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Scoping NZ ETS and removals pathways for better climate and nature outcomes

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Abstract

The New Zealand Emissions Trading Scheme (NZ ETS) is based on outdated assumptions and must evolve to deliver on New Zealand's climate targets and send clear long-term investment signals to emitters and foresters. By the mid-2030s, the Government will progressively lose control over unit supply and prices, placing market stability and climate targets at risk. The substitution of forestry removals for feasible emissions reductions is delaying decarbonisation and creating intergenerational risks. As alternatives to the status quo with unconstrained removals, NZ ETS reform pathways could provide for boosted removals (a modified status quo), constrained removals (an intermediate option), or no removals in the NZ ETS (major change). Alongside all NZ ETS pathway options, a new Removals Investment Mechanism (RIM) could be used to drive long-term and large-scale investment into higher-value and more diverse removals without displacing emissions reductions. This would help with meeting current climate targets – and more ambitious future targets in response to temperature overshoot. The paper outlines key design challenges, opportunities, and guardrails for introducing a RIM. Government decision-making would require careful staging, inclusive and transparent processes, and process guardrails that would build confidence in policy change and ensure a just transition for NZ ETS participants, iwi and Māori, broader stakeholders, and communities. Collective effort should begin as soon as possible to design an integrated policy framework for the NZ ETS and removals that will deliver what is needed in the decades ahead.

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Q23, Q54, Q56, Q58

Keywords

Climate change, emissions trading, removals, forestry, offsetting, voluntary markets, Aotearoa New Zealand

Summary haiku

In times of great change
our systems must evolve to
support new pathways

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1 Introduction

1.1 Why NZ ETS reform and a new approach for supporting removals are essential

The New Zealand Emissions Trading Scheme (NZ ETS) places a price on greenhouse gas (GHG) emissions and incentivises forestry and other activities that remove carbon dioxide (CO_2) from the atmosphere, helping drive action on climate change. However, its current structure is not fit for purpose to manage the challenges ahead. As auctioning ends by the early 2030s – making unit supply fully dependent on forestry and other removals, industrial free allocation, and the participant-held stockpile – the Government will progressively lose its ability to manage unit supply and prices, ensure market stability, collect auction revenue, and align the NZ ETS with climate targets. The system trades off forestry removals against emissions reductions when they have different price points, demand drivers, investment horizons, and climate benefits. Associated unit price volatility and long-term unit price uncertainty discourage decarbonisation and indigenous afforestation and negatively impact business and government balance sheets. Over the next decade, as declining unit demand from emitters is projected to converge with increasing unit supply from forestry, the NZ ETS will be unable to cut net emissions further or drive significant planting of new indigenous forests. It will also fail to deliver on Aotearoa New Zealand's 2050 target for gases excluding biogenic methane (CH_4).

New Zealand has committed to help meet the Paris Agreement's temperature goal, and global action is off track. It is no longer possible to limit warming to 1.5°C above pre-industrial levels with no or limited overshoot. However, limiting warming to 2°C is still possible without overshoot if efforts to reduce emissions of all GHGs accelerate rapidly, with upscaling of CO_2 removal as an additional measure. In contrast, current global policies point to about 2.8°C of warming. Urgent action is needed globally to limit peak warming below 2°C and to minimise the magnitude and duration of overshoot of 1.5°C, enabling overshoot recovery.

Under current domestic policies, New Zealand faces net emissions reduction gaps to reach its Nationally Determined Contributions (NDCs) for 2030 and 2035, with no plan for how to close them. Five-yearly emissions budgets (EBs) set 15 years in advance are supposed to chart the path of progress. However, the Climate Change Commission's 2026 Emissions Monitoring Report finds that New Zealand is at risk of missing EB2 (2026–2030) and off track for EB3 (2031–2035), despite NZ ETS settings being legally required to accord with delivering these budgets.

Alongside the climate crisis, New Zealand also faces a biodiversity crisis, with more than 75% of several groups of indigenous species threatened by or at risk of extinction. Nature-based solutions like forestry that both remove CO_2 from the atmosphere and protect and enhance ecosystems can deliver wins for climate and biodiversity. Compared with single-species, even-

aged exotic forests, multi-species indigenous forests can be more resilient to natural disturbances and more beneficial for biodiversity.

The NZ ETS was intended to send clear long-term investment signals in line with New Zealand's climate targets. Instead, the current settings create investment risk for emitters and foresters, climate target risk for the Government, and intergenerational risk for New Zealanders. Policy reform is essential to avoid misdirected investment under the status quo. Greater voluntary investment in climate mitigation and nature conservation is also needed to bridge current funding gaps.

Over the past decade, multiple studies have assessed the evolution and impacts of the NZ ETS.[1] Since 2019, the call for significant NZ ETS reforms has strengthened across sequential reports from the Parliamentary Commissioner for the Environment[2] and He Pou a Rangi Climate Change Commission.[3] A consistent message has emerged: the current policy settings for the NZ ETS are incentivising mitigation via large-scale exotic afforestation over more costly, but essential, energy and industrial decarbonisation and indigenous afforestation. A shift in this balance is necessary if New Zealand wishes to meet its current target to reach and sustain net-zero emissions from 2050 onwards for gases other than biogenic CH_4, let alone to increase its target ambition given escalating climate risks. Although the reports demonstrate that the status quo settings are impacting climate target feasibility, NZ ETS market stability, and biodiversity, specific policy solutions remain untested.

1.2 Purpose of this paper

While recognising that multiple reforms are needed to improve the NZ ETS, this paper focuses on a range of NZ ETS reform options for removals. It also explores how a new Removals Investment Mechanism (RIM) could operate alongside the NZ ETS to boost and diversify long-term funding for forestry and other removals. This paper is targeted at policymakers, participants in the NZ ETS and voluntary nature and carbon markets, and other stakeholders confronting the failings of the current emissions pricing system and seeking constructive solutions. It presents the findings of initial analysis by a small team of independent researchers, with the goal of setting the stage for deeper research, cross-sector dialogue, and design to create an integrated policy framework that is fit for purpose. This paper offers a direction of travel rather than a detailed proposal and implementation plan. Resolving the challenging issues raised in this paper will require collective efforts by officials, iwi and Māori, and diverse stakeholders.

[1] For example, see Beca and Sapere (2026), Bertram and Terry (2010), Carver et al. (2022), Carver and Kerr (2017), Cortes-Acosta et al. (2020), Evison (2017), Hall and McLachlan (2022), Kerr et al. (2017), Leining (2026), Leining et al. (2020), Ministry for the Environment (2016a, 2016b), Pohatu et al. (2020), and Rontard and Leining (2021).
[2] See Parliamentary Commissioner for the Environment (2019, 2025a, 2026a).
[3] See Climate Change Commission (2021, 2023, 2024d, 2026a).

1.3 How the paper is structured

Part A of the paper provides contextual information and defines the problems to be solved. Section 2 provides a brief overview of the climate and nature challenges facing New Zealand, and section 3 explores how forestry and other removals can help. Section 4 reviews New Zealand's current policy settings for emissions pricing and removals, and section 5 explains why they are inadequate to manage the challenges ahead. Section 6 presents analysis of modelled outcomes under the status quo NZ ETS for unit supply, demand, and prices as well as afforestation, auction revenue, emissions budgets, and the 2050 target. It concludes with implications for key stakeholder groups.

Part B of the paper scopes the solution space. Section 7 compares the outdated assumptions that underpin New Zealand's current emissions pricing policies with today's realities and proposes eight objectives for future policy on the NZ ETS and removals. Section 8 evaluates three pathway options for NZ ETS reform as alternatives to the status quo: boosted removals in the NZ ETS (a modified status quo), constrained removals in the NZ ETS (an intermediate option), and no removals in the NZ ETS (major change). Section 9 introduces the concept of a RIM that could operate alongside any of the NZ ETS pathway options. It examines what opportunities this could create, what policy design challenges would need to be addressed, and what guardrails would be needed to build public confidence in the policy transition. Section 10 presents insights from modelled scenarios for alternative NZ ETS pathways with and without a RIM. Section 11 provides examples of how other advanced economies are managing removals under their climate targets and mitigation policies. Section 12 presents high-level conclusions. The paper's findings are supported by an appendix with case studies on removals policies in other countries and an accompanying technical paper (Green, 2026).

This working paper is accompanied by a summary for policymakers and a technical modelling insights brief,[4] both of which are available at https://motu.nz.

1.4 Key messages

Box 1 presents the key messages from this paper.

[4] See Green (2026).

Box 1: Key messages

1. ***The NZ ETS must evolve*.** The NZ ETS is based on outdated assumptions and must evolve to deliver on Aotearoa New Zealand's climate targets and send clear long-term investment signals to emitters and foresters.
2. ***Under the status quo NZ ETS, the Government will lose control over outcomes.*** In its current form, the NZ ETS will soon become a rudderless ship caught in crosswinds. As auctioning ends by the early 2030s and unit supply becomes dependent on forestry and other removals, industrial free allocation, and the participant-held stockpile, the Government will progressively lose its ability to manage unit supply and prices, support market stability, collect auction revenue, and deliver on any intended climate target.
3. ***Under the status quo NZ ETS, imbalance between unit supply and demand threatens climate targets***. From the mid-2030s, as falling unit demand by emitters is projected to converge with rising unit supply from forestry, the status quo NZ ETS will be unable to cut net emissions further or drive significant planting of new indigenous forests. It will also fail to deliver on New Zealand's 2050 target for gases excluding biogenic CH_4.
4. ***The status quo NZ ETS creates uncertainty and risk for removals investment***. Forestry and other removals are critical to preventing dangerous climate change, but the status quo limits both compliance and voluntary removals investment. Under offsets-driven emissions pricing, removals investment will decline with decarbonisation – when it should be increasing to meet the growing global need for removals as temperatures rise above 1.5°C. Uncertain long-term demand for removals creates investment risk for foresters.
5. ***The status quo NZ ETS is delaying decarbonisation***. The substitution of lower-cost and higher-risk removals for feasible emissions reductions creates intergenerational risks for New Zealanders. These risks come from a delayed transition to a low-emissions economy, lock-in to fossil fuel technologies with ongoing exposure to price shocks, and depletion of New Zealand's long-term removals potential.
6. ***Credible NZ ETS reform pathways are available***. The paper compares the status quo NZ ETS, which allows unconstrained forestry and industrial removals, with three reform pathways: boosted removals supply/demand in the NZ ETS, constrained removals supply/demand in the NZ ETS, and an NZ ETS covering gross emissions only with removals rewarded through a separate mechanism. All pathways involve trade-offs. Limits on removals in the NZ ETS could require increases in removals outside the NZ ETS to support New Zealand's climate targets.

7. ***A complementary Removals Investment Mechanism (RIM) could improve outcomes***. Under current settings, a single price signal cannot deliver both the decarbonisation and removals New Zealand needs in the long term. A RIM would combine government- and market-driven incentives with policies and regulations to value removals for their climate and wider benefits, such as biodiversity and resilience. A RIM could be used alongside any NZ ETS pathway to boost and diversify investment in forestry and other removals without displacing emissions reductions. This would help with meeting current climate targets – and more ambitious future targets in response to temperature overshoot.
8. ***Modelling suggests the concept of a RIM is worth pursuing, but more work is needed***. Depending on design, a RIM could be used to help maintain government control over climate targets and NZ ETS market stability, send clearer investment signals for emitters and foresters, generate net revenue for the Crown, and improve outcomes for climate and nature. It could be designed in ways that maintain or increase the value of existing and new removals investments relative to the status quo NZ ETS. The RIM modelled in this paper is a hypothetical illustration for demonstrating proof of concept, not a proposal or recommendation, and additional approaches should be considered.
9. ***Policy change must enable a just transition*****.** To avoid market disruption, government decision-making on the introduction of a RIM would need to be staged carefully; shaped and informed by inclusive processes with full regard to the rights, interests, and aspirations of iwi and Māori; and concluded well in advance of implementation. Process guardrails would be essential to build confidence in policy change and ensure a just transition for NZ ETS participants, iwi and Māori, broader stakeholders, and communities.
10. ***Policy development should start now***. Given the lead time required, the process of policy development should begin as soon as possible, while the Government still holds the lever of auctioning and before misdirected investment decisions driven by the status quo NZ ETS lock in adverse outcomes for decades. Deferring policy change beyond 2030 could forgo around $11–12 billion in auction revenue through 2035. A collective effort is required to build on the findings of this paper and design an integrated policy framework for the NZ ETS and removals that will deliver what is needed in the decades ahead.

PART A: CONTEXT AND PROBLEM DEFINITION

2 Climate and nature challenges facing New Zealand

2.1 The global climate change mitigation gap

The world is not on track to achieve the global temperature goal under the Paris Agreement: "holding the increase in the global average temperature to well below 2°C and pursuing efforts to limit the temperature increase to 1.5 °C." This is to be achieved by reaching global peaking of GHG emissions as soon as possible, "so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century."[5] The annual average global temperature has already breached 1.5°C in a single year, and this warming trend will continue in the near term.[6] Current policies are projected to deliver a temperature rise of 2.8°C above pre-industrial levels.[7]

At current emissions rates, the global CO_2 budget consistent with a 50% likelihood of limiting temperature rises below 1.5°C is likely to be exceeded before 2030. At current emissions rates, the CO_2 budgets consistent with warming of 1.7°C and 2.0°C could be exceeded within about 12 and 25 years, respectively.[8] Given the inadequate global mitigation response to date, pursuing efforts to limit global warming to 1.5°C now inevitably involves temperature overshoot pathways. These are defined as pathways in which warming temporarily exceeds a specified goal and then returns to or below that level by a specified time.[9] However, limiting warming to 2°C is still possible without overshoot if efforts to reduce all GHG emissions accelerate rapidly, with upscaling of CO_2 removal as an additional measure.

Climate change damages increase with higher temperatures, and many damages from temporarily high temperatures would be slow to reverse when temperatures fall or would be irreversible altogether.[10] Urgent action is needed globally to limit peak warming below 2°C and to minimise the magnitude and duration of overshoot of 1.5°C, enabling overshoot recovery. Key

[5] See Article 2 (p. 3) and Article 4 (p. 4) in United Nations Framework Convention on Climate Change (2015).
[6] According to the World Meteorological Organization (2025, 2026), the annual average global mean near-surface temperature for 2025 was 1.55 °C ± 0.13 °C above the 1850–1900 average. Over 2026 to 2030, it is predicted to be between 1.3°C and 1.9°C higher. Note that the IPCC assesses long-term warming using 20-year averages, so a single warm year does not on its own mean the goal has been exceeded. Forster et al. (2026) reported that the 2016–2025 decadal average observed warming relative to 1850–1900 was 1.26°C. Even so, it is expected that the long-term warming will exceed 1.5°C within the next few years, and this warming will continue approximately until global CO_2 emissions reach net zero.
[7] See United Nations Environment Programme (2026).
[8] See Friedlingstein et al. (2026).
[9] See Intergovernmental Panel on Climate Change (2023a).
[10] See Canadell et al. (2021), Intergovernmental Panel on Climate Change (2023b), Reisinger et al. (2025), and Schleussner et al. (2024). According to Canadell et al. (2021), "Some climate change trends, such as the increase in global surface temperature, would start to reverse within a few years. Other aspects of climate change would take decades (e.g., permafrost thawing) or centuries (e.g., acidification of the deep ocean) to reverse, and some, such as sea level rise, would take centuries to millennia to change direction" (p. 775).

strategies are producing clean electricity, boosting electrification and energy efficiency, decarbonising hard-to-abate sectors, and scaling up removals activities.[11]

2.2 The growing nature crisis

The world is facing serious declines in biodiversity and the loss and degradation of ecosystems. Globally, over a million species are threatened with extinction, with risks exacerbated by climate change and habitat loss.[12] There is an urgent need to develop economic indicators and incentives that improve biodiversity outcomes.[13]

In New Zealand, more than 75% of indigenous species of reptiles, terrestrial and marine birds, bats, and freshwater fish are either threatened with extinction or at risk of becoming threatened. Pressure from invasive species is driving declines in vegetation and forest bird populations. Indigenous ecosystems continue to be threatened by both degradation and conversion to alternative land uses.[14] Erosion is a serious issue already facing communities in regions such as Tairāwhiti, Manawatū-Whanganui, and the West Coast.[15] The impacts of climate change are compounding other pressures on ecosystems.

There is growing recognition that addressing biodiversity loss and climate change in an integrated way can augment co-benefits and help address the systemic underfunding of nature conservation and restoration together with climate change mitigation and adaptation. The current policy narrative in New Zealand – and internationally – is that a substantial increase in private nature finance is required to address the biodiversity funding gap. Regulatory and voluntary markets for biodiversity and nature-based carbon removals – referred to in this paper as "nature and carbon markets" (see Box 2) – are routinely proposed as a mechanism for incentivising private investment. However, a large body of scientific research shows that nature markets regularly do not achieve their environmental objectives in the absence of strong regulation.[16] Further, failing to design nature and carbon markets in an integrated way risks crowding out diverse types of nature investment, double counting credited benefits across markets, and supplanting public funding needed for transformation at scale.[17]

[11] See Intergovernmental Panel on Climate Change (2022) and Keramidas et al. (2025).
[12] See Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019).
[13] See Dasgupta (2021).
[14] See Ministry for the Environment and Statistics New Zealand (2025).
[15] See Statistics New Zealand (2024).
[16] See zu Ermgassen et al. (2026).
[17] See Fiore and Grabbe (2025).

Box 2: What are nature-based solutions, natural climate solutions, and nature markets?

In 2022, the United Nations Environment Assembly adopted the first multilaterally agreed definition of *nature-based solutions*: "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits" (p. 2). The Assembly recognised that:

> …nature-based solutions may contribute significantly to climate action, while recognizing the need for analysis of their effects, including in the long term, and acknowledging that they do not replace the need for rapid, deep and sustained reductions in greenhouse gas emissions, but can improve action for adaptation and resilience to and mitigation of climate change and its impact (p. 2).[18]

As a subset of nature-based solutions, Griscom et al. (2017) defined a set of 20 *natural climate solutions*: "conservation, restoration, and improved land management actions that increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural land" (p. 11645).

The concept of *nature markets* is still evolving. The Taskforce on Nature Markets (2022) proposed the following definition: "a system composed of transactions between separate buyers and sellers, in which the transacted good or service specifically reflects a stock of ecosystem assets or a flow of ecosystem services from terrestrial or aquatic ecosystems" (p. 22). It offered a taxonomy consisting of:

- *Intrinsic markets*: Provisioning, regulating, or cultural ecosystem services are traded.
- *Credit markets*: Credits that reflect efforts to enhance or conserve ecosystem assets or services are traded.
- *Asset markets*: The rights to use ecosystem assets with long-lived value are traded.
- *Derivative markets*: Financial products that directly reflect ecosystem service values are traded.

In this context, biodiversity credit markets and carbon credit markets involving natural climate solutions can be considered subsets of nature markets.

2.3 New Zealand's climate change mitigation targets

2.3.1 Paris Agreement

As a Party to the Paris Agreement, New Zealand has committed to two self-determined targets:

- A 2030 Nationally Determined Contribution (NDC) of a 50% reduction in net emissions below 2005 gross emissions (with a cumulative net emissions budget for 2021–2030)

[18] See United Nations Environment Programme (2022).

- A 2035 NDC of a 51–55% reduction in net emissions below 2005 gross emissions (a point-year target).[19]

Both NDCs can be met through a combination of domestic emissions reductions, domestic forestry and other removals, and offshore mitigation. Under current policies, New Zealand faces a gap of about 85 million tonnes of carbon dioxide equivalent ($MtCO_2e$) to reach the 2030 NDC, and 13–23 $MtCO_2e$ to reach the 2035 NDC.[20] To date, the New Zealand Government has not announced a plan for how to remedy the two sets of NDC gaps.

2.3.2 Climate Change Response Act 2002

Under the Climate Change Response Act 2002, New Zealand has committed to a 2050 target to:

- Reduce biogenic methane (CH_4) emissions[21] at least 10% below 2017 levels by 2030 and 14–24% below 2017 levels by 2050 and for each subsequent calendar year
- Reduce all other GHGs to reach net zero by 2050 and for each subsequent calendar year.

This split-gas 2050 target is an outlier among advanced economies with net-zero long-term targets, as it does not achieve net-zero emissions across all GHGs.[22] New Zealand's 2050 target is to be achieved through (typically) five-yearly EBs set 15 years in advance. EBs are to be met as far as possible through domestic action.[23] While New Zealand is expected to have achieved EB1 (2022–2025), under current policies it is at risk of missing EB2 (2026–2030) and is off track to achieve EB3 (2031–2035). Current policies will also fail to deliver the 2030 biogenic CH_4 target. Meeting EB2 and EB3 and the 2050 target will require doubling the current pace of mitigation efforts, with actions needed across all sectors.[24]

As the impacts of global warming rising above 1.5°C become more severe, all countries – and particularly advanced economies – are likely to face increasing global pressure to adopt net-negative emissions targets under the Paris Agreement.[25] In 2024, the Climate Change Commission recommended that New Zealand boost the ambition of its 2050 target to 35–47% below 2017 levels for biogenic CH_4 and achieve a net-negative target of -20 $MtCO_2e$ for other emissions, with progressive ambition after that date. The Commission also recommended including emissions from international shipping and aviation in New Zealand's 2050 target.[26]

Instead, in 2025 the Government lowered the ambition of New Zealand's 2050 target for biogenic CH_4 from 24–47% to 14–24% below 2017 levels and chose not to change the 2050 net-

[19] See New Zealand Government (2021, 2025).
[20] See New Zealand Treasury (2026).
[21] Biogenic CH_4 emissions are those from agriculture and waste.
[22] Based on the 2026 national GHG inventory, residual emissions of biogenic CH_4 from agriculture and waste in 2050 under the target would be 29–32 $MtCO_2e$ (Ministry for the Environment, 2026d).
[23] Climate Change Response Act 2002, s 5Z.
[24] See Climate Change Commission (2026a).
[25] See Geden and Reisinger (2025) and United Nations Environment Programme (2026).
[26] See Climate Change Commission (2024e).

zero target for other gases or include international aviation and shipping. The Government also deferred decision-making on EB4 (2036–2040) by an additional two years, from December 2025 to December 2027.[27]

2.3.3 How forestry contributes to New Zealand's climate targets

Overview of New Zealand's forest estate

New Zealand has extensive forest land, constituting 38% (10.3 million hectares (Mha)) of total land use (26.9 Mha) in 2024.[28] New Zealand's national GHG inventory classifies this forest land into planted and natural forests.[29] Planted forests are predominantly formed of exotic species such as *Pinus radiata* (about 90% of New Zealand's planted forest estate[30]), Douglas fir, and eucalypts, and are typically grown for commercial purposes such as timber or carbon revenue. Natural forests, which totalled 7.87 Mha in 2024, are predominantly formed of tall indigenous forests (e.g. rimu, tōtara), and broadleaved hardwood shrubland (e.g. mānuka).[31] For information on how New Zealand's forest estate has evolved over time, see Green (2026).

As reported in 2024, Māori are estimated to own around 1.3 Mha of forest land. This includes 572,980 ha of indigenous forest, 190,181 ha of exotic forest, and 559,576 ha of former Crown forest land, mostly in exotic forest owned by private companies.[32] Forestry makes up an estimated 46% of the total area of whenua Māori covered by Te Ture Whenua Māori Act 1993,[33] with this forestry disproportionately pre-1990 natural forest (74%) compared with general title land (53%).[34]

Estimates of the land suitable for further afforestation/reforestation in New Zealand vary depending on the methods and criteria used to identify land (i.e. the geospatial analysis filters applied) and the types of forest being considered (e.g. permanent forests only, or permanent and production forest). The Ministry for the Environment and Statistics New Zealand (2018) identified 1.1 Mha of land deemed at risk of severe erosion and suitable for permanent forest cover. Similarly, analysis by the Ministry for Primary Industries in 2024 identified 2.4 Mha of grassland on Land Use Capability (LUC) classes 6-8[35] held in private title as suitable for

[27] These changes were legislated through the Climate Change Response (2050 Target and Other Matters) Amendment Act 2025.
[28] See Ministry for the Environment (2026d).
[29] See Ministry for the Environment (2024c).
[30] See Manley (2023).
[31] Note that some self-seeded exotic species (e.g. conifers) are also included in the GHG inventory definition of natural forests. See Ministry for the Environment (2012).
[32] See Holt and Bennett (2014) and Ngā Pou a Tāne (2024).
[33] Te Ture Whenua Māori Act 1993 defines Māori land as Māori freehold and Māori customary land. These figures exclude land held by Treaty settlement entities, and broader land held under general title by Māori. See Hohaia (2022).
[34] See Ministry for Primary Industries (2022).
[35] These are the land-use classes less suited to agricultural production. For more information, see Manaaki Whenua Landcare Research (n.d.).

afforestation, with 0.8 Mha suitable for production forestry in addition to other forest types.[36] This is broken down in Table 1 below.

Table 1: Land area suitable for afforestation on LUC classes 6–8 land identified through geospatial analysis

Afforestation potential type	LUC 6	LUC 7	LUC 8	Total
Suitable for all tree species except production exotic (ha)	452,000	297,000	25,000	774,000
Suitable for all tree species (ha)	1,232,000	424,000	9,000	1,664,000
Total (ha)	1,638,000	721,000	34,000	2,438,000

Source: Adapted from Parliamentary Commissioner for the Environment (2025a).

Among non-government estimates, the Recloaking Papatūānuku initiative established by Pure Advantage estimated up to 5 Mha of land suitable for either enhancement of existing degraded forest, natural reversion in marginal hill country and Crown land, or afforestation/reforestation of non-forest land.[37]

Once established, well-managed tall indigenous forest (e.g. tōtara, kauri, kahikatea, rimu) can sequester carbon at rates approaching those of pine forests,[38] reaching 18.2–29.9 tCO_2/ha/yr by age 50 and mean annual sequestration over 50 years of 10–16.4 tCO_2/ha/yr. This compares to average sequestration of 21–27 tCO_2/ha/yr over 50 years for pine forests in the current default NZ ETS look-up tables from the Ministry for Primary Industries, and 36 tCO_2/ha/yr for pine forests using the Field Measurement Approach (FMA).[39]

These sequestration rates are significantly higher than rates typically achieved for indigenous forests in the NZ ETS to date, where regenerating broadleaved hardwood mānuka/kānuka can see rates of approximately 6.5 tCO_2/ha/yr.[40]

For whenua Māori specifically, around 124,000 ha of Māori freehold land has been identified as well suited to forests.[41] Of this, around 71,000 ha has been identified by the Ministry for Primary Industries as remote and marginal-to-harvest land suitable for permanent forest cover, and 68,500 ha as suitable for production forests. Ngā Pou a Tāne (2024) have a stated ambition to increase Māori forested land to 1.6 Mha by 2040, up from around 1.3 Mha today (across Māori-owned forests and former Crown forest land, mostly in forests owned by private companies).

Research is ongoing to improve the understanding and quantification of carbon storage and fluxes in New Zealand forests. Information about the Ministry for Primary Industries'

[36] See Parliamentary Commissioner for the Environment (2025a).
[37] See Pure Advantage (2023).
[38] See Kimberley et al. (2022).
[39] Weighted average FMA tables sourced from Ministry for Primary Industries (2024).
[40] See Kimberley et al. (2022).
[41] See Ministry for Primary Industries (2022).

Maximising Forest Carbon programme is provided in section 4.2.1. Box 3 highlights research by CarbonWatch NZ on enhancing the carbon storage potential in Fiordland in the South Island.

Box 3: CarbonWatch research on Fiordland's carbon sink

CarbonWatch, a research programme under Earth Sciences New Zealand,[42] has identified that New Zealand's largest natural carbon sink occurs in the Fiordland Region, where lush forests are regenerating on steep slopes, and is of the same magnitude as national fossil CO_2 emissions.[43] A further six-year research programme is investigating how fiords form a conveyor belt for sequestration as storms and earthquakes trigger landslides and debris flows, depositing carbon-rich vegetation and soil directly into marine sediments. Following erosion, rapid forest regrowth pioneered by native nitrogen-fixing species renews landscape carbon storage.

Management opportunities to enhance natural sequestration include reducing flows from New Zealand's largest hydroelectric outflow during large storms and assisting native regeneration by seeding areas disturbed by erosion – also aiding the retention of native biodiversity in response to increasing storm-induced disturbances. With deeper understanding, such opportunities could enhance New Zealand's climate contribution.[44]

Accounting for forestry under New Zealand's climate targets

To account for net emissions from the land use, land-use change, and forestry (LULUCF) sector under the Paris Agreement, New Zealand has elected to use a modified activity-based accounting approach across afforestation and reforestation, deforestation, and forest management with a 1990 base year. Pre-1990 forest management includes both planted and natural forest. New Zealand does not currently account for other land-use activities (e.g. ongoing emissions from or management of cropland, grassland, peatlands, or coastal wetlands).[45]

For post-1989 afforestation, New Zealand credits forest growth up to the long-term average (LTA) carbon stock. Different LTAs are assumed to apply across production and permanent forest. Averaging factors out the effects on carbon stocks of cyclical harvesting and replanting. For management of pre-1990 forest, New Zealand credits carbon stock changes relative to a forest reference level, reflecting business-as-usual activity over 2000 to 2009. Separate forest reference levels apply to planted and natural forest. New Zealand accounts for harvested wood products under harvesting but not deforestation.[46] It also excludes qualifying

[42] See Earth Sciences New Zealand (n.d.).
[43] See Bukosa et al. (2025).
[44] This case study is courtesy of Troy Baisden, a Motu Research Affiliate involved in the associated research programme led by the University of Otago.
[45] See Ministry for the Environment (2024b).
[46] See Ministry for the Environment (2024b), Wakelin (2024), and Wakelin and Paul (2024).

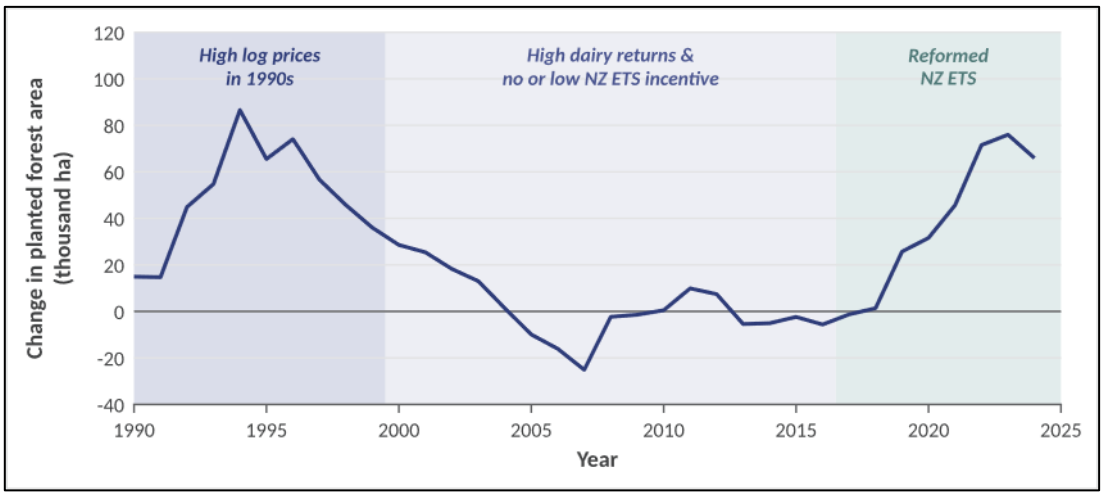
natural disturbance losses (and the matching recovery removals) until pre-disturbance carbon stocks are restored.[47]

These target settings are largely reflected in forestry accounting under the NZ ETS, although harvesting emissions liabilities still apply to post-1989 forests under stock change accounting (see section 4.1.2).

