ ETS review and amendment to moderate its price impact through 2012 and defer the entry of biological emissions from agriculture until 2015
December 2010 to November 2012	Second NZ ETS review and amendment to both extend moderated price settings and defer biological emissions from agriculture indefinitely
September 2011 to May 2015	Adjustment of international linkages, ending with full delinking from the international Kyoto market
November 2015 through 2016	Third NZ ETS review; outcome to be determined

Table 6: Major milestones of the NZ ETS

Year	Month	NZ ETS policy	NZ ETS implementation	International
2005	Dec	Government decided not to proceed with a carbon tax		
2007	Apr	Government established an Emissions Trading Group to design an ETS		
	Sep	Government established the Climate Change Leadership Forum and Māori Reference Group		
	Dec	Government established Technical Advisory Groups		
2008	Jan		Forestry sector retrospectively assumed unit obligations under the NZ ETS	First commitment period of Kyoto Protocol began
	Sep	Parliament passed founding legislation for NZ ETS		
	Nov	NZ general election resulted in a National-led government and first NZ ETS review		
2009	Jan		Transport sector began voluntary NZ ETS reporting	
	Jun	Parliament passed the Climate Change Response (Emissions Trading Forestry Sector) Amendment Bill		
	Aug	Government announced a conditional 2020 GHG target of 10–20 percent below 1990 level		
	Nov	Parliament passed the Climate Change Response (Moderated Emissions Trading) Amendment Bill		
	Dec			UNFCCC conference in Copenhagen

Year	Month	NZ ETS policy	NZ ETS implementation	International
2010	Jan		Stationary energy, industrial process and transport sectors began mandatory NZ ETS reporting	
	Jul		Stationary energy, industrial process and transport sectors assumed NZ ETS unit obligations	
	Dec	Government appointed panel for second ETS review		
2011	Jan		Waste, synthetic gas and agriculture sectors began voluntary NZ ETS reporting	
	Mar	Government set a 2050 GHG target of 50 percent below 1990 level		
	Dec		Ban on surrendering industrial-gas CERs took effect	
2012	Jan		Waste, synthetic gas and agriculture sectors began mandatory NZ ETS reporting	
	Nov	Parliament passed the Climate Change Response (Emissions Trading and Other Matters) Amendment Bill		
	Nov	NZ took its 2020 GHG commitment under the UNFCCC, not Kyoto Protocol		
	Dec		Ban on surrendering industrial-gas ERUs and large-scale-hydro ERUs/CERs took effect	First commitment period of Kyoto Protocol ended; the second period began the next day
2013	Jan		Waste and synthetic gas sectors assumed unit obligations under the NZ ETS	
	Aug	Government announced an unconditional 2020 GHG target of 5 percent below 1990 level		
	Dec	Government announced future delinking of the NZ ETS from the Kyoto market		
2014	May	Government legislated against arbitrage by post-1989 forest owners		

Year	Month	NZ ETS policy	NZ ETS implementation	International
2015	Jun		NZ ETS delinked from the Kyoto market	
	Jul	Government announced a 2030 GHG target of 30 percent below 2005 level (11 percent below 1990 level)		
	Nov	Government launched consultation on third NZ ETS review		
	Dec	Government announced New Zealand's Kyoto compliance for 2008–2012 with a unit surplus and projected a surplus for the period 2013–2020		Paris Agreement reached by Parties to the UNFCCC

Source: (Leining 2016a).

During the course of 2006, the government implemented new whole-of-government climate change work programmes including one on alternatives to the carbon tax post-2012. From November 2006 through March 2007, the government consulted on a series of climate change discussion papers including the "Discussion Paper on Measures to Reduce Greenhouse Gas Emissions in New Zealand Post-2012," in which the government proposed a preference for emissions trading (Ministry for the Environment 2006).[14] Business engaged extensively during the consultation period; for example, Business New Zealand commissioned a study on emissions trading by the economics consultancy NZIER (NZIER 2007). The government's summary of submissions showed considerable support for proceeding with emissions trading post-2012 (Ministry for the Environment 2007).

While this effort was underway during the 2006–2007 period, international momentum was growing for more ambitious mitigation effort, and emissions trading was becoming more prominent as a policy tool in industrialised countries. The release of Stern (2007) had raised awareness of the economic costs of inaction on climate change, and the report had endorsed emission pricing as part of the global strategy for mitigation. The IPCC released its "Fourth Assessment Report" starting in February 2007, drawing attention to the mitigation effort required by industrialised and developing countries to stabilise emissions at safer levels. The EU ETS was operating its pilot phase (2005–2007) and preparing for its second phase (2008–2012). In the United States, a group of northeastern states had agreed in December 2005 to implement the Regional Greenhouse Gas Initiative (RGGI), a power-sector ETS, from 2009, and California had passed legislation in September 2006 setting the foundation for a state-level ETS. Design options for nationwide ETSs were under active consideration in Australia and the United States.

Under these circumstances, the government shifted course on its climate change strategy. In February 2007, Prime Minister Helen Clark announced the intention for New Zealand to become carbon neutral (Clark 2007). Although consultation had focused on emissions trading as a post-2012 option, the government chose to pursue implementation of an ETS pre-2012. In April 2007, the month after consultation on the discussion papers concluded, the government established a cross-department Emissions Trading Group, housed at The Treasury and led by the Ministry for the Environment, to develop a proposal for a broad-based ETS. In late August 2007, Cabinet made a series of in-principle decisions on core design features for an NZ ETS (Cullen and Parker 2007).

In September 2007, the government released a comprehensive consultation document entitled "Framework for a New Zealand Emissions Trading Scheme" (Ministry for the Environment and The Treasury 2007). At the same time, the government announced it was now

[14] Separate papers addressed "Transitional Measures: Options to Move Towards Low Emissions Electricity and Stationary Energy Supply and to Facilitate a Transition to Greenhouse Gas Pricing in the Future," "Powering Our Future: The Draft New Zealand Energy Strategy to 2050," a replacement New Zealand Energy Efficiency and Conservation Strategy, and "Sustainable Land Management and Climate Change."

facing a projected Kyoto deficit of 45.5 Mt CO_2eq. During consultation, independent technical assessments were released on NZ ETS design and potential impacts (e.g. Infometrics [2007]; Kerr [2007]; Tanaka [2007]).

Different stakeholder processes were used to enhance engagement on emissions trading. The Māori Reference Group was tasked with advising the government on the NZ ETS and the Sustainable Land Management and Climate Change Plan of Action (Horomia 2007). To build capability within business, civil society and the media to contribute to informed policy debate on emissions trading design, a group of businesses and foundations funded a cross-sector, Motu-led New Zealand Climate Change Policy Dialogue from June through October 2007. This group produced a series of short papers on key aspects of emissions trading. The Climate Change Leadership Forum, which first met in October 2007, brought together 33 stakeholders and officials across diverse sectors for discussions on the NZ ETS over the following year (Ministry for the Environment 2008, 4).

