International emissions trading schemes and forestry

A Literature Review
Commissioned by Beef + Lamb New Zealand

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International Emissions Trading Schemes and the Use of Forestry Offsets

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Executive Summary

Emissions pricing, including emissions trading scheme (ETS) policies, is widely used and is generally viewed as an effective means of reducing emissions and meeting climate goals. Internationally the implementation and design of ETS policies are highly diverse, with each ETS policy designed to best consider domestic circumstances.

The New Zealand ETS is unique in including the entire forestry sector as a category of the ETS. This means that the sector can be rewarded for emissions removals if it enters trees into the ETS but also faces liabilities if the land is deforested. All other counties that include forestry offsets in an ETS do so on a project and not a sector basis. Including forestry in the New Zealand ETS enables the unlimited use of forestry sequestration credits by ETS participants to theoretically offset their entire emissions liability.

The use of forestry offsets varies significantly in ETS policies globally. Most ETS policies enact strict quantitative limits and/or put in place qualitative requirements to ensure that offsets deliver co-benefits.

Along with New Zealand Kazakhstan appears to be the only other ETS jurisdiction that allows ETS participants to offset 100% of their liabilities. While this offsetting mechanism had not been used in Kazakhstan as of 2015, it is unclear how widely the forestry offsetting option is used at the time of writing. It is also worth noting that Kazakhstan has not included forestry in their ETS, but rather has enabled offsetting on a project basis.

Some ETS policies, such as those in operation in the American states of California, Oregon, and RGGI member states specifically outline requirements for forestry offsetting projects that are not directly related to climate policy. These requirements range from demanding native trees to foster biodiversity to promoting public health, and environmental and economic benefits for environmental justice communities.

While New Zealand regulators may wish to tackle non-climate related policies through bespoke policies and not the ETS, this is currently not a policy choice but rather a result of the operational limitations of the ETS. There is currently no regulatory means for New Zealand regulators to restrict the use of forestry offsets by ETS participants.

The combination of increasingly high NZU prices and the unique inclusion of the forestry sector in the New Zealand ETS has resulted in policy decisions that are mentioned in some reports as a theoretical long-term issue, becoming a present-day reality in New Zealand. However, structural limitations within the New Zealand ETS are preventing decisions to address such concerns from being made. ICAP notes in a recent report that:

> *"Incentivizing removals in an appropriate manner poses questions for the long- term design and functioning of ETSs. Removals have already been included in some ETSs through offset credits from afforestation and reforestation projects. The coming decades will see the development and scaling up of a wider variety of negative emissions technologies (NETs), including direct air capture and storage (DACS). To protect the integrity of the ETS, any removal methodology will need to ensure that carbon will be permanently stored and negative impacts on biodiversity and land use have to be avoided. And finally, NETs must not jeopardize the decarbonization of the global economy, especially through ETSs."*[1]

The manner in which the entire forestry sector has been uniquely included in the ETS means New Zealand regulators are currently unable to make policy changes designed to address

[1] https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-2022-icap-status-report

political concerns on the appropriateness of the current (and expected future) impacts forestry offsets are having on outcomes such as biodiversity, land use and gross GHG reduction incentives in New Zealand.

Recent structural reforms made to the New Zealand ETS mean it is reasonable to assume that NZU prices will continue to rise in the long-term. Relative to international ETS policies that have qualitative and quantitative limits on the use of offsets in place, New Zealand regulators have little to no ability to control if increasing NZU prices results in reductions in gross GHG or increased use of afforestation offsets.

The impacts of increased ETS-driven afforestation are diverse, localized, complex and sometimes controversial. New Zealand regulators and the New Zealand government may wish to continue allowing the use of forestry offsets by ETS participants with no quantitative and few qualitative limits in place. However, if there is a desire to put limits on the use of forestry offsets within the ETS, the unique manner in which the entire forestry sector has been included in the New Zealand ETS means that significant reforms will be needed.

Such significant reforms are not required in other ETS policies, which if including forestry offsets, do so on a project and not a sector basis. While it is not clear which approach is best overall, there are multiple examples of ETS policies internationally that change forestry offsetting policy regularly with relative ease.

If New Zealand policymakers wish to put qualitative or quantitative limits on the use of ETS forestry offsets in place, there are no global examples to follow. Significant legislative changes will be required and long-term social, environmental, economic and cultural impacts will need to be considered. These considerations mean that if regulators decide that forestry offset limits are desired, there will be a significant amount of time required to develop the policy. To account for this significant regulatory lag, it may be best to proactively give New Zealand ETS policymakers the operational tools required to enact qualitative and quantitative limits before deciding exactly how such limits will be used.

Introduction

Forests and the forestry industry provide diverse and valuable social, economic, environmental and cultural benefits. The United Nations Environment Programme (UNEP) summarises the role of forests as:

> *"Forests cover one third of the earth's land mass, performing vital functions and supporting the livelihoods of 1.6 billion people…*
>
> *…It's clear that forests play an important role in Climate action, which are all the efforts done to mitigate the frequency and intensity of extreme weather events such as heat waves, droughts, floods and tropical cyclones, aggravating water management problems, reducing agricultural production and food security, increasing health risks, damaging critical infrastructure and interrupting the provision of basic services such water and sanitation, education, energy and transport.*
>
> *Forests also provide non-carbon services that are essential for human societies to thrive: from its role in sustaining livelihoods to providing water and food security, and regulating global rainfall patterns."*[2]

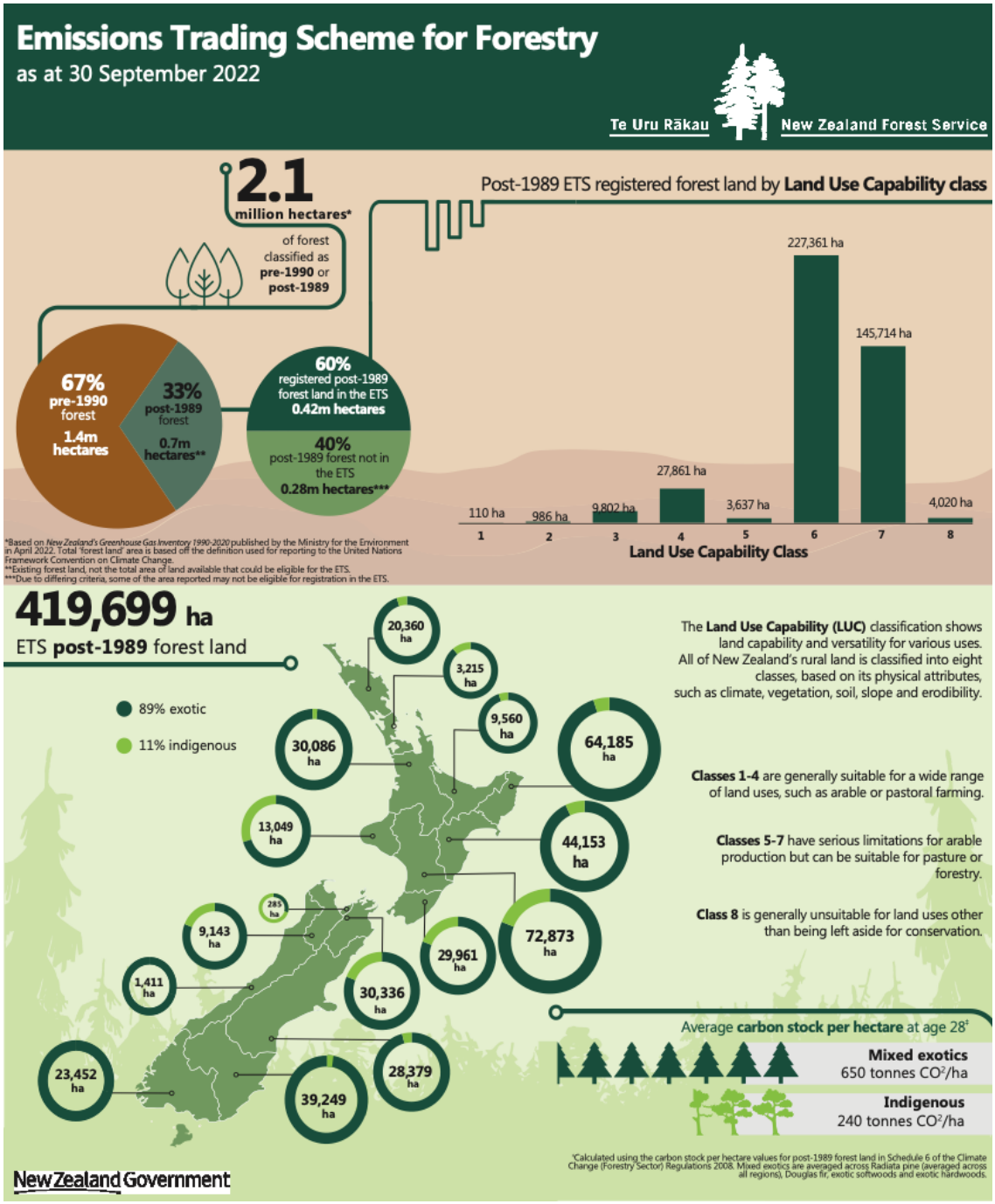
However, not all forests and forestry practices are equal. 'Forestry' and 'Forests' are broad terms with numerous definitions. Forests can include various plant and tree species, can be planted, can generate naturally, can be managed, can be unmanaged, can be harvested or permanent, can be viewed as a natural resource, can be viewed as a conservation asset, can be dominated by one species or can be heterogeneous. How the different types of forestry are defined is important when it comes to policy, with some policies explicitly incentivising some types of forestry over others. The value of certain types of forest and the desirability of specific forestry practices are deeply subjective, depending on how specific social, economic, environmental and cultural outcomes are valued.

Forestry has a long history of playing an important role in the rural landscape of New Zealand. While native forestry makes up the most significant proportion of forestry in New Zealand, most of the production forestry depends on exotic trees (mainly *pinus radiata*). The distinction between permanent forestry which is mainly native and managed as a conservation asset, and production forestry which is mainly exotic and generally planted for the purpose of harvesting timber is a key distinction in the New Zealand context. The New Zealand Forest Owners Association (FAO) states:

> *"Radiata seed had been imported from California in the 1840s to grow shelter for farms. Because the species had been shown to grow faster here than anywhere else in the world, it became the tree of choice for forest plantings.*
>
> *Mass plantings in the 1920s and 1930s, and again in the 1960s, created a robust exotic plantation forestry industry that was soon able to supply all New Zealand's domestic timber needs and secure the future of the remaining native forest…*
> *…Today, forests cover 31 per cent of New Zealand's land surface — 24 per cent is indigenous (native) forest and 7 per cent plantations of mainly exotic species."*[3]

[2] https://www.unep.org/explore-topics/forests/about-forests#:~:text=Forests%20are%20home%20to%20more,of%20the%20world's%20largest%20cities.
[3] https://www.nzfoa.org.nz/plantation-forestry/plantation-forestry-overview

The New Zealand Ministry for Primary Industries (MPI) produced the below infographic, which shows the scale of the forestry industry in New Zealand, the role of the ETS and the concentration of forestry in specific regional communities as of September 2022.[4]

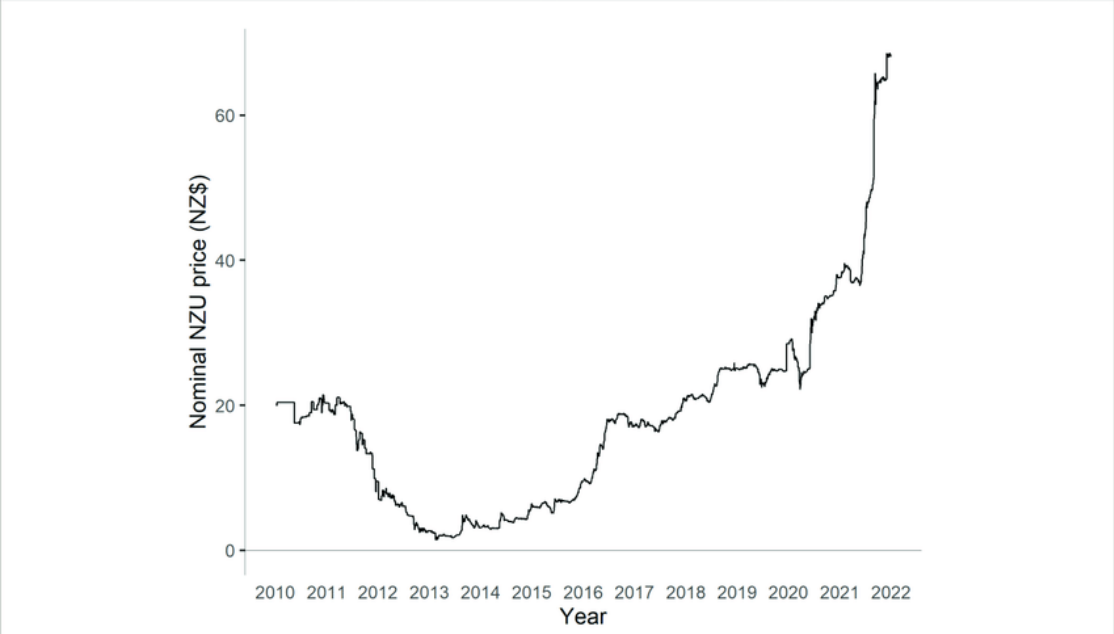


The Emissions Trading Scheme (ETS) is a key policy lever used in New Zealand to meet emissions reduction targets, incentivise increased rates of afforestation and to incentivise reduced greenhouse gas emissions. Recent legislative changes made to the New Zealand ETS, such as the 2019 Climate Change Response (Zero Carbon) Amendment Act, and the 2020 Climate Change Response (Emissions Trading Reform) Amendment Act, have led to

[4] https://www.mpi.govt.nz/dmsdocument/45232-Emissions-Trading-Scheme-for-Forestry-land-statistics-

an increase in the value of units within the ETS (called New Zealand Units, but also referred to as NZUs or carbon credits).