As a result of these accounting practices, New Zealand's forestry estate generates large fluxes in GHG gross emissions and removals over time due to harvesting/disturbances and replanting that are not counted when assessing achievement of New Zealand's targets. The policy rationale for this is that target accounting for forestry reflects New Zealand's contribution to cumulative net emissions in the long term. It also avoids the pendulum swing in forestry gross emissions and removals that can make it much easier for New Zealand to meet targets in some periods and much harder in others, simply as a function of sustainable harvesting and natural disturbances followed by replanting.

However, these large fluxes still affect physical outcomes in the atmosphere and have implications for managing transient and peak warming. These fluxes would be less marked if New Zealand's forests had an even age-class distribution. This is not the case. As shown in Figure 1, New Zealand experienced large spikes in planted forest in the 1990s and 2020s. Given the harvest cycle for exotic forests in New Zealand, dominated by *Pinus radiata*, harvesting from both spike periods will converge in approximately 30 years, producing a particularly large flux in gross emissions from forestry at a time when the world is likely to be approaching peak warming.

Figure 1: Change in total planted forest area per year from 1990 to 2024, separated by descriptive era



Source: Ministry for the Environment (2026d).

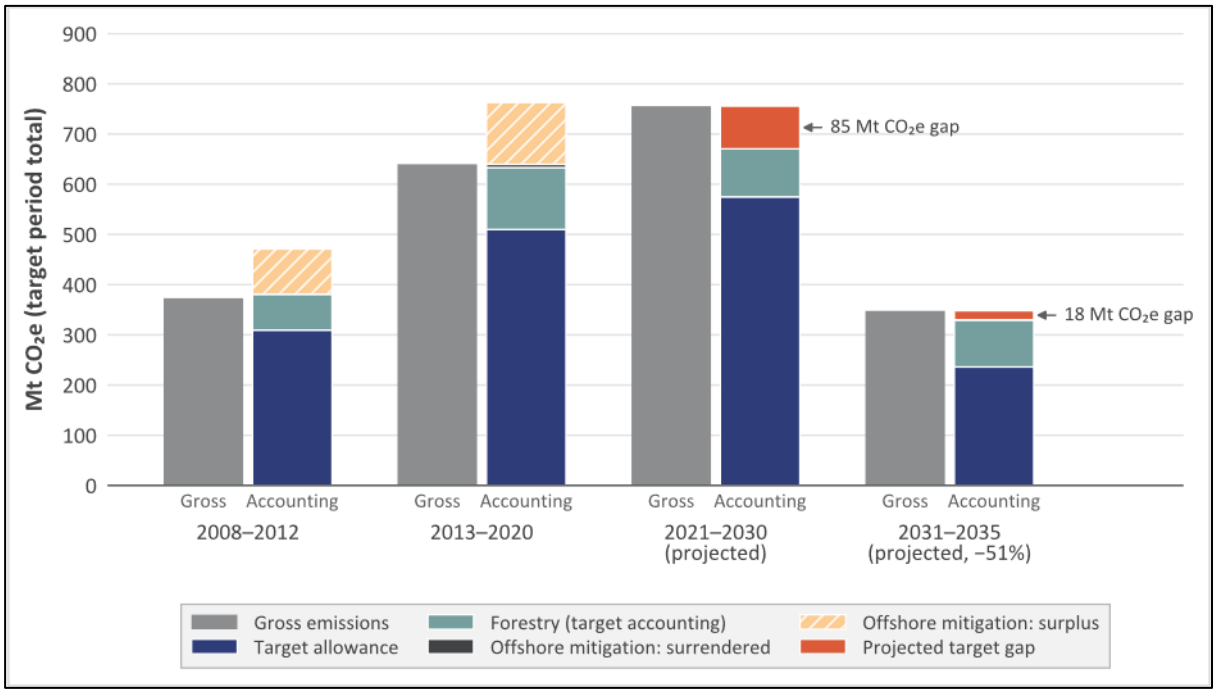
[47] See Decision 2/CMP.7 under the United Nations Framework Convention on Climate Change (2011), and New Zealand Government (2025).

Forestry's contribution to New Zealand's climate targets to date

New Zealand's forest sector has contributed significantly to helping New Zealand meet its international targets under the Kyoto Protocol (2008–2012) and United Nations Framework Convention on Climate Change (UNFCCC, 2013–2020), and this is projected to continue under New Zealand's NDCs for 2030 and 2035. Figure 2 illustrates the actual and projected contributions from forestry and offshore mitigation relative to New Zealand's international target allowances.

Despite the effort made to secure offshore mitigation under the NZ ETS from 2008 to 2015 (see section 4.1), New Zealand did not need any offshore mitigation to meet its 2008–2012 target and needed only a small margin for the 2013–2020 target, primarily because of net forestry removals. The offshore mitigation surrendered by participants in the NZ ETS was swapped for New Zealand Assigned Amount Units (NZ AAUs)[48] and carried over from the first Kyoto commitment period, but most was ultimately cancelled. Its domestic legacy lives on in the large NZ ETS stockpile, which now poses risks to targets and costs to taxpayers.

Figure 2: Forestry's contribution to New Zealand's international GHG targets



Note: Data are not directly comparable across target periods due to differences in accounting rules and national GHG inventories. Surplus offshore mitigation from 2008–2012 was carried over in the form of NZ AAUs but is reported here as offshore mitigation for the 2013–2020 target, and the amount from 2008–2012 is subsumed into the amount for 2013–2020 (which included units purchased after the first commitment period outcome was reported in 2014). Source: Adapted from Ministry for Cities, Environment, Regions & Transport (2023), Ministry for the Environment (2014, 2026c), and New Zealand Treasury (2026).

[48] NZ AAUs were the Kyoto units issued in relation to New Zealand's target level under the Kyoto Protocol from 2008 to 2012.

3 How removals support climate change mitigation

3.1 The role of removals in climate change mitigation scenarios

Removal activities can support both climate change mitigation and conservation and restoration of nature. The Intergovernmental Panel on Climate Change (IPCC, 2023a) defined carbon dioxide removal (CDR) as:

> Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical CO_2 sinks and direct air carbon dioxide capture and storage (DACCS), but excludes natural CO_2 uptake not directly caused by human activities (p. 121).

As reported by the Intergovernmental Panel on Climate Change (2022) and many other studies, large-scale removal activities are required in modelled global mitigation scenarios consistent with global temperature outcomes of 1.5°C and 2°C. The extent of modelled removals varies across scenarios, with higher volumes of removals required under lower temperature outcomes, higher cumulative emissions, and higher levels of certainty over climate outcomes. Scenarios that limit warming to 2°C and lower assume increasing deployment of CDR technologies, some of which are not yet technically or economically feasible and may not be sustainable.

The climate-carbon cycle response to removals is not symmetric with the response to emissions, and it changes over time. This is due to rebound effects involving terrestrial and ocean sinks, which respond to declining atmospheric concentrations of CO_2 by releasing stored carbon. There is an open question as to whether an emission and a permanent removal of CO_2 have a fully equal but opposite effect on climate, or whether there is an asymmetry. According to Canadell et al. (2021), model simulations of pulse emissions/removals showed "an emission of CO_2 into the atmosphere is more effective at raising atmospheric CO_2 than an equivalent CO_2 removal is at lowering it" (p. 761).[49] The authors also reported that in scenarios where CO_2 emissions decline to net zero and net negative levels, a sink-to-source transition occurs across the land – and in some cases the oceans – over time.[50] However, this suggested asymmetry is considered uncertain given the range of outcomes from different climate-carbon cycle models.

[49] Under simulations of pulse emissions/removals of ±100 petagrams of carbon (PgC) across eight models, "the fraction of CO_2 remaining in the atmosphere after an emission is larger than the fraction of CO_2 remaining out of the atmosphere after a removal (by 4 ± 3%; mean ± standard deviation)" (p. 761). The authors reported medium confidence in the sign of the asymmetry to the carbon cycle response to positive and negative CO_2 emissions, and low confidence in the sign of the asymmetry of the temperature response. See section 5.6.2.1.4.

[50] The authors explained, "For the land carbon sink, the sink-to-source transition occurs decades to a century after CO_2 emissions become net negative….The ocean remains a sink of CO_2 for centuries after emissions become net negative….Whether the transition to source occurs at all, the timing of the transition and the magnitude of the CO_2 source are determined by the magnitude of the removal and the rate and amount of net CO_2 emissions prior to emissions becoming net negative (medium confidence)….For scenarios with large amounts of CO_2 removal, such as SSP5-3.4-overshoot, the land source is larger than for SSP1-2.6 and the ocean also turns into a source" (p. 759).

Furthermore, and more importantly, nature-based removals are vulnerable to climate change itself. Gidden, Gasser, et al. (2023) found that in some scenarios consistent with 1.5°C and 2°C, declining CO_2 fertilisation effects and growing climate impacts across both anthropogenic and natural sinks (especially the increasing risk of wildfires, as observed in recent years) could shift the LULUCF sector as a whole from a projected sink to a source by 2100. The limited permanence of nature-based removals also implies a fundamental imbalance between the near-permanent warming from a fossil CO_2 emission and the potentially time-limited cooling from a biogenic CO_2 removal.[51]

Other biophysical effects can also change how nature-based removals influence the climate. One example is albedo effects. Forests reflect less light than cropland, grassland, or snow, and the associated warming of the land reduces some of the cooling effect of forest removals. Another example is evapotranspiration: forests add water to the air, which creates local cooling and supports cloud formation. These types of effects can vary by location and season.[52]

According to Lamb et al. (2026), national CDR proposals submitted to the UNFCCC fall significantly short of the levels modelled under different scenarios consistent with the Paris Agreement. If achieved, current proposals would generate 2.5 $GtCO_2$ in 2030, 2.7 $GtCO_2$ in 2035, and 3.6 $GtCO_2$ in 2050. This would leave a gap of 0.3 $GtCO_2$ in 2030, 1.2 $GtCO_2$ in 2035, and 5.2 $GtCO_2$ in 2050 to achieve the global temperature goal.

Schleussner et al. (2024) suggested that much higher levels of removals than those under modelled scenarios referenced by the IPCC would be needed to hedge against climate response uncertainty, but this may not be feasible under technical, economic, and sustainability constraints. They reported, "…we cannot be confident that temperature decline after overshoot is achievable within the timescales expected today. Only rapid near-term emission reductions are effective in reducing climate risks" (p. 366).

The prospect of overshoot significantly increases the need for both emissions reductions and removals. According to Geden and Reisinger (2025), about 220 Gt of net-negative CO_2 emissions are needed to reduce the global average temperature by 0.1°C. This is equivalent to five years of current annual global emissions and 100 years of current annual CDR levels (now dominated by anthropogenic forestry and revegetation[53]). In overshoot scenarios with levels of peak warming above 1.8–1.9°C, it would not be possible to return to 1.5°C during this century.[54]

[51] See Allen et al. (2025).
[52] See Jia et al. (2019).
[53] According to Friedlingstein et al. (2026), vegetation-related CDR accounts for 99% of current global CDR of 2.2 $GtCO_2$. In 2024, engineered CDR produced only 0.003 $MtCO_2$ – about a million times less than fossil CO_2 emissions.
[54] See Geden and Reisinger (2025) and United Nations Environment Programme (2026).

3.2 A typology of removal activities

Figure 3 from Babiker et al. (2022) illustrates the range of CDR activities across environmental domains. Figure 4 provides a simplified typology for nature-based (biological) and engineered (technological[55]) removals for use in this paper. Removals are grouped by durability (in years) and domain (terrestrial, aquatic, geological, and with underground storage). In the simplified typology, bioenergy with carbon capture and storage (BECCS) is classified primarily as a nature-based removal for convenience, although it actually spans both categories.

Additional types of activities are sometimes discussed as removals but are more accurately classified as emissions reductions as they do not achieve a removal of CO_2 that is already in the atmosphere. Key examples are:

- Carbon capture, utilisation, and storage (CCUS), and carbon capture and storage (CCS) from fossil fuel point sources
- Production of carbon-based products (biogenic or technological) that substitute for fossil-fuel-derived products (e.g. plastics, fuels, and carbon fibre).

It is also important to distinguish between nature-based removals activities that draw down and store atmospheric CO_2 (like afforestation and forest management) and conservation activities that protect existing carbon stocks (like avoiding deforestation and degradation of forests, wetlands, peatlands, and grasslands). Conserving existing carbon stocks still has significant value for the climate but is not a removal activity.

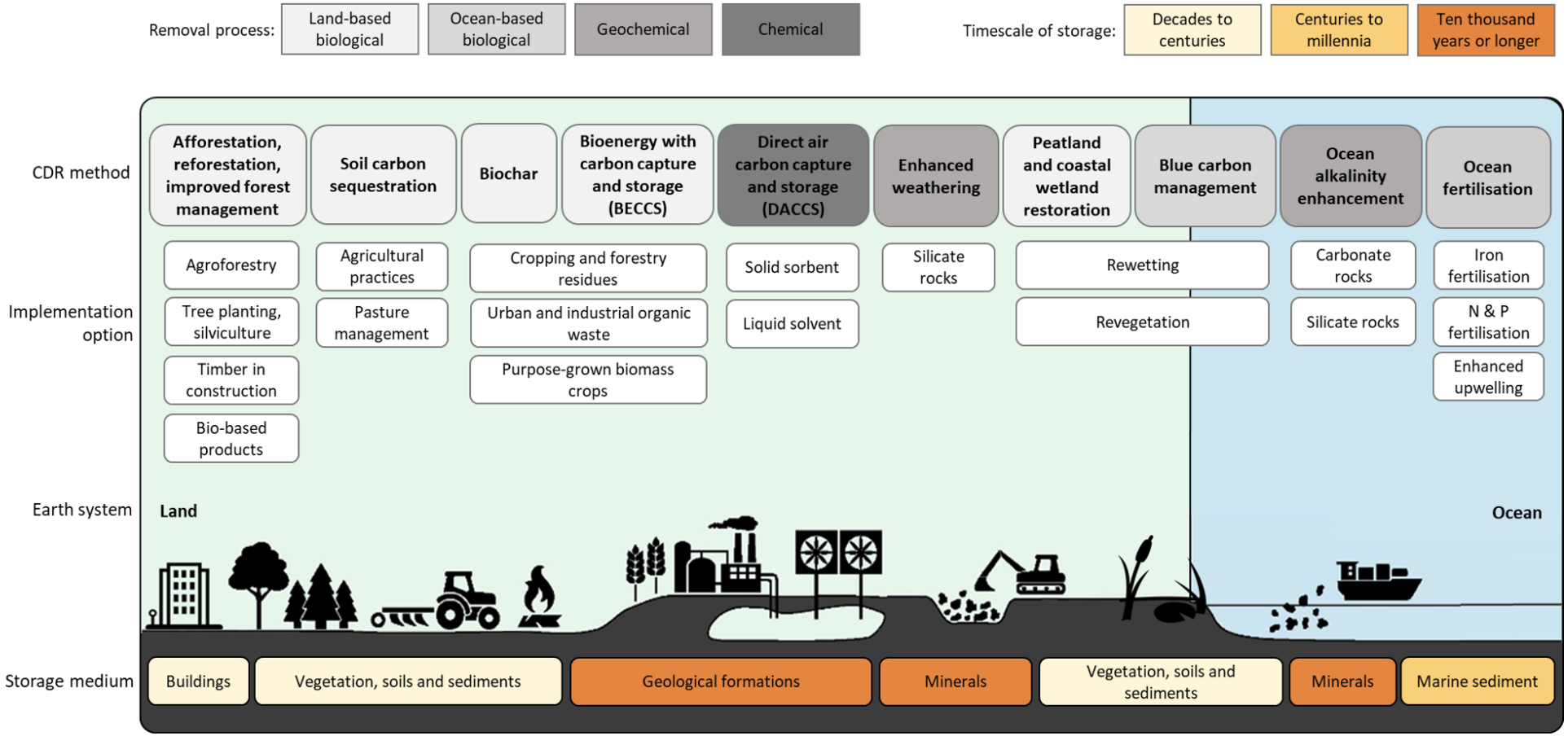
Removals vary widely in their mitigation potential and cost.[56] Based on a literature review, Fuss et al. (2026) found the costs of forest-related CDR to generally fall in the range of US$5–US$53 per tCO_2 removed, compared to US$15–US$400 for BECCS, US$10–US$360 for biochar, and US$400–US$2,500 for DACCS (see Figure 5). The authors cautioned that cost assessment is not consistent across studies and can be expected to change over time. The authors observed that the various mitigation potentials are not additive, as they can compete for land, energy, and funding.

Both nature-based and engineered removals can produce positive and negative co-impacts for the environment and communities. Soil carbon enhancement can improve soil health and agricultural productivity. Depending on how they are implemented, afforestation, forest management, and agroforestry activities can improve outcomes for freshwater, biodiversity, ecosystem conservation, erosion, climate resilience, and cultural amenity. The converse can also be true. For example, clearing diverse indigenous forests and replanting with monoculture exotic species can have negative impacts on biodiversity and resilience. Ocean fertilisation and alkalinisation have complex ecosystem impacts and risks, and more research is needed.[57]

[55] These are sometimes referred to as negative emission technologies (NETs) or novel CDR.
[56] See Babiker et al. (2022).
[57] See Secretariat of the Convention on Biological Diversity (2009).

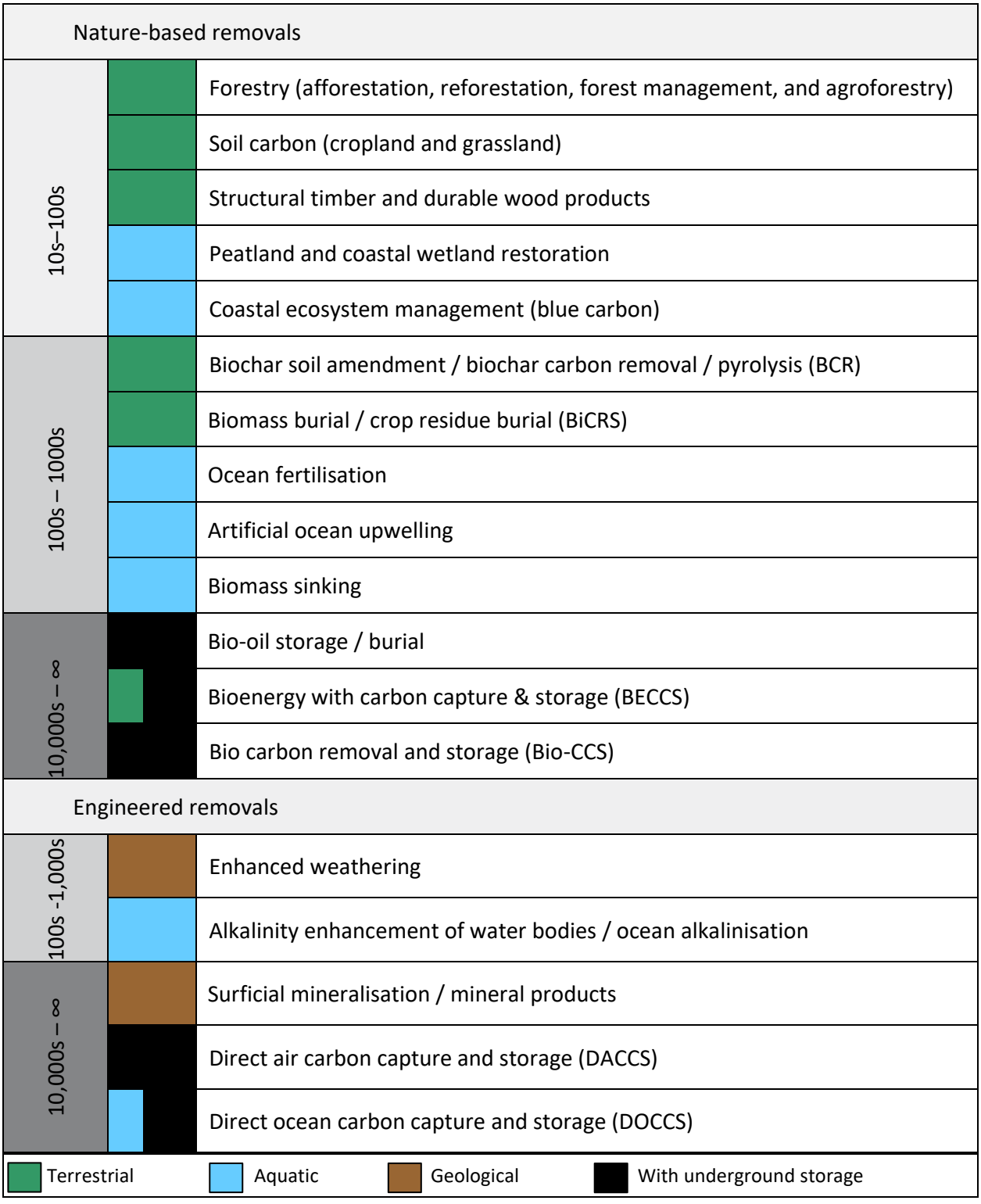
Using removals as substitutes for fossil fuel reductions has indirect negative impacts on air and water quality and human and ecosystem health due to ongoing fossil fuel use. Trade-offs between the broader impacts of different types of removals – and between removals and alternative land uses – need to be managed carefully across environmental, social, and economic considerations. Rueda et al. (2021) recommend building a risk-hedging portfolio of CDR activities that accounts for factors including feasibility (technical, economic, and governance), effectiveness (effect, timeliness, and permanence), and co-impacts (environmental, social, and economic).

Figure 3: Carbon dioxide removal taxonomy



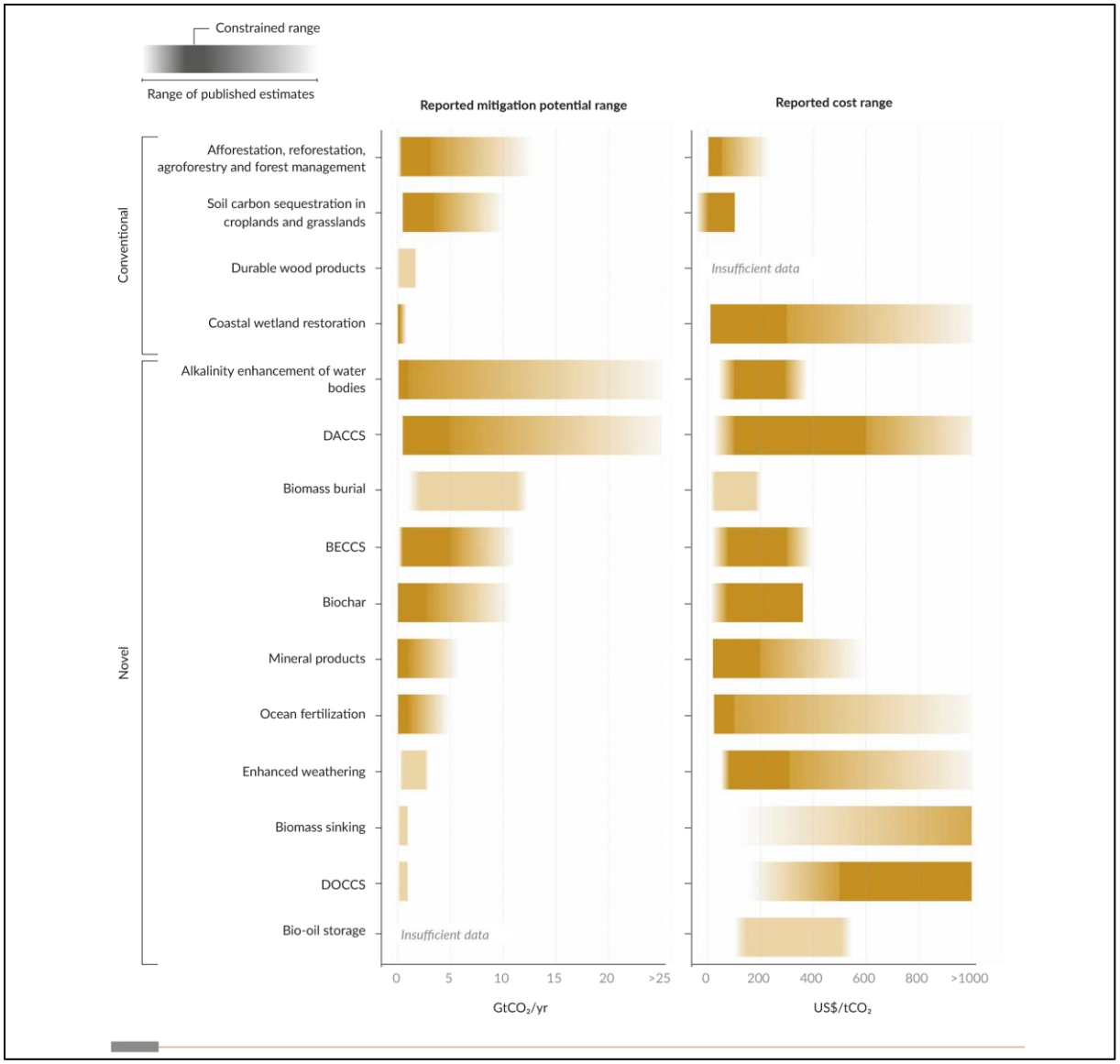
Cross-Chapter Box 8, Figure 1 | Carbon dioxide removal taxonomy. Methods are categorised based on removal process (grey shades) and storage medium (for which timescales of storage are given, yellow/brown shades). Main implementation options are included for each CDR method. Note that specific land-based implementation options can be associated with several CDR methods, for example, agroforestry can support soil carbon sequestration and provide biomass for biochar or BECCS (Babiker et al., 2022).

Figure 4: Simplified typology of removals



Note: Numbers indicate durability in years. Source: Adapted from Babiker et al. (2022), Canadell et al. (2021), Carbon Gap (2026), and Smith and Cowie (2023).

Figure 5: Mitigation potentials and costs by CDR method



Note: Estimated range of mitigation potentials and costs of CDR methods. Presented ranges depict the spread of reported estimates in the literature. Darker shading indicates more constrained ranges, considering more rigorous deployment assumptions or higher agreement across reported estimates. Some estimates may also include avoided emissions, so we refer to mitigation potential instead of removal potential. Estimates of costs also vary across methods in terms of system scope and whether they are meant to represent current costs versus future costs at scale. For both potentials and costs, these different methodological approaches limit direct comparability across CDR methods. Further, note that estimates of potential are not additive due to overlapping resource demands and related constraints. Source: Fuss et al. (2026), Figure 10.1. Reprinted with permission.

3.3 Challenges with integrating removals into mitigation policy

The diversity and complexity of removals affect their use within climate change targets and mitigation plans. This section examines challenges with the strategic application and crediting of removals and then reviews how those considerations have been reflected in international climate agreements and voluntary markets. It concludes with key insights for future removals policies.

3.3.1 Strategic application of removals

Removals can be directed in different ways to boost mitigation ambition and accelerate progress. They can help achieve greater net reductions of GHG emissions in the near term. They can compensate for hard-to-abate emissions, helping to achieve and sustain net-zero GHG emissions outcomes that stabilise atmospheric concentrations. They can augment national contributions to global mitigation beyond what is possible from emissions reductions alone, producing both climate and equity benefits. They can enable net-negative emissions outcomes essential in overshoot scenarios.[58] In these kinds of roles, removals can **contribute** to climate change mitigation that would not otherwise be possible from emissions reductions alone.

Removals can also be used to **substitute** for emissions reductions that would otherwise be possible. Deploying lower-cost removals can reduce near-term costs to meet a given target and generate economic, social, and/or distributional benefits. It can be suitable where emissions reductions are difficult, disruptive, or costly. However, substitution can also delay or displace sectoral decarbonisation essential to stabilising global temperatures and meeting societies' needs in the long term, particularly when removals are used to substitute for emissions reductions that are already practically and economically feasible. Delaying or displacing decarbonisation investment can contribute to high-emissions lock-in, making it more difficult and costly to decarbonise in later years and increasing the risk of stranded assets. Furthermore, ongoing gross emissions will require ongoing removals to achieve a specified temperature goal. When used as substitutes, temporary removals that enable higher fossil fuel emissions and are reversed without compensation would worsen long-term climate outcomes beyond the natural rebound effects discussed in section 3.1.

In some contexts, particularly corporate GHG targets and carbon footprints for goods and services, removals are used to **offset** emissions. The concept of offsetting is not used by the IPCC in its assessment reports or national GHG inventory guidelines, or by the UNFCCC in international climate change agreements. In common use, offsetting typically refers to counterbalancing or

[58] See Babiker et al. (2022); Honegger et al. (2021); Lamb et al. (2024).

compensating for specified emissions through external mitigation (e.g. beyond one's own supply chain or corporate boundary).

In its weakest applications, offsetting has been used as a substitute for reducing an entity's own emissions and involved non-permanent removals. International norms are evolving regarding the use of offsetting in general, the use of removals as offsets, and the types of claims that entities can make using external mitigation (e.g. carbon-neutral, net-zero, or contribution claims). A new mitigation hierarchy has emerged that emphasises reducing emissions and enhancing removals within one's own boundary as far as possible, and supports external mitigation as compensation only for residual, hard-to-abate emissions. In the context of the net-zero transition, norms are shifting towards support for external removals over external emissions reductions, and towards long-lived over short-lived removals. Whether the use of external mitigation enables a carbon-neutral, net-zero, or contribution claim depends on the standard being used and the type of external mitigation, and can vary across certification systems.[59]

3.3.2 Crediting of removals

Crediting of removals for use in mitigation targets and policies requires consideration of measurement and reporting, additionality, durability, emissions leakage, and potential for double counting.

Measurement and reporting

Measuring removals involving biological or geochemical processes is typically more uncertain than emissions from energy and industry at both global and national levels.[60] In the case of New Zealand's annual GHG inventory, the Ministry for the Environment (2026d) provided an uncertainty assessment for activity data, emissions factors, and trends for both net and gross emissions. In 2024, the combined uncertainty from activity data and emissions factors as a percentage of the national total for net emissions was below 1% for each of the energy and industrial source categories, but about 21% for the category of LULUCF–forest land.[61]

[59] For more information, see Axelsson et al. (2024), Integrity Council for the Voluntary Carbon Market (2024), International Organization for Standardization (2023), Science Based Targets initiative (2026), and Voluntary Carbon Markets Initiative (2025).