In December 2007 the government introduced the Climate Change (Emissions Trading and Renewable Preference) Bill into Parliament. The legislative process involved further public consultation and was informed by independent impact assessments. Two were general equilibrium modelling studies (Infometrics 2008; NZIER 2008); another scoped how to assess wider potential impacts (Sinner et al. 2008). The government also established formal advisory groups, enabling sector experts to assist with the development of technical regulations and system guidelines. These included Technical Advisory Groups on Forestry Measurement, Stationary Energy and Industrial Processes, Agriculture and Transport Fuels. The legislation was passed in September 2008, about 17 months after the Emissions Trading Group began work. It was passed by a vote of 63 to 57, with support from the Labour, Progressive, New Zealand First and Green parties, and opposed by the National, ACT, Māori and United Future parties (Cameron and Rive 2011).

The NZ ETS underwent two major stages of review and amendment[15]. The first review was announced shortly after a general election brought a National-led government to power in November 2008, eight weeks after the NZ ETS passed into law and during the intensification of the Global Financial Crisis. The review was a condition of the National Party's confidence-and-supply agreement with the ACT Party, which opposed the NZ ETS (Cameron and Rive 2011). A special select committee was appointed in December 2008 and concluded its review in August 2009 with a recommendation to proceed with an ETS (Emissions Trading Scheme Review Committee 2009).

[15] Two further stages of minor amendments were made to the NZ ETS. In June 2009, the Climate Change Response (Emissions Trading Forestry Sector) Amendment Act deferred implementation of some measures in the forest sector while the NZ ETS review was underway. In May 2014, the Climate Change Response (Unit Restriction) Amendment Act blocked the surrender of overseas Kyoto units by post-1989 forest owners to meet obligations associated with deregistering their forest land under the NZ ETS. This was intended to prevent an arbitrage opportunity created when post-1989 forest owners deregistered their land and cleared their liabilities using low-cost Kyoto units, and then reregistered their land and received higher-cost NZUs from the government.

Following the review, the government introduced the Climate Change Response (Moderated Emissions Trading) Bill to Parliament in September 2009. Legislative deliberation was contentious, with key issues being the government's proposals to defer unit obligations for agriculture until 2015 and introduce uncapped output-based free allocation in the industrial sector. The Finance and Expenditure Committee failed to reach agreement on the bill and reported a series of party positions (Finance and Expenditure Committee 2009). Following cross-party negotiations to reach a compromise, the legislation was passed in November 2009 by a vote of 63 to 58 with support from the National, Māori and United Future parties, and opposed by the Labour, Green, ACT and Progressive Parties (*New Zealand Herald* 2009). The changes to the NZ ETS design were intended to moderate its impact on the economy through 2012, with the intention for the system to assume full force from 2013. Key changes included:

- Shifting the start of unit obligations for the stationary energy, industrial processes and transport sectors to 1 July 2010;
- Deferring unit obligations for biological emissions from agriculture until 2015;
- Introducing a one-for-two unit obligation for non-forestry sectors through 2012;
- Introducing a price cap of NZ$25 per tonne through 2012, which equated to an effective price cap of NZ$12.50 per tonne in non-forestry sectors;
- Changing from a fixed pool to output-based free allocation for industry and agriculture with an extended phase-out; and
- Barring NZU exports for non-forestry sectors.

Under statutory requirements, a second review in 2011 involved appointment of an independent panel and consultation. The panel issued extensive recommendations in June 2011 (Emissions Trading Scheme Review Panel 2011). A general election in November 2011 returned the National-led government to power. In August 2012, the government introduced the Climate Change Response (Emissions Trading and Other Matters) Amendment Bill to Parliament, and in November 2012 it was passed. The government's amendments broadened and extended indefinitely the price moderation measures initially set to expire at the end of 2012, enabling low domestic emission prices to continue. Key changes included:

- Deferring indefinitely unit obligations for biological emissions from agriculture;
- Extending indefinitely the one-for-two unit obligation for non-forestry sectors (extended to include waste and synthetic gases entering in 2013, as well as biological emissions from agriculture at such time as they assumed unit obligations);
- Extending indefinitely the $25 price cap;
- Deferring the phase-out of free allocation in the industry and agriculture sectors until a full unit obligation was in place;
- Removing retrospectively the requirement to "back" NZUs with Kyoto units;

- Introducing forest offsetting for pre-1990 landowners (enabling them to avoid deforestation liabilities by replanting elsewhere) and retaining the second tranche of free allocation for forest owners not participating in offsetting;
- Substituting a levy for synthetic GHGs in imported goods; and
- Providing for discretionary rather than mandatory reviews of the system.

Table 7 shows how some of the key legislated changes in 2012 compare to the 2011 recommendations from the review panel. In several notable cases, the government's amendments were less ambitious than the recommendations.

Table 7: Comparison of selected 2011 review panel recommendations with 2012 legislation

Panel's 2011 recommendations	**Government's 2012 amendments**
Extending the one-for-two unit surrender provisions beyond 2012 and to all participants, with a phase-out through 2015 (2019 for agriculture)	Extending the one-for-two unit surrender provisions indefinitely
Extending the $25 price cap beyond 2012 and to all participants but raising it by $5 per year	Extending the price cap indefinitely and to all participants at $25
Not introducing a price floor, and placing no quantity restrictions on imported units but considering a restriction on HFC CERs	Adopted
Phasing out free allocation for industry and agriculture after 2012 with a straight-line reduction of 1.3 percent per year in place of an asymptotic reduction at that rate	Changing the phase-out to a reduction in the level of assistance by one percentage point per year (straight line reduction), and deferring the start of the phase-out as long as the one-for-two unit obligation remained in place
Considering the application of a cap on allocation in the next ETS review	Introducing the power to auction within a cap that applies across both auctioned and freely allocated units but does not limit free allocation
Applying unit obligations to biological emissions from agriculture from 2015 but with the point of obligation changed from the processor to the farm level	Deferring unit obligations for biological emissions from agriculture indefinitely, with no change to the legislated default point of obligation at the processor level and the option to change to the farm level by Order in Council
Applying a levy in place of ETS obligations for synthetic gases in imported products	Adopted
Introducing "forest offsetting" for pre-1990 forests (enabling landowners to avoid deforestation liabilities by replanting elsewhere) even if this did not eventuate in international rules under negotiation	Adopted