These legislative changes included putting a cap on the ETS, setting long-term targets and reducing the extent of price control settings designed to lower the NZU price. The recent increase in the value of NZUs is shown in the below figure by *Carver et al.*[5]

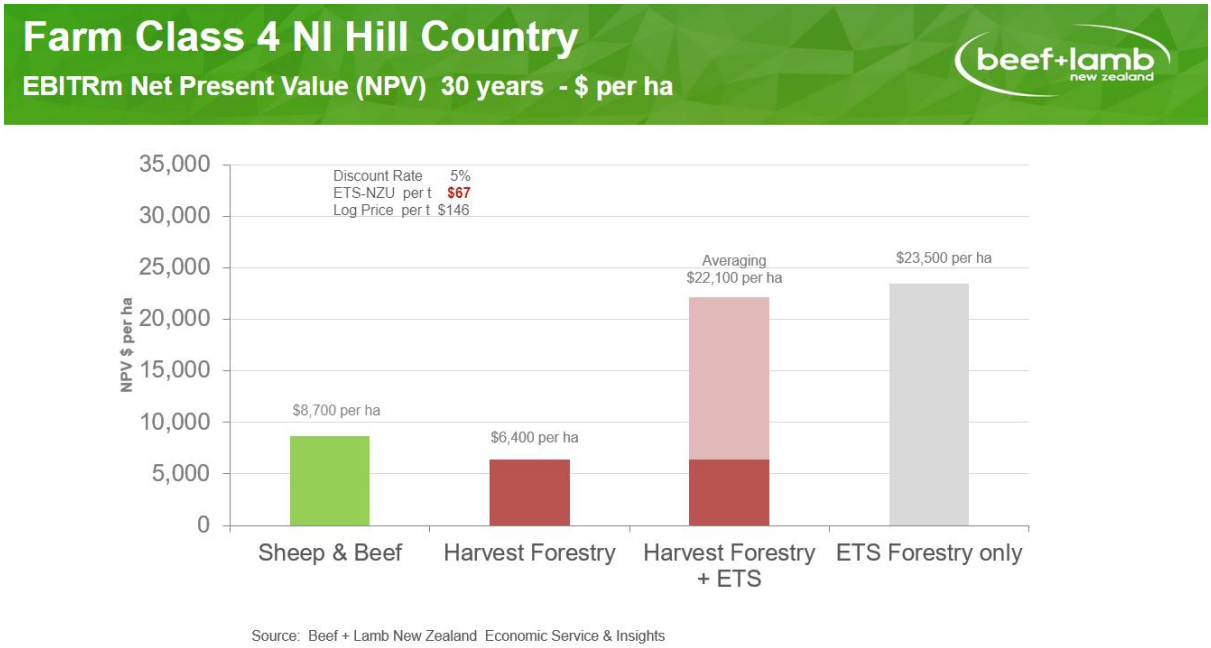


The increasing economic value of NZUs which can be accrued through forestry practices is leading to increased afforestation. This was noted in an article by Carver et al:

> *"As a significant new development, post-1989 forest registration requests from new participants and from those wishing to add land from existing registrations have increased dramatically since mid-2021. From the start of 2018 through mid-2021, when emissions prices ranged from approximately NZ$20-40 per ton, an average of 7,000 hectares per quarter were submitted for registration. In the second quarter of 2022, when emissions prices were over NZ$70 per ton, 80,000 hectares were submitted (MPI, 2022c)."*[6]

Much of this afforestation is taking place on land previously used for sheep and beef farming and this afforestation is concentrated in specific rural communities. The recent rise in the NZU price has resulted in the practice of planting exotic trees and entering these trees in the ETS becoming much more profitable than sheep and beef farming. Before the creation of the ETS in New Zealand, sheep and beef farming and forestry were two sectors with a long history of operating in an open market with few government distortions and had therefore reached an approximate market equilibrium as land uses. This is shown in the below graph produced by the Beef+Lamb New Zealand Economic service.[7] The graph also shows that the economic value of carbon credits vastly exceeds the economic value of the harvested products from forestry, demonstrating the economic influence of government issued NZUs.

[5] https://www.researchgate.net/publication/363804846_Including_forestry_in_an_emissions_trading_scheme_Lessons_from_New_Zealand
[6] https://www.frontiersin.org/articles/10.3389/ffgc.2022.956196/full
[7] https://www.50shadesofgreen.co.nz/wp-content/uploads/2022/02/FinalForestryReport12022022.pdf-edited.pdf



The recent rate of land use change from farmland to forestry has concerned some stakeholders and members of affected rural communities. A February 2022 Green Paper carried out by Yule Alexander Limited and commissioned by fifteen local councils, Local Government New Zealand (LGNZ) and Beef + Lamb New Zealand (B+LNZ) summarised the issue, stating:

> *"Undoubtedly New Zealand needs to use forestry (both native and indigenous) as a fundamental part of our climate change mitigation strategy. Equally, New Zealand farmers are some of the most efficient in the world and can usually export high-quality food with a lower carbon footprint than that destination country's domestic product.*
>
> ***If forestry/carbon is not considered in a strategic sense there is a real risk that short-term land-use decisions will be made to the detriment of long-term land-use flexibility…."***[8]

The costs and benefits of forestry policy settings were also explored in an article by *Carver et. al.* which stated:

> *"The system's recent success in accelerating afforestation is also raising significant policy challenges for the future. The potential for large-scale exotic afforestation – and more permanent exotic forests – has raised significant concerns among a range of stakeholders. Some have criticized the environmental impacts (e.g., Salmond, 2021; Forest and Bird, 2022) and some the potential displacement of productive agricultural land uses (BDO Gisborne Limited, 2021; Orme and Orme, 2021). However, other stakeholders have emphasized exotic forests deliver faster sequestration to help with climate change targets and exotic plantation forests help supply the bioeconomy (e.g., NZFOA, 2022; WPMA, 2022). Some have expressed concerns that while landowners who register post- 1989 afforestation have the option to exit the NZ ETS, pay back the units, and deforest, high emissions prices in the*

[8] https://www.50shadesofgreen.co.nz/wp-content/uploads/2022/02/FinalForestryReport12022022.pdf-edited.pdf

future could make such land-use change uneconomic and limit future land-use flexibility (Forestry Reference Group, 2018).”[9]

This literature review explores the interaction between forestry and carbon pricing schemes globally. It focuses on how forests are used within these policies to support financially recognising carbon removals occurring from forestry , and what quantitative and qualitative limits have been put in place on their use.

It does not go into exhaustive detail on all the many ways that forests are considered as part of climate change policy but does provide some key insights on the opportunities and risks that forest offsets can provide if included in an ETS.

This literature review has been commissioned by Beef + Lamb New Zealand. After providing a brief background on the New Zealand Emissions Trading Scheme (ETS) this review compares the forestry regime within the New Zealand ETS to other carbon pricing policies internationally.

The potential risks posed by the limitations of the GWP_{100} metric and the fungibility of short-lived GHG, long-lived GHG and sequestration in an ETS are explored in Appendix One.

The intentional and unintentional limitations of ETS policies are explored in Appendix Two.

[9] https://www.researchgate.net/publication/363804846_Including_forestry_in_an_emissions_trading_scheme_Lessons_from_New_Zealand

Background on Emissions Pricing

This section of the literature review details what carbon pricing is, how the different forms of emissions pricing (including an ETS) operate, how sequestration and offsetting can be incorporated in ETS policies and how the inclusion and exclusion of GHG sources and sinks (either intentionally or unintentionally can impact the effectiveness of ETS policies.

What is an Emissions Trading scheme?

Emissions pricing is a widely used means of reducing greenhouse gas emissions (GHG) and an ETS is one form of emissions pricing.

An ETS is a policy framework that places a price on GHG (a negative externality in which there otherwise would not be an financial incentive to reduce). Unlike a simple greenhouse gas emission (GHG) or carbon tax, an ETS does not regulate what the price of carbon will be but sets a limit on the volume of GHG that can be emitted, and a market mechanism is used to determine the price. An ETS is also known as a 'cap and trade' scheme because emitters can trade their allocations once a cap has been put on the number of permitted GHG. Both a carbon tax and an ETS are forms of emissions pricing.

A carbon price and an ETS are both market-based mechanisms that aim to result in GHG being reduced where it is cheapest to do so. While an ETS delivers certainty over emissions, it is more complicated than a simple carbon price.

Under a carbon tax, the price is set by the Government and while best efforts are made to estimate the impact that this price will have on the volume of GHG emitted, this is ultimately unknown. An ETS operates in reverse, with the Government setting the volume of GHG allowed and estimating the impact the cap will have on the price.

In comparing a carbon tax and an ETS pricing mechanism a research note by the International Monetary Fund(IMF) states:

> *"Overall, carbon taxes have significant practical, environmental, and economic advantages (especially for developing countries) due to ease of administration, price certainty which promotes investment, the potential to raise significant revenues, and coverage of broader emissions sources. However, ETSs provide more certainty over emissions levels, can be implemented by environment ministries, and some free permit allocations might garner political support from affected firms (at a fiscal cost)."*[10]

A vital principle of an ETS is allowing participants to trade units and this concept (known as fungibility) is explained in an article by *van der Gaast et al.* [11]

> *"An important rationale for carbon trading is to enable countries or companies with climate commitments to fulfil these cost-effectively. Since GHGs mix evenly in the atmosphere, it does not make any difference for the climate where emission reductions take place. It then makes economic sense to locate emission reductions where investment costs are relatively low. In an ETS, such cost-saving opportunities can be used for trading emission allowances between companies. Each company covered by the ETS has a quota with a maximum amount of allowed emissions per*

10 https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/07/14/Carbon-Taxes-or-Emissions-Trading-Systems-Instrument-Choice-and-Design-519101

[11] Issues regarding the fungibility of GHG and the limitations of the primary metric used to determine relative values of GHG are covered in Appendix One.

year. A company can comply with its quota by investing in emis- sion reduction measures. However, if the costs of doing so are relatively high, it is economically attractive to purchase allowances from other capped companies, for whom remaining below their caps is easier and thus less costly "[12]

Under an ETS it doesn't matter where the GHG reductions come from but just that the decrease occurs to the extent necessary to ensure that the cap is maintained. As consumers in aggregate make choices based on the cost of GHG being passed along, the reductions will generally occur where it is cheapest, with no regard to indirect co-benefits or costs.

Rather than putting in place a market-based policy such as a carbon price or an ETS, Government can instead choose to intervene in markets to deliver emissions reductions directly; examples include subsidising electric vehicles, banning oil exploration or mandating home insulation. Such direct policies may deliver important co-benefits (such as quieter streets, less polluted waterways, and warmer homes) but are generally less efficient than market-based approaches. While experts disagree on the effectiveness of combining a market-based and direct regulatory approach, both approaches can be taken simultaneously.

Participants in an ETS (such as a power generator, steel factory or fuel producer) can choose to either:

1. reduce their GHG in line with their allocation,
2. purchase sufficient units from a fellow ETS participant that has excessive units or
3. purchase units from the Government.

Many pricing mechanisms, including some ETS schemes, also allow participants the additional option of

4. Offsetting GHG emissions.

Offsetting GHG in an ETS

Along with pricing the release of greenhouse gas emissions, A carbon tax and an ETS can also include the financial recognition of carbon sequestration. Carbon sequestration is a process in which carbon is captured from the atmosphere and stored; the most widely known example is forestry, but other methods of carbon sequestration include soil carbon sequestration, ocean fertilization, carbon capture and storage and direct air carbon capture. It is possible to recognise sequestration in both pricing mechanisms, with sequestration receiving a direct subsidy under a carbon tax and sequestration generating GHG units under an ETS. However, incorporating sequestration into an ETS risks creating perverse policy outcomes and the International Carbon Action Partnership (ICAP) notes in a recent report that:

"Incentivizing removals in an appropriate manner poses questions for the long- term design and functioning of ETSs. Removals have already been included in some ETSs through offset credits from afforestation and reforestation projects. The coming decades will see the development and scaling up of a wider variety of negative emissions technologies (NETs), including direct air capture and storage (DACS). To protect the integrity of the ETS, any removal methodology will need to ensure that carbon will be permanently stored and negative impacts on biodiversity and land use

[12] https://www.tandfonline.com/doi/epdf/10.1080/14693062.2016.1242056?needAccess=true&role=button

have to be avoided. And finally, NETs must not jeopardize the decarbonization of the global economy, especially through ETSs."[13]

In 2008 New Zealand legislated for an ETS and the rest of this literature review will primarily focus on ETS (and not carbon tax) policies, both in New Zealand and globally. The New Zealand ETS is unique in including forestry as a mandatory category of the ETS. This inclusion of forestry in the ETS enables the unlimited use of forestry sequestration credits by ETS participants to offset their emissions liability.