[60] For example, when assessing the global carbon budget in 2024, Friedlingstein et al. (2026) reported fossil fuel CO_2 emissions of 10.3±0.5 gigatonnes of carbon per year (Gt C/yr) and net CO_2 emissions from anthropogenic LULUCF of 1.3±0.7 Gt C/yr. While the absolute magnitudes of the uncertainties are comparable, the relative uncertainties are about ±5% for fossil fuels and ±54% for LULUCF.

[61] See Annex 2, table A2.1.1 in Ministry for the Environment (2026d).

In the LULUCF sector, it can be difficult to distinguish anthropogenic removals, which fall within the scope of the Paris Agreement, from natural removals. Accounting conventions vary. Successive studies have found a significant discrepancy between global LULUCF fluxes from integrated assessment models used in IPCC assessments compared to those used in national GHG inventories.[62] Much of this can be attributed to conceptual differences in what forest sinks are considered anthropogenic. Key factors include CO_2 fertilisation and climate effects. These are captured and reported as anthropogenic removals in national GHG inventories that account for total carbon stock changes on managed land. However, these are not considered anthropogenic in global models used (e.g. in IPCC assessments) to provide global emissions pathways and key milestone dates (e.g. the need to reach global net-zero CO_2 emissions by about 2050 in the most ambitious pathways that limit the overshoot of 1.5°C). The difference between these approaches is non-trivial, currently amounting to some 6–7 $GtCO_2$/yr. Where national inventories report a small net removal from forestry, global models report substantial net emissions.

Reconciling such accounting differences between models and inventories results in a reduction in the remaining capacity for net emissions under global carbon budgets consistent with 1.5°C or 2°C on the order of 120–192 $GtCO_2$.[63] Ongoing work to reconcile this accounting difference is intended to be reflected in the next IPCC assessment report, which may result in national emissions targets needing to be strengthened even further.

With engineered removals, a further consideration is the energy required to produce the removals. The contribution of engineered removals towards climate outcomes should account for energy emissions associated with capture, transport, and storage. It should also account for reductions in the efficiency of carbon capture and storage over time.

There is currently active discussion about how CDR is reported and accounted for in corporate standards. One proposal[64] would see a substantial shift away from the method used in national GHG inventories to one that considers the opportunity cost of plantation forestry. For example, under inventory accounting approaches, a net CO_2 removal is reported for plantation forestry as long as the total carbon stock of the forest estate is growing. Under the alternative approach, the carbon stock in a plantation forest is compared with the theoretical carbon stock that a mature native forest would have, and if the carbon stock in the plantation forest is lower, the forestry activity would be reported as a net emission (based on the difference between the plantation and

[62] See Gidden, Gasser, et al. (2023) and Grassi et al. (2018, 2021, 2023).
[63] See Grassi et al. (2021).
[64] See Greenhouse Gas Protocol (2026).

the mature native carbon stock), even if the plantation carbon stock is growing over time. Such an approach is unlikely to be adopted for national GHG inventories but would have a major impact on the ability of New Zealand forestry to provide offsets for corporate accounting.

Additionality

In climate change policy and voluntary carbon markets, the concept of additionality refers to whether a particular activity is generating mitigation that would not have happened anyway. It is applied to prevent entities from claiming credit for business-as-usual mitigation and emitting against that claim. The concept has proven difficult to define and operationalise consistently. In practice, common dimensions can include *inter alia:*

- ***Emissions additionality***: whether the emissions reductions claimed by the activity would have happened in the absence of the activity
- ***Regulatory/policy additionality***: whether the activity would have been required by existing laws and policies
- ***Financial/investment additionality***: whether the activity would have been financially viable without the application of new carbon-related finance
- ***Technology additionality***: whether the activity involves technologies that represent best available practice or extend beyond common practice in the local context of the activity.[65]

Three commonly observed practices for determining additionality are to: (1) compare outcomes from an activity against those under a counterfactual baseline ("without project") scenario, (2) select a base year from which all activities qualify as additional, or (3) pre-designate particular activities as additional for a specific jurisdiction or context.

Durability

Emissions of long-lived GHGs[66] can remain in the atmosphere and contribute to climate change for hundreds to thousands of years. In contrast, carbon stored by many types of removals can be reversed, making the climate benefits of removals temporary unless such reversals are compensated for through further removals or emissions reductions. All trees and vegetation will eventually die, releasing stored carbon to the atmosphere, although sustained land use can enable their replenishment. During their expected lifetime, nature-based removals can be vulnerable to pests, diseases, land-use change, and climate impacts, which will intensify over time. Some

[65] For a detailed discussion of additionality, see Gillenwater (2012).
[66] These include CO_2, nitrous oxide (N_2O), and industrial gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6)).

engineered removals can also be vulnerable to release (e.g. due to loss of well integrity or seismic events) or to reduced efficiency over time.

Importantly, long-term climate impacts are driven by cumulative net emissions. Temporary removals that are reversed without compensation will not reduce long-term climate change, but they can still have climate value. For example, depending on how they are used, temporary removals can help limit transient and peak warming.[67] They can also reduce the cumulative effects of increased temperatures. However, due to complex climate-carbon cycle feedbacks, temporary removals can also contribute to higher instantaneous effects of temperature rises and higher rates of temperature change upon reversal than if those removals had not occurred.[68]

A range of approaches has been used or proposed in different contexts (e.g. international agreements, national policies, compliance and voluntary carbon markets, and results-based payment programmes) to account for non-permanence when crediting removals. Examples are provided below; note that these are not mutually exclusive.

- ***Perpetual liability for reversal***: Applying a legal obligation for entities to replace or otherwise compensate for any credited removals that are reversed. For permanence, the liability would need to be enforced in perpetuity.
- ***Buffer requirement***: Setting aside a portion of removals from crediting as a safeguard against future reversals. The size of the buffer typically varies with the risk of reversal. For permanence, the size and durability of the buffer would need to be sufficient to compensate for reversals in perpetuity.
- ***Discounting***: Applying a discount rate when crediting less durable removals in recognition of the potential for reversal.[69] For permanence, the discount rate would need to be sufficient to compensate for reversals in perpetuity.
- ***Averaging***: Issuing credits up to the level of the long-term average carbon stocks generated by the activity and not accounting for subsequent fluxes from cyclical harvesting and replanting. For permanence, liability for reversal or other measures would still need to apply to credited stocks.
- ***Temporary crediting***: Issuing credits that expire after a set time period and must then be renewed or replaced with equivalent mitigation.

[67] See Dornburg and Marland (2008) and Matthews et al. (2023).
[68] See Kirschbaum (2003, 2006).
[69] Discounting could also be used to compensate for measurement uncertainty, non-anthropogenic effects, or other factors.

- ***Tonne-year accounting***: Issuing credits for every year of carbon storage weighted by their expected duration. This is a time-integral of carbon held out of the atmosphere, and it is a fundamentally different measure from stock-change accounting.[70]

Across these options, important policy judgements need to be made about the value of temporary removals relative to permanent removals and emissions reductions in the context of limiting cumulative, peak, and transient warming. Such judgements need to account for both the physical and institutional risks of reversal, particularly when removals are used to substitute for emissions reductions.

Emissions leakage

Both nature-based and engineered removals have the potential to generate net GHG emissions beyond the boundary of the activity, a process known as "emissions leakage." For example, a DACCS project that consumes electricity could result in higher fossil generation across the grid. A BECCS project could raise biomass prices and shift harvest elsewhere. Afforestation on marginal land could displace grazing that would shift elsewhere. Any domestic emissions leakage from removals would be self-correcting, since it would be reported in the national GHG inventory and be compensated for under the national mitigation target. However, policymakers who seek to credit or otherwise reward individual removal activities should take account of their potential to increase net emissions beyond their own boundary and avoid over-compensation. The risk of international emissions leakage from large-scale removals activities merits further study.[71] To correct for international emissions leakage from removals activities, the recipient country could compensate for the shifted emissions under its target, or the acting country could increase its target ambition and/or provide further mitigation support to other countries.

Double counting

Under both compliance and voluntary market mechanisms, the double counting of removals (like emissions reductions) by market participants can undermine the environmental integrity of emissions trading. With Article 6 of the Paris Agreement, corresponding adjustments are used to avoid double counting of internationally transferred mitigation outcomes (ITMOs) by the host and buyer under their NDCs. Article 6.4 of the Paris Agreement also enables a contribution claim to be

[70] For more information, see Matthews et al. (2023).

[71] In the industrial sector, the risk of international emissions leakage is expected to decline over time under the Paris Agreement, although this is expected to vary by jurisdiction and commodity (Acworth et al., 2020; Department of Climate Change, Energy, the Environment and Water, 2025; Rontard & Leining, 2021).

made, in which mitigation claimed by the funder is counted by the host and not the buyer (see section 3.4).

The issue of double counting also arises in voluntary markets. The mitigation underlying corporate offsets is typically reported in national GHG inventories and counted towards national targets unless the Government enables the domestic equivalent of a corresponding adjustment. Whereas some crediting systems prohibit any double counting, others tolerate the double counting of mitigation between governments and organisations but not between organisations.

International norms for managing measurement, additionality, durability, emissions leakage, and double counting vary considerably across UNFCCC target frameworks, national policies, and crediting mechanisms (whether voluntary or compliance). This has resulted in unclear and fragmented standards and incentives for removals producers. The use of inadequate standards in some cases has undermined the integrity of crediting claims, tarnishing the reputation of removals-crediting mechanisms more broadly. This has led to renewed efforts under the Paris Agreement and voluntary carbon markets to improve the quality and transparency of removals crediting.

3.4 Treatment of removals under international agreements

Across the decades of negotiations under the UNFCCC, countries have debated how to account for the LULUCF sector under national mitigation targets. While net LULUCF removals can increase target ambition and flexibility and lower target costs, they can also displace decarbonisation in other sectors and be vulnerable to reversal. Removals activities can impact positively and negatively on sustainable development as well as human rights and the rights of Indigenous peoples.

Under the Kyoto Protocol[72] and Paris Agreement, countries ultimately agreed that anthropogenic emissions reductions and removals can be used interchangeably towards meeting their mitigation commitments, subject to agreed rules, guidelines, and methodologies for accounting and reporting. This treatment presumes that countries will carry future target liability for any subsequent reversals of credited removals. However, there is currently no legally binding mechanism for enforcement. Across national targets and market-based approaches[73] under both

[72] See United Nations (1997).

[73] "Market-based approaches" refer to cooperative approaches involving the use of emissions trading (mitigation transfers) between countries to help with meeting their targets. These were defined under Articles 6 and 12 of the Kyoto Protocol and Article 6 of the Paris Agreement.

instruments, removals accounting has involved a determination of additionality to distinguish removals that would have occurred under business-as-usual from those due to new interventions.

As explained in Box 4, the Kyoto Protocol applied top-down rules for the treatment of emissions and removals from LULUCF activities by Annex I (developed) countries and under the project-based mechanism involving non-Annex I (developing) countries. These rules have had a significant influence on how New Zealand accounts for the LULUCF sector under its NDCs and the NZ ETS, although New Zealand has modified the rules in some cases, as discussed below.

Box 4: LULUCF accounting under the Kyoto Protocol

Under the Kyoto Protocol, Annex I countries set their targets relative to a base year (1990 in most cases). Countries with net removals from land-use change and forestry in the base year (such as New Zealand) did not include them in the calculation of their targets but could count them towards meeting their targets. Whereas national GHG inventories apply stock change accounting for the LULUCF sector across all land uses, the Kyoto Protocol applied activity-based accounting, as follows:

- Under Article 3.3, Annex I countries were obligated to account for net emissions/removals across afforestation, reforestation, and deforestation in each commitment period relative to the base year. The base year and the land-use change requirement provided the measure of additionality.
- Under Article 3.4, Annex I countries had first the option (in the first commitment period, CP1, 2008–2012) and then obligation (in the second commitment period, CP2, 2013–2020) to account for net emissions/removals from forest management. In CP1, the additionality measure consisted of both a discount (an 85% reduction in forest management removals to exclude CO_2 fertilisation, indirect nitrogen deposition, and dynamic effects of age structure from previous activities) and a cap (crediting up to 3% of base-year emissions). In CP2, the additionality measure was the application of a forest management reference level (FMRL), and a cap set at 3.5% of base-year emissions.[74]

[74] According to Zhang (2011), the self-nominated methods used by Annex I countries to credit forest management under the Kyoto Protocol resulted in inflated crediting. Under CP2, countries that factored increasing levels of harvesting into business-as-usual forest management lowered their FMRLs, increasing crediting. The author reported, "Presuming a significant increase of the harvest rate, the FM reference level (FMRL) for 2013–2020 is only 1/5 of the historical mean value of FM removals even though most parties show an increasing or a steady trend of net removals from 1990 to 2009" (p. 171). The impact of over-crediting was constrained by the forest management cap.

- Under Article 3.4, Annex I countries could elect to count net emissions from cropland and grassland management in both commitment periods. This used "net-net" accounting relative to the base year: countries counted the net flux during the commitment period relative to that in the base year (multiplied by the number of years in the commitment period).
- Annex I countries that generated net removals from LULUCF activities earned removal units (RMUs) which counted towards their targets. As a reflection of impermanence, RMUs could not be carried over for use in a future commitment period.

Annex I countries could use three flexibility mechanisms (international emissions trading under Article 17, Joint Implementation (JI) under Article 6, and the Clean Development Mechanism (CDM) under Article 12) to help meet their Kyoto targets. International emissions trading and Joint Implementation between Annex I countries were bound by the terms of Annex I targets.

Under the CDM, afforestation and reforestation projects hosted in non-Annex I countries were assigned temporary units (temporary Certified Emission Reductions (tCERs) and long-term Certified Emission Reductions (lCERs)). These carried requirements for replacement upon expiry, reversal, and (for lCERs only) failure to meet reporting requirements. Additionality was determined using counterfactual baselines.

Under the Paris Agreement, both developed and developing countries have the flexibility to pledge NDCs with variable form and scope, subject to common principles and guidelines for accounting and reporting.[75] Successive NDCs are to represent progression and reflect the highest possible ambition. Countries are to promote environmental integrity, transparency, accuracy, completeness, comparability, and consistency, and ensure the avoidance of double counting. They are also encouraged to take account of existing methods and guidance under the UNFCCC (e.g. IPCC guidelines for national GHG inventories). Countries should strive to include all categories of anthropogenic emissions or removals in their NDCs, and to continue to include any sources, sinks, or activities once they have been included. To date, most – but not all – countries have included the LULUCF sector in their NDCs. As a result of this flexibility, there is no prescribed removals

[75] For example, NDCs can include absolute economy-wide reductions against a base year, baseline scenario targets, emissions intensity targets (e.g. emissions per unit GDP), peaking targets (e.g. a year rather than a quantity), policies and measures, and non-GHG targets (e.g. renewable capacity in gigawatts).

methodology for NDCs covering net-net versus gross-net accounting, forest reference levels, caps on forest management crediting, or the exclusion of non-anthropogenic effects.

Under Article 6 of the Paris Agreement, countries can cooperate to achieve their NDCs through market and non-market approaches. Article 6.2 provides for bilateral or multilateral government agreements involving the transfer of ITMOs. To avoid double counting of transferred mitigation, a corresponding adjustment (CA) is made to the emissions balance of the host and buyer countries. Article 6.4 creates a centrally governed Paris Agreement Crediting Mechanism (PACM), which promotes mitigation and sustainable development and can involve public and private entities authorised by participating governments. Under Article 6.4, host countries can either: (a) authorise the transfer of Article 6.4 emissions reductions (authorised A6.4ERs) as ITMOs that carry CAs and can be used to help meet NDCs or for other international mitigation purposes, or (b) use them domestically as mitigation contribution A6.4ERs and/or cancel them for voluntary market contribution claims.

The Supervisory Body of the PACM has developed a series of standards for the crediting of removals under Article 6.4, and further work is ongoing. In 2024, a standard[76] was issued for general project methodologies (addressing baselines, additionality, leakage, and conservativeness) and a separate standard[77] for removals activities (plus emissions reduction activities involving reversals). In 2025, the Supervisory Body agreed a standard for removals methodologies.[78]

Pursuant to these standards, net removals under Article 6.4 are determined by comparing the net emissions/removals outcomes from an activity relative to a baseline scenario, taking account of emissions leakage and any crediting deficit[79] and subtracting a share of proceeds for the Adaptation Fund (typically 5%), a contribution of 2% towards an overall mitigation of global emissions (OMGE), and a buffer contribution. The buffer contribution is determined from a reversal risk assessment.[80] Participants are required to submit monitoring reports during both the crediting period and a post-crediting period. After a minimum post-crediting period, participants may request termination of monitoring if they can demonstrate "negligible risk of reversal." This applies when the removals

[76] See Supervisory Body for the Article 6.4 Mechanism (2024a).

[77] See Supervisory Body for the Article 6.4 Mechanism (2024b).

[78] See Supervisory Body for the Article 6.4 Mechanism (2025).

[79] A crediting deficit occurs if an activity generates negative removals (i.e. net emissions) during a crediting period; the deficit is then carried over to the next period.

[80] This involves identifying, assessing, and mitigating reversal risks, and calculating an overall percentage-based risk rating covering both avoidable and unavoidable reversals. Based on the risk rating, a share of A6.4ERs is directed to a Reversal Risk Buffer Pool Account. This is used to compensate for reversals; in the case of avoidable reversals, participants must replenish the Account.

from an Article 6.4 activity "have reached and will remain in a steady state or, where relevant, are stabilized for at least 100 years from the year of demonstration of negligible risk of reversal."[81] Negligible risk of reversal is to be defined as a maximum percentage of loss over that 100-year period. To date, that figure has not been agreed. The standards also address avoiding other negative environmental and social impacts and respecting human rights and the rights of Indigenous peoples.

This policy architecture for crediting removals and managing reversal risk under Article 6.4 is very different from the CDM's temporary crediting approach (see Box 4), which did not incentivise significant uptake.[82] The Supervisory Body considered but did not accept country proposals for tonne-year accounting. The combined impact of the buffer contribution and the negligible risk threshold will determine the feasibility of nature-based and engineered removals under Article 6.4.

The approach under Article 6.4 sets a possible precedent for international crediting of removals activities through voluntary carbon markets and for countries considering domestic removals policies to help achieve their NDCs. However, it also enshrines some key assumptions that have yet to be tested, particularly whether it will be feasible to exclude non-anthropogenic effects from activity-based removals accounting, determine the ongoing additionality of removals activities in a world converging towards net-zero and net-negative emissions outcomes, and enforce any future non-negligible reversal of removals credited under Article 6.4 for a period of 100 years or longer. As discussed earlier in this section, requiring durability of only 100 years for credited removals is not consistent with ensuring the climate equivalence of emissions reductions and removals to achieve the global temperature goal.

3.5 Treatment of removals in voluntary markets

While compliance markets remain the core market mechanism for addressing the goals of the Paris Agreement, voluntary carbon markets (VCMs) are now responsible for 2% of carbon trades and, in 2024, were responsible for 182 million tonnes of carbon removals.[83] Unlike regulatory-driven carbon markets, VCMs are driven by organisations and individuals voluntarily offsetting their emissions. Participants purchase carbon credits to compensate for their carbon footprint for the purpose of offsetting or enabling removals. However, VCMs are guided by international standards

[81] See Supervisory Body for the Article 6.4 Mechanism (2025, p. 18).
[82] Together, tCERs and lCERs accounted for less than 1% of the nearly 2.5 million CERs issued from November 2007 to August 2026 (CDM Executive Board, 2026).
[83] See Forest Trends' Ecosystem Marketplace (2025).

and best practices rather than strict regulatory requirements. As a result, VCMs have faced challenges of credibility and transparency, as well as accusations of greenwashing that can help explain their variable performance over time.[84]

Today, demand for the VCM is driven by private companies that have made net-zero or carbon-neutrality commitments.[85] As of 2020, companies that have pledged some form of net-zero or carbon-neutrality commitment by 2050 or earlier account for revenues of more than US$16 trillion, exceeding the gross domestic product (GDP) of China.[86] However, many of the targets lack clarity in key aspects,[87] and grapple with issues of additionality and leakage[88] as well as implementation.[89]

There is substantial variability in the storage timescale and acceptable reversal risk within VCMs across jurisdictions.[90] Further, for removal approaches that rely on geological storage or mineralisation, and for biochar, methodologies for developing standards are only just beginning to emerge.[91] Nevertheless, new frameworks and criteria are emerging to help companies meet their net-zero targets.[92] One example is the updated Corporate Net-Zero Standard from the Science Based Targets initiative (SBTi), described in Box 5. In some cases, significant price differentials are emerging for higher-durability credits with high integrity that are being backed by large technology companies, such as Microsoft and Stripe, as well as financial sector players like Swiss Re,[93] which offer potential pathways for incentivising more durable or permanent removals.

[84] See Donofrio et al. (2020).
[85] See Donofrio et al. (2020).
[86] See UN Data (2020).
[87] See Rogelj et al. (2021).
[88] See Ruiting et al. (2025).
[89] See Machnik et al. (2020) and Tong et al. (2020).
[90] See Michaelowa et al. (2023).
[91] See Smith et al. (2026).
[92] For more information, see Axelsson et al. (2024), Integrity Council for the Voluntary Carbon Market (2024), International Organization for Standardization (2023), Science Based Targets initiative (2026), and Voluntary Carbon Markets Initiative (2025).
[93] See Ahonen et al. (2023).

Box 5: Removals in SBTi's Corporate Net-Zero Standard

Background on the SBTi

Launched in 2015, the SBTi is a voluntary corporate climate change initiative that aims to drive the adoption of emissions targets consistent with the best available scientific evidence. In 2021, it launched the Corporate Net-Zero Standard, providing a framework for companies to set near-term and long-term targets aligned with limiting global warming to 1.5°C. The updated Corporate Net-Zero Standard Version 2.0 was published in June 2026. Validation against V2.0 will begin in February 2027, with its use becoming mandatory for new target submissions from February 2028.

At the time of writing, over 12,000 companies across more than 100 countries and territories have validated science-based targets through the SBTi, while a further 2,300 have active commitments. Collectively, companies with SBTi-validated targets represent around 40% of global market capitalisation. Over 2,800 companies have set a net-zero target in addition to a near-term target. New Zealand has 56 companies with validated targets.

Role of removals under the Corporate Net-Zero Standard V1

Under the Corporate Net-Zero Standard (2021), emissions reductions take priority. To achieve net-zero emissions, companies must firstly "reduce scope 1, 2 and 3 emissions to zero or a residual level consistent with reaching net-zero emissions at the global or sector level in eligible 1.5°C scenarios or sector pathways" (p. 42). Target-setting methods and pathway options vary by sector, but the SBTi advises that long-term science-based targets will involve at least a 90% absolute reduction across scopes for many companies, regardless of whether cross-sector or sector-specific pathways are used. The net-zero target year must be no later than 2050, and sooner for some sectors (e.g. power generation).

Removals play two distinct roles within the SBTi framework:

- ***Neutralisation of residual emissions***: At the net-zero target year and thereafter, companies must permanently neutralise all residual emissions using carbon removals. Carbon credits cannot be counted towards progress against emissions targets but may be used to neutralise residual emissions.
- ***Beyond value chain mitigation***: Companies are encouraged to take additional mitigation action or make investments outside their value chains. This can include financing carbon removal and storage activities, as well as emissions-reduction projects. Such activities are additional to the company's own emissions-reduction targets and do not count towards progress against those targets.

Evolution under Corporate Net-Zero Standard V2

Version 2 retains the core principles of the original standard but introduces a more explicit expectation that companies support carbon removals during the transition to net zero, rather than waiting until they reach their net-zero target year.

This is reflected in two developments:

- ***Ongoing Emissions Responsibility (OER)***: V2 evolves the V1 approach to beyond-value-chain mitigation through an Ongoing Emissions Responsibility framework. This provides formal recognition for companies making climate contributions to address the impact of their ongoing emissions. OER encompasses a broader range of activities, including verified emissions reductions and removals, mitigation funding, low-carbon research and development, adaptation and resilience, and loss and damage. These contributions are accounted for separately from companies' emissions inventories and progress against their targets.
- ***Phased requirement to support removals from 2035***: From 2035, larger companies will be required to support eligible carbon removals equivalent to at least 1% of their ongoing scope 1, 2, and 3 emissions. This responsibility increases linearly to 100% by the company's net-zero target year, and no later than 2050.

Additionally, V2 introduces a more differentiated approach to removals durability: residual emissions from long-lived GHGs must be neutralised using long-lived removals (defined as capable of retaining carbon for centuries to millennia), while residual emissions from other gases may be neutralised using either short-lived or long-lived removals. The distinct requirement for long-lived removals is also phased in, from a minimum of 10% of covered long-lived gas emissions in 2035 to 100% by the net-zero target year.

As discussed in section 3.3.2, voluntary offsetting that substitutes for feasible emissions reductions can produce perverse outcomes. The literature increasingly highlights "the practical limitations of offsets and the potential for offset schemes to credit abatement that is non-existent, nonadditional, and potentially impermanent."[94] However, offset schemes are dominant within the VCM landscape and are likely intractable.[95] It is important for offsets to focus on high-quality, durable removals, coupled with strong and enforceable long-term monitoring, reporting, and verification.[96]

[94] See Macintosh et al. (2024, p. 6).
[95] See Romm et al. (2025).
[96] See Fankhauser et al. (2022).

Interest is growing in the complementarity between climate and biodiversity goals and the potential for integrated market mechanisms.[97] Like VCMs, biodiversity credit markets have been operating for decades, but pressure to close the biodiversity funding gap has accelerated interest in supporting financial instruments, such as biodiversity markets, to incentivise private investment in nature.[98] Nevertheless, there is a risk that new voluntary biodiversity credit markets will crowd out public investment, replicate the flaws of other international systems, and fail to bend the curve on biodiversity loss or reduce climate change.[99] Recognising the design deficiency crisis, zu Ermgassen et al. (2026) outline five rules for scientifically credible biodiversity markets. Rules one, two, and three extend the commonly agreed principles of additionality, leakage, and permanence; rule four advocates for the development of scientifically valid metrics; and rule five recommends the development of governance processes that involve robust regulation and independent verification and auditing.

Failing to meet these rules risks having adverse effects on biodiversity objectives. For example, markets that prioritise simple, easy-to-apply measurement systems have created fungible units internationally that do not correlate meaningfully with the desired nature-related policy outcome.[100] Likewise, the use of measures like market "scale," financial value, or volume of trades as indicators of market effectiveness has masked limited progress on achieving biodiversity targets.[101] Further, the majority of biodiversity gains have been non-additional, but clever accounting and lax project rules have allowed biodiversity markets to record biodiversity gains even in the absence of any meaningful environmental change.[102] In other cases, leakage has created perverse outcomes, and a lack of independent monitoring and evaluation risks marginalising the legitimacy of the market.

In situations where policy has turned to integrating biodiversity and climate goals for the purpose of delivering co-benefits, there is ongoing debate about market design.[103] There are clear benefits that could arise from allowing suppliers to be paid for simultaneously mitigating climate and protecting biodiversity either through bundling or stacking biodiversity and carbon credits.

[97] See Zhou and Almond (2026).
[98] See zu Ermgassen et al. (2026).
[99] See Wunder et al. (2025).
[100] See Carreras Gamarra and Toombs (2017) and Duffus et al. (2025).
[101] See Department for Environment, Food & Rural Affairs (2023).
[102] See Gibbons et al. (2017).
[103] See Scott et al. (2026).

Nevertheless, concerns remain about the practicalities of an integrated nature market approach.[104] While some VCM and biodiversity credit markets have begun to bundle credits,[105] the extensive experience with bundling/stacking from implementing payment for ecosystem service (PES)-type land-use conditional contractual payments offers mixed lessons for the practicalities of an integrated nature market. Von Hase and Cassin (2018) showed that while bundling credits has sometimes been feasible, stacking has consistently failed from an ecological and additionality perspective due to buyer additionality concerns, ecological complexities, and high transaction costs. For voluntary nature markets, overcoming these challenges will come down to the governance architecture that will enable robust implementation, monitoring, and enforcement of the institutional arrangements.

3.6 Key insights for future policy on removals

Enhancing both nature-based and engineered removals is essential to achieving the temperature goal of the Paris Agreement, and the need for removals will increase as countries shift from net-zero to net-negative targets due to temperature overshoot. Nature-based removals can generate positive co-benefits for nature, although negative impacts are also possible. Under current policies, countries are falling short of delivering the scale of removals needed to keep the global temperature goal within reach. There are physical, technical, economic, social, and environmental constraints to upscaling removals.

To date, international climate agreements, national policies, and voluntary carbon markets have widely presumed the interchangeability of emissions reductions and removals. While the cooling impact of one tonne of removals may not be fully equivalent to the warming impact of one tonne of emissions over time, the more significant difference between emissions and removals in terms of their impact on climate tends to be the durability of removals. Removals vary widely in their mitigation potential and cost. Accounting for diverse removals requires careful consideration of differences across measurement, additionality, durability, emissions leakage, and double counting.

Under today's constraints, removals supply is finite. Deploying finite removals in place of avoidable emissions carries an opportunity cost: those removals will not be available to compensate for unavoidable emissions – and enable overshoot recovery – into the future. Locking future generations into delivering large-scale durable removals – or maintaining non-durable removals

[104] See Wunder et al. (2025).
[105] For example, see Gold Standard (2026) and Climate, Community, and Biodiversity Alliance (2026).

deployed by previous generations – to compensate for higher historical and current emissions that could have been avoided has grave implications for intergenerational justice. It also raises challenging questions about how the obligations and costs for generating those removals alongside emissions reductions should be distributed across countries and sectors.[106] This is why it remains essential to boost the ambition and speed of both gross emissions reductions and removals.[107]

These challenges point to two conceptual policy pathways for crediting removals in countries' targets and mitigation strategies:

- Applying removals as complementary contributions to deliver mitigation at the highest possible ambition towards desired climate outcomes, or
- Applying removals as imperfect substitutes for emissions reductions within a prescribed emissions target, with safeguards governing the quantity, type, or permanence of removals used.

The choice of policy pathways has significant implications for mitigation targets and strategies and ultimately for the climate.

The pathway of substitution values removals in relation to emissions reductions. It places removals in competition with emissions reductions regarding the cost, ease, timing, uncertainty, and climate and other impacts of implementation. Done with high integrity, it would limit the scope of removals to those that achieve the greatest durability, as they offer the greatest relative offsetting potential with long-lived GHGs. Substitution limits the demand for removals to the level of gross emissions, and the market value for removals to the marginal cost of decarbonisation. As a result, the demand and market value for removals could fall as countries approach net zero, despite the increasing value of removals over time for overshoot recovery, nature conservation, and resilience to climate impacts. The pathway of substitution offers countries an automatic trade-off between removals and emissions reductions under their climate targets and strategies, making it easier to avoid or defer decarbonisation in the short term and creating investment uncertainty for emitters and removals producers.