6 Outcomes of the NZ ETS

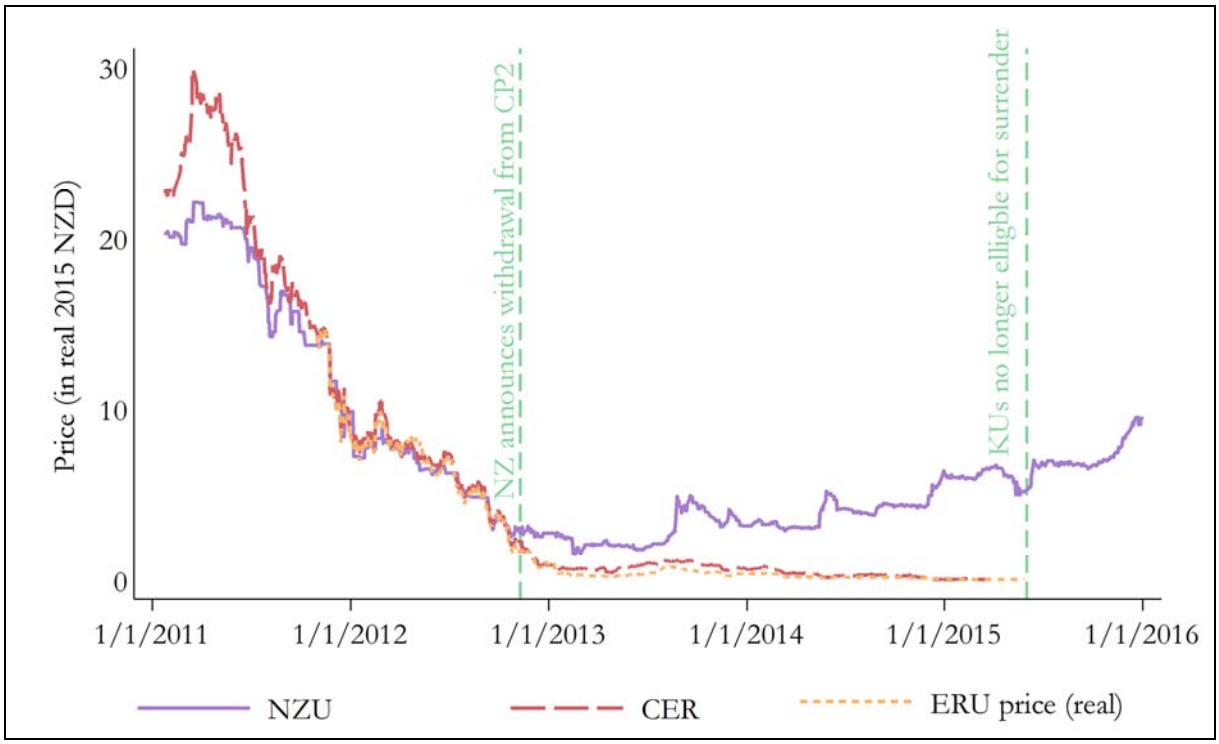
6.1 Emission prices

There have been three distinct periods of prices:[16]

1. Before the NZ ETS was announced until mid-2011, when the New Zealand price was between NZ$15 and $22 and below international prices.[17]
2. From mid-2011 through December 2012, when NZU prices were essentially the same as international unit prices and fell steadily with them.
3. Post-December 2012, when the announcement that New Zealand would not take a commitment under the second Commitment Period of the Kyoto Protocol meant that a ban on surrender of international units was anticipated and NZUs were de-linked from international markets; since then, prices have gradually risen and diverged from the price of international units.[18]

   As of April 2016, prices were more than NZ$13.

Figure 1: Emission prices in the NZ ETS

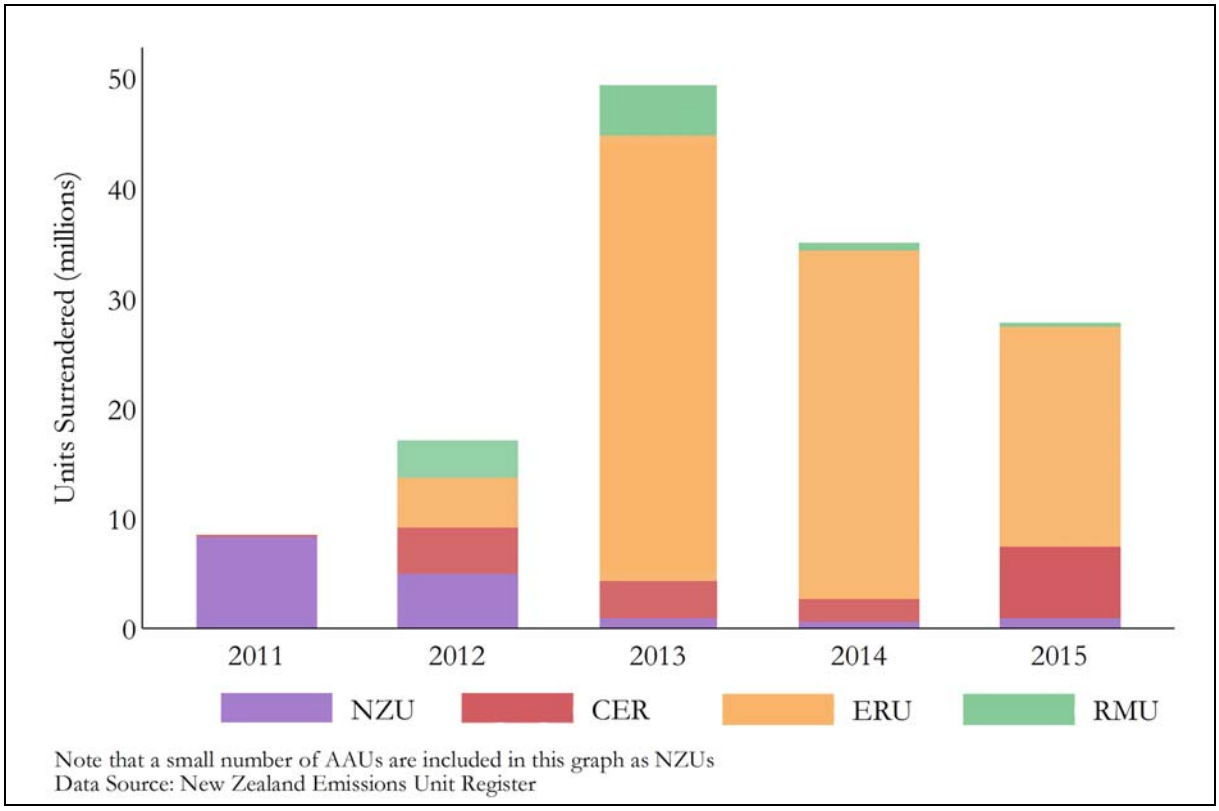


[16] Diaz-Rainey and Tulloch (2016) proposed three slightly different price breakpoints in the NZ ETS over the same period, reflecting the government's decisions in December 2011 and December 2012 to ban specific sources of Kyoto units. They found that unlike in the EU ETS, the major determinant of domestic emission prices in the NZ ETS was imported units rather than market fundamentals such as energy prices, weather conditions and economic conditions.
[17] Ministry for the Environment (2016) includes data before mid-2010 from Point Carbon. OM Financial also provided some data for this period but there were few trades.
[18] This price divergence created an arbitrage opportunity. Those allocated NZUs could bank them and surrender cheap Kyoto units instead. This was a particularly large opportunity for foresters who could discharge their entire emissions liability using Kyoto units and then reregister and claim NZUs for recent sequestration. In 2014, the government passed legislation to prohibit post-1989 forestry participants from using Kyoto units to clear NZ ETS liabilities when deregistering from the system; this was done to prevent this re-registration arbitrage.