Regarding offsets, a paper by ICAP notes that:

> *"Offsets represent emissions reductions and emissions removals resulting from projects undertaken outside the scope of an ETS.*[4] *Offsets are generated by crediting mechanisms, which ensure adherence to specific requirements and issue the units. In some cases, using offsets can allow emissions from sources covered by the ETS to exceed the ETS cap while ensuring aggregate emissions are kept constant. This is because any excess of emissions covered by the ETS are balanced out by reductions generated by offset projects outside of the ETS scope."*[14]

As will be covered in later sections, the academic definition of 'offsetting' used by many sources such as ICAP differs significantly from other commonly used definitions, including widely in New Zealand. This means that under the ICAP definition, forestry offsets in New Zealand are not offsets at all, as the forestry sector is included in the ETS and the ICAP definition limits offsets to sectors outside an ETS. This is only an issue when comparing New Zealand to other schemes, as New Zealand is the only country to include the forestry sector within an ETS.

Intentional and Unintentional limits on the effectiveness of ETS policies

In theory, an ETS should place a price on all activity that results in atmospheric warming and place an incentive on all activity that results in cooling. If properly implemented, such a system would ensure that desired climate goals are met. However, this is not the case for two key reasons; the intended limitations resulting from the need to ensure a socially and economically responsible transition and the unintended limitations resulting from data collection tools. [15]

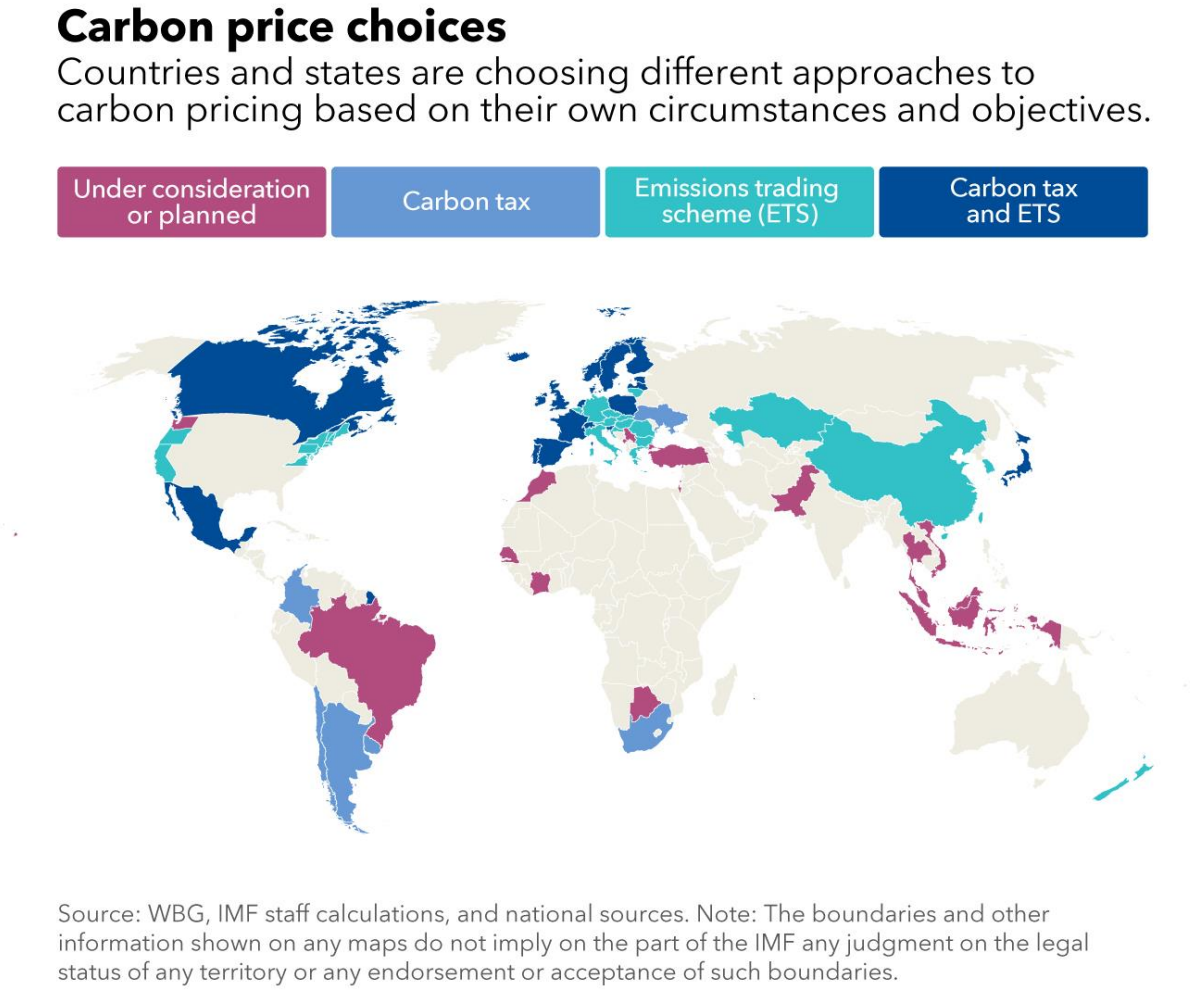
Global Emissions Pricing Policies

This section explores the use of emissions pricing policies, including ETS policies. Offsetting provisions of ETS policies are then compared, including the quantitative and qualitative limits in place for the use of forestry offsets. This section heavily cites work undertaken by ICAP.

Which Countries have Carbon Pricing?

Emissions pricing schemes are increasing in number and coverage worldwide. The ICAP reports that as of 2022 ETS covered about 17% of emissions, a third of the population and 55% of the gross domestic product (GDP) worldwide. The below graph by the IMF shows that in 2022, 46 countries had a carbon tax and/or an ETS in place.[16]

[13] https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-2022-icap-status-report
[14] https://icapcarbonaction.com/en/publications/offset-use-across-emissions-trading-systems
[15] The limitations of ETS policies are further explored in Appendix Two.
[16] https://www.imf.org/en/Blogs/Articles/2022/07/21/blog-more-countries-are-pricing-carbon-but-emissions-are-still-too-cheap



ETS policies are not limited to the nation-state level, with schemes in place also at the regional, provincial and city levels. When comparing the operation of ETS policies, it is essential to note that ETS policies can overlap (such as for Germany) and jurisdictions without an ETS can have similar policies that provide similar incentives for some activities (such as Australia). The various levels of ETS coverage is shown in the below graph produced by ICAP

1 Supranational

EU Member States
+ Iceland
+ Liechtenstein
+ Norway

8 Countries

China
Germany
Kazakhstan
Mexico
New Zealand
Republic of Korea
Switzerland
United Kingdom

19 Provinces & States

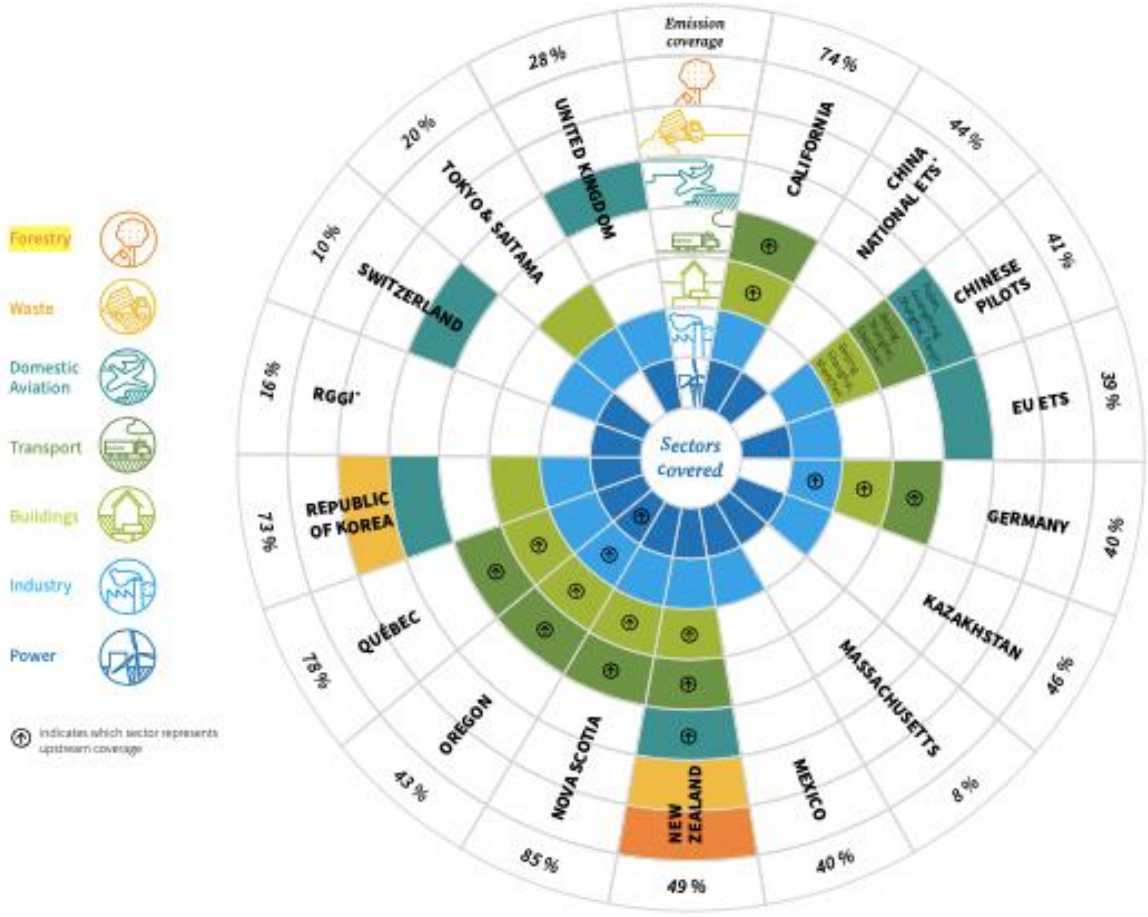
California
Connecticut
Delaware
Fujian
Guangdong
Hubei
Maine
Maryland
Massachusetts
New Hampshire
New Jersey
New York
Nova Scotia
Oregon
Québec
Rhode Island
Saitama Prefecture
Vermont
Virginia

6 Cities

Beijing*
Chongqing*
Shanghai*
Shenzhen
Tianjin*
Tokyo

Not all ETS policies are the same and they vary considerably in terms of what industries they cover and how much covered industries are impacted. The below graph produced by ICAP visually shows what sectors are covered by ETS policies in a sample of jurisdictions worldwide.[17]

[17] https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/about-nz-ets/: Image: ICAP. (2022). Emissions Trading Worldwide: Status Report 2022. Berlin: International Carbon Action Partnership.



The above graph shows that New Zealand is unique in including forestry in it's ETS, with no other ETS globally including forestry. This is explained in an article by *Carver et al* which states:

> *"Unlike other emissions trading systems which link to project-based forestry offsetting mechanisms, the NZ ETS incorporates the whole forestry sector as a participant with both liabilities for deforestation emissions and credits for afforestation removals. New Zealand's approach has demonstrated the feasibility of this concept at a national scale. Over the period from 2008 to mid-2022, the system has established a functional carbon market that creates emissions price incentives to increase afforestation and avoid deforestation, and enables emitters from other sectors to invest in afforestation for climate change mitigation."*[18]

While New Zealand is alone in including the entire forestry sector in an ETS, many other ETS policies allow forestry offsetting while not including forestry in an ETS or similar scheme. This offsetting is enabled by permitting ETS participants to use credits not generated by the sequestration of carbon from within the ETS, but generated outside an ETS. These credits are verified by a number of authorities. *Carver et al* states:

[18] https://www.frontiersin.org/articles/10.3389/ffgc.2022.956196/full#B34

> *"Beyond New Zealand, forestry-derived offsets are accepted in many emissions trading systems. Key examples include California, the Chinese national system and multiple Chinese pilot systems, Kazakhstan, Mexico, the Regional Greenhouse Gas Initiative in the northeast United States, and Saitama…*
>
> *Forestry offsetting regulations are in development in Québec. Unlike the NZ ETS, these systems do not cover forestry as a sector, nor do landowners face compliance obligations (ICAP, 2022). Other countries may wish to consider New Zealand's innovative approach."*[19]

Definitionally the inclusion of the forestry sector within the New Zealand ETS creates challenges when comparing ETS policies, as organisations, such as ICAP, define offsets as credits obtained from outside an ETS. This means forestry offsets used in the New Zealand ETS are not defined as offsets by ICAP.

All other ETS schemes except for Kazakhstan, either exclude forestry offsetting entirely or place quantitative limits on the practice

When New Zealand ETS participants use NZUs that were accrued from forestry activity to meet GHG reduction obligations the effect is comparable to the use of external forestry offsets in other ETS policies. Therefore, while some organisations and resources, such as ICAP, state that New Zealand does not allow the use of offsets, other sources define the forestry provisions within the New Zealand ETS as an offsetting policy.

ICAP defines offsets as:

> *"Offsets represent emissions reductions and emissions removals resulting from projects undertaken outside the scope of an ETS.*[4] *Offsets are generated by crediting mechanisms, which ensure adherence to specific requirements and issue the units. In some cases, using offsets can allow emissions from sources covered by the ETS to exceed the ETS cap while ensuring aggregate emissions are kept constant. This is because any excess of emissions covered by the ETS are balanced out by reductions generated by offset projects outside of the ETS scope"*[20]

However, the academic ICAP definition differs from the common understanding of the concept of offsetting, which are more akin to the below definition by Carbon Neutral New Zealand Trust.