In contrast, the pathway of contribution values removals on their own merits as essential enablers of the global temperature goal. There is no need to force a false conformity with emissions reductions, which adds to climate risk and limits the market value of removals to the marginal cost of decarbonisation. Instead, the unique and variable features of removals become a strength that can be valued and directed across a diverse portfolio to achieve better integrated outcomes for

[106] See Gidden, Brutschin, et al. (2023).
[107] See Andreoni et al. (2024) and Ganti et al. (2026).

cumulative, peak, and transient warming alongside positive co-impacts for the environment, communities, and economy. Countries have clearer incentives to make their targets and strategies for emissions reductions and removals interdependent rather than codependent, enabling decarbonisation to accelerate alongside increasing removals and sending clear investment signals for both emitters and removals producers.

Either of these two removals pathway choices – contribution or imperfect substitution with safeguards – is preferable to what has been observed to date in international agreements, voluntary carbon markets, and New Zealand's climate policies: an oversimplified presumption of equivalence between removals and emissions reductions that enables lower-cost, lower-benefit removals with inadequate liability for reversals to displace essential decarbonisation and push the global temperature goal beyond reach.

4 Overview of New Zealand's current emissions pricing and removal policies

4.1 New Zealand Emissions Trading Scheme

4.1.1 General features

After initially planning for a carbon tax under its 2002 climate change policy package, New Zealand opted for an emissions trading system (ETS) as the core mitigation policy for meeting its international climate change commitments.

By convention, an ETS places a cap on gross or net emissions and assigns obligations for participants to surrender emissions units (i.e. allowances) to cover their emissions within the cap, which declines over time. Emissions units can be allocated for free, sold at government auction, and/or issued for eligible activities, such as removals. An ETS also establishes a market where participants can buy and sell emissions units. The balance between unit supply and demand sets a market price on emissions and removals which flows across supply chains, creating price incentives for goods and services supporting lower emissions and greater removals.[108]

Operational since 2008, the NZ ETS was the first ETS in the world designed to cover every economic sector over time; however, this scope was never achieved. Forestry was the first sector to assume unit obligations in 2008, followed by stationary energy, transport, and industry in mid-2010,

[108] For more information on the design and operation of ETSs around the world, see Partnership for Market Readiness and International Carbon Action Partnership (2021).

and waste and synthetic industrial gases in 2013. Biogenic CH_4 and N_2O emissions from agriculture were initially scheduled to begin unit obligations in 2013. While emissions reporting obligations began as scheduled in 2012, unit obligations were deferred several times, and biogenic emissions from agriculture were formally removed from the NZ ETS by amendments in 2024.[109] Other sectors currently excluded from the system include some synthetic gases, non-municipal waste, wastewater, and international shipping and aviation.

The NZ ETS is currently a domestic-only system that trades in New Zealand Units (NZUs). The current sources of unit supply are auctioning (with an auction reserve price (ARP) and two-tier cost containment reserve (CCR) with a trigger price), output-based industrial free allocation to eligible emissions-intensive and trade-exposed producers, and units issued for forestry and industrial removals. From 2008 to mid-2015, it had an unconstrained buy-and-sell linkage to the international Kyoto market, although the option to sell domestic Kyoto units offshore was restricted to forestry activities in 2009 and was scarcely used. Two fixed tranches of free allocation were provided to pre-1990 forest owners (in 2008 and 2013) and to the fishing sector (in 2010) in recognition of the system's impact on asset values.

Auctioning operates under an overall limit, defined as the sum of auctioning, units available from other sources (currently free allocation), and offshore mitigation (not currently eligible). Although not defined in legislation, the NZ ETS cap conceptually is the difference between budgets for total net emissions (in line with New Zealand's 2050 target) and non-ETS net emissions. This does not represent a hard limit on gross emissions from covered sectors. Units issued for removals, industrial allocation, or cost containment are not bound by the overall limit. The legislation requires the Government to compensate for any emissions units from industrial allocation or cost containment that cause emissions budgets to be exceeded. Unit supply and price control settings for auctioning are decided for five years in advance and are extended by one year each year. These settings are informed by advice from the Climate Change Commission.

4.1.2 Forestry in the NZ ETS

The NZ ETS is the only ETS globally that takes a sector-wide approach to forestry, with mandatory unit liabilities for deforestation and optional units for eligible post-1989 afforestation. Other ETSs either exclude forestry or accept forestry offsets generated through eligible project-based activities. Reflecting international forestry rules applied by New Zealand under the Kyoto

[109] Climate Change Response (Emissions Trading Scheme Agricultural Obligations) Amendment Act 2024.

Protocol and the Paris Agreement, the NZ ETS operates with a 1990 base year for land eligible for forestry activities.[110]

Pre-1990 exotic forest owners (or designated parties) are liable for deforestation emissions in the NZ ETS but not harvesting emissions, provided replanting occurs. Land that was native or exotic forest on 31 December 1989 and was mainly native forest on 31 December 2007 is not covered by the NZ ETS.

Post-1989 forest owners (or designated parties) can register to earn units. Those who opted in before 2019 (or during the transition period from 2019 to 2023) use stock change accounting: they receive units as the forests grow and surrender units for harvesting or deforestation. Those who opted in from 1 January 2023 (or during the transition period) use either: (a) stock change accounting for permanent forests,[111] or (b) averaging accounting for standard (production) forests. Under averaging accounting, participants earn units as the forest grows up to the long-term average level of carbon stocks over multiple forest rotations. For pre-1990 forests and for post-1989 forests under averaging, deforestation liabilities can be avoided by replanting equivalent forest elsewhere ("forest offsetting"). The NZ ETS excludes management of pre-1990 forest, old-growth indigenous forest remaining in forest, fruit and nut trees, and small-scale tree planting.[112]

Importantly, there are no limits on the number of forestry NZUs emitters can use to meet their surrender obligations, or on the number of forestry NZUs that can be supplied into the NZ ETS. This is a globally unique feature in ETS design.

All NZ ETS post-1989 forests are covered by the Temporary Adverse Event Suspension (TAES) mechanism, which pauses earning and surrender obligations on damaged areas until carbon stocks recover from natural disturbances.[113] TAES was designed to alleviate the need for private insurance, shifting that risk to the Crown.[114] The Parliamentary Commissioner for the Environment (2026a) argues that this arrangement compounds moral hazard; because the Crown absorbs reversal risk rather than the forest owner, owners face no equivalent incentive to actively manage that risk down. As explained by Green (2026), climate change is expected to increase physical loss risk for

[110] For more detailed information on eligibility, see Ministry for Primary Industries (2026a).
[111] Permanent post-1989 forests are restricted from deforestation and clear-fell harvesting for at least 50 years.
[112] For more information, see Cortes-Acosta et al. (2020), Leining (2026), Ministry for Primary Industries (2026a), and Parliamentary Commissioner for the Environment (2026a).
[113] See Ministry for Primary Industries (2025a).
[114] See Ministry for Primary Industries (2019) and Parliamentary Commissioner for the Environment (2025a).

forests. The risks of damage from wildfire may be exacerbated by NZ ETS incentives that reward landowners for higher-density planting and for permanent forests.

In 2025, the Government introduced new restrictions on NZ ETS registration of post-1989 exotic forest resulting from conversion of agricultural land. The restrictions apply to exotic afforestation on LUC[115] classes 1–6 land after 31 October 2025. Some exclusions[116] and transitional exemptions apply. Two sets of allowances are available:

- Registering exotic post-1989 forest up to 25% of LUC classes 1–6 land on an individual farm
- Participating in an annual random ballot system for permits to register 15,000 ha of exotic post-1989 forest per year on LUC class 6 land.[117]

At the time of legislation, officials estimated that the Government's ballot limit of 15,000 ha would lead to ~28,000 ha/yr of afforestation, down from the status quo counterfactual of ~38,000 ha/yr.[118] The exact impact of the restrictions on afforestation rates in the long term is unclear.[119]

4.1.3 Evolution and impacts to date

The evolution of the NZ ETS can be divided into phases as follows:

1. **Establishment (2007–2008)**: Initial design, consultation, and legislation.
2. **Price moderation (2009–2012)**: Legislative amendments to introduce a fixed-price option of NZ$25/tCO2e, reduce the unit obligation in non-forestry sectors to one unit per two tonnes of emissions, change the basis for free allocation to emissions-intensive and trade-exposed (EITE) industries and agriculture, and defer unit obligations for biogenic emissions from agriculture.
3. **Post-Kyoto transition (2013–2015)**: Legislative amendments to block re-registration arbitrage for forestry participants, and delinking from the international Kyoto market following the Government's decision to take New Zealand's mitigation commitment for 2013–2020 under the UNFCCC instead of the Kyoto Protocol.
4. **Reform for the Paris Agreement (2016–2020)**: Phased restoration of a one-for-one unit obligation in non-forestry sectors; passage of the Zero Carbon Act to create a 2050 target for net emissions supported by emissions budgets, emissions reduction plans, and advice from a new independent Climate Change Commission; and passage of major NZ ETS reforms to

[115] For more information, see Manaaki Whenua Landcare Research (n.d.).
[116] Exclusions include indigenous forest land, exempt Māori land, high or severe erosion-prone land in a regional or district plan, Crown afforestation land, unmapped land (i.e. not on the national-scale LUC map), or unfarmed land.
[117] See Ministry for Primary Industries (2026b).
[118] See Ministry for Primary Industries and Ministry for the Environment (2024).
[119] See Chen et al. (2026) and Green (2026).

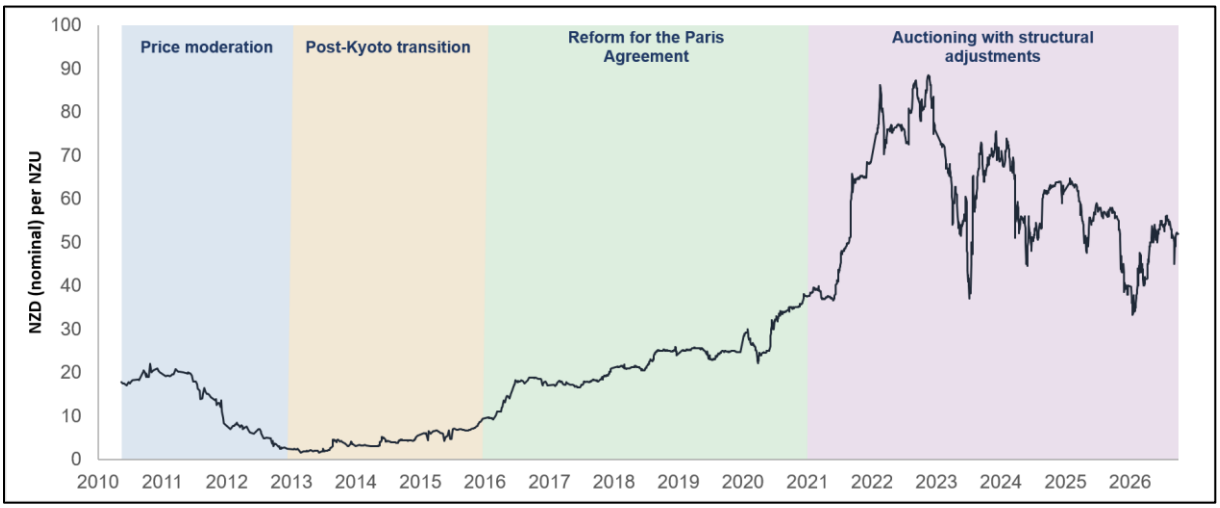
remove the fixed-price obligation, introduce unit auctioning under an overall limit and with price controls, and shift to a new classification and accounting system for post-1989 afforestation.

5. **Auctioning with structural adjustments (2021–2026)**: Commencement of auctioning with an auction reserve price and cost containment reserve, introduction of standard and permanent classifications for post-1989 afforestation with averaging accounting for standard forests, deferral and then removal of unit obligations for biogenic emissions from agriculture, reforms to address industrial over-allocation, restrictions on forest conversion on agricultural land, removal of the accordance requirement for NZ ETS settings with New Zealand's NDCs, and changes to facilitate the future inclusion of new removals activities.[120]

As shown in Figure 6, these phases of policy development have played out in the variability of NZU prices over time. Due to the Kyoto market linkage, NZU prices through 2012 tracked the decline of international Kyoto unit prices. When the Government announced its future international commitment intentions in 2012 and the possibility of delinking arose, price divergence occurred. NZUs carried a premium relative to offshore Kyoto units whose long-term use became uncertain. This created arbitrage opportunities and contributed to the accumulation of a large participant-held stockpile. After delinking in mid-2015, new NZU supply was dominated by forestry removals and NZU prices gradually rose to the level of the fixed-price option. With the introduction of auctioning and the removal of the fixed-price option in 2021, NZU prices rose quickly, reaching the highest recorded value to date of $88.50 in November 2022. Since then, the system has experienced considerable price volatility, largely driven by policy uncertainty and unit oversupply due to the large participant-held stockpile and ongoing forestry removals.

[120] More detailed information on the history and current features of the NZ ETS is available from Carver et al. (2022), Leining (2026), Leining et al. (2020), and Parliamentary Commissioner for the Environment (2026a).

Figure 6: NZU prices (NZD) in the secondary market, May 2010 to September 2026



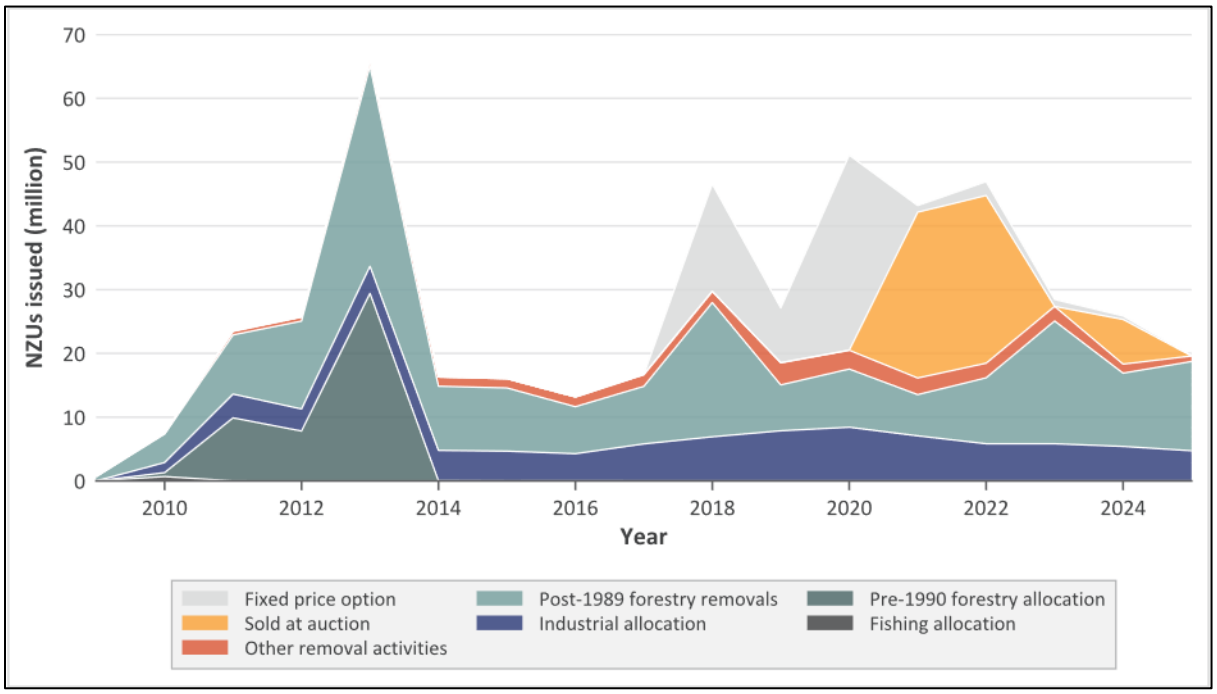
Source: theecanmole (2026).

The history of NZU issuance is illustrated in Figure 7. Forestry removals were the largest source of NZU supply from 2009 to 2025 (47%), followed by industrial allocation (20%) and auctioning (14%). Other removal activities accounted for only 6% of NZUs. A significant share of forestry NZUs is currently held against future harvest liabilities and not available to the broader market. Further contributors to cumulative unit oversupply were the system's acceptance of unlimited offshore Kyoto units from 2008 to mid-2015 and the fixed price option available from 2010 to 2021. Cumulative unit demand to date has been limited by the period in which non-forestry sectors surrendered one unit per two tonnes of emissions (introduced in 2010 and phased out before 2019) and by the exclusion of some sectors (particularly agriculture) from the system.

No NZUs were sold at 13 out of 23 quarterly auctions from March 2021 through September 2026, and no bids were made at 9 out of 10 auctions from June 2024 through September 2026. Auction revenue has totalled NZ$3.8 billion (nominal) from 2021 to date.[121] From May 2021 to May 2024, NZ ETS auction revenue was directed towards a Climate Emergency Response Fund, which was then discontinued.[122]

[121] See NZX & EEX (2026).
[122] See Office of the Minister of Finance (2021) and The Treasury (2025a).

Figure 7: Issuance of NZUs, 2009–2025



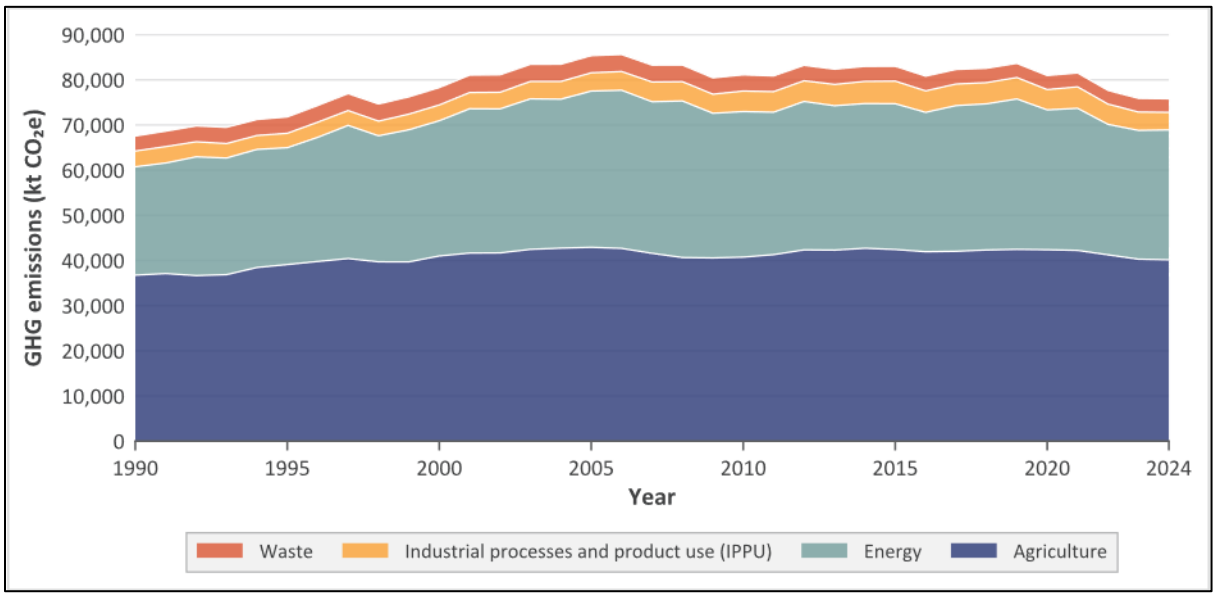
Note: These data exclude repayments and reimbursements. "Other removal activities" include the embedding of gases in products as well as the export or destruction of hydrofluorocarbons or perfluorocarbons. Units issued through the fixed price option had to be surrendered immediately and could not be traded in the market. The issuance of forestry NZUs around 2013–2014 was inflated by re-registration arbitrage: some forestry participants deregistered their forests, cleared their NZ ETS liabilities using low-cost offshore Kyoto units instead of banked NZUs, and re-registered to receive further NZUs. This practice ended in 2014 following a legislative amendment to close the loophole. Source: Data from Environmental Protection Authority (2026).

The impacts of the NZ ETS on domestic mitigation have been far less evident for gross emissions than for forestry. As shown in Figure 8, gross emissions were relatively static for the decade through 2018, although ongoing economic and population growth over that period suggested some decoupling of emissions from economic activity. A notable decline in gross emissions starting in 2019 largely reflected the impacts of COVID-19, sectoral mitigation policies (particularly for transport and industrial heat), and renewable generation. Under dry-year conditions affecting renewable generation, declining fossil gas reserves, and policy changes, gross emissions reductions stalled in 2024. Given the time lag in generating removals from new afforestation, accelerated reductions in gross emissions are needed to manage the risks of missing EB2 and EB3.[123]

[123] See Climate Change Commission (2026a).

In contrast, the forestry sector has proven highly responsive to emissions prices for both deforestation and afforestation[124] (see Figure 9). A spike in deforestation was observed in the lead-up to the start of the first Kyoto commitment period in 2008 in anticipation of mitigation policies. When NZ ETS emissions prices fell over 2011 to 2013, another deforestation spike occurred. Deforestation decreased as emissions prices rebounded. Conversely, afforestation increased with the introduction of the NZ ETS, declined under low emissions prices, and then increased rapidly once emissions prices passed the NZ$20 mark and continued to rise. Rising emissions prices also triggered the registration of previously established post-1989 forests.

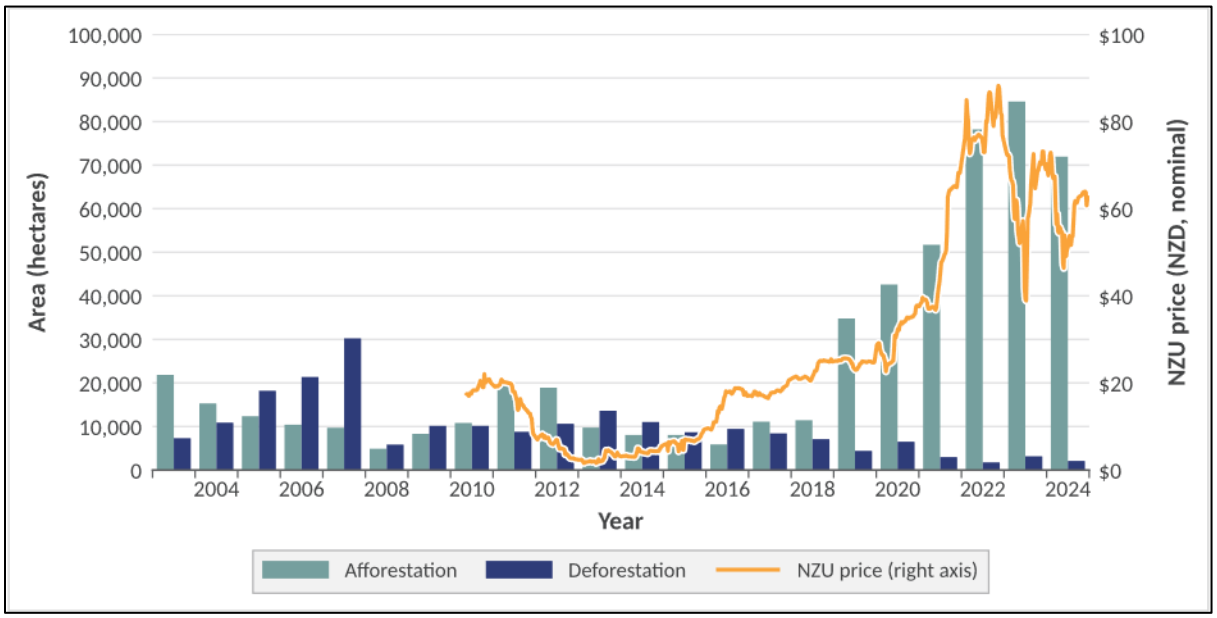
Figure 8: New Zealand's domestic gross GHG emissions, 1990–2024



Source: Data from Ministry for the Environment (2026d). Note New Zealand's national GHG inventory uses 100-year global warming potentials (GWPs) from the IPCC's Fourth Assessment Report.

[124] For more information about the relationship between emissions pricing and forestry in the NZ ETS, see Carver et al. (2022).

Figure 9: Comparison of afforestation/deforestation rates with the changing NZ ETS unit price, 2003–2024



Source: Adapted from Ministry for the Environment (2026d), Figure 6.1.2. Weekly mean price data from theecanmole (2026).

4.2 Other forestry policies driving climate action

Across successive governments, policies beyond the NZ ETS have been used to drive improved forestry outcomes with climate benefits. While some have had non-climate goals (like erosion control, regional economic development, and employment), others have been used to overcome barriers to participation in the NZ ETS, boost incentives beyond what is offered in the NZ ETS, or address gaps in policy coverage. After profiling some current initiatives (Afforestation on Crown-owned land, Hill Country Erosion Programme, Maximising Forest Carbon, and the Five Iwi Afforestation Programme), this section also describes five initiatives that have been discontinued (the Erosion Control Funding Programme, the Permanent Forest Sink Initiative, the Afforestation Grant Scheme, One Billion Trees, and Jobs for Nature).

4.2.1 Current initiatives

Afforestation on Crown-owned land

The Government has been exploring this option since 2025, with no official decisions made to date. The proposal is for the Government to partner with entities like iwi and hapū, commercial forest owners, Crown leaseholders, institutional and private investors, and domestic and international NGOs to plant native or exotic trees on Crown land (excluding national parks) with low

farming and conservation value. Approximately 760,000 ha has been assessed by the Government as suitable, mostly in the South Island. The policy intention is that as little as possible of this new forestry should be registered in the NZ ETS.[125] However, under the current policy architecture, any new forestry outside of the NZ ETS would still be accounted for in unit supply settings.

Hill Country Erosion Programme

This programme, aimed at preventing erosion, started in 2007 and has funding allocated until 2031. The Ministry for Primary Industries supports councils to work with landowners to identify erosion-prone land, deliver management, and build technical capacity; and plant trees (widely spaced so that pasture can grow), enable reversion to native vegetation, and/or establish forestry. Projects last four years, with costs shared between the Ministry for Primary Industries, councils, and landowners.[126]

Maximising Forest Carbon

This is a Ministry for Primary Industries research programme run by Te Uru Rākau New Zealand Forest Service, the Ministry for Cities, Environment, Regions and Transport (MCERT, formerly the Ministry for the Environment (MfE)), and the Department of Conservation (DOC) starting in 2022 to improve understanding of carbon storage in New Zealand forests and predict changes due to climate change. It aims to update the default NZ ETS forest carbon tables, explore faster and easier ways to measure forest carbon in the NZ ETS, and explore how managing pre-1990 forests can increase carbon storage.[127]

Five Iwi Afforestation Programme

This grievance resolution process involves five iwi whose Treaty settlements included the transfer of pre-1990 forest land before the NZ ETS was introduced in 2008. The five iwi, led by Ngāi Tahu (which received the largest share at 180,000 ha), argue that the Crown did not meet the information disclosure requirements of their Treaty settlement when the NZ ETS (and new rules around deforesting pre-1990 forest land) were introduced, and that this materially impacted the value of the forestry assets returned. In 2009, the National-led Government secured the support of the Māori Party on the condition that it explore solutions to the concerns of the five iwi.[128]

[125] See Ministry for Primary Industries (2025b) and Office of the Minister of Forestry and Office of the Minister of Climate Change (2025).
[126] See Ministry for Primary Industries (2026f).
[127] See Ministry for Primary Industries (2026e) and Te Uru Rākau et al. (2025).
[128] See Office of the Minister of Forestry and Office of the Minister of Climate Change (2025).

4.2.2 Discontinued initiatives

Erosion Control Funding Programme (previously the East Coast Forestry Project)

This programme ran from 1992 to 2023 to address severe erosion in the Gisborne district. Community groups, iwi, local organisations, and businesses with innovative ideas to help reduce erosion could apply for funding at a community or regional scale. Funding was used for seedlings and materials, labour and skills, trials of new or alternative erosion treatments, river erosion control, and post-harvest options. The programme also aimed to increase understanding of erosion, land governance, and optimal land use.[129]

Permanent Forest Sink Initiative (PFSI)

Active from 2006 to 2023, this enabled post-1989 forest owners to earn emissions units (NZ AAUs from 2008 to 2012 and NZUs from 2013 onward) starting from 1 January 2008 for land registered under a permanent forest covenant. Covenants could be terminated after 50 years and allowed limited harvesting. Units could be traded in the NZ ETS or sold offshore. Participants were liable for reversals. By 2023, forests participating in PFSI transitioned into the current permanent forest activity classification in the NZ ETS.[130]

Afforestation Grant Scheme (AGS)

The AGS was intended to generate benefits for soil erosion, land-use productivity, regional economic development, carbon storage, and water quality. It provided grants of NZ$1,300/ha to establish new small- to medium-sized post-1989 forest (defined as 5–300 ha). The Government retained the associated emissions units for the first 10 years. The scheme had two phases: 2008–2013 (with 9,343 ha) and 2015–2020 (with 7,846 ha). It was superseded in 2018 by the One Billion Trees Programme.

One Billion Trees

This included a grant scheme and partnership fund with the goal to establish one billion trees over 2018 to 2028, doubling the forest planting rate. The base rates for planting ranged from NZ$1,000/ha for indigenous regeneration to NZ$1,500/ha for exotic species, NZ$1,800/ha for indigenous mānuka/kānuka, and NZ$4,000/ha for an indigenous mix. Top-ups applied for further benefits for erosion control or ecological restoration. Eligible funded forests could also be registered in the NZ ETS immediately except for *Pinus radiata*, which could not be registered for the

[129] See Ministry for Primary Industries (2026c).
[130] See Ministry for Primary Industries (2015).

first six years from (and including) the year of planting. As of November 2025, the programme had planted 800,969,000 trees and funded 38,760,000 trees for planting by 2028. Some of the funding was reallocated and the fund closed in 2021.[131]

Jobs for Nature

This programme operated from 2020 to 2025 to create jobs and economic support with environmental benefits as part of recovery from COVID-19. It received NZ$1.185 billion and was implemented across multiple government departments. Tree planting with native species was included as an eligible activity, and 29 projects under One Billion Trees, totalling NZ$35 million, were aligned to Jobs for Nature.[132]

4.3 Other policies supporting removals activities

Successive governments have considered adding further types of removals activities to New Zealand's mitigation targets and the NZ ETS. For example, including carbon capture and storage as an additional removal activity in the NZ ETS was enabled in the 2008 founding legislation, but never actioned through an Order in Council. In 2023, Cabinet approved the development of a Carbon Removals Strategy with the objectives of complementing rather than substituting for economy-wide emissions reductions, setting goals for the use of removals, diversifying removals, including further removals in New Zealand's national GHG inventory, and achieving high-quality standards and co-benefits.[133]

While the Carbon Removals Strategy did not proceed after the 2023 election, the new Government continued to develop enabling policies for CCUS and additional categories of removals. In 2025, the Government released an Assessment Framework for Carbon Removals.[134] This establishes a process to determine if new removals activities can count towards the NDC or be included in the NZ ETS. Applicants[135] can test their removal activities through an online self-assessment tool and decide whether they want to seek voluntary market accreditation or apply for a formal science assessment for the NDC and/or NZ ETS. The assessment stage focuses on the scientific robustness and validity of the type of activity (not the specific project) to inform government decision-making. It draws on existing New Zealand and international standards and

[131] See Ministry for Primary Industries (2026d) and Te Uru Rākau (2025).
[132] See Ministry for Primary Industries (2025c) and Te Uru Rākau (2025).
[133] See Office of the Minister of Climate Change and Office of the Minister of Forestry (2023).
[134] See Ministry for the Environment (2025a).
[135] Applicants can exit the framework at any time, including to join voluntary markets instead.

aligns with the Government's standards being developed for the voluntary market. The removal activity will also be assessed if there are no standards available. Readiness is assessed based on information about measurement, validation, carbon removal additionality, and permanence. Sufficiency (ability to move into real-world outcomes) is based on volumes, leakage risk, sustainability, transparency, and scalability. Other considerations are monitoring and measuring ability, impact on New Zealand's overall emissions profile, and data costs. If approved by the Government, final implementation could require new regulations, consultation, changes to NZ ETS processes, and the development of monitoring and verification processes.