6.2 Patterns of unit surrender

The New Zealand ETS was designed to be fully linked to Kyoto market. Initially this led participants to surrender the cheapest units – NZUs. When prices roughly equalised, participants were indifferent about the type of units they surrendered; they used similar amounts of four types of units. As soon as it became clear that NZUs could be banked while international units had a limited life, participants surrendered only international units. The mix of ERUs (from industrialised countries, predominantly in Eastern Europe) and CERs (from developing countries) may largely reflect availability; prices were similar.

Figure 2: Types of units surrendered in the New Zealand ETS



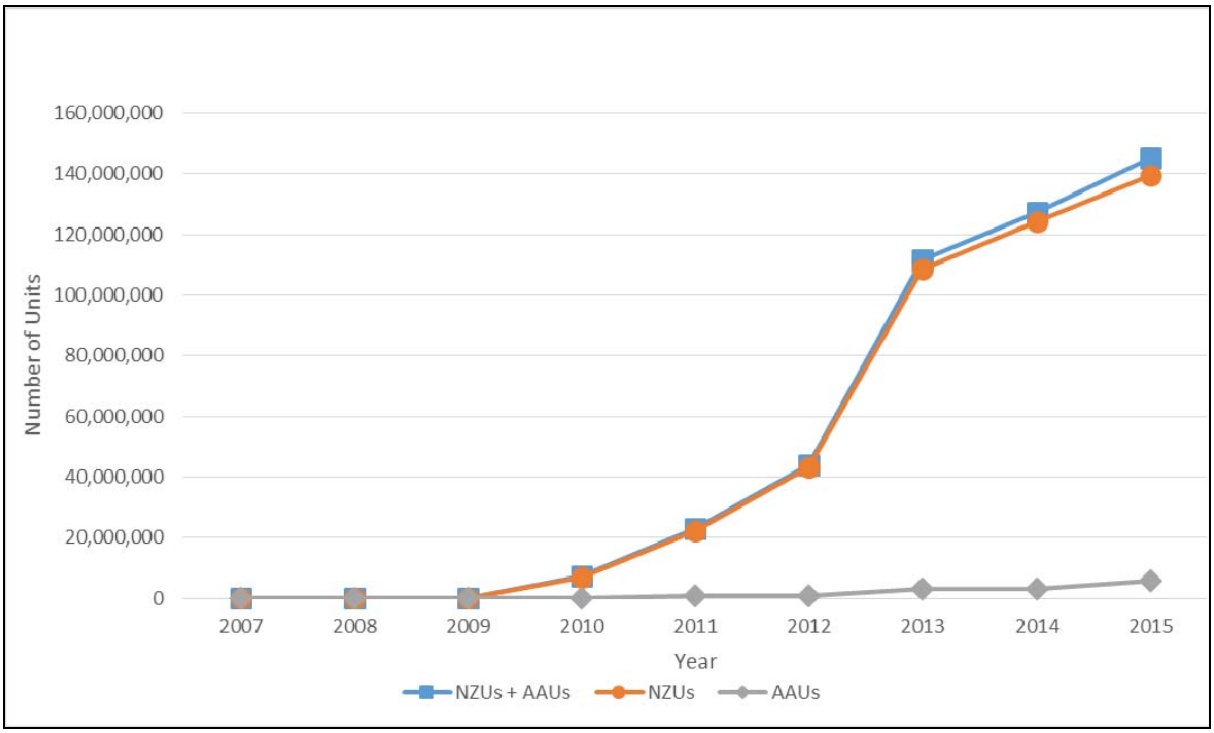
From 2016, only NZUs can be surrendered, but New Zealand will need to find a new source of international mitigation that it can fund in order to meet international commitments. This could be achieved within or outside the ETS. ERUs come from arrangements that are unlikely to be repeated – full linkage with countries (e.g. Ukraine and Russia) with emissions caps/targets that are well above business as usual; CERs come from developing countries. While New Zealand is unlikely to accept these particular credits again, it may find another way to fund mitigation in developing countries and take credit for some of that mitigation.

6.3 The rise of the bank

There have been three basic motivations for banking units. First, foresters (and other companies) who know they will face liabilities in future can bank units to manage price risk.

Second, those who believe that the emissions price will rise will bank units. Both of these motivations will be relevant for the ETS in the future. Third, the ability to surrender cheap international units while NZUs were still allocated to participants (both for forestry removals and free allocation to emissions-intensive trade-exposed industries) led to massive banking of NZUs – this was a specific feature of one period of the NZ ETS. Essentially the government allocated a large volume of units at very low price; the bank is currently sufficient to cover more than three years of gross emissions for the ETS sectors (without the one-for-two scheme).

Figure 3: Estimated private bank stockpile over time[19]