> *"Offsetting" is paying someone else to reduce your carbon emissions or absorb carbon in some way rather than reducing your own greenhouse gas emissions."*[21]

When comparing the use of offsets in international ETS policies, it should be noted that the term 'offsets' includes not only forestry removals but also removed and avoided emissions in many other sectors not included in an ETS. While the below table by ICAP uses the broader definition, the qualitative case studies only examine the regulations impacting forestry removals and do not cover avoided emissions.

Comparing limitations in the use of offsets in ETS schemes worldwide

[19] https://www.frontiersin.org/articles/10.3389/ffgc.2022.956196/full
[20] https://www.carbonneutraltrust.org.nz/buy-carbon-offsets
[21] https://icapcarbonaction.com/en/publications/offset-use-across-emissions-trading-systems

The below comprehensive table is taken from a 2023 ICAP report titled *"Offset Use Across Emissions Trading Systems*".[22] As previously discussed, under the ICAP definition, New Zealand ETS participants using forestry-generated NZUs to avoid reducing gross emissions is not defined as offsetting by ICAP (as forestry is included within the NZ ETS. New Zealand is the only country to have such a policy. While the ICAP definition is academically appropriate, most New Zealand sources consider that New Zealand does have a system that enables the use of forestry offsets to meet 100% of an ETS liability.

7 Appendix - Offset types, scope, and qualitative/quantitative criteria across key ETS jurisdictions, as of August 2022

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
Austria	No offsets	N/A	N/A	N/A
Beijing Pilot	Chinese Certified Emissions Reductions (CCERs) Offset credits from Beijing certified energy conservation projects. Offsets credits from Beijing local forestry carbon sink projects. Offsets credits from citizen low carbon transportation incentive projects.	China for CCER projects Beijing for local energy conservation, forestry carbon sink and low carbon transportation projects.	Beijing Municipal DRC and Ecology and Environment Bureau developed methodologies to calculate offsets from local energy conservation projects, carbon sink projects and citizen low carbon transportation incentive projects. No CCER credits from hydropower, HFCs, PFCs, N_20, and SF6 projects. Projects must have begun operation after the beginning of 2013 (except for Beijing local forestry carbon sink projects, for which the date is February 2005). Among non-Beijing CCERs, priority is given to those with regional climate or pollution control cooperation agreements (e.g., Hebei and Tianjin).	The use of CCERs is limited to 5% of the annual allocation. The use of CCERs generated by projects outside Beijing is limited to 2.5% of the annual allocation.
California (WCI)	Offset credits issued under the California Compliance Offset Program. Offsets issued by Québec are also accepted.	United States	Currently six domestic offset project types ('protocols') covering agriculture, forestry, mine methane capture and avoidance of ozone depleting substances.	2021-2025: up to 4% per year of each entity's compliance obligation, increasing to 6% for 2026-2030. No more than half of the quantitative usage limit may be sourced from projects that do not provide DEBS.
China national ETS	CCERs	China	~200 methodologies, the largest share of which originate from CDM. CCERs must not come from emission reduction projects included in the national carbon market (covered entities may not generate CCERs for their own use).	Covered entities can use CCERs for up to 5% of the annual compliance obligation.

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[22] https://icapcarbonaction.com/system/files/document/ICAP%20offsets%20paper_vfin.pdf

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			CCER methodologies may cover project types from six GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, and SF6.	
Chongqing Pilot	CCERs and Chongqing Certified Emissions Reduction (CQCER) credits since September 2021	China	CCERs, largely originating from CDM and approved by the NDRC. No credits from hydro projects. For CCERs, reductions must be achieved after 2010, except for carbon sink projects. For CQCERs, no specific project types yet defined in regulation; likely to cover wide range of small-scale reduction activities.	The use of CCERs is limited to 8% of the compliance obligation.
EU ETS	From Phase 4 (2021-2030), no offsets are admitted.	N/A	N/A	N/A
Fujian Pilot	CCERs and Fujian Forestry Certified Emission Reduction credits (FFCERs)	China for CCER projects. Fujian Province for FFCER projects.	CCER CO_2 or CH_4 projects, largely originating from CDM and approved by the NDRC. FFCER projects, with three project types (afforestation, forest management, and bamboo management). No credits from hydropower-related projects. Must start implementation after 16 February 2005 and the project developers must have independent legal personality.	The use of CCERs is limited to 5% of the annual compliance obligation, which is increased to 10% for companies that use both FFCER and CCER credits.
Germany	No offsets	N/A	N/A	N/A
Guangdong Pilot	CCERs and Tan Pu Hui Certified Emission Reductions (PHCERs)	China for CCER projects. Guangdong Province for PFCER projects. At least 70% of offsets must come from within Guangdong Province.	CCERs, largely originating from the CDM and approved by the NDRC. Of the annual compliance obligation met by offsets, at least half must be from CO_2 or CH_4 reduction projects. No credits from hydro and most fossil fuel projects. No pre-CDM credits. No credits generated in other Chinese ETS pilots.	The use of CCERs and PHCERs is limited to 10% of the annual compliance obligation.

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System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			Tan Pu Hui projects, with 5 project types (forest sink, distributed PV, high efficiency air conditioner, air source heat pump, re-use of waste cloth).	
Hubei Pilot	CCERs	CCERs must come from key counties under the national or provincial poverty alleviation plan in urban agglomeration areas of the middle reaches of the Yangtze River (within Hubei).	CCERs, largely originating from CDM and approved by the NDRC. CCERs must come from rural biogas or forestry projects. CCERs must have been generated between 1 January 2013 and 31 December 2015.	The use of CCERs is limited to 10% of the annual initial allocation for each entity.
Kazakhstan ETS	Domestic offsets	Kazakhstan	GHG reduction or absorption activities in all economic sectors; IPCC methodologies and rules developed by the Ministry of Ecology, Geology and Natural Resources	None
Korea ETS	Phase 3 (2021-25): Domestic and international (including CDM credits)	South Korea and international	Up to 50% of offsets in the ETS can be international, but only from projects minimum 20% owned/funded by Korean firms.	In Phase 3, limited to 5% of each entity's compliance obligation. No separate limit for international offsets applies.
Massachusetts	No offsets	N/A	N/A	N/A
Mexico	Domestic program of mitigation activities and early action mitigation activities	Domestic	Not yet published. For offsets: domestic projects that have been validated and verified under internationally or domestically recognized protocols (still to be specified). Emission reductions related to all GHGs will be eligible, except for those related to direct CO_2 emissions. Early action: National mitigation activities that received credits before the start of the Pilot from programs recognized by SEMARNAT. SEMARNAT is currently working on the regulations to operationalize the offset and early action provisions in the Pilot ETS.	Quantitative limit: Up to 10% of the compliance obligation. Share of surrendered offsets: N/A

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System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
New Zealand	As of 1 June 2015, international units are not eligible for surrender in the NZ ETS. International offsets may be allowed as part of the government's 2030 strategy.	N/A	N/A	Currently no offsets are allowed.
Nova Scotia	Legislation includes the possibility for an offset system. A study was completed in 2020 to explore offset potential in the province's carbon market	N/A	N/A	N/A
Oregon	Community Climate Investment (CCI) offsets	Oregon	Eligible projects in Oregon that reduce anthropogenic GHG emissions. A CCI entity can only use funds to implement eligible projects in Oregon that reduce anthropogenic GHG emissions. Priorities include reducing emissions by at least 1 tCO_2e on average per CCI credit; reducing non-GHG emissions; promoting benefits for environmental justice communities; and accelerating the transition from fossil fuels to low-carbon energy sources.	First Compliance Period (2022–2024): 10% of compliance obligation may be covered with CCI offsets Second Compliance Period (2025–2027): 15% of compliance obligation may be covered with CCI offsets From 2028 onwards: 20% of compliance obligation may be covered with CCI offsets
Québec (WCI)	Offset credits issued under the Québec Offsets program. Offsets issued by California are also accepted.	Generally, Quebec. Canada for some protocols e.g., destruction of halocarbons	Currently five domestic project types ('protocols'), all relating to high GWP gases (CH_4 and HFC).	Up to 8% of each entity's compliance obligation.
RGGI	Offset credits issued under the RGGI program	RGGI states	Three project types: landfill methane capture and destruction, forestry projects, and avoidance of methane emissions from agricultural manure management operations.	Up to 3.3% of entities' compliance obligation. This quantitative limit is to remain at least until 2030.
Saitama	Small and mid-size facility credits; Outside Saitama credits; Renewable energy credits; Tokyo credits (via link); Forest absorption credits	Saitama and Japan	Emissions reductions from small and mid-sized facilities; large facilities; renewable energy; forest absorption.	Quantitative limits apply only to Outside Saitama credits (up to one third of offices' reduction

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System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			Emissions reductions from non-covered small and medium-sized facilities in Saitama; large facilities have energy consumption of 1,500 kL of crude oil equivalent or more in a base year, and with base-year emissions of 150,000 tonnes or less. Offsets from solar, wind, geothermal, or hydro (under 1,000 kW) electricity production for use under the Saitama ETS are converted on a 1:1 basis (same for biomass at a rate of 95% or more, black liquor excluded). Emissions reductions from facilities in Tokyo with base-year emissions of 150,000 tonnes or less. Offsets from forest absorption (from inside Saitama, credits are counted at 1.5 times the value of regular credits).	obligations; factories may us up to 50%).
Shanghai Pilot	CCERs	China	CCERs, largely originating from the CDM and approved by the NDRC. No credits from hydro projects. Credits for reductions that were realized before January 2013 cannot be used for compliance.	The use of CCERs is limited to 3% of the annual verified emissions.
Shenzhen Pilot	CCERs and local crediting mechanism Tan Pu Hui.	Some geographic restrictions apply to the use of certain CCERs.	CCERs, largely originating from the CDM and approved by the NDRC. No credits from hydro projects. Tan Pu Hui: Two developed methodologies focus on public transportation and electricity-saving in citizen's daily life; others under development.	The use of CCERs is limited to 20% of the gap between the free allowance and the verified emissions, at least for the 2021 compliance year. Unclear whether this will continue to apply in the future.
Swiss ETS	No offsets	N/A	N/A	N/A
Tianjin Pilot	CCERs and Tianjin regional forestry offsets	At least 50% must originate from Beijing, Tianjin, or Hebei.	CCERs, largely originating from the CDM and approved by the NDRC. Credits must stem from CO_2 reduction projects. No credits from hydro projects.	The use of CCER credits is limited to 10% of the annual compliance obligation. For the 2021 compliance year, at least 50% of the CCER credits must have

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System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			No credits for reductions that were realized before 2013.	originated from Beijing, Tianjin, or Hebei.
Tokyo	Small and mid-size facility credits; Outside Tokyo credits; Renewable energy credits (Environmental Value Equivalent, Renewable Energy Certificates, and New Energy Electricity, generated under the Renewable Portfolio Standard Law); Saitama credits (via link)	Tokyo and Japan	Reductions achieved through measures based on certification criteria for small and medium-sized facilities in Tokyo. Large facilities have energy consumption equivalent to at least 1,500kL of crude oil in a base year and with base year emissions of 150,000 tonnes or less; offsets from solar, wind, geothermal, or hydro (under 1,000kW) electricity production for use under the Tokyo ETS are converted on a 1:1 basis (same for biomass, rate of 95 % or more, black liquor excluded); emissions reductions from facilities in Saitama with base-year emissions of 150,000 tonnes or less.	Quantitative limits apply only to Outside Tokyo credits (up to one third of facilities' reduction obligations).
UK ETS	No offsets	N/A	N/A	N/A

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Additional information on Forestry Offsetting provisions within specific ETS Policies

Along with restricting how many offsets can be used many ETS policies also restrict the type of offsets. In the above table, IPAC call these restrictions 'qualitative restrictions'. Forestry offsets are often regulated by the authority that grants offset permits and below some of the requirements from a selection of ETS schemes are detailed.

Again, it is important to note that, along with removals through forestry sequestration, many of these offsetting schemes allow credits to be accrued by avoiding emissions through voluntary activities for sectors that are not covered in a jurisdiction's ETS. This is explained by ICAP, who states:

> *"Mitigation activities that generate offsets can relate to reducing emissions or to removing emissions from the atmosphere. Offsets are generated by comparing monitored project emissions with an emissions baseline. Crediting programs establish detailed rules for eligibility, as well as methodologies for proving additionality (see Box 2), calculating baselines, and monitoring emissions…*
>
> *Greenhouse gas removals are different from offsets, though these terms are sometimes used interchangeably. Unlike offsetting activities from offset projects, which are designed to reduce CO_2 emissions now and in the future, removals are activities that sequester from the atmosphere CO_2 that has already been emitted."*[23]

The below case studies do not include emissions mitigations (or avoided emissions) from sectors outside an ETS and only focus on the qualitative regulatory limits impacting forestry

[23] https://icapcarbonaction.com/en/publications/offset-use-across-emissions-trading-systems

offsets within some ETS policies. Therefore, the below case studies can be compared to how forestry is treated in the New Zealand ETS.

California Compliance Offset Program

The California ETS currently allows participants to offset up to 4% of their emissions liability. Participants of the Californian ETS include fuel distributors, industrial manufacturers and power generators; in total 74% of California's GHG are covered by its ETS.[24]

Offset permits are granted by the California Air Resources Board (CARB) through a system called the 'Compliance Offsets Program'. The CARB describes the use of offsets as:

> *"The Compliance Offsets Program is an important cost-containment element within the broader Cap-and-Trade Program. The California Air Resources Board issues ARB Offset Credits to qualifying projects that reduce or sequester greenhouse gases (GHG) pursuant to six Board-approved Compliance Offset Protocols. Compliance offsets are tradable credits that represent verified GHG emissions reductions or removal enhancements from sources not subject to a compliance obligation in the Cap-and-Trade Program. In addition to their climate and other environmental benefits, offset credits provide important cost containment and compliance flexibility for covered entities.*

Under the Cap-and-Trade Program, covered entities may use compliance offset credits to satisfy a small percentage of their overall compliance obligation.