Under the Climate Change Response Amendment Bill introduced in July 2026, the Government has proposed adding a new category of removal activities for which participants could earn units in the NZ ETS: "using technologies, practices, and approaches that provide enduring storage of carbon dioxide from the atmosphere" (p. 59). This would be actioned through an Order in Council, so new legislation would not be required to add further removals to the NZ ETS.[136]

New Zealand participates in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) developed by the International Civil Aviation Organization. Under CORSIA, Air New Zealand faces mitigation obligations that can only be met at present through purchasing offshore mitigation carrying corresponding adjustments, and accessing eligible high-quality mitigation is a challenge across the sector. There is currently no policy mechanism that would enable Air New Zealand to fund removals in New Zealand that would count towards CORSIA.

4.4 Voluntary nature and carbon markets in New Zealand

New Zealand was drawn into VCMs during a period of policy precarity during Clark's Labour-led and Key's National-led governments. Early participants focused on creating infrastructure and knowledge sharing to build market integrity; however, ongoing global economic and policy uncertainty and low certification recognition hindered momentum and caused buyers and sellers to drift.[137]

Over time, some project developers have marketed forestry removals from afforestation or forest management outside the NZ ETS that were independently certified. Successive governments have issued high-level guidance to VCM participants, covering issues such as ensuring

[136] See clause 112 of the Climate Change Response Amendment Bill (2026).
[137] See Birchall et al. (2018).

environmental integrity, making crediting claims, and navigating the relationship between the VCM and the NZ ETS.[138]

Over 2025 and 2026, the Government has chosen to support the growth of privately run voluntary nature and carbon markets in New Zealand.[139] Following support for 10 pilot projects, the Government released updated guidance in 2026 on voluntary climate change mitigation and introduced a new Government endorsement process for voluntary nature and carbon markets.[140] The guidance document identified six principles for voluntary mitigation: additional; durable and permanent; outcomes that are real, measurable, and verifiable with risk mitigation; transparent; respectful of rights; and not double counted and supporting accurate claims. The document reaffirms previous guidance that voluntary cancellation of NZUs does not qualify for claims of voluntary mitigation. The new endorsement process has two tracks: Government recognition of internationally accredited schemes,[141] and a new domestic endorsement process for voluntary claims. In September 2026, the Government released technical guidance for scheme operators and conformity assessors on criteria for domestic scheme endorsement.[142] Through this process, the Government is not providing a guarantee of crediting claims.

During the era of the Kyoto Protocol, target accounting practices made it possible for New Zealanders to voluntarily buy, sell, and cancel units for post-1989 afforestation under the NZ ETS or PFSI that were not double counted under New Zealand's targets. To date, the New Zealand Government has not enabled a comparable mechanism under the Paris Agreement. Article 6 of the Paris Agreement uses corresponding adjustments to avoid double claiming between governments; however, how this is applied through voluntary claims remains a matter of debate. New Zealand's new voluntary market mechanisms will need to avoid double issuance whereby one emissions reduction or GHG removal leads to the issuance of more than one credit, double use whereby one credit is used twice to achieve a mitigation target, and double claiming where two entities claim the same emission reduction or GHG removal to achieve a mitigation target.[143]

[138] For example, see Commerce Commission (2009, 2020) and Ministry for the Environment (2020, 2022a).
[139] See Ministry for the Environment (2025b, 2026e).
[140] See Ministry for the Environment (2026b).
[141] These are the Integrity Council for the Voluntary Carbon Market (ICVCM), CORSIA, and the PACM.
[142] See Ministry for Cities, Environment, Regions & Transport (2026).
[143] See Kreibich (2024).

5 Why current emissions pricing policies will not deliver what is needed

In their current forms, the NZ ETS and voluntary nature and carbon markets are incapable of incentivising large-scale, long-term removals as well as ambitious decarbonisation, or of incentivising diverse removals that support multiple policy objectives beyond climate change mitigation.

5.1 Challenges for the NZ ETS and removals

This section highlights key current challenges to the effective operation of the NZ ETS: the sunset of auctioning, loss of market confidence in mitigation ambition, misalignment of unit supply with climate targets, the inability to incentivise mitigation beyond exotic forestry removals, investment uncertainty for emitters and foresters, non-price barriers to mitigation, and the prospect of adding further sources of removals. It also discusses three important climate policy gaps that affect forestry removals outside the NZ ETS, with consequential effects for NZ ETS unit supply settings under emissions budgets.

5.1.1 Sunset of auctioning

Under current settings, auctioning must end in the early 2030s for NZ ETS unit supply to accord with EBs, given ongoing industrial free allocation and forestry removals.[144] At this point, the Government will lose its primary lever to influence unit supply and prices – both critical for climate target alignment and market stability – and the fiscal benefits of auction revenue. Although no bids have been received at 9 out of 10 auctions since June 2024, auctioning continues to serve an important purpose in the system. Participants with unit surrender obligations face high financial penalties for noncompliance together with a unit make-good requirement. In contrast, the supply of forestry removals depends on foresters' decisions to plant and harvest those forests and sell versus stockpile the units they earn. Forestry removals are also vulnerable to natural disturbances and influenced by other market drivers. The potential for auctioning to supply units and contain emissions prices through the auction reserve price and cost containment reserve helps ensure the proper functioning of the market and maintain market confidence. Auctioning can also generate significant government revenue that can be returned to the economy.

[144] See Climate Change Commission (2026a).

5.1.2 Loss of market confidence in mitigation ambition

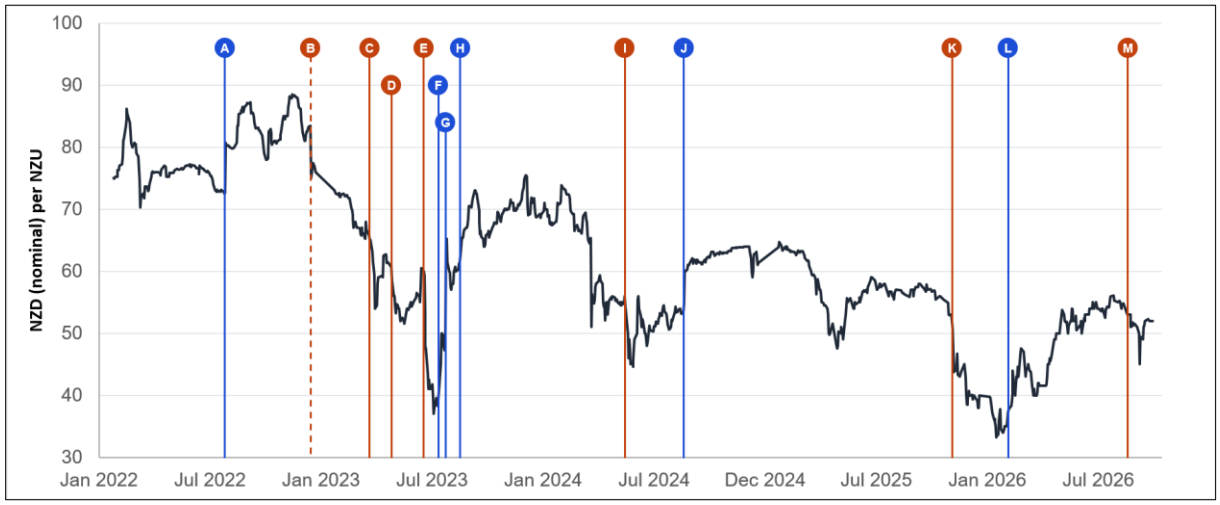
Market confidence in mitigation ambition for covered sectors has been eroded by policy uncertainty and policy changes. In a trading system that has evolved under unconstrained unit supply – driven by offshore mitigation, the fixed price option, and domestic afforestation – prices have been influenced heavily by market expectations of future policy stringency or leniency.[145] As shown in Figure 10, market prices rose following decisions in 2019 on a new 2050 target and in 2020 on auctioning under an overall limit. Notably, NZU prices more than doubled over 2021 to 2022, despite participants holding a stockpile of roughly four times the annual surrender volume, anticipation of future NZU supply from afforestation, the economic downturn from COVID-19, and announcements of intended closures by two major emitters.[146]

Since then, NZ ETS market prices have shown volatility in response to Government policy announcements, Climate Change Commission advice, and other policy-relevant events affecting expectations of NZ ETS policy settings and climate target ambition. Figure 10 overlays the trend in NZU prices with key policy-relevant events since 2022. As a recent example, a significant price decline occurred in November 2025 after the Government announced it would decouple NZ ETS settings for unit supply and price controls from accordance with NDCs, which previously had been required by legislation. NZU prices fell below $35 per tonne in early 2026 – a level not seen since 2020.

[145] See Climate Change Commission (2026a).

[146] These were the Tiwai Point Aluminium Smelter, which at the time consumed about 13% of New Zealand's electricity and has continued to operate, and Refining NZ, which closed in 2022.

Figure 10: NZU spot prices and policy-relevant announcements, 2022 to 2026



Letter	Trigger date	Event (shorthand)
A	27 Jul 2022	CCC advises higher ARP and two-tier CCR for 2023–27
B	15 Dec 2022	Cabinet sets 2023–27 price controls well below CCC advice
C	22 Mar 2023	NZ ETS review announced (proposed changes to forestry)
D	27 Apr 2023	CCC advice urges ETS overhaul; pre-Budget uncertainty
E	19 Jun 2023	NZ ETS review consultation (proposed changes to forestry)
F	13 Jul 2023	High Court (LCANZI): Minister must reconsider NZ ETS settings
G	25 Jul 2023	Government adopts CCC price-control settings for 2023–28
H	18 Aug 2023	Free-allocation reform passed; National Party announced no major changes to the NZ ETS
I	15 May 2024	Consultation on option to lower ARP and CCR trigger
J	20 Aug 2024	Auction volumes 2025–29 cut from 45m to 21m NZUs; ARP price held
K	04 Nov 2025	Govt decouples NZ ETS unit limits and price controls from NDCs
L	04 Feb 2026	Minister asks CCC for options to underpin NZU price
M	20 Aug 2026	Cabinet papers on NZ ETS settings released; pre-election period

Note: Events are associated with a change greater than or equal to about 10% in the reference series for NZU prices within 31 days of the trigger. Source: Identification of events by Claude AI applying NZU price data from theecanmole (2026).

5.1.3 Misalignment of unit supply with climate targets

Under the current NZ ETS design, the Government cannot fully align unit supply with the intended contribution of NZ ETS sectors to New Zealand's climate targets. Contributing factors to the mismatch include unit banking and borrowing, industrial free allocation, and the lack of government levers for managing the volume and timing of removals units.

Banking and borrowing

The NZ ETS sets no expiry date on NZUs, allowing market participants to bank unlimited units across compliance years, emissions budgets, or NDC periods and then sell or surrender them when commercially advantageous. While the borrowing of units from future supply is not enabled by legislation, market participants still have the informal option to "borrow" stockpiled units from other participants to meet their surrender obligations and then acquire future units to "pay them back" with interest.

The options for banking and borrowing weaken the link between net emissions in any given year and the Government's unit supply settings. For example, a shortfall in removals in the lead-up to 2050 from lower-than-projected afforestation would not necessarily trigger a corrective price response and further mitigation by gross emitting sectors. The market could instead draw down the existing stockpile.

Different banking provisions apply to the NZ ETS relative to emissions budgets and NDCs, and this creates target risk. Whereas the NZ ETS offers participants unlimited banking of NZUs across compliance years and target periods, NDCs are assessed based only on actual emissions and removals during the target period. Under EBs, the Government has the option (but not the requirement) to bank surplus mitigation across EBs.[147] However, an EB surplus may not correspond to the NZ ETS surplus for two reasons. First, as discussed in section 4.1, a large portion of the stockpile was generated before 2022 (the first year of EB1) and falls outside EB carry-over provisions. Second, any mitigation surplus from the NZ ETS in an EB or NDC period could be offset by extra emissions in non-ETS sectors. As a result of these differences, stockpiled units used to cover NZ ETS emissions may not be backed by mitigation that counts towards the same EB or NDC period.

Uncertainty in projections adds a further layer of risk. Gross emissions projections in some sectors do not capture year-to-year variability unrelated to policy or price, for example, dry years affecting electricity generation emissions. Here, too, the market may rely on stockpiled units from removals that occurred years or decades prior.

As of June 2026, the participant-held stockpile totalled 123.8 million NZUs, 3.6 times the surrender volume of 34.4 million units for 2024/25.[148] Not all of the stockpile is readily available to the market. In 2026, estimates of the unit surplus (the portion of the stockpile posing a particular risk to meeting emissions budgets) from the Climate Change Commission and the Government were

[147] Note that the Minister is required to consider advice on banking from the Climate Change Commission.
[148] See Environmental Protection Authority (2026).

17.1–41.7 million units and 16.5–48.3 million units, respectively.[149] The surplus is deemed to consist of units excluding those held to cover near-term surrender obligations, to hedge against future risk, to manage future forestry liabilities, or to preserve legacy assets resulting from free allocation in respect of pre-1990 forests. The target risk from the stockpile is not limited to the surplus.

Successive governments have aimed to draw down the surplus by 2030 by reducing auction volumes. However, the unit stockpile is expected to increase again over time from the 2030s given the uneven age profile of production forests on stock change accounting and the potential for forests under stock change accounting to substantially delay harvesting or convert from production to permanent. Whether or not a new unit surplus is created depends on the ability of the market to match supply and demand (i.e. whether foresters generate excess units that they wish to sell to the market but are unable to).[150]

Industrial free allocation

The default phase-out rates for industrial free allocation do not align with declining emissions budgets and will begin to exceed the projected overall limit on auctioning in the early 2030s. Without industrial free allocation, auctioning could continue for longer under emissions budgets. Moderately intensive industrial producers will continue to receive free units until 2050. Highly intensive industrial producers, which currently receive the vast majority of freely allocated units, will still be receiving 50% free allocation by 2050, at which point the net-zero part of the 2050 target is supposed to be achieved and sustained. This means the Government will need to compensate for ongoing industrial emissions enabled by free allocation through further removals outside the NZ ETS or offshore mitigation.

Lack of government levers for managing removals supply

Except for the agricultural land conversion restrictions introduced in 2025 (which have an indirect effect), the Government currently has no means to manage the volume or timing of forestry or other removals under the NZ ETS. The registration of new afforestation eligible for the NZ ETS is shaped by landowners' expectations for NZ ETS unit demand and prices alongside external factors such as land values, commodity prices, and land-use preferences. Afforestation investments involve long-term decision and establishment cycles that do not necessarily align with unit demand and price dynamics in the NZ ETS. Furthermore, the supply of forestry removals into the NZ ETS is

[149] See Climate Change Commission (2026b) and Ministry for the Environment (2026a).
[150] These dynamics also create issues with respect to NDCs, where New Zealand has not stated it will carry over units between NDC periods.

unevenly distributed across age classes, susceptible to disruption from natural disturbances, dependent on landowners' decisions to sell versus bank units, and (in the case of production forests under stock change accounting) affected by unpredictable decisions about harvesting. Because of the time lag between favourable policy and market signals and the actual supply of removal units in the market, and the uncertainty of that supply, the Government cannot rely on new afforestation to bridge near-term climate target gaps and faces delivery risk for longer-term climate targets. This also means the NZ ETS market cannot rely on new afforestation to bridge shortfalls in unit supply.

5.1.4 Inability to incentivise mitigation beyond exotic forestry removals

The NZ ETS is primarily driving the production of high-volume exotic forestry removals – which are lower cost and higher risk – as a substitute for gross emissions reductions. Modelling has suggested it would be possible for New Zealand to meet its 2050 target for GHGs excluding biogenic CH_4 at a price below NZ$50/t$CO_2$e relying heavily on exotic afforestation.[151] In contrast, technically feasible decarbonisation in NZ ETS sectors could require effective emissions prices reaching NZ$250 per tonne by 2050.[152] Without technology breakthroughs, novel removal technologies like BECCS and DACCS will be unable to compete on a cost basis against exotic forestry removals in New Zealand (see section 3.2).

Low emissions prices driven by exotic forestry removals enable investment in high-emitting activities to continue, delaying the necessary transition to a low-emissions economy. As discussed in section 3.6, allowing lower-cost removals to slow decarbonisation shifts economic transition costs and climate risks to future generations, increasing cumulative gross emissions while depleting the finite removals potential. The option that appears to be low cost in the short term will become high risk and high cost in the longer term.

Low unit prices will also not incentivise investment in slower-growing, higher-cost indigenous forests. Whereas both production and permanent exotic forests can present a positive NPV and outperform some sheep and beef farms at emissions prices as low as NZ$35, planted indigenous forests present a negative NPV at present-day emissions prices around NZ$50 per tonne, and negative even under emissions price paths rising from NZ$90 per tonne. The economics of indigenous forests relative to permanent and production exotic forests mean that the NZ ETS under status quo design is unlikely to ever be effective at incentivising direct planting of indigenous forests. Indigenous regeneration can be cost-competitive with exotic forestry at current emissions

[151] See Climate Change Commission (2021).
[152] See Climate Change Commission (2024b).

prices in some contexts but offers slow removal rates. Transition forests (in which exotic species are harvested, enabling natural regeneration of indigenous forests) have been explored to help to overcome the high cost of direct establishment of indigenous species. However, these involve other trade-offs affecting long-term carbon stocks and profitability.[153]

5.1.5 Investment uncertainty for emitters and foresters

Decarbonisation will be driven both inside and outside of government at an unpredictable pace. Whereas a sustained rise in unit demand and prices could favour removals investments, a sustained drop due to accelerated decarbonisation could strand them. Changes in government policy add to market uncertainty, one example being the Government's 2025 decision to restrict NZ ETS registration of exotic post-1989 forest converted from farmland. The broad range of scenarios for unit supply/demand and prices heightens investment risk for high-emissions industries, low-emissions innovators, and removals producers. Price volatility and long-term price uncertainty affect corporate balance sheets and the net NZ ETS financial position in the Crown accounts.

For nearly two decades, the NZ ETS has operated under assumptions of long-term demand from emitters for forestry removals. The outlook is different now, with the technical and economic potential for New Zealand to largely decarbonise stationary energy, transport, and industrial heat by the early 2040s.[154] Under long-term unit demand and price uncertainty, the most viable removals will be those that depend least on emissions pricing, which in New Zealand means exotic production forests.

5.1.6 Non-price barriers to mitigation

It takes more than emissions prices to transform an economy; regulation and investment shaped by long-term market expectations play complementary roles. Many non-price barriers stand in the way of mitigation, such as split incentives (e.g. between landlords and tenants), consumer preferences, risk aversion, supply chain constraints, high upfront capital costs, existing regulations, and insufficient information, training, financing, and/or infrastructure.[155]

Emissions pricing is a blunt instrument, and further government policies are needed to:

- Coordinate complex change across sectors and supply chains
- Support research, development, and commercialisation for new technologies and land-use practices

[153] See Green (2026).
[154] See Climate Change Commission (2024e).
[155] See Climate Change Commission (2021), Leining (2026), and Partnership for Market Readiness and International Carbon Action Partnership (2021).

- Prevent or manage inequitable distributional impacts
- Improve environmental outcomes beyond climate change mitigation
- Give effect to the principles of Te Tiriti o Waitangi.

To the extent that non-price barriers to action are unresolved, emissions pricing will be less effective at driving mitigation.[156]

5.1.7 The prospect of adding further types of removals to the NZ ETS

The Government has created policies to allow the addition of new removals activities to the NZ ETS (see section 4.1). The Government has already decided to recognise emissions reductions or removals from CCUS in the NZ ETS. However, the first candidate for this, Todd Energy, decided it was not economically viable to implement CCS at the Kapuni gas field at current NZU prices.[157] Further options could include small-scale vegetation, harvested wood products, managing and restoring wetlands and peatlands, and coastal vegetation.

Successive governments have shown interest in recognising carbon sequestration by on-farm vegetation that falls short of the NZ ETS forest land definition.[158] This includes riparian strips, shelterbelts, small woodlots, pole plantings, and regenerating scrub such as mānuka in some contexts. Most on-farm vegetation that falls outside the NZ ETS forest definition occurs in small, scattered patches, making it costly to map, measure, and verify relative to the value of sequestration earned. For many landowners, their vegetation may also already be approaching a mature, steady-state carbon level, meaning there would be limited further sequestration left to claim. Together, these factors mean that including these sparse vegetation sources in the NZ ETS under its current design would make poor economic sense for the landowner once compliance and transaction costs are accounted for.[159]

New sources of removals could involve widely divergent mitigation costs, investment horizons, measurement certainty, durability, and liability regimes for reversals. Different forms of removals could also have different investment barriers and needs and require different types of incentives and enabling measures. Sources of removals that are more expensive than exotic forestry could be priced out of the system, whereas those that are less expensive could undercut previous forestry investments and be politically and economically untenable for the land sector.

[156] See Parliamentary Commissioner for the Environment (2026a).
[157] See Gibson (2025) and Newton (2025).
[158] This was discussed extensively under the Primary Sector Climate Action Partnership involving He Waka Eke Noa (2022).
[159] For further discussion, including estimates of sequestration rates, see Green (2026).

Incentivising further removals in New Zealand beyond NZ ETS emissions liabilities could help boost mitigation ambition, reduce target risk, and improve environmental, social, and economic outcomes. Simply adding them to the NZ ETS under its current design will not work because the NZ ETS will not provide the long-term demand and emissions prices that are needed.

5.2 Climate policy gaps for removals

Within New Zealand's climate policy framework, the limited scope of the NZ ETS leaves important policy gaps that add to the risk of meeting current climate targets. These include non-ETS emissions included in climate targets and non-ETS removals that are – or could be – included in climate targets. The climate policy framework is also not equipped for potential net-negative emissions targets in the longer term.

Although originally intended to cover all sectors of the economy over time, the NZ ETS excludes emissions of N_2O from fertilisers and synthetic GHGs covered by a separate levy – both of which are part of the net-zero 2050 target for gases excluding biogenic CH_4. The NZ ETS also excludes biogenic CH_4 from agriculture. This means the NZ ETS does not incentivise reductions in those emissions – or removals to compensate for those emissions – to help achieve New Zealand's net-zero 2050 target and NDCs.

There is currently a mitigation policy gap regarding pre-1990 forest management. New Zealand could potentially generate additional removals in pre-1990 forest relative to business as usual (defined by the forest reference level) through activities like pest management, changes to harvesting practices, and changes to species composition. It is also important under New Zealand's targets to maintain existing carbon stocks in pre-1990 forest by preventing degradation. The current regulatory and market drivers for this are limited and inadequate. During the period from 2013 to 2020, New Zealand recorded substantial net removals from pre-1990 forest management, which helped with meeting its international target.[160] Based on the period from 2021 to 2024, New Zealand is currently in deficit against the pre-1990 forest reference level under its 2030 NDC.[161]

Another mitigation policy gap is improved management of post-1989 forest. Smaller participants with less than 100 ha of registered forest area using the default carbon look-up tables

[160] For New Zealand's target over 2013–2020, net removals from pre-1990 forest management contributed 18.7 $MtCO_2e$, compared to net removals from afforestation, reforestation, and deforestation of 104.6 $MtCO_2e$. Pre-1990 forest management actually generated net removals of 32 $MtCO_2e$ relative to the forest management reference level, but New Zealand could only count those removals up to a cap defined by 3.5% of gross emissions in the base year. See Ministry for Cities, Environment, Regions & Transport (2023) and Ministry for the Environment (2022b).
[161] See Ministry for the Environment (2026d).

see no carbon benefit from activities that increase sequestration and improve forest health (e.g. pest management and fencing to exclude browsing stock). Small landowners make up around 20% of registered post-1989 forest land in the NZ ETS but make up close to 80% of registered forestry participants. Furthermore, it is unclear how participants with post-1989 forest will be incentivised to enhance carbon stocks after their forests have reached the long-term average used for crediting under the NZ ETS. To date, no forest reference level has been announced for post-1989 forest after reaching its long-term average.

Climate targets for advanced economies in the coming decades may be net negative rather than net zero, to draw down excess CO_2 that has caused global temperatures to overshoot safe levels and to reflect a fair contribution by countries well placed to mitigate GHG emissions. Under current NZ ETS design, these additional removals will not be paid for by NZ ETS participants, who are obligated to surrender only one unit for every tonne of gross emissions. Placing the full removals burden for historical emissions onto residual emitters in hard-to-abate sectors would be inequitable and likely not economically viable. Mobilising long-term removals beyond the level of residual emissions is an important gap in both domestic and global climate policy.

5.3 Challenges for voluntary nature and carbon markets

Key challenges facing voluntary nature and carbon markets include the broad coverage of New Zealand's existing mitigation targets, divergent domestic and international standards for permanence, an unclear domestic framework for voluntary markets, and uncertainty over long-term voluntary demand for removals.[162]

5.3.1 Broad coverage of existing mitigation targets

New Zealand's NDCs and 2050 target are economy-wide, and New Zealand faces substantial challenges to meet these targets. The NZ ETS covers all major emitting sectors except agriculture, and post-1989 afforestation is broadly eligible to register. The Government has signalled its intention to introduce further removals activities into the GHG inventory, NDCs, and the 2050 target in the future. This makes it difficult for voluntary activities to generate additional mitigation that is not already counted – or likely to be counted – by the Government towards New Zealand's domestic and international targets. Given the long-term nature of many removal activities, this effectively restricts VCM removals projects in New Zealand to contribution rather than carbon-neutral claims.

[162] For more discussion, see Deloitte New Zealand et al. (2026).

5.3.2 Divergent domestic and international standards for permanence

The removals accounting practices used by New Zealand under its targets and the NZ ETS diverge from permanence protocols used in many voluntary crediting programmes and emerging guidance under Article 6.4. For example, New Zealand uses perpetual liability rather than crediting buffers for reversals. New Zealand's standard for permanent forests registered in the NZ ETS is 50 years compared to 100 years in many crediting systems. New Zealand's use of a 50-year period stems from constraints on the length of leasing arrangements for Māori freehold land, where Te Ture Whenua Māori Act 1993 prevents the courts from granting leases exceeding 52 years.[163] This is a material constraint given the significant role that forestry plays within whenua Māori. These differences complicate combining voluntary contributions with NZ ETS compliance activities, a practice that could be useful in bridging the cost gap for indigenous forestry and engineered removals.

5.3.3 An unclear domestic framework for voluntary markets

The Government's new guidance and endorsement processes for voluntary nature and carbon markets (discussed in section 4.4) do not address the fundamental barriers to making claims for voluntary mitigation activities in New Zealand: demonstrating additionality, durability or permanence, and no double counting. They also do not address the trend towards convergence of voluntary and compliance markets globally, and the evolving relationship between voluntary nature and carbon markets.

To date, the Government has opted not to offer letters (or statements) of authorisation under the Paris Agreement, which would enable internationally recognised crediting of domestic mitigation that would receive a corresponding adjustment and not count towards New Zealand's NDCs. New Zealand currently faces a gap to meet both its 2030 and 2035 NDCs, creating a challenging environment for project proponents to demonstrate to government that export of units can be beneficial. Although mitigation contribution claims under Article 6.4 do not require a government statement of authorisation, it could be difficult for domestic removals activities to meet the Article 6.4 criteria for crediting.

5.3.4 Uncertainty over long-term voluntary demand for removals

Demand for removals beyond compliance obligations is currently driven by voluntary mitigation or nature targets for the purpose of demonstrating corporate responsibility. It is

[163] See Ministry for Primary Industries (2018) and Te Puni Kōkiri (2025).

unknown how such demand will evolve and how removals will be valued over time in relation to compliance obligations as emitters decarbonise, especially as norms change around climate-contribution versus carbon-neutral claims. This creates investment uncertainty for long-term removals activities.

6 Projected outcomes under the status quo for the NZ ETS

6.1 Modelling analysis overview

As detailed in Green (2026), the modelling analysis in this paper draws on scenarios from:

- The Ministry for the Environment (MfE) NZ ETS market model
- NZUpy: an open-source Python-based NZ ETS optimisation model
- Modelling prepared by Concept Consulting for the Parliamentary Commissioner for the Environment (PCE) in 2026 using the Emissions in New Zealand (ENZ) model
- Scenarios published by the Government and the Climate Change Commission drawn from ENZ and sector-specific projection models.

Variations across models are driven by differences including:

- The response of exotic afforestation to emissions prices
- The rate of indigenous afforestation
- The degree of market liquidity, including the potential for participant borrowing from the private stockpile
- Whether dynamic switching is enabled between permanent and production stock-change exotic forestry during the lifetime of a forest (with foresters able to defer harvest when this is due)
- Whether emissions price trajectories are constrained.

Model runs attempt to reflect these uncertainties as follows:

- ***Afforestation response***: The two MfE NZ ETS market model scenarios presented reflect conditions in which there is constrained afforestation or responsive afforestation (higher responsiveness to emissions price).
- ***Forest management flexibility***: The PCE scenarios presented allow endogenous switching from production forestry to permanent forestry when harvest is due, depending on the relative returns of each.

- ***Market liquidity***: The scenarios presented for NZUpy see liquid market conditions (with greater levels of borrowing from the stockpile) and relatively more illiquid market conditions (with minimal borrowing).

Modelling is useful for exploring the potential implications of policies under different assumptions about how markets will respond. All models have limitations, and the data presented in this paper should not be interpreted as forecasts or predictions. Under real-world conditions, complex forestry decisions are shaped by landowners' expectations for NZ ETS unit demand and prices alongside other factors such as land values, timber and fuel prices, distance to market, environmental standards, land-use preferences, and business plans. A key insight from this analysis is the broad range of possible outcomes for emissions prices and net emissions across different models and scenarios, driven by variable assumptions about market dynamics.

Table 2 presents a synthesis of outcomes under the status quo NZ ETS across the range of models and scenarios considered in this paper. The findings are detailed in the sections below.

Table 2: Range of modelled outcomes under the status quo NZ ETS

Indicator	Modelled status quo outcome
NZU price (real 2025 NZD)	Range of modelling peaks at $60–$105 in the 2030s; falls to $5–$55 by 2060
NZ ETS auction revenue	Average of ~$550m in EB2 and ~$245m in EB3; none from EB4 onwards
Forest estate (2025–2050)	Additional 865,000 ha of planted forest, 55,000 ha of natural forest, and 32,000 ha of deforestation (government central projection)
Emissions budgets	EB2 (2026–2030) met in all scenarios; EB3 (2031–2035) missed in most; recommended EB4 (2036–2040) missed in all by 21–63 $MtCO_2e$
2050 climate target for gases excluding biogenic CH_4	Between 4.5 $MtCO_2e$ over and 4.8 $MtCO_2e$ under net zero in 2050; net emissions subsequently rise above net zero post-2050

Note: Modelled results are not forecasts or predictions.