6.4 New Zealand's emissions pathway and Kyoto net position

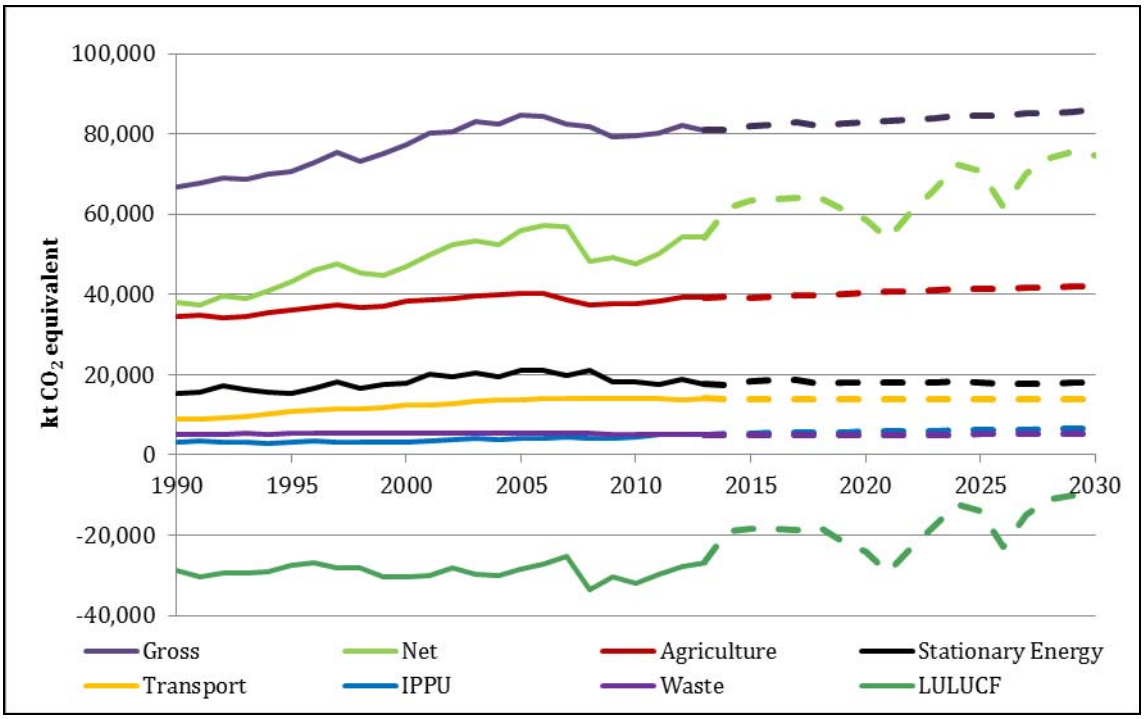
It can be difficult to isolate the emissions impact of any ETS from other emission drivers, such as changes in international energy and commodity prices and economic activity. If there has been an effect however, it has been small. Manley (2016) estimates that the ETS had a small positive impact on afforestation, with the effect limited primarily by the short period of high prices. In their 2016 evaluation of the NZ ETS, government officials found no evidence that the NZ ETS has contributed significantly to domestic mitigation outside of the forestry sector (Ministry for the Environment 2016).[20] This is consistent with stated business intentions in the stationary energy, industrial process and transport sectors in 2010 before they entered the system but when the

[19] For details on estimation of these figures see Kerr and Ormsby (2016). Our estimates for 2014 are confirmed by Ministry for the Environment (2015a).
[20] Results of earlier surveys of business responses to the NZ ETS were reported by Numan-Parsons et al. (2011); Mundaca and Richter (2013); Richter and Mundaca (2013); Statistics New Zealand (2013); and Richter and Chambers (2014).

few trades that were occurring were at prices of around $20. Numan-Parsons et al. (2011) reported that "the majority of firms surveyed are intending to pay emissions prices rather than seek to reduce their emissions".

The government's international emissions reporting reflects the low impact. In 2015, the New Zealand government estimated that its suite of climate change mitigation measures in the stationary energy and transport sectors had reduced cumulative emissions over 2007–2013 by 681 kt CO_2eq, 0.3 percent, and with current measures did not project significant reductions relative to business as usual. Actual and projected emission trends through 2030 are reported in Figure 4; these projections clearly run counter to the government's 2030 INDC of an 11 percent reduction below 1990 levels unless that contribution is largely achieved through international mitigation.

Figure 4: New Zealand's actual and projected emissions 1990–2030 under the UNFCCC



Source: Ministry for the Environment (2015d).

The NZ ETS did help the government achieve New Zealand's target under the first Kyoto commitment period of 2008–2012. Because few units were freely allocated relative to units surrendered, participants purchased overseas units and surrendered them; the government then used these to comply with the Kyoto Protocol. New Zealand net emissions could thereby exceed the 1990 emissions level target. While the ETS was being developed, from 2005 through 2008, the government was projecting a Kyoto deficit; by March 2009 their projection had moved into surplus. By the conclusion of the true-up for the first commitment period, New Zealand's net emissions over the first commitment period, 2008–2012, were 301.2 Mt CO_2eq using Kyoto accounting rules. This represented an 8.4 Mt CO_2eq surplus relative to the period budget based

on 1990 emissions. Domestic forestry removals contributed 71.6 Mt CO_2eq toward creation of this surplus; these forests will generate emissions when they are harvested. Because of the import of Kyoto units, the government held a surplus of 128.2 million units. The government plans to apply that surplus to help meet its target for the period 2013–2020 (Ministry for the Environment 2015b).

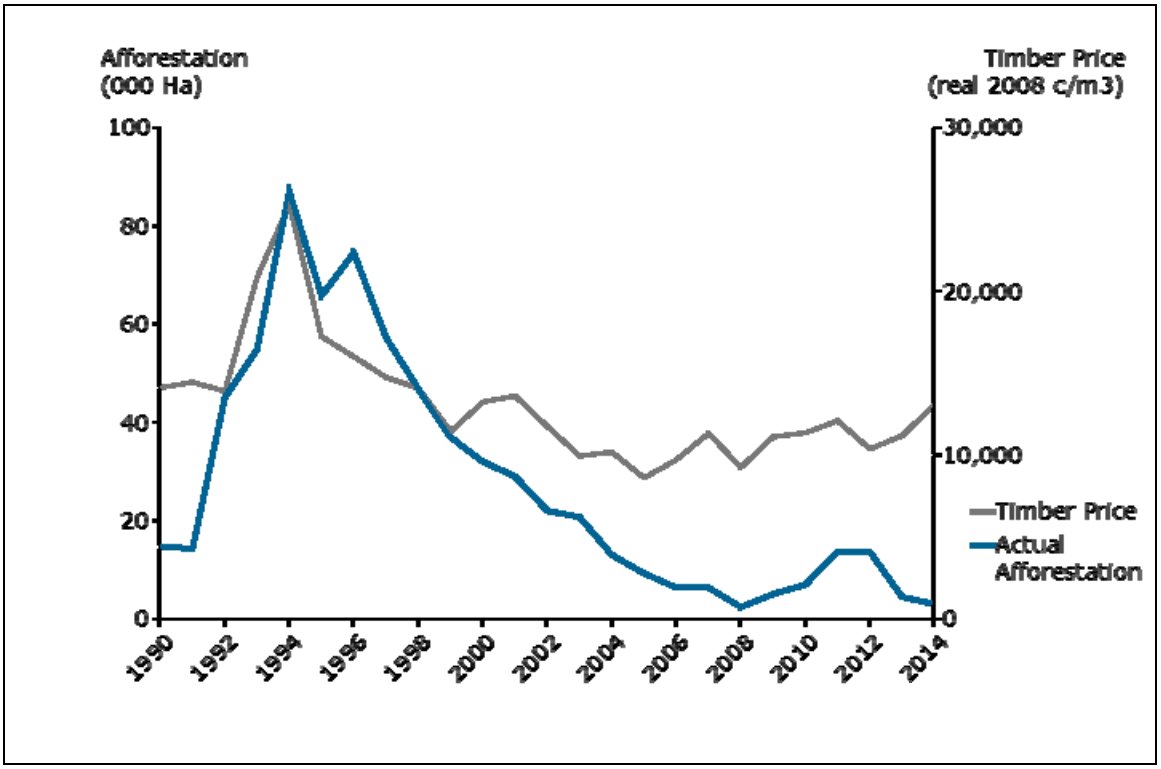
6.5 Forestry sector responses

The forestry sector has been in the ETS the longest and, at initial ETS prices, faced a high incentive to change behaviour. This is the sector therefore in which we are mostly likely to observe responses to ETS. We show some evidence around forestry sector behaviour as an illustration of responses, and non-responses to ETS so far.[21]