Compliance entities may use ARB Offset Credits to meet up to 8 percent of their compliance obligation for emissions through 2020; 4 percent of their compliance obligation for emissions from 2021-2025; and 6 percent for emissions from 2026-2030. Starting with 2021 emissions, no more than one half of the quantitative usage limit may be sourced from projects that do not provide direct environmental benefits in the state."[25]

The six protocols that dictate what activities that can qualify to generate offsets in California are:

- Livestock Projects (November 14, 2014)
- Mine Methane Capture (MMC) Projects (April 25, 2014)
- Ozone Depleting Substances (ODS) Projects (November 14, 2014)
- Rice Cultivation Projects (June 25, 2015)
- U.S. Forest Projects (June 25, 2015)
- Urban Forest Projects (October 20, 2011)

The '*U.S. Forest Projects (June 25, 2015)' protocol includes the following demands on forestry projects:*

- *All Forest Projects must promote and maintain a diversity of native species and utilize management practices that promote and maintain native forests comprised of multiple ages and mixed native species within the Project Area and at multiple landscape scales ("Natural Forest Management")...*
- *All Forest Projects are required to establish and/or maintain forest types that are native to the Project Area. For the purposes of this protocol, native forests are defined as those forests occurring naturally in an area, as neither a direct*

[24] https://www.c2es.org/content/california-cap-and-trade/
[25] https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program

nor indirect consequence of human activity post-dating European settlement…

- *Forest Projects must manage the distribution of habitat/age classes and structural elements to support functional habitat for locally native plant and wildlife species naturally occurring in the Project Area, as specified in Table 3.2 and Section3.8.4 below..*
- *…For offset projects that employ even-aged management practices, harvesting must be limited to stands no greater than 40 acres. Stands adjacent to recently harvested stands must not be harvested using an even-aged harvest until the average age of the adjacent stand is at least 5- years old, or the average height in the adjacent stand is at least 5 feet. On a watershed scale up to 10,000 acres, all projects must maintain, or make progress toward maintaining, no more than 40 percent of their forested acres in ages less than 20 years. Areas impacted by a Significant Disturbance are exempt from this test until 20 years after reforestation of such areas."*[26]

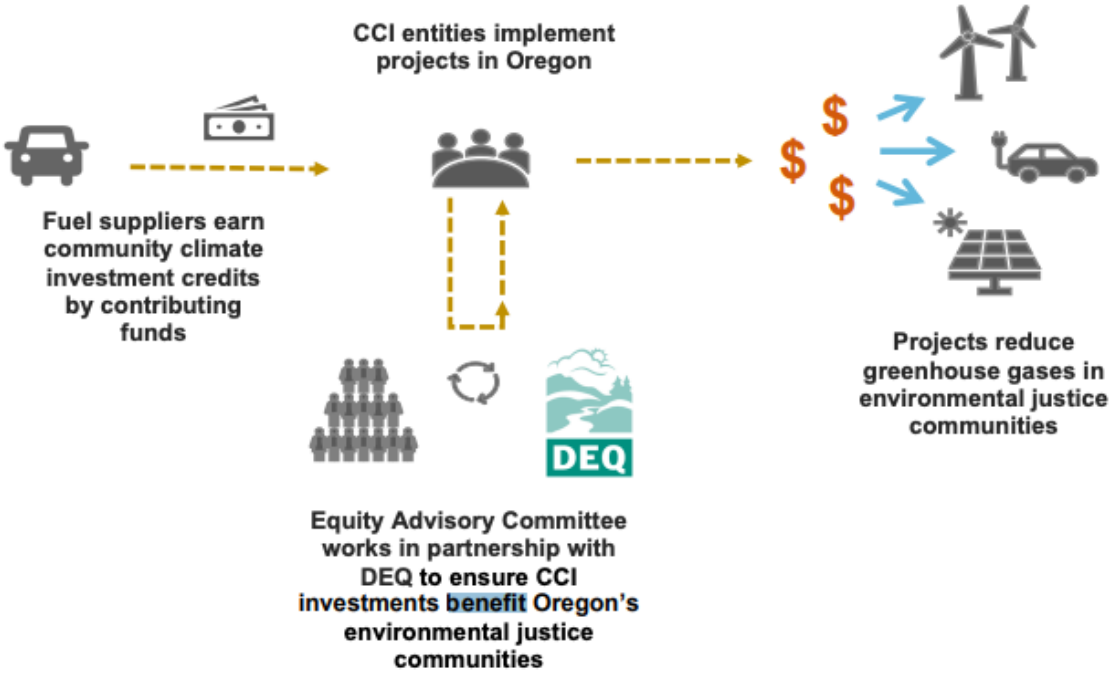
The Californian ETS is linked to the Quebec cap and trade scheme, meaning Californian offsets can be used in Quebec and vice versa.[27] In 2021 New Zealand signed an agreement with California and Quebec that announced an intention to explore linking the New Zealand ETS with the other two policies.[28] At the time of writing this has not occurred.

Oregon Community Climate Investment (CCI) offsets

Oregon's ETS is called the Climate Protection Program (CPP) and the policy covers fuel suppliers which make up 43% of the American state's GHG.[29] The CPP currently allows the use of offsets for 10% of a participant's liability and units must be used within two years of the credit being granted. The CPP is administered by the Oregon DEQ (Department of Environmental Quality) and DEQ also administers the offsetting program. Rather than the price for offsets being set for by the market, the DEQ set the price paid for offsets and participants can apply with projects not only being required to offset a tonne of carbon but also required to meet social goals.The DEQ website states:

> *"In addition to using compliance instruments, fuel suppliers can also choose to use a limited number of Community Climate Investment (CCI) credits. Fuel suppliers can earn CCI credits by contributing funds to DEQ-approved CCI entities. The CCI entities then invest those funds in projects that reduce greenhouse gas emissions in Oregon's communities. CCI entities must be 501(c)(3) nonprofits and must demonstrate appropriate administrative processes and financial controls to hold and spend CCI funds on approved projects. They will go through application, contracting, and approval of workplans prior to spending any available funds. DEQ sets the prices for a CCI credit, which rises modestly each year and is adjusted for inflation. The initial price is $107 in 2021 dollars…*

[26] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2014/capandtrade14/ctusforestprojectsprotocol.pdf
[27] https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage
[28] https://www.argusmedia.com/en/news/2272076-new-zealand-quebec-california-sign-carbon-partnership
[29] https://icapcarbonaction.com/en/ets/usa-oregon



Community Climate Investment project priorities are:

- *Reducing greenhouse gas emissions on average at least one ton per CCI credit*
- *Reducing emissions of other air contaminants, particularly in or near environmental justice communities*
- *Promoting public health, environmental, and economic benefits for environmental justice communities, helping to mitigate impacts from climate change, air contamination, and energy costs*
- *Accelerating the transition to clean energy particularly in or near environmental justice communities*

For the Climate Protection Program, environmental justice communities are communities of color, communities experiencing lower incomes, tribal communities, rural communities, coastal communities, communities with limited infrastructure and other communities traditionally underrepresented in public processes and adversely harmed by environmental and health hazards, including seniors, youth, and persons with disabilities. Environmental justice community engagement and representation is crucial for ensuring that Community Climate Investments are invested as intended and meeting program goals. DEQ, in partnership with the Equity Advisory Committee, will review and approve workplans for CCI entities. For more information on Community Climate Investments and the Equity Advise"[30]

When commenting on the CPP and the CCI in Oregon the Climate Trust stated:

> *"The decision to use CCI contributions instead of traditional carbon offsets ensures that environmental justice takes center stage in these emissions reductions. However, The Climate Trust has observed that, as proposed, the CCI fund lacks stringent, science-based requirements for quantifying and verifying emissions reductions, potentially reducing the program's effectiveness and leaving it open to subjectivity and criticism [3]. Leveraging the expertise of the existing carbon offset*

[30] https://www.oregon.gov/deq/ghgp/Documents/CPPCCIOverview.pdf

marketplace could help Oregon supply CCI credits that are real, additional, and cost-efficient. The cost of implementing this program has been a major concern for some groups, who argue that the new policy burdens consumers, farmers, and other industries [4].

Oregon's CPP addresses both the causes and the effects of climate change, an ambitious task that will demand investment and evolution. The Climate Trust applauds this historic development and looks forward to continuing to support climate action in Oregon."[31]

While it is unclear, based on the DEQ website it appears that the DEQ is currently accepting applications for the first round of CCRIs.

The Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is an ETS in operation in the 12 American states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. The RGGI only covers emissions from the electricity sector which make up about 11% of total GHG. RGGI participants can use offsets to meet only 3.3% of their obligations.[32]. The only category of offset that has been accepted to date is methane capture and destruction, however, the scheme also allows two other activities to apply for credits; projects that avoid methane by better managing agricultural manure and projects which involve forestry to apply. While not all RGGI states grant offset credits, once accrued, the credits are recognised in all 12 states.

The (as yet unused) forestry category of the RGGI outlines criteria for forestry, There are three types of forestry that can apply; Reforestation, Improved Forest Management, and Avoided Conversion.

"To qualify for the award of CO_2 offset allowances, Afforestation offset projects must:

1. *Occur on land that has been in a non-forested state for at least 10 years preceding the commencement of the offset project.*
2. *Be managed in accordance with widely accepted environmentally sustainable forestry practices and designed to promote the restoration of native forests by using mainly native species and avoiding the introduction of invasive non-native species.*

If commercial timber harvest activities are to occur, certification must be obtained, prior to any harvest activities at the site, through the Forest Stewardship Council (FSC), Sustainable Forestry Institute (SFI), American Tree Farm System (ATFS), or such other similar organizations as may be approved by the appropriate state agency where the project is located."[33]

The Kazakhstan ETS

The Kazakhstan ETS covers power generation and industrial emissions which make up about 46% of the nation's total.[34]

[31] https://climatetrust.org/oregon-formally-adopts-climate-protection-program/#:~:text=The%20CCI%20fund%20prioritizes%20investments,2021%20dollars)%20%5B1%5D.
[32] https://icapcarbonaction.com/en/ets/usa-regional-greenhouse-gas-initiative-rggi
[33] https://www.rggi.org/allowance-tracking/offsets/offset-categories/forestry-afforestation
[34] https://icapcarbonaction.com/en/ets/kazakhstan-emissions-trading-system

The Kazakhstan ETS has been in operation since 2013 but much like the New Zealand ETS has undergone multiple significant reforms since first being established. Also like New Zealand, the Kazakhstan ETS allows participants to offset 100% of their ETS liabilities with forestry credits. Projects can apply for domestic Kazakhstan offset credits by avoiding emissions in sectors not covered by the ETS or by sequestering emissions in projects such as forestry. Unlike New Zealand, Kazakhstan does not include forestry in it's ETS. Up-to-date English information on the operation of the Kazakhstan ETS is sparce, with little English information available on if forestry offsets have been widely used in the ETS, but a 2015 report by Carbon Limits and Thompson Reuters Point Carbon states

> *"At this time, there is no regulation pertaining to any limits on the amount of carbon units from domestic offset which can be used by an operator. In other words, as the regulation currently stands, theoretically a company could use 100% of domestic offset units for compliance. With respect to CERs and ERUs, their use for compliance is not envisaged, so only units generated from domestic offset projects may be used for compliance"*[35]

A 2015 Environmental Defence Fund (EDF) case study on the Kazakhstan ETS also states:

> *"According to the relevant sections of the legislation,* ***domestic offsets*** *located in Kazakhstan can stem from the following sectors: mining and metallurgy (utilization of mine methane); agriculture; housing and communal services; forestry; prevention of land degradation; renewables; processing of municipal and industrial waste; transport; and energy-efficient construction. Other sectors or project types can be introduced over time. The crediting period for domestic offset projects approved prior to December 31, 2015 lasts until December 31, 2020; and, the crediting period for domestic offset projects approved after December 31, 2015 is yet to be determined. In addition, domestic offset projects that reduce CO2 and other GHGs are acceptable, and installations covered under the NAP are not eligible for generating offsets.27 At the time of publication, no domestic offsets in Kazakhstan have been issued."*[36]

While theoretically enabled, it is unclear if forestry offsets are widely used, or used at all as of the time of writing.

The European Union ETS

The European ETS (EU ETS) is the oldest in the world, covering the power, aviation and industrial sectors which make up 30% of the jurisdiction's emissions. The EU ETS was established in 2005 and is in it's fourth phase which began in 2021.[37]

The EU was previously a significant source of demand for international carbon offset credits, allowing the use of both Clean Development Mechanism (CDM) and Joint Implementation (JI) Kyoto Protocol credits (both of which are explained in the next section). Despite not being used, EU ETS participants could theoretically have used international offsets to meet 100% of their ETS liability in the first phase (2005-2007) of the policy, in a manner akin to the current use of forestry offsets in New Zealand.