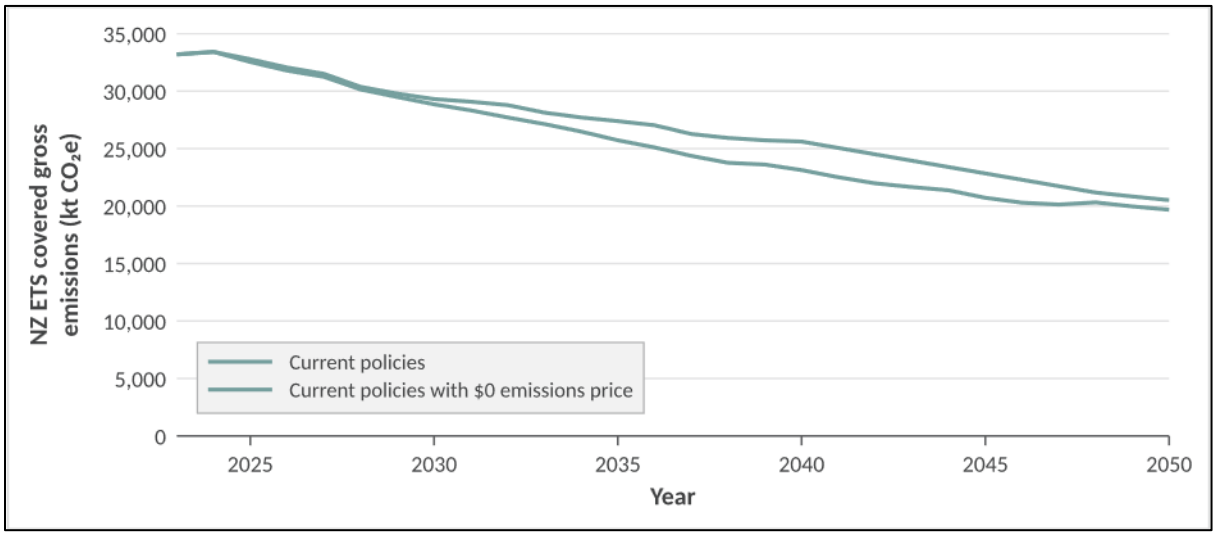
6.2 Unit supply and demand

The modelling analysis suggests that under the status quo NZ ETS, unit demand will decline over time, irrespective of the emissions price applied, due to external drivers (e.g. changes in technologies, gas reserves, and other policies).[164] This is illustrated in Figure 11, which shows projections of gross emissions covered by the NZ ETS under current policy settings, and an illustrative $0 emissions price scenario applied with other current policies alongside the NZ ETS

[164] See Parliamentary Commissioner for the Environment (2025b).

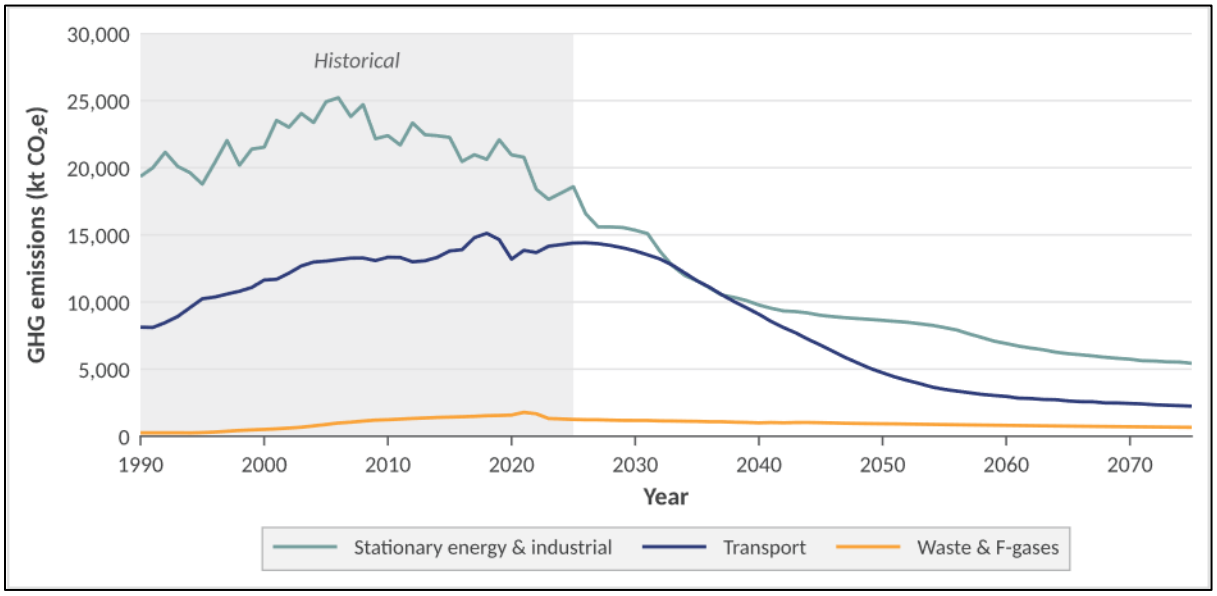
maintained. These trends are projected to occur in all gross emitting sectors covered by the NZ ETS, as shown in Figure 12 for an illustrative $0 emissions price.

Figure 11: Gross emissions covered by the NZ ETS ($ktCO_2e$) under current policies (status quo) and current policies ($0 emissions price)



Source: Ministry for the Environment (2026a, 2026c).

Figure 12: Gross GHG emissions (excl. biogenic CH_4) covered by the NZ ETS ($ktCO_2e$) with $0 emissions price from 2026

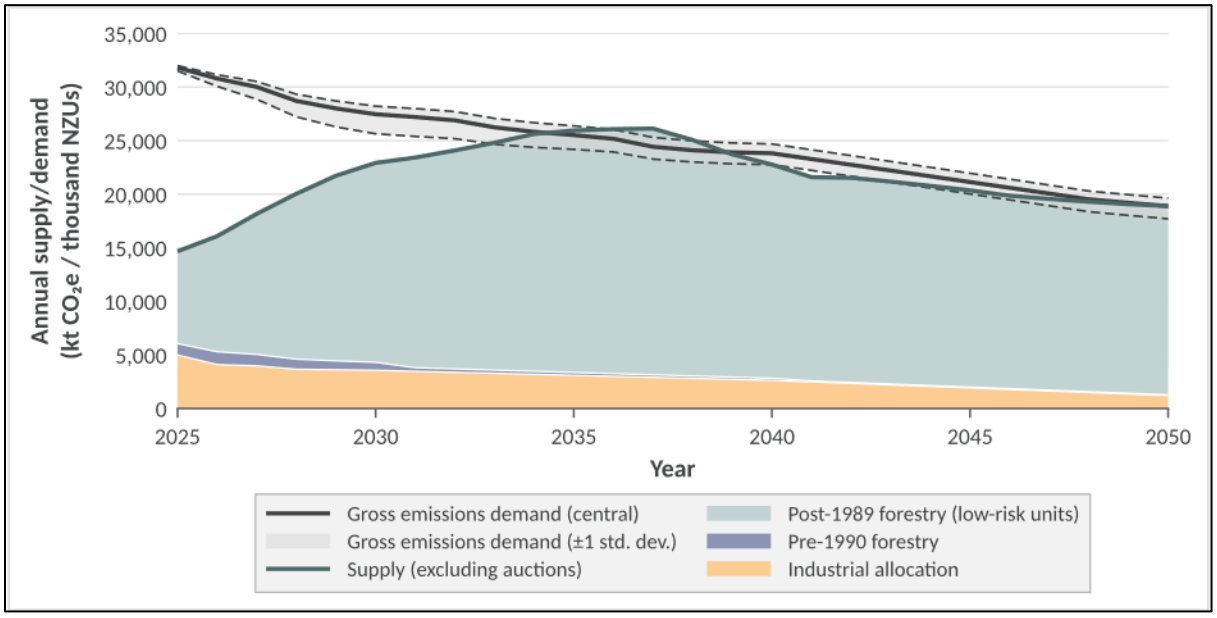


Source: Adapted from Concept Consulting (2026).

In parallel, forestry unit supply is expected to increase, given current emissions prices and the potential for further afforestation. These trends are eventually expected to lead to a new norm in

which all market demand for units is met through supply from forestry and industrial allocation alone, without any need for auctioned units sold by the Government. This convergence in demand and supply from non-government sources is anticipated around the mid-2030s.[165] This is reflected in Figure 13 below, drawn from MfE's NZ ETS market model. Other models examined reflect similar results.

Figure 13: NZ ETS gross emissions demand compared against supply from sources other than auctioning under status quo NZ ETS ($ktCO_2e$ / thousand NZUs per annum), 2025–2050



Note: NZ ETS supply/demand from Ministry for the Environment (2026c) under the emissions price scenario reflected in Figure 14 (below). Pre-1990 forestry supply taken from central projection from Climate Change Commission (2026c). Gross emissions demand range varies based on demand elasticity (1 standard dev. from central scenario). Supply shown in figure excludes transfers into or out of stockpile and use of surplus units, which cover the gap to gross emissions demand in the 2020s and early 2030s. Source: Green (2026).

In the models examined, supply and demand often remain roughly equivalent once convergence occurs (i.e. throughout the 2040s), with forestry supply often declining in models in the long run alongside falling gross emissions demand. This reflects rational behaviour on the part of foresters, where afforestation should be expected to slow down as the market approaches a state in which existing registered forests are able to satisfy demand in the market. Attempts by the Government to rally the scheme's price at this point (e.g. through raising the auction price floor or tightening auction supply) will prove ineffective given both the availability of units from forestry and industrial allocation, and the large number of forestry participants registered in the NZ ETS

[165] See Parliamentary Commissioner for the Environment (2025b).

(5,865 as of June 2026). Auctioned units will not be needed by the market from around the mid-2030s onwards.

6.3 Unit prices

Modelling suggests supply and demand trends will lead to a short-term rise in prices (lifting up to prices needed to clear the auction reserve price and/or to induce reductions in net emissions later in the 2020s), followed by a decline in the emissions price as supply from non-government sources begins to approach levels needed to satisfy annual demand in the NZ ETS. This is reflected in Figure 14 below, where most scenarios see the emissions price (expressed in real 2025 NZD) peaking at $60–$105 in the 2030s. However, they could decline thereafter, with long-run outcomes ranging from $5 to $55 by 2060.

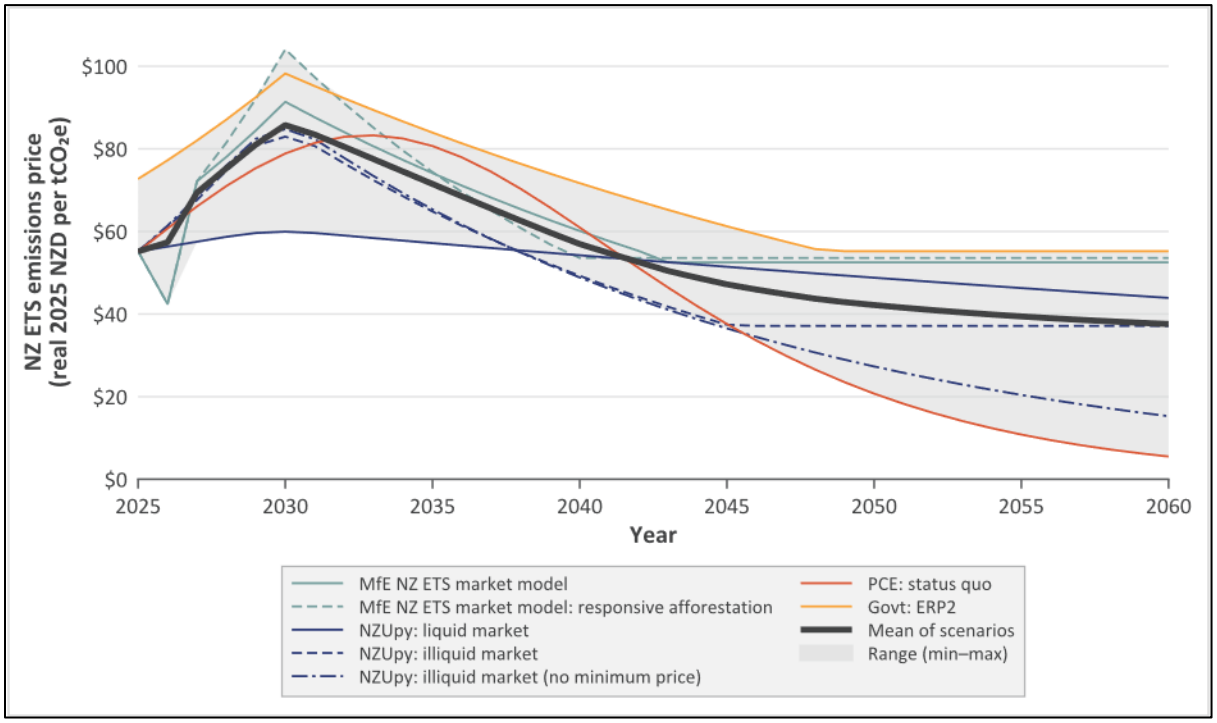
In some models featured in Figure 14, a ~$50 price point is assumed to serve as a minimum long-term price level in the scheme (e.g. the MfE NZ ETS market model), reflecting the long-run marginal cost for forestry supply and afforestation.[166] This specific $50 emissions price point can be loosely tied to Manley (2023), which found that the majority of surveyed sites were more profitable in permanent forestry relative to production forestry at an emissions price of $50. Thus, below this price, forest operators on stock change accounting may switch intentions to production forestry, reducing supply and increasing demand, thereby generating a rebound price effect back up to $50.

The two NZUpy scenarios featured in Figure 14 use a lower minimum price of $37 (real 2025 NZD), reflecting the price point at which both permanent exotic and production exotic forestry models are economic relative to some types of sheep and beef farms in Ministry for Primary Industries (2024). Removing the minimum price in the scenario run with greater market liquidity (i.e. more borrowing from the stockpile can occur) had no effect on the modelled emissions price, as the model never reaches $37 in this scenario. For NZUpy: illiquid market, removing the minimum price assumption saw prices falling off more in the long term, reaching $29 by 2050 (versus $37 at 2050).

In PCE: status quo, no minimum price level is set, and prices fall to $20 by 2050 and $5 by 2060 (real 2025 NZD). This result is driven by high costs for switching from permanent exotic forestry to other land uses (e.g. production forestry or sheep and beef) that make switching away from permanent exotic forestry uneconomic in the model, even at very low emissions prices.

[166] See Ministry for the Environment (2024a).

Figure 14: NZ ETS emissions price (real 2025 NZD) under status quo policy settings from a range of models and reports, 2025–2060



Note: Scenarios that settle on same long-run emissions price (MfE NZ ETS market model) are varied in chart by $0.50 to allow visual separation. Source: Green (2026).

6.4 Afforestation and deforestation

The Government's central projections see long-term rates of exotic afforestation totalling around 27,000 ha/yr, while the PCE report and NZUpy see afforestation rates tapering off as the emissions price falls. In the PCE report, afforestation reaches as low as 6,000 ha in 2050 and 3,000 ha in 2070, consistent with the low emissions prices seen in this projection.

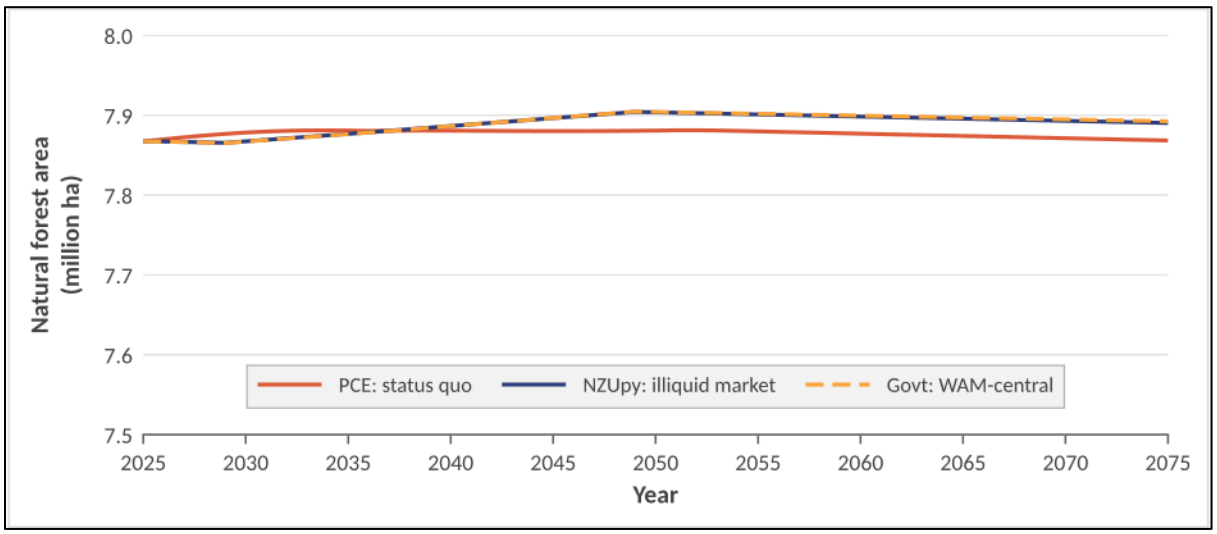
Indigenous afforestation is offset by deforestation in all three projections, and New Zealand's indigenous natural forest estate is only projected to increase by a net 38,400 ha by 2050 in the Government's central afforestation forecast.[167] By comparison, New Zealand's planted exotic forest estate is projected to increase by a net 849,500 ha by 2050 in the same scenario (a 35.6% increase on the current estate). The corresponding change in New Zealand's natural/indigenous forest and planted exotic forest estates is shown in Figures 15 and 16, respectively.

One source of uncertainty is the impact of the Government's new restrictions on NZ ETS registration of post-1989 exotic forest resulting from conversion of agricultural land (see section

[167] Calculation by Green (2026) using data from Climate Change Commission (2026c).

4.1.2). The Ministry for Primary Industries and Ministry for the Environment (2024) estimated that the Government's ballot limit of 15,000 ha would lead to afforestation of ~28,000 ha/yr, down from the status quo counterfactual of ~38,000 ha/yr. Separately, the Ministry for Primary Industries' most recent afforestation intentions survey found a decline in afforestation intentions (falling to 17,200 ha in 2026), attributed to uncertainty over the LUC restrictions themselves.[168] Concept Consulting (2026) also suggests that the effective impact on afforestation is uncertain, since the 25% on-farm exemption could in principle permit up to one million ha of LUC classes 1–6 conversion. The restrictions are unlikely to fundamentally alter the long-term price trajectory of the NZ ETS under the status quo, given that even afforestation rates only slightly above the ballot limit of 15,000 ha will still see substantial long-term forestry supply.

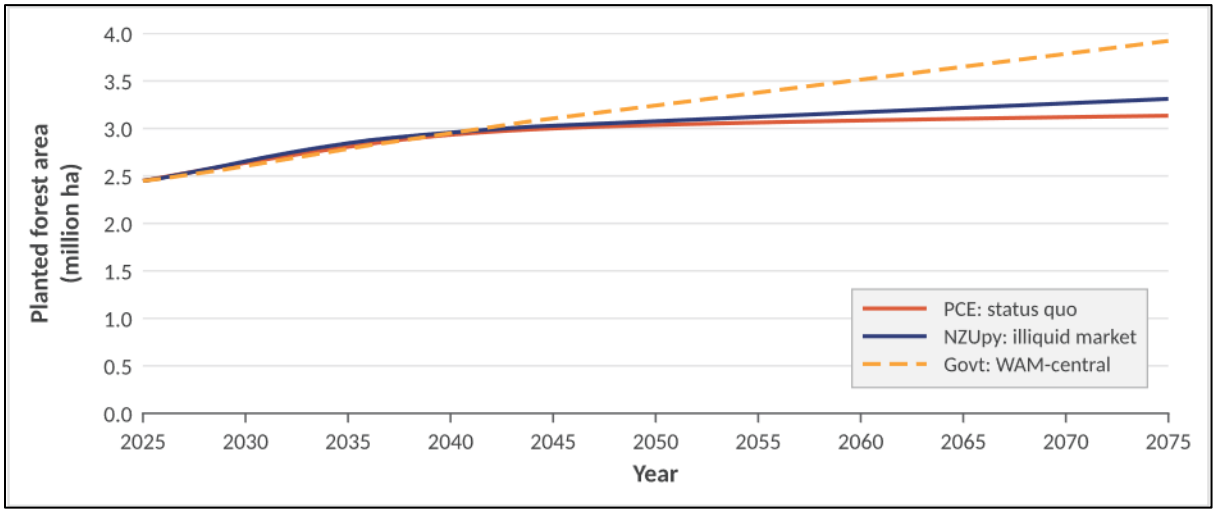
Figure 15: Total natural forest area from 2025 to 2075 in PCE: status quo, NZUpy: illiquid market and Govt: WAM-central



Note: Historical forest area in 2024 is taken from Ministry for the Environment (2026d); Govt: WAM-central sourced from Climate Change Commission (2026c); Govt: WAM-central and NZUpy: illiquid market include the Government's plans for afforestation on Crown land; y-axis minimum is set to 7.5 Mha to allow visual distinction between scenarios. Source: Green (2026).

[168] See Manley (2025).

Figure 16: Total planted forest area from 2025 to 2075 in PCE: status quo, NZUpy: illiquid market and Govt: WAM-central

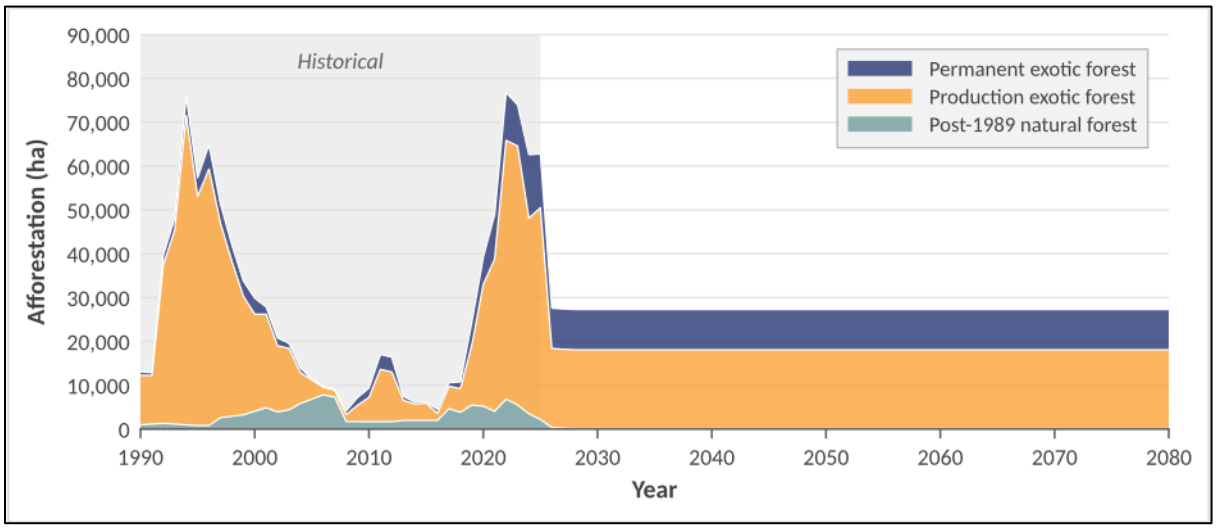


Note: Historical forest area in 2024 is taken from Ministry for the Environment (2026d); Govt: WAM-central sourced from Climate Change Commission (2026c); Govt: WAM-central and NZUpy: illiquid market include the Government's plans for afforestation on Crown land. Source: Green (2026).

Modelling demonstrates how emissions pricing assumptions can affect outcomes for the amount, type, and timing of post-1989 afforestation. Afforestation rates are presented in:

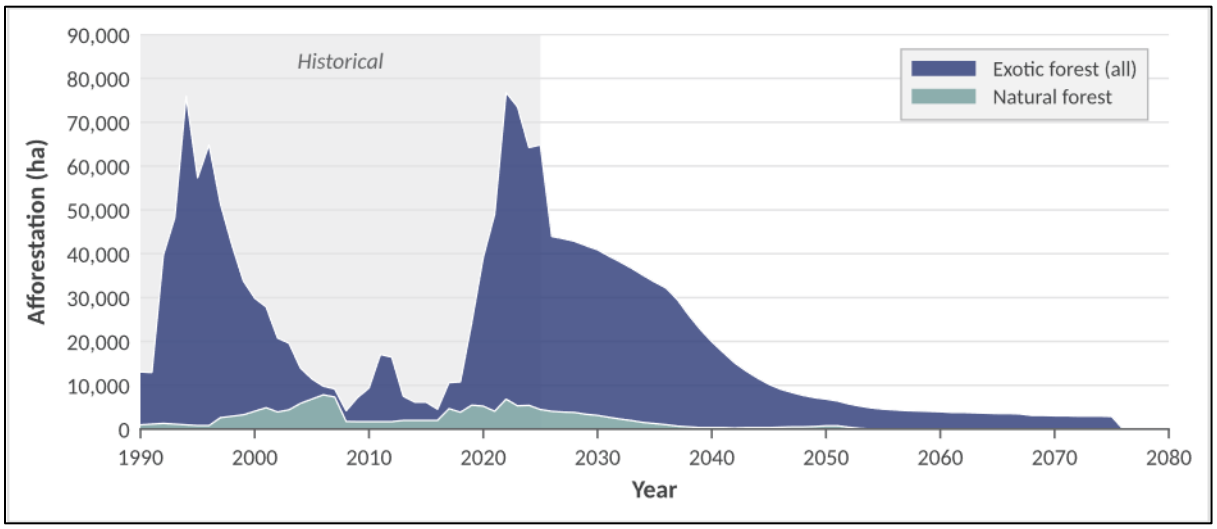
1. Figure 17 for the Government's central With Additional Measures (WAM) projection (Govt: WAM-central) (consistent with a long-term ~$50 emissions price)
2. Figure 18 from PCE: status quo, which features emissions prices peaking at around $83 (real 2025 NZD) in 2033 and declining thereafter
3. Figure 19 from NZUpy (illiquid market) with the emissions price declining to $37 in the long term.

Figure 17: Projected afforestation in Govt: WAM-central for status quo NZ ETS, 1990 to 2080



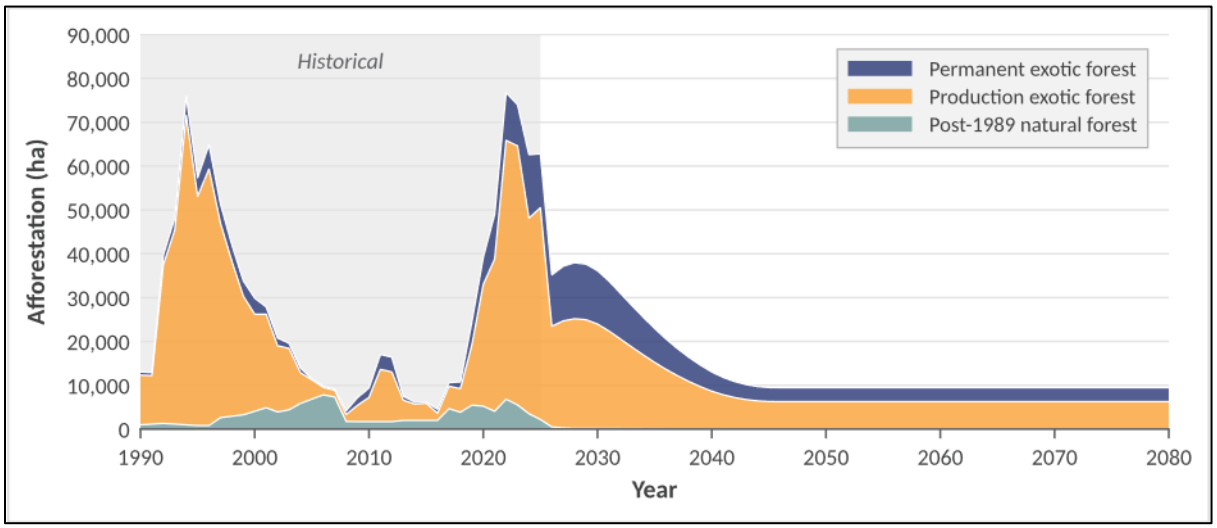
Note: Data from Climate Change Commission (2026c). Source: Green (2026).

Figure 18: Projected afforestation in PCE: status quo for status quo NZ ETS, 1990 to 2075



Note: Data from Parliamentary Commissioner for the Environment (2026a) for status quo NZ ETS. Source: Green (2026).

Figure 19: Projected afforestation in NZUpy: illiquid market for status quo NZ ETS, 1990 to 2075



Source: Green (2026).

6.5 Auction revenue

Modelling studies published to date indicate that it is likely that prices will lift to clear the auction price floor again for a period of time during EB2 or EB3. Results for auction units sold and revenue are presented in Table 3 where available from the model scenarios featured in Figure 14 above. No models project any auction revenue from EB4 onwards under the status quo, as all models see the market fully supplied with industrial allocation and forestry removals units by this point in time. For comparison to the revenue figures presented in Table 3, government revenue from auctioning through to the end of EB1 was $4.3bn (real 2025 NZD), with over $2bn in revenue from auctions in 2022 alone.[169]

[169] Calculation by Green (2026) converted to real 2025 NZD using auction clearance price and volumes sold on NZX & EEX (2026).