6.5.1 Afforestation (non) responses

Afforestation was projected by three separate sources[22] to rise by around 20,000 hectares per year with a stable emissions price of $25. Interviews in 2010 suggested that uncertainty about policy and prices was inhibiting forestry investment[23] and the collapse in emissions prices from mid-2011 bore out forestry investors' fears.

Figure 5: Timber prices and afforestation



Source: Ministry for Primary Industries (2016); Ministry for the Environment (2015c)

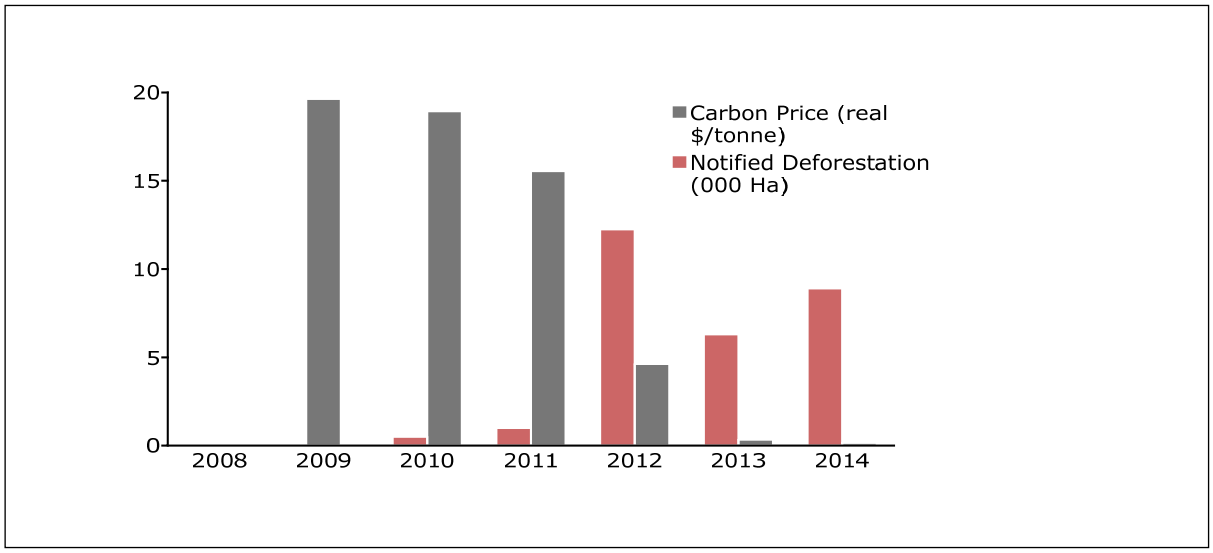
[21] For more detail see Kerr, Carver, and Dawson (2016).
[22] Manley and Maclaren (2009); Kerr et al. (2012) and Adams and Turner (2012).
[23] Karpas and Kerr (2011).

Low afforestation since 2008 has been consistent with timber prices which have been low relative to the 1990s. The ETS has not obviously raised afforestation relative to the baseline. Some afforestation in 2011 and 2012 may have been a response to the high ETS price during that period and the Afforestation Grant Scheme. From 2008 to 2013, over 12,000 hectares was planted with AGS funding[24] which offered landowners similar effective emissions prices to the ETS but with greater certainty around returns on investment. Recent rises in emissions prices may revive interest in forestry – if uncertainty is perceived to be manageable.

6.5.2 Deforestation responses to ETS

During the period from 2008 to 2014, dairy prices and dairy profitability were rising. This created increasing pressure to convert cleared land (or even young forest) to dairy. At the same time pre-1990 forest was being harvested – however landowners had not necessarily yet decided whether to replant. If landowners do not replant within three years they are required to pay a deforestation liability.

Figure 6: Emissions prices and notified deforestation



Note: Deforestation figures 'extracted' from EPA graph.
Source: Environmental Protection Authority (2015b); OM Financial

In the first years of the ETS, emissions prices were high and almost no deforestation was notified. When emissions prices fell however, rates of deforestation notification soared. Some of this was land already cleared in earlier years and some was new clearing, including some clearing of immature forest. It is not clear that there has been a net reduction in deforestation as a result of the ETS yet – particularly taking into account the boom in deforestation in 2007 in anticipation of the scheme. If the emissions prices had stayed high for longer, they may have led to replanting and increased the barrier to dairy conversions. Now that dairy returns are low,

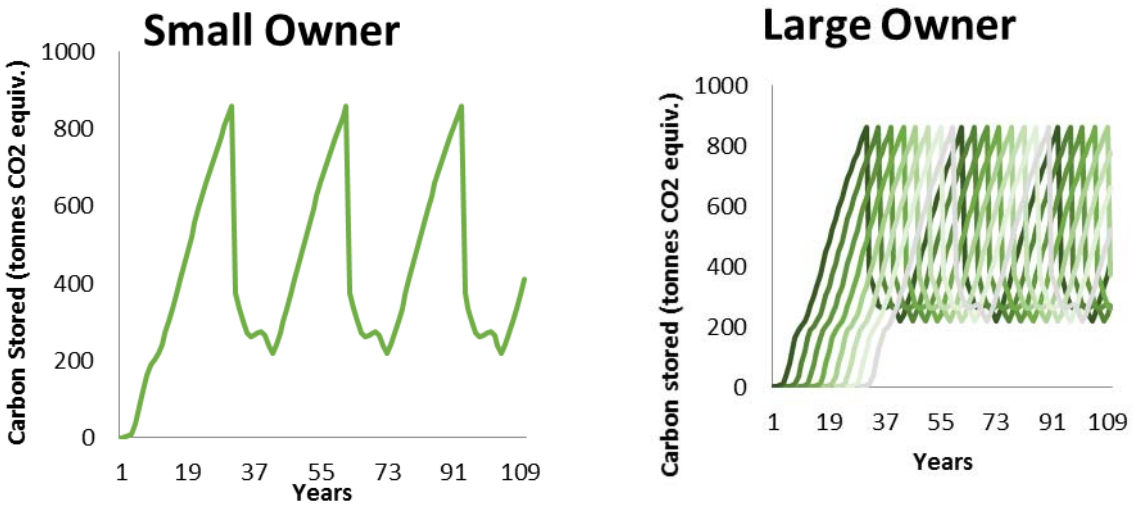
[24] https://www.mpi.govt.nz/funding-and-programmes/forestry/afforestation-grant-scheme/

even modest emissions prices may be sufficient to deter deforestation, though they may not be necessary. It will remain difficult to identify the effect of the ETS itself.