The second and third phases of the EU ETS (2008- 2012 and 2013 -2020) both introduced a limit on the proportion of ETS liabilities that can be met with offsets and introduced additional

[35] https://www.euractiv.com/section/central-asia/news/kazakhstan-plans-to-model-new-ets-on-eus-scheme-say-lawmakers/
[36] https://www.edf.org/sites/default/files/kazakhstan-case-study-may2015.pdf
[37] https://icapcarbonaction.com/en/ets/eu-emissions-trading-system-eu-ets

restrictions to the international standards, restricting the use of offsets from areas such as preventing the use of credits generated by nuclear power, forestry and the destruction of industrial gases.[38]

The fourth phase of the EU ETS (2021 -2030) prevents the use of offsets entirely, placing the policy in dramatic contrast to the New Zealand ETS.

Third-Party forestry carbon credit verification schemes:

In addition to allowing the use of offsets from credits administered by an ETS regulator, many ETS regulators also allow the use of third-party offsets. As shown in the table produced by ICAP such ETS policies include the Korean ETS (which allows the use of CDM credits). In addition, domestic offset regulators can also make reference to 'international standards' (such as China which uses Kyoto protocol standards in the development of domestic credits). ICAP summarises this issue by stating:

> *"Offset projects can take place within and/or outside jurisdictional borders. Crediting mechanisms can either be set up by an ETS regulator or be externally administered. Externally administered mechanisms can be subject to multilateral oversight (such as the CDM under the Kyoto Protocol and Article 6.4 under the Paris Agreement) or be run independently (such as VCS and Gold Standard)."*[39]

Below the forestry provisions of some of the major international offset mechanisms are summarised.

Multilaterally administered offsetting standards

The Kyoto Protocol and its successor, the Paris Agreement, provide for the trading of offsets between countries internationally. This means that countries could meet emissions reduction targets by not only implementing policies such as an ETS that reduce emissions domestically, but also by purchasing credit for actions taken by other countries. Such provisions were widely used under the Kyoto Protocol but such a system is not currently fully operational for the Paris Agreement.

Kyoto Protocol's flexibility mechanisms schemes

The Kyoto Protocol introduced three mechanisms to facilitate the trading of offsets between signatories. The two main mechanisms are the;

- Clean development mechanism (CDM), and the
- Joint implementation (JI)

The CDM mechanism within the Kyoto Protocol allows developed countries to meet some obligations by funding projects in developing countries. The JI mechanism within the Kyoto Protocol is similar to the CDM but is for projects that are within developed countries. The widespread use of the CDM and JI is stated in an article by Hohne et al.

[38] https://icapcarbonaction.com/en/ets/eu-emissions-trading-system-eu-ets
[39] https://icapcarbonaction.com/en/publications/offset-use-across-emissions-trading-systems

"The CDM and JI stimulated large domestic and foreign investments in climate change mitigation activities. Total investments by 2012 are forecast to be in the order of USD 100 billion to USD 200 billion and investment leverage factors are large.

The Kyoto Protocol flexibility mechanisms have diffused price signals for carbon and carbon pricing approaches around the world. 110 developing and 42 developed countries have been directly engaged in the buying and selling of carbon credits, and many regional, national and subnational carbon pricing instruments rely upon capacities built under the Kyoto Protocol flexibility mechanisms."[40]

A high-level summary of the CDM and the controversy surrounding the forestry category is given in an article by Corbera and Friedli:

The exclusion of forest conservation activities from the CDM and the subsequent decision of the EU to exclude forestry credits altogether from the ETS responded to past and still existing controversies on the use of forest ecosystems as sinks of carbon dioxide. In the run-up to the KP negotiations during the mid 1990s and during the design of the KP rulebook by the end of 1990s and the early 2000s, some developing countries, such as Brazil, India and China, and civil society organisations, like Friends of the Earth or the World Rainforest Movement, opposed the inclusion of forestry activities on the grounds that they would divert attention from the adoption of more significant greenhouse gas reduction commitments by developed countries. The same actors, and even some negotiating Parties, like the EU, also expressed concerns on the unlikely permanence of standing forest sinks and the potentially negative impacts of new-established plantations (Friends of the Earth, 2002; Dessai et al., 2005; Boyd et al., 2008). As explained below in greater detail, these controversies are far from settled and the recently established international framework for Reducing Emissions from Deforestation and Degradation, plus conserving and enhancing forest carbon stocks and sustainably managing forests in developing countries *(REDD+) has reinvigorated them."*[41]

The United Nations Food and Agriculture Organisation (UN FAO) sets out what types of forestry can qualify for the Afforestation and Reforestation categories of the CDM.

Definitions: Under the CDM, "forests" consist of trees with at least a height of between 2-5 m, crown density between 10-30%, and area between 0.05-1 ha. Countries must choose values for these parameters and determine a minimum width of a "forest". Since the Protocol does not define "tree" [2]*; fruit trees, bamboos, and palms may qualify. A&R can consist of assisted natural succession to trees, productive and protective plantations, agroforestry, and urban forests. For purposes of CDM, trees in a landscape may or may not reach the chosen threshold for crown density of a "forest", depending on crown cover and project boundaries. Enrichment planting in degraded forests or forest rehabilitation does not qualify as "reforestation".*

Additionality: Carbon sequestration via A&R must be additional to what would have occurred without the project. The Executive Board, a supervisory body for the CDM, applies a stringent additionality test to project proposals. A project is not additional, if

[40] https://www.g7germany.de/resource/blob/974430/436914/7da5a2370a726ce4f963247789421a39/2015-06-01-carbon-pricing-data.pdf?download=1
[41] https://ephemerajournal.org/contribution/planting-trees-through-clean-development-mechanism-critical-assessment

it is the most financially attractive among feasible options. It may be additional if it overcomes barriers related to investments, technology or prevailing practice.

Rules and modalities:
Baseline: A baseline for the A&R project is calculated based on the changes in carbon stocks in above- and below ground biomass, litter, soils, and deadwood that would have reasonably occurred without the project. To define a baseline, project proponents must use an approved methodology or propose a new one to which the Executive Board must agree…"[42]

Paris Agreement ITMOs

Article 6 of the Paris Agreement provides for the trading of international credits. These Paris Agreement Units are called Internationally Transferred Mitigation Outcomes (ITMOs) and can be traded bilaterally, regionally or multilaterally. While the high-level concept has been agreed to by parties to the Paris Agreement, the system is not operational, including the trading of forestry offsets, . The current status of ITMOs under the Paris agreement is summarised by Carbon Market watch, which states:

"Detailed rules still need to be hammered out. These include rules to govern how projects will be assessed before being registered, how emission reductions will be measured, how the system can generate finance for adaptation, and more. Significant work is still needed."[43]

Independently administered offsetting standards

Along with offsetting credits verified by government authorities or international agencies, there are also third-party offsets verified and generated by non-governmental organisations. These credits are mainly used for voluntary carbon markets and can enable entities to make carbon neutrality claims. The two largest third-party standards are the Verified Carbon Standard (VCS) operated by Vera and the Gold Standard operated by a foundation by the same name.[44]

Verified Carbon Standard (VCS)

The VCS contains the Afforestation, Reforestation and Revegetation (ARR) section, which Ver defines as:

"Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing or restoring vegetative cover (forest or non-forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation. Eligible ARR projects may include timber harvesting in their management plan. The project area shall not be cleared of native ecosystems within the 10 year period prior to the project start date, as set out in Section 3.2.4."[45]

As ver explain the ARR sections of the VCS standard are based on the CDM standard of the Kyoto Protocol:

[42] https://www.fao.org/forestry/8953-0fa3a647c952f216b939dcb25fca9d103.pdf
[43] https://carbonmarketwatch.org/2022/11/02/cop27-faq-article-6-of-the-paris-agreement-explained/
[44] https://www.nefco.int/wp-content/uploads/2019/05/NICA-Crediting-Mechanisms-Final-February-2019.pdf
[45] https://verra.org/wp-content/uploads/2022/02/VCS-Standard_v4.2.pdf

> *"This methodology was developed from the Clean Development Mechanism AR-ACM0003: A/R Large-scale Consolidated Methodology – Afforestation and reforestation of lands except wetlands and associated tools. The original CDM methodology has been substantially revised to incorporate innovative approaches to standardize additionality and crediting baselines, account for leakage, and accommodate small-scale tree planting activities."*[46]

Much like the forestry policy of the New Zealand ETS, the VCS standard allows for look up tables and field measurements, described as an area based and a census based quantification approach. These approaches are outlined in the Methodology for Afforestation, Reforestation and Revegetation Projects.[47]

Troublingly, a 2023 investigation claims that over 90% of the avoided deforestation offsets issued by Vera are 'worthless', these claims are disputed by Vera.[48]

The Gold Standard

The Gold standard is the second largest third-party offsetting standard. It was started in 2003 by a group of international Non-government organisations including the World Wildlife Fund (WWF).[49] The Gold Standard website states:

> *"We seek to accelerate progress toward the Paris Agreement and Sustainable Development Goals through robust standards and verified impacts. We do so by reducing barriers to market entry, increasing capacity, and incentivising more action across three strategic pillars: environmental markets, corporate sustainability and climate + development finance."*[50]

The requirements for the forestry projects to qualify for credits within the Gold Standard are outlined in "*The Gold Standard Afforestation/Reforestation (A/R) Requirements"*.[51] These requirements are wide-ranging including many social, cultural, environmental and economic components; some examples of the many requirements are given below:

- *Sites with legal rights and customary rights of indigenous people and local communities shall be identified, known and respected by the workers.*
- *Workers shall have safe protective equipment, tools and machinery appropriate for their work.*
- *The genotypes of the tree species planted shall be well-adapted to the site*
- *Exotic tree species[1] shall not be used, unless direct experience, or scientific research, demonstrate that there is, or can be, no invasiveness and no adverse impacts.*
- *Minimum 10% of the project area shall be identified and managed to protect or enhance the biological diversity3 of native ecosystems4. For this, the HCV5 approach should be followed.*

[46] https://verra.org/wp-content/uploads/imported/methodologies/VCS-ARR-Methodology.pdf
[47] https://verra.org/wp-content/uploads/imported/methodologies/VCS-ARR-Methodology.pdf
[48] https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe
[49] https://www.goldstandard.org/about-us/vision-and-mission#:~:text=Gold%20Standard%20was%20established%20in,also%20contributed%20to%20sustainable%20development.
[50] https://www.goldstandard.org/about-us/vision-and-mission
[51] https://globalgoals.goldstandard.org/standards/PRE-GS4GG-AF/ar-requirements_v0-9.pdf

- *Fertilizers shall be avoided, or their use shall be minimised and justified.*
- *Chemical pesticides shall be avoided, or their use shall be minimised and justified.*[52]

The Australian ERF: An ETS-like sequestration incentive policy

Australia does not have an ETS that places a compulsory price on GHG. There is however a system that enables companies to purchase offsets voluntarily. These offsets are also purchased by the Australian government via a reverse auction, providing an incentive for emissions reduction but occurring at a cost to the Australian government (rather than generating revenue like a carbon tax or ETS). The Australian ERF is an example of a policy framework that is not an ETS or a carbon tax, but provides incentives for the sequestration of carbon. The Australian Government describes the Emissions Reduction Fund (ERF) policy as

> *"The Emissions Reduction Fund offers landholders, communities and businesses the opportunity to run projects in Australia that avoid the release of greenhouse gas emissions or remove and sequester carbon from the atmosphere. It is enacted through the Carbon Credits (Carbon Farming Initiative) Act 2011 and the Carbon Credits (Carbon Farming Initiative) Rule 2015.*
>
> *A number of activities are eligible under the scheme and participants can earn Australian carbon credit units (ACCUs). Each ACCU represents one tonne of carbon dioxide equivalent (tCO2-e) emissions stored or avoided by a project. ACCUs can be sold to generate income, either to the Australian Government through a carbon abatement contract, or to companies and other private buyers in the secondary market.*
>
> *To ensure these emissions reductions are not displaced significantly by a rise in emissions elsewhere in the economy, the Emissions Reduction Fund also includes a safeguard mechanism, which requires Australia's largest greenhouse gas emitters to keep their net emissions below an emissions limit (a baseline). The government will gradually reduce emissions limits under the Safeguard Mechanism to help Australia reach net zero emissions by 2050".*[53]

Farmers and landowners can opt into the ERF and generate carbon credits by undertaking eligible activities including:

- Soil carbon sequestration (a $5000 advance is available to assist with the costs of establishing a soil carbon baseline),[54]
- Regenerating native vegetation,
- Avoiding the clearing of native vegetation regrowth,
- Plantation forestry,
- The restoration of tidal wetlands. [55]

In response to concerns over the potential risks large-scale voluntary carbon offsetting could pose for food production, the Australian government passed legislation granting the Agriculture Minister the ability to prevent projects that convert farmland into plantation forestry from generating carbon credits. This extra requirement does not apply to all categories, only to the plantation forestry category. The details of this are outlined in the Australian Department of Agriculture, Forestry and Fisheries (DAFF) website , which states:

[52] https://globalgoals.goldstandard.org/standards/PRE-GS4GG-AF/ar-requirements_v0-9.pdf
[53] https://www.cleanenergyregulator.gov.au/ERF/About-the-Emissions-Reduction-Fund
[54] https://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-the-land-sector
[55] https://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-the-land-sector

> *"New plantations are commonly established on land previously used for agriculture. To complement the eligibility requirements of the ERF Plantation Forestry Method, the Australian Government Minister responsible for Agriculture assesses whether a proposed project/s may lead to an undesirable impact on agricultural production in that region. The requirement applies only to projects involving establishment of a new plantation forest (that is, a project that converts non-forest land to forest). The project could be a new project or the addition of land to an existing project as outlined in the explanatory statement…*
>
> *Where the Agriculture Minister determines that the project would have an undesirable impact on agricultural production in the region, the project is deemed ineligible.*[56]