Table 3: Units sold at auction and auction revenue (real 2025 NZD) to the Crown during EB2 and EB3 in a selection of models

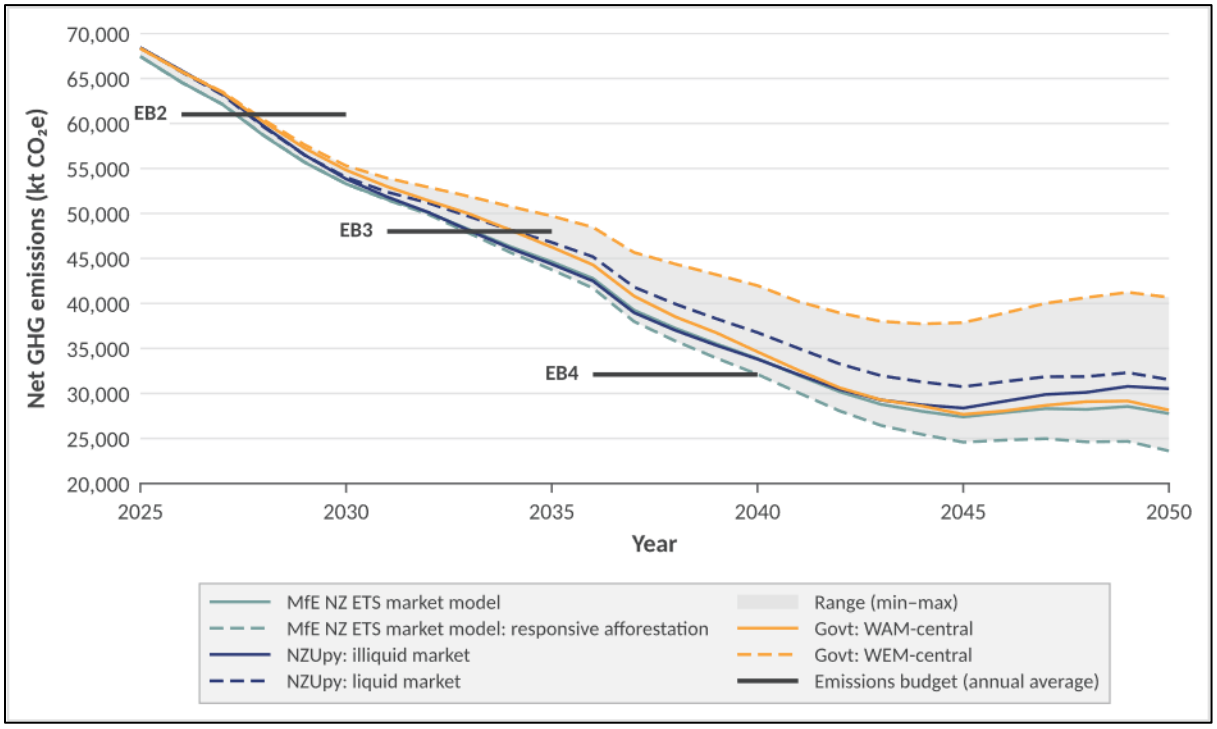
Model scenario	Auction units sold (Million NZUs)		Auction revenue (real 2025 NZD)	
	EB2	*EB3*	*EB2*	*EB3*
MfE NZ ETS market model	11.7	5.2	$925m	$450m
MfE NZ ETS market model: responsive afforestation	11.7	5.2	$975m	$490m
PCE: status quo	3.9	0.6	$300m	$50m
NZUpy: illiquid market	7.4	3	$580m	$240m
NZUpy: liquid market	0	0	-	-
Average of model scenarios	6.8m	2.8m	$550m	$245m

Note: Auction units rounded to one decimal place, and auction revenue to nearest $5m. Source: Green (2026).

6.6 Emissions budgets and the 2050 target

Projections of net emissions using target accounting for forestry are presented in Figure 20 relative to New Zealand's current emissions budgets from a selection of models using scenarios reflecting status quo policy settings.

Figure 20: Net GHG emissions ($ktCO_2e$) under emissions budgets using target accounting in a selection of status quo scenarios, 2025 to 2050



Note: Govt: WAM-central and Govt: WEM-central are the Government's central projections with additional measures and with existing measures, respectively. NZUpy and MfE NZ ETS market model scenarios use Govt: WAM-central for emissions outside the NZ ETS. Y-axis minimum set to 20,000 $ktCO_2e$ for clearer distinction between scenarios. Source: Green (2026).

All scenarios are projected to meet New Zealand's budget for EB2 (2026–2030), whereas for EB3 (2031–2035), only one scenario (MfE NZ ETS market model: responsive afforestation) meets this budget. The remaining scenarios range from 0.5 to 19 $MtCO_2e$ above the budget.

For the recommended budget for EB4 (160.5 $MtCO_2e$ over five years) in Climate Change Commission (2024a), no scenarios met this budget, with all scenarios at least 20 $MtCO_2e$ over budget (21–63 $MtCO_2e$ range). Paying for units to cover this gap for EB4 (e.g. via additional removals, emissions reductions in non-ETS sectors, or international purchase[170]) would carry an implied cost of $1.3 to $4.1bn if valued at average modelled NZ ETS prices observed during that period ($64.35, real 2025 NZD). This value exceeds future projected auction revenue during EB2 and EB3 (refer to Table 3).

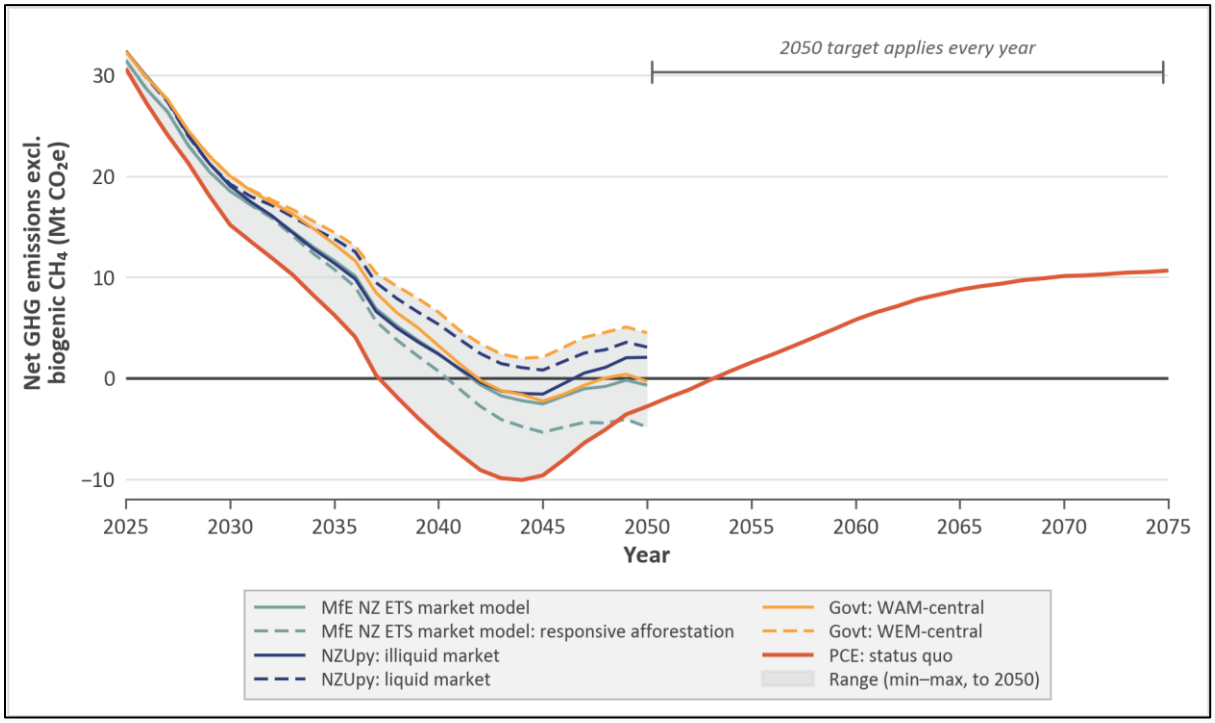
[170] Under section 5Z of the Climate Change Response Act 2002, emissions budgets must be met, as far as possible, through domestic emissions reductions and domestic removals. However, offshore mitigation may be used if there has been a significant change of circumstance that affects the considerations on which the relevant emissions budget was based, and that affects the ability to meet the relevant emissions budget domestically.

Projections presented in Figure 20 above for NZUpy and the MfE NZ ETS market model slightly understate net emissions in scenarios with lower rates of afforestation than the government's forecasts given the use of a fixed assumption for agricultural emissions drawn from the Govt: WAM-central projection. This is because afforestation is expected to reduce sheep and beef land use, and consequent sheep and beef sector emissions. As an illustration, when factoring in the implied greater area of remaining sheep and beef farms in the NZUpy: illiquid market scenario, net emissions would be 400–640 $ktCO_2e$ higher than those reflected in Figure 20 at 2050.[171]

Projections of net emissions excluding biogenic CH_4 show emissions of +4.5 to -4.8 $MtCO_2e$ over or under New Zealand's 2050 target for gases excluding biogenic CH_4 in 2050 (i.e. the target is met in some scenarios in the year 2050 and missed in others). This is presented in Figure 21 below across a selection of scenarios reflecting the status quo. Beyond 2050, the potential for falling prices in the NZ ETS creates risk that New Zealand will be unable to sustain net-zero GHG emissions. This risk is pertinent because the 2050 target requires net accounting emissions (other than biogenic CH_4) to be zero not only in 2050, but in every subsequent calendar year. Modelling prepared for the PCE illustrates this risk. This projection sees net GHG emissions (excluding biogenic CH_4) falling to around -10,000 $ktCO_2e$ in the mid-2040s before rising again, breaching the target from the mid-2050s and rising further thereafter.

[171] Calculation by Green (2026) using average emissions per ha for sheep and beef farms ranging from 2.3 tCO_2e/ha to 3.66 tCO_2e/ha. Lower-end estimate sourced from Ministry for the Environment (2024a) for sheep and beef farms, and excludes fertiliser emissions (reported as a separate category). Higher-end estimate sourced from Vibart et al. (2022) drawn from Beef+Lamb NZ economic data from a sample of 170 sheep and beef farms.

Figure 21: Net GHG emissions excluding biogenic CH_4 ($MtCO_2e$) under the 2050 target using target accounting in a selection of status quo scenarios, 2025–2075



Note: Govt: WAM-central and Govt: WEM-central are the Government's central projections with additional measures and with existing measures, respectively. NZUpy and MfE NZ ETS market model scenarios use Govt: WAM-central for emissions outside the NZ ETS. Data from Concept Consulting (2026); Parliamentary Commissioner for the Environment (2026a). Source: Green (2026).

6.7 Implications for key stakeholder groups

Under the status quo NZ ETS, no stakeholder group is well served in the longer term, and that heightens policy uncertainty and investment risk in the near term.

- For **emitters**, low and volatile unit prices and policy uncertainty make it hard to plan and justify decarbonisation investment.
- For **foresters and landowners**, returns ride on volatile and unpredictable unit prices and declining long-term unit demand. Indigenous forests and other higher-value removals cannot compete.
- For the **Government**, the early end of auctioning cuts off its primary lever over unit supply and prices as well as auction revenue, and the current NZ ETS structure places EBs, the 2050 target, and NDCs at risk.
- For **iwi and Māori**, the status quo NZ ETS and policy gaps for removals create barriers to realising the potential environmental, economic, and social benefits from both pre-1990 and

post-1989 indigenous and exotic forestry on Māori land. Deeper discussion of these issues falls outside the scope of this paper; however, this remains a vitally important area for further research and policy development through tikanga-aligned processes.

- For **all New Zealanders**, a delayed low-emissions transition and heavy reliance on removals at risk of reversal lock in high-emissions investment, defer emerging opportunities for low-emissions economic development and innovation, and push costs onto today's youth and future generations.

PART B: SCOPING THE SOLUTION SPACE

The first part of this paper has demonstrated that while the NZ ETS market is functional at present, the current package of NZ ETS and removals policies needs to improve to serve the interests of New Zealand and the global climate in the longer term. Policy uncertainty is already affecting long-term investment decisions, and avoiding or delaying substantial reforms will compound the uncertainties and investment risks facing market participants both now and in the future.

Nevertheless, transitioning to new policy settings could introduce new uncertainties and destabilise the market unless change is managed through an inclusive, well-considered, and well-signalled process. The second part of this paper offers an initial conceptual framework for opening a broader conversation on NZ ETS and removals policy reform. It scopes high-level pathway options for the NZ ETS and removals policy and identifies key issues that will need to be addressed through further research, engagement, and consultation.

7 Updating policy assumptions and objectives

A first step towards reforming the NZ ETS and removals is to identify and test the policy assumptions used to shape the design of the system nearly 20 years ago.[172] Table 4 presents eight foundational assumptions behind NZ ETS design that need to be updated to reflect today's realities.

[172] Many of these were first expressed in Ministry for the Environment and The Treasury (2007) and reiterated in subsequent government policy documents and decisions.

Table 4: Outdated assumptions and current realities for the NZ ETS

Policy considerations	Foundational assumptions	Current realities
Devolution of climate target obligations and costs to sectors	Target obligations, costs, and mitigation outcomes should be devolved to sectors.	Both public and private effort and funding are needed to achieve targets with public-good outcomes.
Least-cost compliance	Emissions pricing should deliver least-cost compliance with near-term targets.	Highest-value outcomes are needed from emissions pricing over the long term.
Domestic mitigation potential	New Zealand has few cost-effective opportunities to reduce domestic gross and net emissions.	Ambitious domestic emissions reductions and removals are technically and economically feasible.
Efficiency and equity	All sectors should face the same emissions price for efficiency and equity.	Blunt emissions pricing across diverse sectors by itself does not produce efficient or equitable outcomes, and some sectors have been shielded or excluded from emissions pricing.
Policy and market fungibility of emissions reductions and forestry removals	Emissions reductions and forestry removals are equivalent under climate targets and should be fungible under the NZ ETS.	Emissions reductions and forestry removals are not equivalent on climate, market, societal, or political terms. Enabling market fungibility creates investment and target risks as well as risks to rural communities.
Consideration of local effects	It does not matter to New Zealand where or how emissions reductions and removals occur, since they all benefit the climate.	Where and how emissions reductions and removals occur matters for our communities, landscape, economy, and national security.
Use of NZ ETS revenue	The NZ ETS is not intended to generate government revenue.	NZ ETS revenue can be directed for positive outcomes but will decline alongside decarbonisation.
International carbon market opportunities	Foresters will find ways to sell surplus units offshore through compliance and voluntary markets.	The Government can facilitate investment in domestic removals from international compliance and voluntary nature and carbon markets.

The future design of policy for the NZ ETS and removals needs to be resilient to uncertainties such as:

- The evolution of the Paris Agreement under climate overshoot, including potential changes to NDC ambition and target accounting rules
- Unpredictable changes in mitigation technologies and markets
- Land-sector resilience to pests, diseases, climate impacts, and other natural disasters
- Socioeconomic, political, and institutional change.

On that basis, we propose a series of eight key policy objectives to guide future decision-making. These are listed in Table 5.

Table 5: Proposed policy objectives for decision-making on the NZ ETS and removals

Policy objective	Description
Sustaining governance over unit supply and prices to support climate targets and market stability	The Government needs effective levers to manage unit supply and emissions prices in order to achieve climate targets and ensure NZ ETS market stability.
Delivering high-value outcomes across climate and other domains	Mitigation investment should deliver value for money across climate change mitigation and adaptation, nature conservation, economic development, and social wellbeing.
Incentivising removals beyond NZ ETS emissions liabilities	Incentivising net removals that complement – rather than substitute for – gross emissions reductions in the NZ ETS can help New Zealand bridge current target gaps and boost future target ambition under overshoot.
Decoupling emissions prices for emissions reductions and removals	Emissions reductions and removals support climate change mitigation in different ways, and decoupling emissions prices enables diverse attributes to be valued and incentivised separately.
Sending clear investment signals for both emissions reductions and removals	Sending clear investment signals for both emissions reductions and removals helps lower investment risk for emitters and removals producers and target risk for the Government.
Incentivising diverse removals with broader co-benefits	Diversifying removals with broader co-benefits can boost outcomes for climate, nature, the economy, and communities.
Enabling fiscally sustainable removals incentives	The net fiscal cost of policy solutions for removals must be sustainable for government policies to deliver long-term outcomes.
Encouraging domestic and international investment in New Zealand's removals from nature and carbon markets	The Government should facilitate domestic and international investment in New Zealand's removals from nature and carbon markets (both compliance and voluntary).

8 NZ ETS pathway alternatives to the status quo

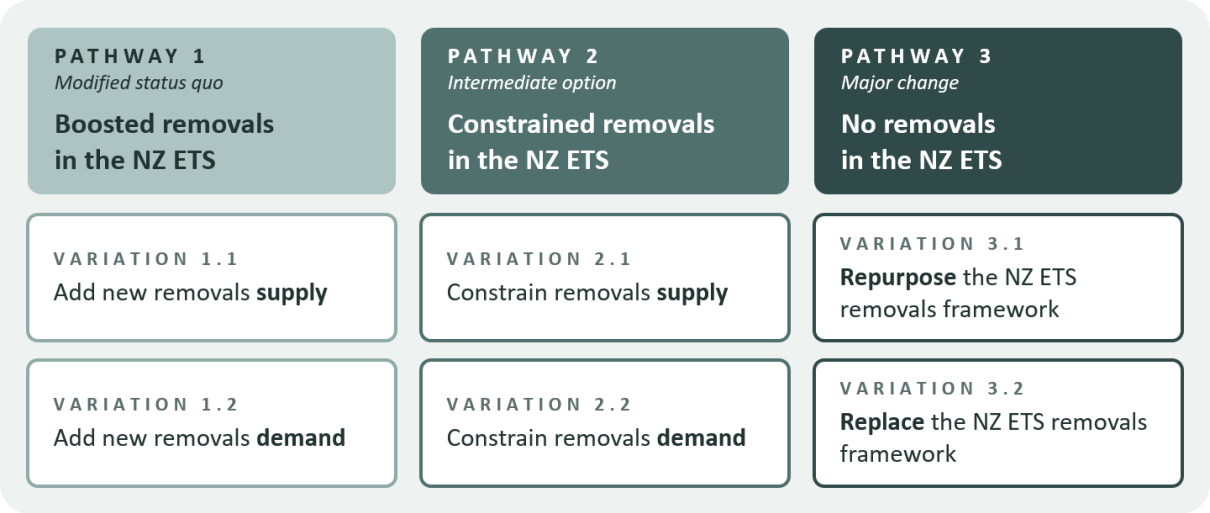
8.1 Spectrum of NZ ETS pathway options

Any jurisdiction with an ETS will face the challenges of navigating the transition towards net-zero – and eventually net-negative – emissions.[173] New Zealand needs to be preparing its ETS for

[173] See Holovko et al. (2026) and La Hoz Theuer et al. (2025).

those challenges now. This paper evaluates three NZ ETS pathway reform options as alternatives to the status quo. As shown in Figure 22, these options are differentiated by their treatment of removals.[174] Two variations – each with a range of implementation options – are offered for each pathway option. Various elements of these pathways are not necessarily exclusive. All pathway options could be combined with incentives for removals outside the NZ ETS and would require transitional provisions; this is the focus of section 9.

Figure 22: Alternative pathways for removals in the NZ ETS



Three additional NZ ETS pathway options need to be acknowledged.

- One option is **combining the status quo for the NZ ETS with complementary incentives for gross emissions reductions**.[175] While this could help with decoupling prices between emissions reductions and removals, it would not solve broader challenges facing removals or address risks to market function from the status quo.
- A second option is **combining a gross-emissions NZ ETS with a land-sector ETS** comprising biogenic methane from livestock production and forestry. This idea was proposed by the Parliamentary Commissioner for the Environment (2019) and further analysed in Parliamentary Commissioner for the Environment (2022). The stated rationale for this proposal is that the cooling effect from impermanent afforestation is better aligned with the warming effect from agricultural CH_4 than from fossil fuels. There could be merit in creating

[174] For recent discussion of NZ ETS reform options, see Climate Change Commission (2023, 2026a) and Parliamentary Commissioner for the Environment (2026a).
[175] One example identified by the Climate Change Commission (2026a) is to introduce a minimum emissions price for emitters via an additional levy or fee.

options for the agriculture sector to fund removals to help compensate for its warming. Although changing to a land-sector ETS could create at least some emissions liability for non-CO_2 emissions from agriculture, it could also discourage gross reductions in those emissions due to the same kind of substitution effects observed in the NZ ETS. A land-sector ETS could also continue to incentivise least-cost outcomes for removals, and the adverse impacts on rural communities from large-scale afforestation would not necessarily differ according to whether the purchasers of removals credits were large corporate CO_2 emitters or large corporate CH_4 emitters. Given the potential for new technologies to reduce agricultural CH_4, this scenario could create investment uncertainty for removals producers about long-term demand.

- A third option is **replacing the NZ ETS with a carbon tax or sectoral policies and regulations**. As discussed above, although insufficient by itself, emissions pricing plays a critical role in supporting the low-emissions transition. Carbon taxes and emissions trading systems have much in common and, with perfect information, could deliver comparable outcomes. Both instruments are vulnerable to political volatility, and replacing one with the other would not guarantee better climate or economic outcomes.[176] Abandoning the NZ ETS would require complex transitional arrangements for the large number of entities with interests in the system.

These three pathways are not considered further in this paper but could be assessed in future work.

8.1.1 Pathway 1: Boosted removals in the NZ ETS (modified status quo)

Under Pathway 1, an expansion of the status quo, forestry and other removals would remain in the NZ ETS without constraints on their use to meet surrender obligations, with variations to introduce new sources of removals supply or removals demand. Introducing new removals supply could help diversify removals and make the system more resilient. Introducing new removals demand could help bridge climate target gaps and create economic opportunities for removals producers.

Like the status quo, this pathway option would continue to assume the climate equivalence of emissions reductions and whichever removals were eligible. It would continue to incentivise least-cost removals, limiting the scope of financially viable removals. Removals that were more expensive than exotic afforestation would fail to compete, and those that were less expensive could undercut previous investments in exotic afforestation.

[176] See Leining (2017).

Variation 1.1: Add new removals supply

Under this variation, sources of removals would be expanded beyond the current scope to include further nature-based and/or engineered removals (see Figures 3 and 4 for options). This pathway option has already been enabled by legislative amendments and the Government's Assessment Framework for Carbon Removals (see section 4.3). It could potentially diversify eligible removals, helping to mitigate risks to climate targets and the NZ ETS market, boost the resilience of the removals portfolio to climate impacts and other natural disturbances, and generate new removals market opportunities and co-benefits. However, this pathway would potentially add further unit supply to an oversupplied market with declining long-term unit demand driven by decarbonisation, creating further investment uncertainty for removals producers.

Variation 1.2: Add new removals demand

Under this variation, new sources of demand for units (more broadly) or removals units (more specifically) would be added to the NZ ETS market. This could be done through options such as:

(a) Adding further obligated sectors to the system (e.g. synthetic fertilisers, livestock production, international aviation, and/or international shipping)

(b) Applying a progressive unit surrender obligation (e.g. requiring participants to surrender more than one unit per tonne of emissions[177])

(c) Introducing new removals surrender obligations that could be applied to public and/or private entities based on gross emissions or other factors

(d) Having the Government stand in the NZ ETS market as a buyer

(e) Enabling voluntary cancellation of units or removals units with the effect of boosting mitigation ambition

(f) Linking the NZ ETS to other ETS markets.

All the options could help reduce the current target gaps for non-ETS emissions. They could help absorb the oversupply of removals under the status quo, although they could also incentivise fresh waves of removals supply under rising emissions prices. They could potentially be used to incentivise removals beyond current NZ ETS liabilities, decoupling removals demand from the pace and cost of ETS-driven decarbonisation. The Government would need to manage the economic, distributional, and political implications of broadening obligations under the NZ ETS.

Linking the NZ ETS to another ETS market is not a feasible option in the near term. An ETS linkage can be buy-only, sell-only, or buy-and-sell. A buy-and-sell linkage would require

[177] This would be an inversion of the previous one-for-two unit surrender obligation discussed in section 4.1.

harmonisation across both markets of key settings for unit integrity, unit supply, price management, and compliance. It would also require a degree of compatibility of complementary measures. This would be challenging given the unique design of the NZ ETS. A sell-only linkage to another system would still require a complex bilateral agreement. Both types of linkages would require international mitigation transfers under Article 6 of the Paris Agreement in parallel to the ETS unit transfers, and associated target risks to New Zealand would need to be managed carefully. They would expose the NZ ETS to any economic, policy, or geopolitical risks in the other market. They could also constrain New Zealand's ability to unilaterally change the future design of the NZ ETS, affecting national sovereignty over domestic climate change policy.

8.1.2 Pathway 2: Constrained removals in the NZ ETS (intermediate option)

Under Pathway 2, removals would remain in the NZ ETS subject to quantitative or qualitative constraints on removals supply or demand. Such constraints could enable NZU prices to rise, supporting more ambitious decarbonisation. Depending on how the constraints were set, auctioning could continue for longer than under the status quo. Limits on removals in the NZ ETS could require increases in removals outside the NZ ETS to support New Zealand's climate targets.

Increased investment risk for removals producers would add to unit supply uncertainty, complicating government decisions on auction volumes. Differential access to NZ ETS incentives could create or exacerbate market distortions across the removals economy, with consequential impacts on land values and land use. Like the status quo and Pathway 1, Pathway 2 would subject removals to declining unit demand alongside decarbonisation. This pathway would require sensitive political decisions about how to set the constraints.

Variation 2.1: Constrain removals supply

Under this variation, the supply of removals into the market could be constrained using options such as:

(a) Placing a quantitative limit (quota) on new NZ ETS registrations or unit issuance for all or specified removals activities

(b) Limiting new NZ ETS registrations or unit issuance to specific types of removals activities, such as indigenous post-1989 afforestation and/or engineered removals

(c) Establishing a unit set-aside for removals with constraints on its use

(d) Adjusting the crediting basis for removals (e.g. to account for measurement uncertainty, leakage, or impermanence)

(e) Introducing expiration dates for units (referred to as "vintaging").

These options would reduce unit supply and raise unit prices to a point. However, they could also trigger post-1989 forests under stock change accounting to shift from production to permanent, adding further forestry units to the market and limiting emissions price rises. They would raise equity considerations across existing and new removals producers.

Under Option (a), constraints could be applied to the area of eligible land[178] (for nature-based removals), or the volume of removals (for all removals). The method of quota allocation and uncertainty about market access would raise equity considerations for removals producers and add to investment risk.

Under Option (b), constraining new removals supply to slow-producing activities like indigenous afforestation and engineered removals could help incentivise these higher-cost activities but create near-term unit supply uncertainty and target risk. By the time significant volumes of these types of removals entered the market, demand would have declined to the level of hard-to-abate emissions. Higher-cost removals would struggle to compete in a market with an overhang of lower-cost removals units from previously registered exotic post-1989 afforestation.

Options (c), (d), and (e) could be applied to all removals in the system, to new removals from existing or newly registered activities, or to new removals from newly registered activities, depending on the Government's preference for grandparenting investments made under previous policies. They would also raise equity considerations across existing and new removals producers.

Variation 2.2: Constrain removals demand

Under this variation, options could include:

(a) Applying a surrender limit to removals units (e.g. as a percentage of total unit obligations)

(b) Limiting the eligibility to surrender removals units to specific sectors (e.g. those with hard-to-abate emissions)

(c) Applying an exchange rate that lowers the value of removals relative to emissions reductions at the point of surrender

(d) Applying a supplementary surrender fee to specific types of removals.

Options (a) and (b) would redistribute the surrender of removals units across the market while increasing investment risk for removals producers. Option (c) would continue to incentivise least-cost removals. Option (d) could be used to raise emissions prices in the market and generate additional government revenue while maintaining some demand for lower-cost nature-based

[178] As discussed in section 4.1.2, the Government has already introduced restrictions on registration of post-1989 exotic afforestation on LUC classes 1–6 land.

removals activities. Options (c) and (d) would require political – rather than technical – judgements about market equivalence for emissions reductions and removals.

8.1.3 Pathway 3: No removals in the NZ ETS (major change)

Under Pathway 3, the NZ ETS would trade only in gross emissions, although previously stockpiled forestry NZUs not held for future forestry liabilities could be retained in the system to honour past investments and support market continuity. New removals (whether from previously registered or new removals activities) would be incentivised through an external mechanism. Future forestry liabilities for deforestation or for harvesting of post-1989 forest under stock change accounting in the NZ ETS would be managed through the external mechanism, and forest owners could transfer stockpiled NZUs to the mechanism for that purpose. New NZU supply would come from auctioning and industrial free allocation.[179] When setting auction volumes, the Government would have regard to the contribution to climate targets from removals generated outside the NZ ETS. The relative contributions of emissions reductions and removals to meet climate targets would be determined through government policy rather than the NZ ETS market. To implement Pathway 3, the Government could either repurpose or replace the NZ ETS removals framework.

Pathway 3 would fully decouple unit supply, demand, and prices for emissions reductions and removals. When setting auction volumes, the Government would have regard to the volume and type of removals generated outside the NZ ETS and their contribution towards meeting domestic and international targets. However, unlike Pathways 1 and 2, the incentives for removals would not be constrained (entirely or partially) by a market structure that ties removals demand to gross emissions, trades in NZUs as a uniform commodity, and prices NZUs at the marginal cost of mitigation across all sources. This would create new opportunities for incentivising diverse removals. The extent to which removals complemented versus substituted for emissions reductions would be determined through government policy rather than the NZ ETS market. Note that the two variations for this pathway discussed below could also be applied to complementary removals incentives under Pathways 1 and 2.

Variation 3.1: Repurpose the NZ ETS removals framework

Under this variation, to reduce the disruption from transitioning to an external system for incentivising removals, the Government would retain and repurpose the NZ ETS architecture for

[179] The NZ ETS does not currently accept overseas units, but these could also become a source of unit supply in the future. Under section 30GB of the Climate Change Response Act 2002, any approved overseas units would displace other unit supply under the overall limit defined in regulation.

removals registration, accounting, and MRV; unit issuance; and liability for reversals. This would essentially subdivide the current NZ ETS market, positioning the Government as the primary buyer in the removals market. However, foresters with unit liabilities and surplus units could buy and sell in the removals market. The removals market could also be opened to voluntary buyers looking to make contribution or offsetting claims, depending on government decisions about issuing corresponding adjustments.

Variation 3.2: Replace the NZ ETS removals framework

Under this variation, the Government would introduce a new removals framework to address shortcomings under the status quo and prepare the system to support a broader range of nature-based and engineered removals over time. This could enable alternative approaches to valuing diverse removals according to their measurement certainty, durability, timing, co-benefits, and potential to generate independent revenue. It could also enable alternative approaches to managing reversals that may be more economical and practical to implement and provide for more flexibility in future land use where this is appropriate.

8.2 Comparison of NZ ETS pathway options

Table 6 compares NZ ETS pathway options and their implications. Under all NZ ETS pathways, including the status quo, it would be possible to design incentives for removals outside the NZ ETS. Introducing external removals incentives could produce different outcomes for the volume, type, timing, and value of removals – and the potential to achieve more ambitious future climate targets – across NZ ETS pathway options. Depending on design, splitting removals incentives inside and outside the NZ ETS could lead to windfall gains and losses for some removals producers, with equity and efficiency implications for the broader removals market relative to managing removals incentives under one mechanism.