6.5.3 Participation and windfall gains in forestry

Many post-1989 foresters who were eligible to receive credits have not participated in the ETS. Of 659,332 hectares of eligible land, only 277,212 hectares are registered (Environmental Protection Authority 2015b). This should not be surprising: because most post-1989 forests were planted before 1998, only large foresters were able to sell credits without risk that prices would be high when they needed to harvest and face liabilities. Large foresters with forests of varied age classes are more likely to be able to repay liabilities on harvest with new credits from sequestration from younger forests. The red line in Figure 7 indicates the level of credits that can be sold from a new forest without later needing to purchase credits to meet liabilities. More sophisticated emissions markets that allow small foresters to sell more credits without exposing themselves to price risk and higher emissions prices, could encourage more small foresters to enter the ETS and benefit from the incentive to extend rotation length.

Figure 7: Foresters who plant several stands of different age classes can safely sell more credits



This observation of low gains to many foresters contrasts with concerns by some international and domestic observers that New Zealand's ETS was providing large windfall gains for foresters (and non-additional credits into the NZ ETS). Non-additionality may be more significant when post-1989 forests are harvested and replanted, or when timber prices are higher, but the present value of non-additional risk-free credits, valued at the time the ETS began, is likely to be low overall. Some large foresters have benefited and some small foresters benefited by selling units at the high prices early in the scheme and buying back later, but these latter gains were speculative gains from potentially risky choices.

7 Lessons learned from the NZ ETS

From an examination of the last decade of emissions trading policy development in New Zealand, a number of observations emerge that offer insights into many of the design challenges facing NZ ETS policy makers today.

7.1 The lasting influence of policy precedents

The government's 2002 sectoral policies are still echoed in the NZ ETS design, by both replication and differentiation. Features that were carried into the 2008 design included exposing the domestic market to the international emissions price, applying an upstream point of obligation in the energy sector, reducing the system cost to emissions-intensive, trade-exposed industrial producers (through free allocation rather than NGAs), providing an initial level of free allocation to pre-1990 forest owners set at 21 Mt CO_2eq (the level of the previous deforestation cap), and having the government retain both credits and liabilities for post-1989 forests whose owners do not opt into the NZ ETS. The two NGAs in force were honoured under the NZ ETS. The Permanent Forest Sink Initiative was retained, serving as another source of unit supply in the NZ ETS.

Differentiated features that were presented initially as a relative advantage of the NZ ETS included covering all sectors and gases by a common measure (addressing equity concerns raised by stakeholders under the 2002 policy) and enabling domestic and international emissions trading (more effectively supporting least-cost compliance with Kyoto obligations). Allowing the international market to set the domestic price directly saved officials from having to select a domestic emission price that approximated the international price (a potentially complex task since there was no single "international price" and prices would be expected to fluctuate). While in its initial presentation of the NZ ETS the government signalled the possibility of future auctioning, it opted not to auction units, making the international market the primary source of unit supply and avoiding the perception that the NZ ETS would be generating government revenue similarly to a tax. Under the Climate Change Response Act 2002, the government always had the power to sell units. An explicit government power to auction units under the NZ ETS was introduced in the 2012 amendments but as of early 2016, has not been used.

In the 2009 amendments, the government capped the emission price at NZ$25 per tonne (the same level as under the carbon tax) and deferred unit obligations for biological emissions from agriculture until 2015 (citing the same criteria around the absence of mitigation options used to exclude that sector from the carbon tax). In the 2012 amendments, the government deferred biological emissions from agriculture indefinitely. The system continues to reflect the 2002

principle that in the absence of mitigation options, the agriculture sector should fund research on mitigation rather than paying for its biological emissions.

Sectors' expectations that were set in 2002 regarding their exposure to mitigation responsibility and cost under government mitigation policy continue to shape the NZ ETS today. It is important to be aware of those expectations and continue to test their relevance as the broader context evolves.

7.2 The importance of defining the system's purpose

Since it ratified the Kyoto Protocol, New Zealand has managed its international obligations to reduce emissions as "responsibility targets" which can be met through both domestic mitigation and investment in overseas mitigation through the carbon market. The NZ ETS was conceived as an instrument that would expose the domestic economy to the international emission price and allow market participants to make economically efficient decisions on whether to reduce their own emissions or invest in mitigation elsewhere. It was also intended to devolve the purchasing of overseas units for Kyoto compliance from the government to market participants. It was not designed to constrain domestic emissions. The reasoning was that as long as New Zealand's production was highly efficient under an emission price, then we could allow our domestic emissions to rise (and in the case of harvesting, to fluctuate cyclically) while still contributing to net global mitigation through the carbon market. If New Zealand simply cut production to reduce emissions, then the equivalent demand would be met by less efficient and uncapped producers, raising global emissions overall (referred to as leakage).

From this viewpoint, in 2007 the government initially defined the purpose of the NZ ETS as follows (Ministry for the Environment and The Treasury 2007):

> "…to support and encourage global efforts to reduce GHG emissions by:
>
> - reducing New Zealand's net emissions below business-as-usual levels; and
> - complying with our international obligations, including our Kyoto Protocol obligations;
>
> while maintaining economic flexibility, equity, and environmental integrity at least cost in the long term."

The 2008 legislation provided for a simplified purpose with dual outcomes: a greenhouse gas emissions trading scheme that "supports and encourages global efforts to reduce greenhouse gas emissions by assisting New Zealand to meet its international obligations under the Convention and the Protocol, and by reducing New Zealand's net emissions below business-as-usual levels." This purpose was intended to ensure the system could endure even in the absence of future Kyoto commitment periods.

Although the legislative purpose does not favour one outcome over the other or refer to least-cost compliance, prioritising least-cost compliance with international obligations over domestic emission reductions has remained firmly embedded in the policy framework of the NZ ETS. This

underpinned repeated decisions from 2008 through mid-2015 to place no quantity limits on the use of overseas Kyoto units for NZ ETS compliance, allowing domestic emission prices to fall below NZ$1 per tonne for a period of time. In March 2012, Cabinet confirmed its three objectives for the NZ ETS were to "help New Zealand to deliver its 'fair share' of international action to reduce emissions, including meeting any international obligations; deliver emission reductions in the most cost effective manner; and support efforts to maximise the long term economic resilience of the New Zealand economy at least cost" (New Zealand Cabinet 2012). The legislative purpose of the NZ ETS was not amended to reflect this restatement of the system's objectives, but they did influence Cabinet decisions throughout the process of amendment.