Like the VCS scheme operated by Vera, the Australian ERF is not without controversy. Professor Andrew Macintosh from The Australian National University (ANU) has publicly warmed that the ERF is suffering from serious governance flaws and is potentially wasting billions of dollars in taxpayers' money.[57]

Risks and Opportunities of including Forestry and ETS schemes

The case for the use of ETS policies as a means of reducing emissions is strong, with most sources supporting pricing mechanisms and ETS policies; one example is the below by ICAP:

> *"Reaching net-zero emissions by or around mid-century is now a common goal covering the vast majority of the global economy. ETSs are well suited to achieving this ambition: they provide both assurance over emissions levels and longer-term market signals needed to stimulate the investment necessary to enable the low-carbon transition. The role an ETS will play in reaching net-zero emissions will vary among jurisdictions. For some it will be the main instrument, for others a key tool within a portfolio of GHG mitigation measures. Policymakers will need to grapple with issues such as expanding ETS coverage into new sectors, implementing new tools, and intensifying international cooperation. The process will be a dynamic one, with systems adjusting to new challenges and opportunities in the coming decades."*[58]

Yet, the effectiveness of pricing mechanisms on GHG reduction is not universally accepted. An article by *Green* exploring the limitations of such policies states:

> *"Carbon pricing has been hailed as an essential component of any sensible climate policy. Internalize the externalities, the logic goes, and polluters will change their behavior. The theory is elegant, but has carbon pricing worked in practice? Despite a voluminous literature on the topic, there are surprisingly few works that conduct an ex-post analysis, examining how carbon pricing has actually performed. This paper provides a meta-review of ex-post quantitative evaluations of carbon pricing policies around the world since 1990. Four findings stand out. First, though carbon pricing has dominated many political discussions of climate change, only 37 studies assess the actual effects of the policy on emissions reductions, and the vast majority of these are focused on Europe. Second, the majority of studies suggest that the*

[56] https://www.agriculture.gov.au/agriculture-land/farm-food-drought/climatechange/mitigation/cfi/plantation-forestry-notifications
[57] https://law.anu.edu.au/news-and-events/news/australia%E2%80%99s-carbon-market-fraud-environment
[58] https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-2022-icap-status-report

aggregate reductions from carbon pricing on emissions are limited—generally between 0% and 2% per year. However, there is considerable variation across sectors. Third, in general, carbon taxes perform better than emissions trading schemes (ETSs). Finally, studies of the EU-ETS, the oldest ETS, indicate limited average annual reductions—ranging from 0% to 1.5% per annum. For comparison, the IPCC states that emissions must fall by 45% below 2010 levels by 2030 in order to limit warming to 1.5 °C—the goal set by the Paris Agreement (Intergovernmental Panel on Climate Change 2018). Overall, the evidence indicates that carbon pricing has a limited impact on emissions."[59]

The international literature is even more mixed on the inclusion of forestry offsets in ETS policies specifically, with some sources focusing on the risks and others focusing on the opportunities. An example is an article by *Gren & Aklilu, which* summarises the potential for forestry offsets to help meet climate objectives but also notes the administrative risks posed by including forestry in an ETS:

" The potential reduction in release of carbon from avoided deforestation and increased above-ground sequestration through forest plantation *and improved forest management can be significant for climate policy…*

…Any type of policy targeting carbon sequestration has to deal with specific design problems; heterogeneity, uncertainty, additionality, and permanence."[60]

In addition to the need to ensure that the inclusion of forestry offsets in ETS policies maintains the integrity and credibility of carbon markets, broader policy concerns should be considered. These policy concerns are summarised in an article by *Bustamante et al, which notes:*

"The potential impact of AFOLU mitigation measures on food security has recently received attention (Smith et al., 2013b). Both efforts to reduce hunger and malnutrition and improved incomes will increase per-capita food demand in many developing countries, and population growth will increase the number of individuals requiring food sovereignty. Thus, a net increase in food production seems necessary for securing sustainable development (Ericksen et al., 2009; FAO, WFP, & IFAD, 2012). AFOLU mitigation measures linked to increases in food production (e.g. agroforestry, sustainable intensification of agricultural production, higher efficiency use of fertilizers or integrated systems) can increase food availability and access especially at the local level. In contrast, other measures (e.g. large-scale forestry or energy crop plantations) can reduce food production, at least locally (Foley et al., 2005; McMichael et al., 2007; Pretty, 2008; Godfray et al., 2010; Jackson & Baker, 2010; Graham-Rowe, 2011; Jeffery et al., 2011a). Further, it is important to consider possible displacement effects, e.g. GHG emissions in other regions resulting from the production of food that is imported rather than locally produced (Searchinger et al., 2008; Gavrilova et al."[61]

ICAP offers an overview of the costs and benefits of including offsets in ETS policies, noting the ability of offset inclusion to facilitate more ambitious emissions reduction targets.

"ETS jurisdictions that allow offsets tend to have similar objectives. Offsets can reduce compliance costs by providing additional, potentially lower-cost abatement

[59] https://iopscience.iop.org/article/10.1088/1748-9326/abdae9/meta
[60] https://www.sciencedirect.com/science/article/pii/S1389934116301253#bb0180
[61] https://onlinelibrary.wiley.com/doi/epdf/10.1111/gcb.12591

options for covered entities, while at the same time expanding abatement incentives and the benefits of mitigation to other sectors and/or regions. Other benefits commonly attributed to the inclusion of offsets as a compliance option include the potential to facilitate political agreement on a tighter ETS cap, the environmental and social co-benefits of offsetting activities, and the ability to build capacity and incentivize low-carbon investment among actors outside of the ETS…

Rules must be established to define offset eligibility within the ETS. Conditions of offset use have frequently been the focus of political contention and public scrutiny in the ETS jurisdictions. Concerns over the risks posed by offsets to the integrity of ETSs have largely revolved around whether they allow polluting sectors an easier way out of their obligations as compared to taking action to decarbonize. These concerns have partially been addressed by setting limits on which and how many offsets may be used for ETS compliance. In addition to decisions related to the governance of the crediting mechanism, there are two additional key considerations in designing rules for the use of offsets in an ETS (the use of quantitative and qualitative restrictions): "[62]

Qualitative restrictions are restrictions that dictate what offset types can be used in an ETS policy. Quantitative restrictions set out how many of these offsets can be used by an ETS participant, generally setting a proportional limit.

New Zealand is unique in having a forestry offsetting regime that operates by including the forestry sector in the ETS, this makes comparisons between the New Zealand ETS and other similar policies difficult, but the New Zealand ETS effectively has no quantitative limits on the use of forestry offsets and has very few qualitative limits. The risks and opportunities posed by the inclusion of offsets are not always appropriate in the New Zealand context. The below extract from an article by *Parry et al* is an example of international literature that is only partially relevant to the New Zealand context.

"Alternative approaches for agriculture and forestry of combining carbon taxes and ETSs with domestic offsetting provisions can be problematic. With offsets, entities covered by carbon taxes and ETSs can partially avoid cutting their own emissions by paying for mitigation projects in other sectors, for example a reforestation project, to offset their emissions. The purpose of the offset is not to reduce total emissions but rather to promote a more cost-effective balance of mitigation between sectors that are, and are not, covered by formal pricing schemes. One problem however is that offsets may not always be additional (that is, a project might have gone ahead anyway even without the offset payment) and this can be difficult to verify.[29] *Also, the offset may not be permanent, for example, forests may subsequently burn down, releasing the sequestered carbon. In either case of non-additionality or impermanence, the offset provision will increase emissions overall. Moreover, no automatic mechanism exists to ensure that the most cost-effective projects in other sectors are those that receive offset payments."*[63]

A qualitative study *by Shrestha et al* highlights that there is a divide in perceptions of the impact of forestry in ETS policies between regions that host ETS policies, stating:

Findings revealed that many respondents particularly from North America, New Zealand, and Chinese pilot systems portrayed positive attitudes toward the inclusion of forestry carbon offsets and its role in contributing to a viable ETS, while European

[62] https://icapcarbonaction.com/system/files/document/ICAP%20offsets%20paper_vfin.pdf
[63] https://www.elibrary.imf.org/view/journals/066/2022/006/article-A001-en.xml

experts were not supportive. Respondents cited leakage, permanence, additionality, and monitoring design features as the major challenges and concerns that inhibit the expansion and inclusion of forest carbon offsetting. Respondents from Chinese pilot schemes referenced a unique set of challenges related to implementation, including the increasing cost of afforestation and reforestation projects, the uncertainty in the future supply and demand for their national Certified Emissions Reduction (CER) scheme and landowner engagement…"[64]

An article by *Carver et al summarises* the impact the New Zealand ETS could have on future land prices and land use change, stating:

"During operation of the NZ ETS, the chief land-use competition influenced by emissions pricing has been focused between forestry and sheep/beef production, with dairy maintaining a strong advantage over both. MPI and MfE (2022) analyzed the 50-year NPV of alternative land uses based on NZU prices of NZ$70-80, a discount rate of 8%, and one rotation of production forest. They reported an NPV of NZ$30,000 per hectare for permanent exotic forests, compared to NZ$4,500 per hectare for sheep/beef farming (with no emissions pricing), and NZ$20,000 for production forestry. No NPV estimate was provided for dairy. They reported an emissions price of NZ$110 would make permanent exotic forestry cost competitive with marginal dairy production (in the absence of emissions pricing on dairy). However, emergence of new freshwater (MfE, 2022c) and other regulations on livestock production has somewhat dampened landowner interest in forest conversion. In a 2020 survey of large landowners, deforestation intentions over 2020–2030 had shifted markedly; only 31% was for dairy, with 53% for infrastructure/mining and 6% for sheep/beef (Manley, 2021)…

… CCC (2021) reported that 1.2–1.4 million hectares of marginal land was available for afforestation in New Zealand. Under current policy settings and holding the emissions price at NZ$35 per ton, 1.1 million hectares of new afforestation would eventuate by 2050. If the emissions price rose to NZ$50, this would increase to 1.5 million hectares. Under the Commission's demonstration pathway for achieving domestic emissions budgets, about 1.3 million hectares of new afforestation would be needed by 2050, with establishment of 380,000 hectares of new exotic forest and 300,000 hectares of new native forest by 2035. These levels were identified as feasible outcomes consistent with maintaining gross emissions reductions in line with achieving net-zero emissions of long-lived GHGs by 2050 and sustaining performance. However, this assumed limiting the amount of afforestation driven by emissions pricing, which would likely require changes to both NZ ETS settings and land-use policies. MPI and MfE (2022) estimated that without further restrictions, exposure to the emissions price pathway used by the Commission could produce 645,000 hectares of new exotic forest in the next decade. Of this amount, about 350,000 hectares could be permanent exotic forest."[65]

The description of the operation of the New Zealand ETS and the inability of regulators to put in place qualitative or quantitative limits on the use of forestry offsets (as seen in other ETS policies worldwide) contrasts with the below advice by ICAP:

"To protect the integrity of the ETS, any removal methodology will need to ensure that carbon will be permanently stored and negative impacts on biodiversity and land use have to be avoided. And finally, NETs must not

[64] https://link.springer.com/article/10.1007/s11676-021-01329-5
[65] https://www.frontiersin.org/articles/10.3389/ffgc.2022.956196/full

jeopardize the decarbonization of the global economy, especially through ETSs."[66]

The risks of including forestry offsets in an ETS can be broadly defined into two categories; operational and political.

The operational risks include the need to overcome issues such as double counting, the need to ensure additionality and the need to account for the limitations of input data. Studies and articles are often critical of ETS policies that suffer from operational issues but solutions are often given, albeit such solutions may not always be practical.

Political issues regard the appropriateness of a policy's stated goal, not how effectively it is implemented. Issues such as equity, fairness and burden sharing fit within the political issues category and can be practically challenging to address once policy is in place. Internationally qualitative and quantitative limits have been placed on the use of forestry offsets, and offsets generally, to address high-level political concerns about the appropriateness of offsetting

The opportunities represented by including forestry offsets in an ETS are also well documented. If operational and political concerns are addressed an ETS can reduce net GHG levels, while taking care not to lead to negative outcomes such as decreased incentives for gross GHG reduction, reduced biodiversity and reduced food production.

The inclusion of forestry in ETS policies also represent the opportunity to direct significant capital flows to projects that not only sequester carbon but also achieve co-benefits. Such co-benefits are not necessarily limited to environmental outcomes, such as biodiversity and climate adaptation, but can be extended to goals such as social justice outcomes (as seen in the Oregon ETS).

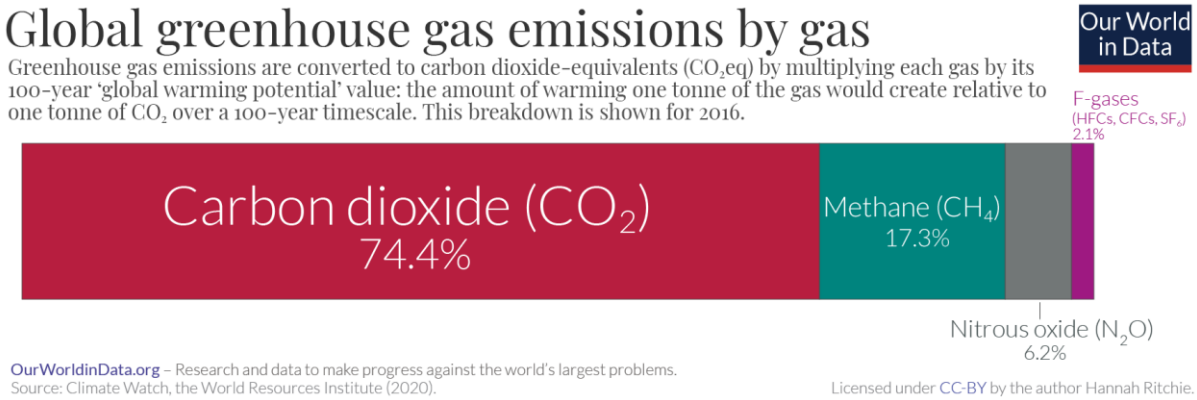
Much of the criticism targeted at the use of forestry offsetting within ETS policies internationally relates to operational concerns, with critics expressing concerns over the integrity of offsetting projects. This contrasts with criticism targeted at the New Zealand ETS, which focuses on political concerns.