When officials evaluated the NZ ETS in preparation for the 2016 review, they found no evidence that sectors other than forestry had reduced their own emissions in response to the NZ ETS over the period 2008–2012. Participants primarily met their obligations by purchasing Kyoto units at very low cost. From a strict interpretation of the legislation, officials were still able to conclude that the system had fulfilled its stated purpose. It is interesting that in their intervention logic for the 2016 evaluation, officials revived the desired outcome from 2007 to "maintain environmental integrity, equity and economic efficiency, at least cost, in the long run" (Ministry for the Environment 2016).

Since the NZ ETS was developed, the framing of global mitigation objectives has shifted to emphasise the need to transition to net zero emissions of long-lived GHGs in order to achieve the two-degree-temperature-reduction goal. This may have implications for the future design and operation of the NZ ETS in the context of supporting domestic decarbonisation.

7.3 The significant impact of policy uncertainty

Participants in the NZ ETS have been heavily impacted by policy uncertainty driven by both international and domestic factors. Slow progress in the international climate change negotiations contributed to uncertainty about long-term global mitigation ambition and the ongoing use of carbon market mechanisms for achieving future targets. The legislation for the NZ ETS was passed without cross-party consensus within weeks of an election, and it spent much of its 'childhood' under review and amendment driven by rushed policy-making processes that pushed through changes despite opposition.

Both practical experience and research suggest that policy volatility can be harder to manage – and more important for long-term investment – than price volatility (for example, see Gilbert et al. [2014]). Policy-driven uncertainty about future emission prices reduces mitigation investment.

7.4 The challenges of linking to international markets

The early experience of New Zealand and other countries with linking ETSs has identified some of the potential pitfalls. Linking can introduce uncertainty over unit supply and price management, expose linked schemes to political uncertainty and environmental integrity risks across jurisdictions, and raise sovereignty concerns over future policy making. Linking also serves as a vehicle for wealth transfers to other countries, which can be politically unpopular. Experience suggests that future linking should be conducted within constraints for managing risks to unit supply, prices and environmental integrity and it may be preferable to reserve linking for systems that are fully established and functioning effectively.

7.5 The value of simplicity and transparency

On the basis of internal assessment and interviews with participants during their 2016 evaluation, officials concluded that the NZ ETS operational systems were generally functioning well. Participants' experiences were somewhat variable; among the more prominent concerns reported were high initial costs for NZ ETS administration, the amount of paperwork required and unclear information from the government (Ministry for the Environment 2016). The simplicity of the system (outside of forestry) has made it easy to operate and participate in. The combination of simplicity and public access to information also has also made the system relatively transparent. The government publicly releases the following information held in the New Zealand Emission Unit Register: monthly data on aggregated transactions, annual data on surrenders and emissions, a list of participants and their holdings, a list of recipients of free allocation, the rate of free allocation for their activity and aggregate free allocation by year, data on removal units, and data on international units coming into (and out of) the register. The government also releases regular forecasts of New Zealand's net position under international agreements, and annual inventory updates on New Zealand's gross and net emissions and associated activity data. Emission price information is available in real time from brokers.

Despite all this useful information, it is still difficult for officials, NZ ETS participants or other stakeholders to understand and forecast demand and supply in the NZ ETS. This makes it impossible to predict the emissions price based on fundamentals. This difficulty has been driven partly by the absence of a cap and changing rules over access to international units, and partly because the relationship between emissions under the ETS and total New Zealand emissions is unclear, especially since the government's 2012 decision to remove the requirement that every NZU be backed by a Kyoto unit held in a Crown account. Now that New Zealand is operating a domestic-only system, this uncertainty drives the emission price which can only be determined by market expectations about future policy stringency. That makes the domestic emission price

a useful visible measure of market expectations about politics but tells nothing about the difficulty or otherwise of mitigation and has limited value as a long-term price signal.

One other frequently misunderstood implication of the current separation between New Zealand's target and the NZ ETS is that if individuals, environmental groups or companies cancel an NZU for altruistic or social responsibility reasons, they may believe that by doing so they are reducing global emissions but this is not likely to be the case under current conditions. As long as New Zealand does not have a clearly defined ETS cap, cancellation may have no impact even on New Zealand emissions. Without a clear link between the ETS and New Zealand's international compliance, cancellation of NZUs is likely to have no impact on how the government complies with its international target and hence no impact on global emissions. NZUs are a liability to the government, not an asset they can use for international compliance.

7.6 Linkages between the ETS and government's net position accounting

The government's approach to accounting for its liabilities and assets associated with its obligations under international climate change agreements and the NZ ETS have implications for the Crown accounts which could influence policy decisions. For the first commitment period of the Kyoto Protocol (2008–2012), the government recorded a net Kyoto position which reflected the Crown's holdings of AAUs and other Kyoto units in relation to its net emissions liabilities. A net surplus or deficit was valued based on the current international price of emissions under the current exchange rate, and recorded in the Crown accounts as the Kyoto financial position. The government also recorded a contingent liability for future reversals of forestry removals for which liabilities were not assumed by sector participants. For the period post-2012, the government assumed a non-binding commitment under the UNFCCC which did not impose a fiscal asset or liability on the Crown; however, it continued to carry (and to value as an asset) a Kyoto surplus from the first period (Ministry for the Environment 2015a). Under the NZ ETS, the government has applied a separate methodology to account for its assets and liabilities associated with issuing and receiving NZUs, and NZUs have been valued differently to international units (Audit New Zealand 2011).

Going forward it would be useful to clarify how the government will value its commitment for the period 2021–2030 under the Paris Agreement, and the surplus Kyoto units which the government is carrying forward and intending to use in the future. It could be useful to consider how to most appropriately align methods for accounting for the government's net position under the NZ ETS and its international obligations.

8 Conclusion

The NZ ETS design was calibrated to operate in a world which no longer exists, one where the system could be nested within a global cap on emissions and linked to other sources of unit supply managed under an international framework for ensuring environmental integrity. Fundamentally, the NZ ETS offers a sound foundation for supporting New Zealand's contribution to global mitigation effort. However, for the potential environmental, economic and social benefits of the NZ ETS to be realised, changes are needed. These relate not just to its architecture but also to its underlying objectives and its relationship with other policies and the evolving international carbon market. Predictable processes for change that help to provide longer-term policy certainty will support mitigation investment in alignment with the transition toward net zero emissions of long-lived GHGs.

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