By being the first country in the world to include the forestry sector within it's ETS New Zealand has not legislated for sufficient regulatory tools to address such political concerns. The current policy in New Zealand of allowing ETS participants to offset 100% of their liability with forestry offsets which have few restrictions designed to enhance co-benefits is out of step with other systems internationally if policymakers wish to address political concerns by putting in place qualitative or quantitative limits on the use of forestry offsets in New Zealand, a major reform of the country's ETS is required.

[66] https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-2022-icap-status-report

Appendix One: Comparing Different GHG

An ETS is a trading system that limits the number of GHGs, and carbon dioxide (CO_2) is not the only GHG. While there are dozens of GHG, the majority of the warming comes from CO_2, nitrous oxide (N_2O) and methane (CH_4). This is shown in the below figure by the Our World In Data.[67]

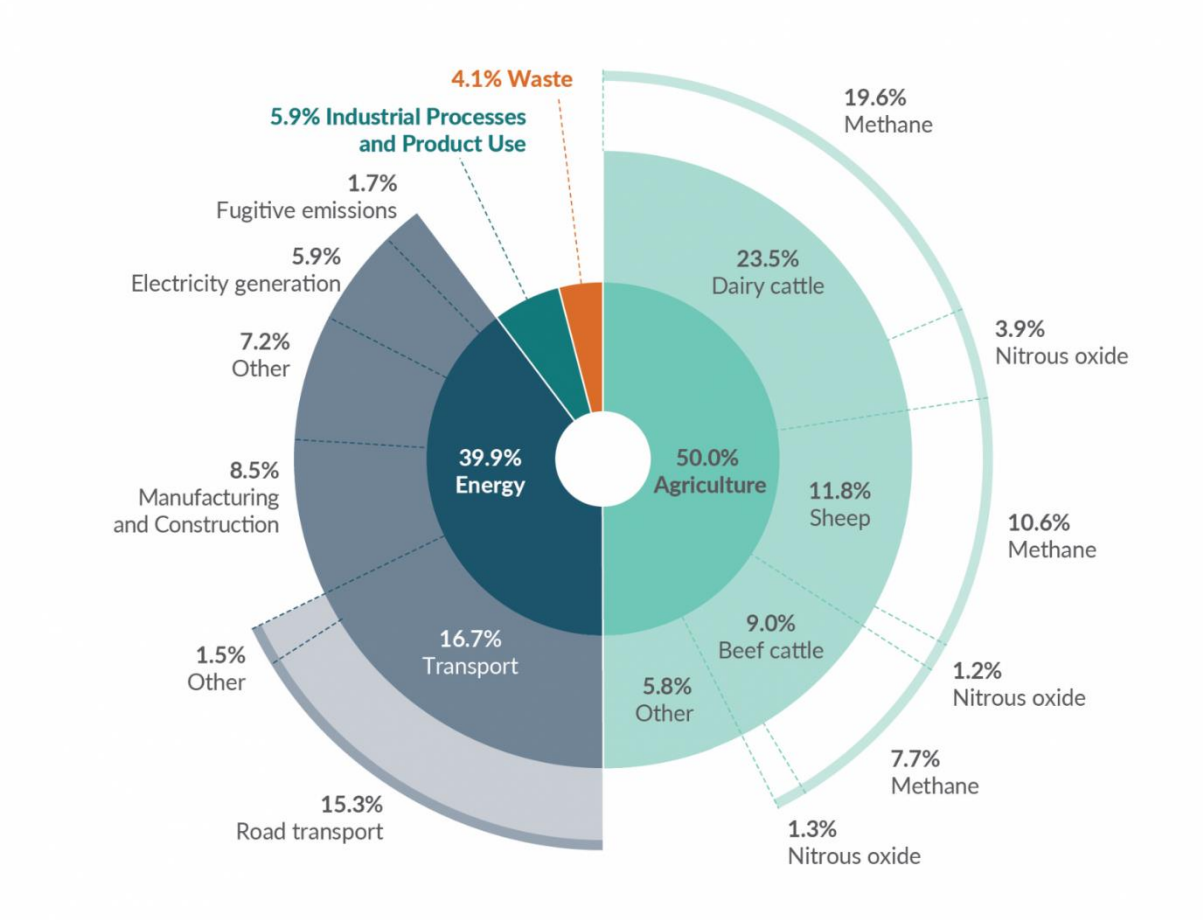


To convert, the warming potential of different greenhouse gases a metric known as a global warming potential (GWP) value is used. The GWP_{100} metric compares the warming cauused by a unit of a GHG relative to carbon dioxide. Therefore, the GWP_{100} value for CO_2 is 1. The GWP_{100} values for N_2O and CH_4 are 265 and 28 respectively.[68] These values attempt to take into account both the warming potency of each molecule of the GHG and to also take into account the amount it takes for each GHG to break town. The GWP_{100} metric works well for comparing n2o and co2, however, it can inflate or deflate the warming from methane, depending on if the GHG is stable, increasing or decreasing.[69] This is a potential major issue if methane emissions are interchangeable with N_2O or CO_2 in a policy such as an ETS. This point was made in the sixth assessment report of the IPCC, which stated:

> *"In summary, new emission metric approaches such as GWP* and CGTP are designed to relate emission changes in short-lived greenhouse gases to emissions of CO_2 as they better account for the different physical behaviours of short and long-lived gases. Through scaling the corresponding cumulative CO_2 equivalent emissions by the TCRE, the GSAT response from emissions over time of an aggregated set of gases can be estimated. Using either these new approaches, or treating short and long-lived GHG emission pathways separately, can improve the quantification of the contribution of emissions to global warming within accumulative emission framework, compared to approaches that aggregate emissions of GHGs using standard CO_2 equivalent emission metrics."*[70]

[67] https://ourworldindata.org/greenhouse-gas-emissions
[68] https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf
[69] https://www.nature.com/articles/s41612-021-00169-8
[70] Forster, P., T. Storelvmo, K. Armour, W. Collins, J. L. Dufresne, D. Frame, D. J. Lunt, T. Mauritsen, M. D. Palmer, M. Watanabe, M. Wild, H. Zhang, 2021, The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press, pp. 124

The gross GHG inventory of New Zealand is shown below in a figure produced by the New Zealand Ministry for the Environment (MfE).[71] As the two figures show, when compared to the global GHG inventory, methane makes up a larger proportion of GHG in New Zealand.



New Zealand has legislated plans to bring agriculture into its ETS by 2025. Given that agricultural emissions make up about half of New Zealand's total emissions (if GWP_{100} is used) and given that about 80% of agricultural emissions are from methane if agriculture is brought into the New Zealand ETS care should be taken with regard to the fungibility of short and long-lived emissions. The uniquely prominent role forestry plays in the New Zealand ETS means that if agricultural emissions are bought into the ETS, there is a risk that the process of offsetting short-lived methane emissions with forestry offsets that are based on the sequestration of long-lived carbon dioxide, the integrity of the ETS could be compromised due to the issues surrounding the GWP_{100} metric.

[71] https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2020-snapshot/

Appendix Two: Intentional and Unintentional limitations of ETS policies

Intentional Policies Designed to Encourage a Responsible Transition

Implementing an emissions pricing policy, regardless of whether this policy takes the form of a carbon tax or an ETS, does not escape the fundamental challenge of climate change policy. Fundamentally the world currently relies on GHG-producing activities to provide essential goods and services at the least cost within regulatory limits. Decarbonising or shifting away from these activities is expensive and potentially regressive and unless the transition is carefully managed such policies risk leading to significant social and economic harm.

One policy framework widely used globally, including in New Zealand is the 'Just Transition framework. The New Zealand Ministry for Business Innovation and Employment (MBIE) describes a 'Just Transition' as:

> *"In general terms, a 'Just Transition' in New Zealand is a strategy to move a region toward a low carbon future. It is about a region leading their own transition to ensure that the impacts and opportunities that may arise from the transition are more evenly distributed.*
>
> *Transitions have traditionally disadvantaged some groups more than others. In a Just Transition, this is acknowledged and incorporated into planning to make the transition more fair, equitable and inclusive."*[72]

To help ensure that economies are decarbonised via a just transition ETS policies include policies designed to lessen the social and economic impact of the ETS although this can also often limit the effectiveness of the ETS from a pure GHG reduction point of view.

The New Zealand ETS includes a system of industrial allocation, where GHG-intensive and trade exposed firms receive a proportion of the units required to surrender for free. This policy is designed to avoid New Zealand firms being put at an overly high competitive disadvantage to international firms and reflects the large role trade plays in the New Zealand economy. Similar policies are in place in all major ETS policies worldwide.

The New Zealand ETS also contains a cost containment reserve (CCR). The CCR is a mechanism that releases additional units if a trigger price is reached. These additional units increase overall supply and drive down the price of units in the ETS. To maintain the integrity of the ETS, the Government must make up for these extra released units later. The CCR is in place to avoid the ETS resulting in an unacceptably high additional cost to goods and services. Like industrial free allocation policies, price control settings (like a CCR) are in place in other ETS policies globally.

Industrial free allocation and the CCR are just two examples of mechanisms that are intentionally in place to help ensure that Just Transition principles are followed and the social and economic costs of the ETS are managed. These policies make the New Zealand ETS less efficient and effective but are necessary to maintain political support for the ETS and to reduce the impact on particularly at-risk groups.

[72] https://www.mbie.govt.nz/business-and-employment/economic-development/just-transition/

Unintentional limitations placed on ETS policies

Just as policies such as industrial free allocation and the CCR limit the theoretical effectiveness of the ETS, this effectiveness is also limited by the data used to inform the policy. Emissions taxes ETS policies are informed by emissions factors that are informed by scientific studies and research.[73] While significant efforts and investments ar made to make the emissions factors as accurate as possible, they are not 100% accurate. Governments, therefore, need to make decisions on what emissions and removals to include and to exclude from an ETS. If an activity is increasing GHG but this activity is not recognised in an ETS then the externality will not be internalised by those undertaking the activity. To this effect ETS policies are not purely market-based policies but are artificially interventionist policies designed with market-based principles in mind.

The global climate system is incredibly complex, and it is therefore necessary to exclude some categories of sources and sinks because of an inability for regulators to confidently incorporate such categories into an ETS while maintaining the integrity of the system. As emissions inventories and ETS inputs improve over time, the gap between an ETS and reality will shrink, until then it is important that policy makers recognize that such a gap exists.

Categories of GHG sources and sinks included in ETS policies also need to be narrowed for practical reasons and this applies to forestry in the New Zealand ETS. The New Zealand government has chosen to base forestry categories in the ETS on international inventory guidelines. The forestry definitions in New Zealand are explained by MPI:

> *"There is a specific definition of "forest" in the ETS. This differentiates between land being used as a forest and other trees in the landscape*
>
> *A forest in the ETS:*
> - *Is made up of 1ha or more of forest species (a "forest species" can grow to at least 5m height at maturity where it is located);*
> - *Can achieve tree canopy cover of more than 30% in each hectare at maturity; and*
> - *Can achieve an average tree canopy width of at least 30m at maturity"*[74]

In addition to the spatial restriction on what forestry sequestration can be included in the ETS, the New Zealand government also places time restrictions. This is explained by MPI below:

> *"The baseline date for net emissions is 1 January 1990 – agreed in the Kyoto Protocol – this creates two kinds of forest which are treated differently in the ETS.*
>
> *Pre 1990:*
> - *Forest established before 1 January 1990 and land still in exotic forest on 31 December 2007 (native forest not covered – managed through RMA and Forests Act)*
> - *Counted as part of NZs baseline carbon stock – can't earn any units from ETS*

[73] https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/participating-in-the-ets/unique-emissions-factors/

[74] https://www.mpi.govt.nz/dmsdocument/44128-Presentation-Introduction-to-forests-in-the-Emissions-Trading-Scheme

- *Can harvest, replant and change species without ETS obligations ▪ Must pay units to the Govt if deforested ▪ Participation is mandatory – only if deforested*

Post 1990

- *Exotic/native forest established after 31 December 1989*
- *Additional carbon storage above the baseline*
- *Earn units for forest growth*
- *Obligations if harvested*
- *Must pay back all units if deforested ▪ Participation is voluntary – need to register"*[75]

While an ETS is likely an effective means of lowering GHG, when implementing ETS policies Governments make policy decisions that improve social and economic outcomes, sometimes following a 'Just transition' framework. In the New Zealand ETS, the such policy includes industrial free allocation and CCR . Likewise, while the NZ ETS includes sequestration, this is limited to certain types of forestry.

[75] https://www.mpi.govt.nz/dmsdocument/44128-Presentation-Introduction-to-forests-in-the-Emissions-Trading-Scheme