Table 6: The range of NZ ETS pathway options in this study

Pathway	Variation	Strengths and weaknesses
Status quo: **Unconstrained removals in the NZ ETS**	N/A	Avoids policy change but: • Auctioning ends in the early 2030s and least-cost removals displace gross emissions reductions, creating climate target and investment risk and limiting co-benefits from removals • Non-ETS removals are needed to bridge target gaps for gases outside the NZ ETS, but no existing mechanism can deliver this at scale • Adding external removals incentives could divide the removals market and create windfall gains or losses, and auction revenue is insufficient to cover their costs
Pathway 1: **Boosted removals in the NZ ETS (modified status quo)**	**Variation 1.1: Add new removals supply** (e.g. new nature-based and/or engineered removals)	Could diversify removals but: • Auctioning ends in the early 2030s and least-cost removals displace gross emissions reductions, creating climate target and investment risk and limiting co-benefits from removals • New removals sources could add to unit oversupply, exacerbating climate target and investment risk • The supply of more diverse removals with variable durability and measurement certainty could result in market incoherence and political controversy • Adding external removals incentives could divide the removals market and create windfall gains or losses, and auction revenue is insufficient to cover their costs
	Variation 1.2: Add new removals demand (e.g. new sectors, new surrender obligations, government as buyer, voluntary cancellation, or ETS linkage)	Could diversify removals and help bridge target gaps but: • Auctioning ends in the early 2030s and least-cost removals displace gross emissions reductions, creating climate target and investment risk and limiting co-benefits from removals • Distributional effects from new NZ ETS obligations need to be managed for equity • Adding external removals incentives could divide the removals market and create windfall gains or losses, and auction revenue is insufficient to cover their costs
Pathway 2:	**Variation 2.1: Constrain removals supply** (e.g. registration quota, eligibility	Partially decouples unit demand and prices for gross emissions reductions and removals and permits further auctioning but: • Reduced afforestation in the NZ ETS adds to climate target and investment risk

Pathway	Variation	Strengths and weaknesses
Constrained removals in the NZ ETS (intermediate option)	limit, unit set-aside, adjusted crediting, or vintaging)	• Quantity constraints require political judgements and incentivise least-cost, higher-risk removals, limiting co-benefits • Rising unit prices could trigger switching of stock-change forests from production to permanent, adding unit supply • Adding external removals incentives could divide the removals market and create windfall gains or losses, and auction revenue is insufficient to cover their costs
	Variation 2.2: Constrain removals demand (e.g. surrender limit, exchange rate at the point of surrender, or supplementary surrender fee)	Partially decouples unit demand and prices for gross emissions reductions and removals and permits further auctioning but: • Reduced afforestation in the NZ ETS adds to climate target and investment risk • Quantity constraints require political judgements and incentivise least-cost, higher-risk removals, limiting co-benefits • Adding external removals incentives could divide the removals market and create windfall gains or losses, and auction revenue is insufficient to cover their costs
Pathway 3: **No removals in the NZ ETS (major change)**	**Variation 3.1: Repurpose the NZ ETS removals framework**	Extends auctioning, fully decouples unit demand/prices for gross emissions reductions and removals, lowers climate target and investment risk, diversifies removals, manages all removals under a common policy mechanism, capitalises on the existing policy framework, and opens opportunities for voluntary removals investment but: • The new framework retains weaknesses for removals accounting and management in the current NZ ETS • More substantial policy change raises transition risk for emitters, foresters, and the Government
	Variation 3.2: Replace the NZ ETS removals framework	Extends auctioning, fully decouples unit demand/prices for gross emissions reductions and removals, lowers climate target and investment risk, diversifies removals, manages all removals under a common policy mechanism, enables maximum removals policy innovation, and opens opportunities for voluntary removals investment but: • More substantial policy change raises transition risk for emitters, foresters, and the Government

Under all NZ ETS pathway options, further policies would be needed to make emissions pricing more effective, address non-price barriers to mitigation, and manage the distributional effects of climate policies, such as the rising price impacts of high-emissions goods and services on low-income households during the transition to low-emissions alternatives.

As shown in Table 6, Pathway 3 – which combines a gross-emissions NZ ETS with external incentives for removals – offers multiple strengths compared to the other pathways. Pathway 3 would:

- Maintain government control over unit supply and prices in the NZ ETS and achievement of climate targets
- Fully decouple demand and unit prices for emissions reductions and removals so that policy and investment could reflect their differing benefits and rates of change
- Support removals diversification in line with government priorities
- Enable more comprehensive coverage of removals under a single policy mechanism
- Open opportunities to integrate voluntary investment in removals.

Pathway 3 would involve the most significant policy transition, making it the most vulnerable to extended policy uncertainty or poor policy design choices that could negatively affect market confidence. However, the status quo and Pathways 1 and 2 also involve policy risks affecting market confidence.

This analysis shows that the NZ ETS alone cannot deliver what is needed to achieve New Zealand's climate targets or send clear investment signals to emitters and removals producers. From this analysis, a core question emerges for further work by policymakers: what policy package would deliver the incentives for gross emissions reductions and diverse removals needed to achieve New Zealand's climate, nature, economic, and social goals?

Answering that question requires a national conversation about how to design a system that will work better for everyone. In the past, whenever a suggestion has surfaced to constrain or transfer forestry removals currently in the NZ ETS, it has appeared that policy change would risk devaluing previous and future forestry investments. Today's reality is that the status quo will risk devaluing previous and future forestry investments. Collective effort is needed to create a pathway for NZ ETS reform that improves on the status quo.

9 Scoping a new RIM

This section explores options for designing a RIM for nature-based and engineered removals outside the NZ ETS. As a scoping exercise, this paper does not offer definitive solutions to the issues raised.

9.1 Core concept of a RIM

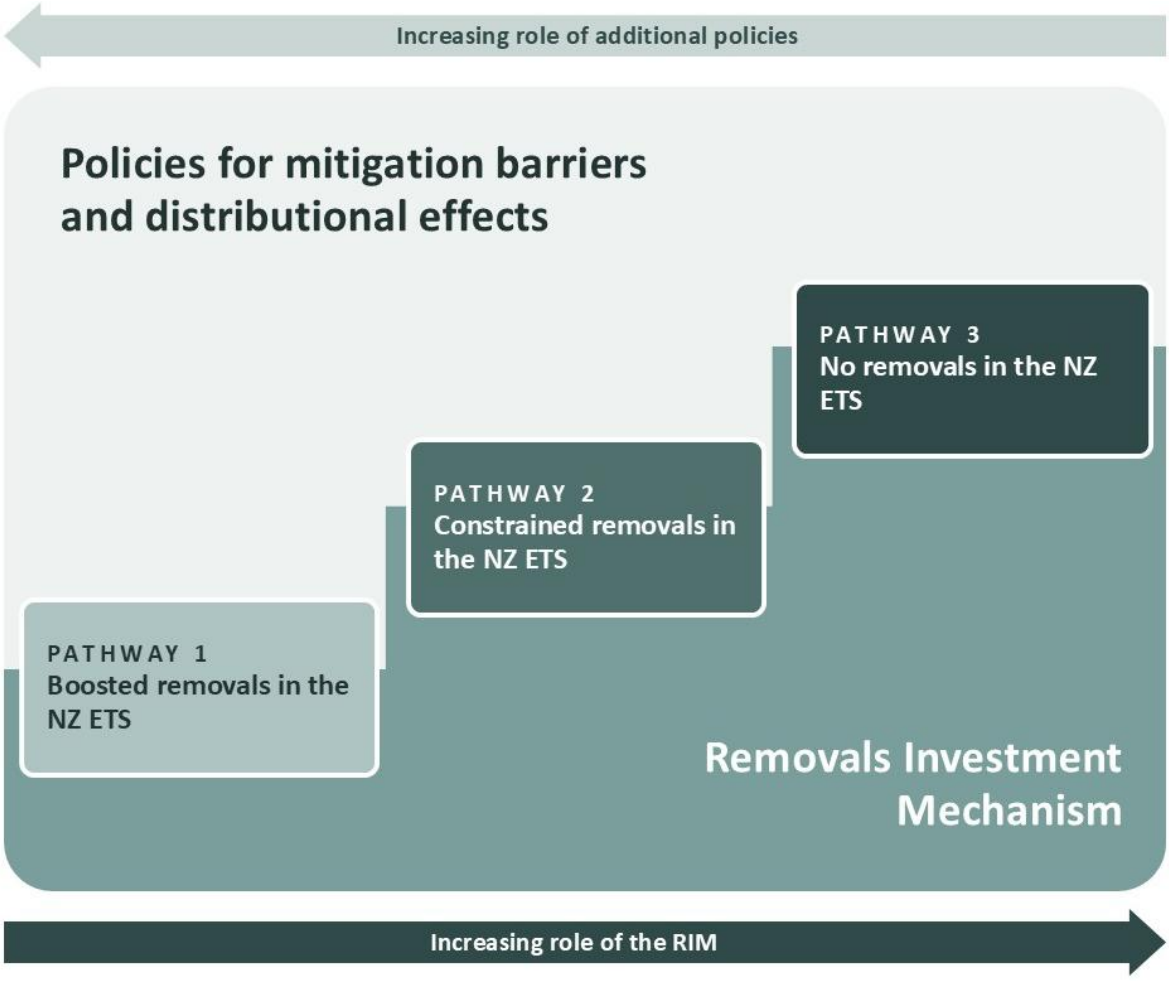
An initial vision for a RIM is presented in Box 6.

Box 6: Initial vision for a RIM

A RIM is an integrated package of government- and market-driven incentives, supported by policies and regulations, to boost long-term and large-scale investment in high-quality and diverse removals alongside gross emissions reductions.

The RIM could operate either independently from an NZ ETS trading only in gross emissions (Pathway 3) or in conjunction with an NZ ETS trading in both gross emissions and removals (status quo and Pathways 1 and 2, to different extents). As shown in Figure 23, the role of the RIM would increase with greater constraints on removals in the NZ ETS, and the role of supporting policies would increase alongside greater reliance on least-cost forestry removals to achieve climate targets.

Figure 23: Conceptual relationship between NZ ETS pathway options and the RIM



This idea is not new. The call for forestry investment outside the NZ ETS has been rising across New Zealand for decades. It has come from Māori as kaitiaki of the whenua, iwi managing settlements under Te Tiriti o Waitangi, initiatives like Recloaking Papatūānuku, the Parliamentary Commissioner for the Environment, the Climate Change Commission, private landowners, farmers, environmental NGOs, local community groups, philanthropists, pioneers in voluntary nature and carbon markets, and domestic and international investors looking for opportunities. As discussed in section 4.2, some government initiatives have contributed usefully along the way – although many of these have not been sustained. Collectively, however, these efforts have fallen short and faced headwinds from the NZ ETS.

If designed well, a RIM could deliver valuable outcomes summarised in Box 7.

Box 7: Potential outcomes from a RIM

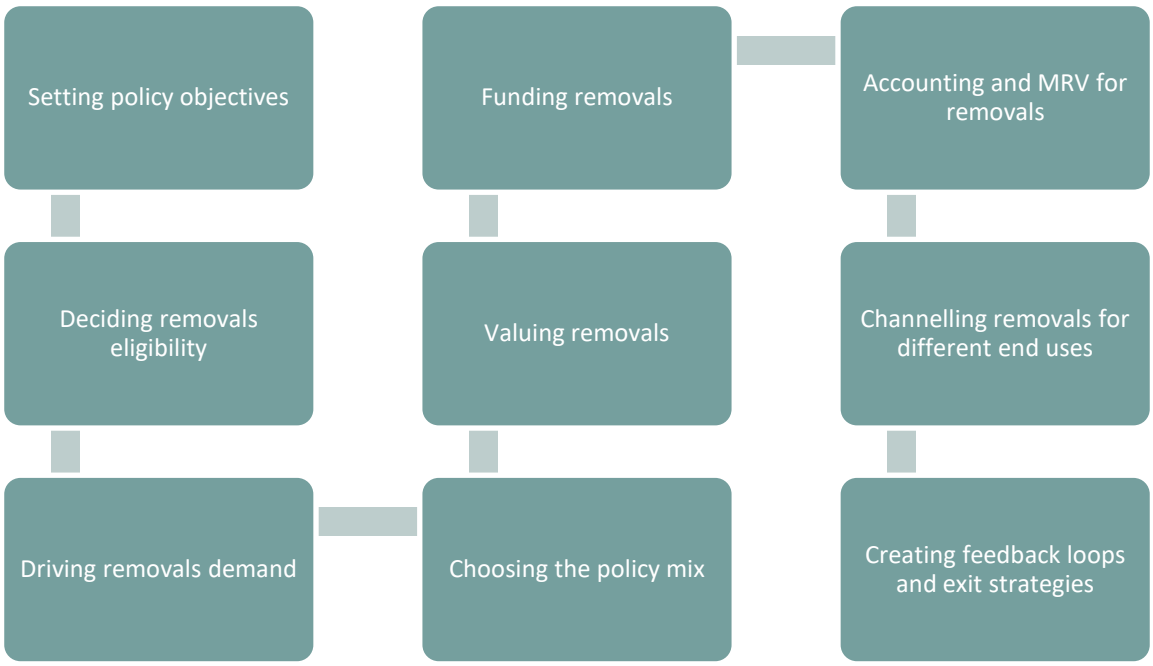
Through strategic design, a RIM could be used to:

- **Extend** governance over unit supply and prices through auctioning
- **Strengthen** investment signals for removals and emissions reductions
- **Value** removals for benefits beyond carbon offsetting
- **Coordinate** public and private funding flows
- **Channel** public funding through multiple instruments suited to needs
- **Diversify** removals for resilience with harmonised standards
- **Facilitate** voluntary nature and carbon markets
- **Bridge** the climate target gaps facing New Zealand
- **Respond** to climate overshoot.

9.2 Key policy design challenges

This section canvasses a series of policy design challenges for an effective RIM for New Zealand. These are summarised in Figure 24 and discussed in more detail below.

Figure 24: Policy design challenges for a RIM



9.2.1 Setting policy objectives

As a first step, the Government would need to define the intended role and extent of removals in achieving New Zealand's domestic and international climate targets and broader environmental, economic, and social objectives. In New Zealand's context, this should include developing shared visions, values, and goals for the forestry sector across the domains of mitigation, adaptation, nature, and the bioeconomy. It would be important for this process to be allocated sufficient time and resources to build understanding of the complex issues and achieve broad public and cross-party support for an agreed policy direction.

One option, recommended by the Climate Change Commission, would be to set distinct sub-targets for removals under the 2050 target and emissions budgets.[180] These sub-targets could be binding as part of target compliance or facilitative for policy planning, allowing the Government the flexibility to pursue emerging opportunities across both types of mitigation. The Government could also consider setting sub-targets for removals under New Zealand's NDCs. To help with managing uncertainty, sub-targets could potentially set a minimum level for removals.

Honegger et al. (2021) identified six functions for CDR policy mixes, summarised as follows:

1. Clarifying the intended role of CDR for mitigation, ensuring compatibility with the goals of the Paris Agreement and countries' climate targets
2. Accelerating innovation, technology learning, and associated cost reductions for CDR options
3. Ensuring public participation in CDR decision-making
4. Transitioning CDR from pilot activities to long-term and large-scale operations
5. Ensuring robust MRV and accounting
6. Preventing adverse impacts on sustainable development goals and maximising positive co-benefits.

9.2.2 Deciding removals eligibility

The Government would need to decide which removals activities would be included in a RIM. As discussed in section 3, nature-based and engineered removals can contribute in different ways towards reducing transient, peak, and cumulative warming and can generate a range of environmental, economic, and social co-benefits. By positioning removals outside the NZ ETS as target contributions rather than offsets for gross emissions, the Government could choose to provide different types or levels of incentive for both more durable removals that are not currently

[180] See Climate Change Commission (2023).

cost-competitive in the NZ ETS and for less durable removals that would still contribute valuable outcomes for climate, nature, the economy, and communities.

Building a diverse portfolio of removals would make New Zealand's emissions reduction plans more resilient to climate change impacts and other natural disturbances, volatility in commodity markets, and the evolution of ambition and target accounting under the Paris Agreement. An effective diversification strategy could take account of factors such as:

- The technical and administrative feasibility of removals activities
- The capital and operating costs of removals activities
- The potential for removals activities to generate non-carbon revenue streams or cost savings (relevant to dependence on public funding)
- The durability of climate change mitigation benefits
- Co-benefits for nature, the economy, and communities
- The current or potential inclusion of removals activities in the national GHG inventory and target accounting.

Table 7 below presents a conceptual matrix for classifying removals for decision-making in a RIM using two key criteria: durability and the potential to generate non-carbon revenue or cost savings. Some sample removals activities are included for illustration; classifications would need to be refined for actual policy design.

An insight from this exercise is that many nature-based removals activities should have the potential to generate substantial cost savings (e.g. from biodiversity conservation, ecosystem services, climate change resilience, and ecotourism), but these may not be monetised under current government accounting and budgeting practices. In a system with existing payments for ecosystem services or adaptation activities, many nature-based removals activities could be considered to generate non-carbon revenue. In a system with no existing payments for ecosystem services or adaptation activities, some of the activities in column R2 could shift to column R1.

Table 7: Conceptual matrix for classifying removals in a RIM

Diversification criteria	R1 – No potential revenue or cost savings without financial support	R2 – Some but insufficient potential for revenue or cost savings	R3 – Profitable without dedicated interventions
D1 – Short-duration nature-based (e.g. <100 years)		Some afforestation, agroforestry, and forest management Some soil carbon sequestration Peatland restoration Blue carbon	Some afforestation, agroforestry, and forest management Some soil carbon sequestration
D2 – Long-duration nature-based with reversal management (e.g. 100–1,000 years)	Some afforestation	Some afforestation	Some afforestation
D3 – Geological permanence (e.g. >1,000 years)	DACCS	Some biochar Some enhanced weathering BECCS	Some biochar Some enhanced weathering

Source: Revenue-related elements adapted from Honegger et al. (2021). Durability elements adapted from Babiker et al. (2022).

The Government could expand removals eligibility in stages, beginning with post-1989 afforestation, pre-1990 forest management, and post-1989 forest management for forests after they reach their long-term average carbon stock. The RIM could include other types of nature-based and engineered removals as they become technically, economically, and administratively feasible to implement (see the typology in Figure 4).

9.2.3 Driving removals demand

In New Zealand to date, the demand for removals has been driven – and constrained – by the opportunity to offset gross emissions by NZ ETS sectors and lower compliance costs. To deliver results at scale and build investor confidence, demand for removals in a new RIM should be grounded in long-term government removals targets that translate into concrete implementation strategies with legal (e.g. legislative or contractual) accountability for outcomes. For example, the Government could choose to:

- Issue contracts for removals as a public good
- Place obligations to purchase or fund removals on certain persons or sectors

- Facilitate crediting of eligible removals activities in voluntary nature and carbon markets.

The demand for removals could also be motivated by outcomes beyond climate change mitigation, such as biodiversity conservation, nature restoration, enhanced ecosystem services, adaptation to climate change impacts, ecotourism, regional economic development, employment, and kaitiakitanga.

As part of implementing the RIM, the Government would need to provide guidance to removals producers, investors, and other stakeholders about what kinds of crediting and marketing claims could be made in relation to removals activities. This would build public confidence in the system, stimulate demand, and manage participants' expectations.

9.2.4 Choosing the policy mix

Instead of being confined to the one-size-fits-all approach of the NZ ETS, the Government would have the flexibility to apply different types of policies, regulations, and market mechanisms to diverse removals according to their feasibility, effectiveness, durability, co-benefits, funding needs, and barriers to implementation. In addition to carbon pricing, Honegger et al. (2021) identified four types of interventions that could be included in a CDR policy mix:

- ***R&D activity-oriented subsidies*** to support technology development
- ***Mitigation results-oriented subsidies***, such as direct grants, tax credits, concessional loans, or contracts for difference (with the option for allocation of subsidies through reverse auctions)
- ***Regulatory mandates*** for implementation or funding of CDR activities
- ***Ancillary instruments*** that enable CDR deployment, such as systems for maintaining removals reserves, managing liability for reversals, and enabling effective public participation.

As discussed in section 11, other countries are building diverse policy portfolios for upscaling removals.

9.2.5 Valuing removals for public policy

In the NZ ETS to date, the value of removals has generally been set by the market relative to the marginal cost of mitigation. This approach has many shortcomings. For example:

- Price convergence locks out higher-cost, high-quality removals.
- Emissions price volatility creates investment risk for removals.
- Removals with different measurement certainty, durability, and timing are not equivalent assets and should not be priced the same.

- Pricing based on a single metric (GHG emissions) ignores other sources of value, such as provision of ecosystem services.[181]

Importantly, removals provide intrinsic value for climate change mitigation independently from what any emitter does now or in the future because they help repair cumulative damage to the atmosphere as a global commons.

When designing and implementing a RIM, the Government would need to make judgements about value for money for removals activities: the best available result for New Zealand for the money spent. Here, the Government would not be constrained to market prices in the NZ ETS and could value diverse removals for public policy according to their mitigation contributions on their own merits alongside other co-benefits. When valuing removals in a RIM, insights could be gained from methods such as:

- Revealed preferences from existing policy commitments
- The social cost of carbon
- Insurance pricing and actuarial valuation for climate-related damages
- Replacement cost valuation for available alternatives
- Avoided adaptation cost valuation
- Ecosystem services market pricing
- Bundling of multiple value streams into composite natural capital assets
- Intergenerational liability accounting.

The determination of value for money can involve quantitative exercises such as cost-benefit or cost-effectiveness analysis; however, many of the benefits from removals activities may be difficult to monetise.[182] With such exercises, policymakers should consider outcomes across multiple time horizons and with alternative social discount rates. Permanent removals produce intergenerational benefits, and discount rates systematically undervalue long-term outcomes.[183]

9.2.6 Funding removals

Under a RIM, the Government would need to decide how funding would be sourced across the public and private sectors and how to allocate funding to support RIM activities.

[181] For recent work on valuing ecosystem services in New Zealand, see Parliamentary Commissioner for the Environment (2026b).
[182] See Parliamentary Commissioner for the Environment (2026b).
[183] For insights on social discount rates, see Parliamentary Commissioner for the Environment (2021).

How funding could be sourced

Funding needs under the RIM could be met through both public and private sources. Private funding for removals could be driven by investment opportunities, new removals compliance obligations (see section 9.2.3), and/or voluntary nature and carbon market opportunities. If the Government were willing to issue corresponding adjustments, funding demand could come from New Zealand and other participants in CORSIA. Public-private partnerships could be considered to leverage funding and share risk. Potential sources of public funding for removals could include:

- NZ ETS auction revenue
- Taxpayer revenue
- Sovereign green bonds
- Sector levies.

Each of these options would have economic, distributional, and equity implications.

Mobilising funding for large-scale durable removals supporting first net-zero and then net-negative emissions outcomes is a global challenge and an important area for further work. This challenge overlaps with the global need to fund activities like nature conservation, climate change adaptation, and broader sustainable development. Box 8 presents one example of such an initiative.

Box 8: The Global Solidarity Levies Task Force: For People and the Planet

The Global Solidarity Levies Task Force: For People and the Planet was launched at COP28 in 2023 to "advance solidarity levies on highly globalized and under-taxed sectors to fund climate and development goals" (para. 1). Such levies would be used by coalitions of willing countries. The initiative is co-chaired by the governments of Barbados, France, and Kenya and supported by a range of experts and organisations. The Task Force previously consulted on 16 levy options spanning aviation, shipping, financial transactions, cryptocurrencies, fossil fuels, plastic polymers, carbon pricing, and high-net-worth individuals. Priority sectors currently under investigation are aviation, financial transactions, cryptocurrencies, and fossil fuels.[184]

In an NZ ETS where forestry is constrained or excluded, NZ ETS revenue could be directed to fund removals activities in the near term (see section 10). However, auction revenue can be expected to decline with decarbonisation. Therefore, longer-term funding solutions will still be needed for removals. A funding architecture that is politically durable may need to broaden the

[184] See Global Solidarity Levies Task Force (n.d.).

motivation for removals investment beyond climate spending towards categories with broader political support, such as infrastructure investment, fiscal risk management, economic development, biodiversity improvement, national security, and obligations under Te Tiriti o Waitangi. Including climate target liabilities in the Crown accounts could also strengthen government incentives to fund removals.[185]

Another option for the longer term would be to shift government accounting practices globally to value removals as assets that count towards national wealth, reduce climate liabilities, and improve sovereign borrowing costs. Similarly, companies could carry verified removals as assets on their balance sheets, which would serve as collateral for project finance, attract benefits from financial regulators, and reduce perceived climate liabilities to improve the cost of capital.

How to allocate funding

Under the NZ ETS, funding for removals comes from emitters, and their willingness to pay is driven by the alternative costs of their compliance obligations. Under other afforestation initiatives (see section 4.2), the Government has typically provided partial funding only for establishment costs in anticipation of other revenue. As a result, producers of higher-cost removals have had to bridge any gaps in establishment, operating, and administrative costs through independent means. This has favoured exotic production forestry.

Under a RIM, the Government would have the flexibility to structure funding for diverse removals activities in accordance with their specific funding needs to become financially viable and the broader public returns on investment. For example, this would create possibilities for permanent indigenous forests without other revenue sources to receive sufficient funding for establishment, maintenance, and administration plus a profit margin, in recognition of their broader contributions to the climate, nature, the economy, and communities.

9.2.7 Removals accounting and MRV

The Government could choose to apply separate approaches for removals accounting and MRV under a RIM relative to accounting under climate targets and/or the NZ ETS. The Government would still need to have regard to the considerations discussed in section 3.3.2 for crediting removals used for climate change mitigation: measurement, additionality, durability, emissions leakage, and no double counting. The Government would also need to develop accounting and MRV approaches for co-benefits used to justify funding levels where these are incorporated in the RIM.

[185] For a discussion of this issue in the context of offshore mitigation, see McGuinness and Ng (2024).

Accounting and MRV approaches under the RIM would need to be sufficiently harmonised across removals activities to ensure environmental integrity, avoid distortions in the removals economy, and support cost-effective, efficient, and equitable outcomes. To the extent that removals are only used as "contributions," they would not need to deliver uniformly fungible credits that are equivalent to emissions reductions. This would open the door to new possibilities for removals accounting and MRV that may better align with the implementation challenges, investment needs, and benefits of diverse removals activities. If the RIM were used to create the option for voluntary or compliance markets to fund removal activities and receive credits, then tighter alignment with international standards and processes would be needed.

As discussed in section 3.3.2, durability is a particularly important challenge for crediting removals activities. As discussed in section 4.1.2, the NZ ETS manages permanence by imposing perpetual liability for reversals. However, perpetual obligations may be unrealistic for landowners to manage and may not be enforceable in practice in the long term. The current NZ ETS crediting and associated liability framework can also lead to land-use lock-in with implications for intergenerational equity.

Both New Zealand's climate target and the NZ ETS use averaging in production forests to manage reversals from sustainable harvesting and exemptions to manage reversals from natural disturbances, provided replanting occurs. These practices obscure the shorter-term climate impacts of cyclical GHG fluxes from the forestry sector. Sections 3.4.2 and 3.5 discuss durability requirements for removals under the Paris Agreement and voluntary carbon markets; in both cases, participants use imperfect equivalences for emissions reductions and removals.

Under a RIM, the Government could choose to provide different types of incentives to reward removals that generate longer-term – but not permanent – climate benefits. The nature of the incentives could be tailored to the objectives of the RIM. Instead of assuming perpetual permanence and assigning perpetual liability for reversals, the Government could scale RIM funding according to the duration of the actual benefits to the climate. One option for doing this is tonne-year accounting, where credits are the product of the quantity and duration of storage.[186] Here, credits could be earned for every year of storage, harvest would not trigger a surrender liability, replanting and regeneration would generate new credits, and the carbon stock stability of production forestry could be more accurately represented. While tonne-year accounting is not compatible with offsetting mechanisms that operate under a stock-change framework, it could

[186] For further discussion on tonne-year accounting, see Cullenward (2023) and Matthews et al. (2023).

prove useful for structuring financial incentives for longer-term but impermanent removals.[187] The Government could also impose requirements for insurance or crediting buffers to help guard against future reversals that are not compensated for by producers.

9.2.8 Channelling removals for different end uses

The RIM could potentially be used to source removals for a range of end uses: New Zealand's domestic and international climate targets, international mitigation transfers and contribution claims under Article 6 of the Paris Agreement, CORSIA compliance, corporate and institutional targets for climate change and nature, and voluntary nature and carbon markets. Government decisions would be needed on how to allocate removals across these different opportunities, with or without double counting under New Zealand's climate targets. These decisions would affect the balance between public and private funding flows for RIM removals.

Developing an integrated policy framework for the RIM could create opportunities to refine New Zealand's removals methodologies for greater compatibility with international voluntary market standards; enable removals to be funded via voluntary markets (where buyers are willing) while retaining backstop funding via the RIM to manage risk for removals that count towards national targets; and provide greater clarity on how investment in New Zealand removals can link to international compliance markets such as international airlines' CORSIA scheme or potentially other countries' Paris Agreement targets.

9.2.9 Creating feedback loops and exit strategies

The NZ ETS provides feedback loops for emissions reduction and removals using emissions prices and unit volumes. These do not necessarily reflect more complex and longer-term feedback loops between the atmosphere and the biosphere, local communities and the global commons, technology and behaviour change, and current and future generations. To guide the production and funding of removals, the RIM's policy architecture would benefit from nested feedback loops to guide the funding strategy over time. Feedback loops could operate over different time scales and across multiple outcomes (e.g. market price signals and technology costs, generation of co-benefits, atmospheric concentration trajectories, and biosphere integrity). In an effective system, feedback loops would trigger policy adjustments.

[187] For further discussion on tonne-year accounting, see Cullenward (2023) and Matthews et al. (2023).

The RIM would need to be designed with coherent and well-signalled exit strategies for public funding for removals. To maintain investor confidence, these would need to honour investments made under previous legislation and contracts.

9.3 Guardrails to build confidence in policy transition

Government decision-making on the introduction of a RIM would need to be staged carefully, with key strategic decisions to include:

- What role the NZ ETS and removals should play in achieving New Zealand's broader climate, nature, economic, and social objectives
- Whether the RIM should replace or complement the crediting of removals in the NZ ETS
- How to drive and distribute demand and funding for removals activities under the RIM.

Government decisions would need to be shaped and informed by inclusive processes with full regard to the rights, interests, and aspirations of iwi and Māori, and decided well in advance of implementation. Suggested principles that could be adopted during the process of decision-making as guardrails for policy transition include:

1. Giving effect to the principles of Te Tiriti o Waitangi
2. Climate integrity
3. Improved outcomes for nature and resilience
4. NZ ETS market stability
5. Just transitions
6. Fiscal and administrative feasibility
7. Staged and well-signalled decisions with cross-party and public engagement and consultation
8. Choosing action over delay.

It would be critical to ensure a just transition for NZ ETS participants, iwi and Māori, broader stakeholders, and communities. As part of this, the RIM should be designed to maintain or increase the value of existing and new removals investments by NZ ETS participants relative to the status quo. For example, this could include scenarios where removals producers earn higher returns with lower risks for removals delivered. Policy transition should also avoid perverse outcomes like increased deforestation, or disruption to existing contracting arrangements for NZ ETS participants and settlements under Te Tiriti o Waitangi.

10 Modelling insights for alternative NZ ETS pathways

10.1 Modelling approach for alternative NZ ETS pathways

As detailed in Green (2026), modelled scenarios were analysed for preliminary insights on how the status quo (unconstrained removals in the NZ ETS), Pathway 2 (constrained removals in the NZ ETS), and Pathway 3 (no removals in the NZ ETS) could affect emissions prices, climate targets, afforestation, and fiscal outcomes with and without a RIM.

The modelled scenarios should not be interpreted as policy proposals or recommendations, and the modelled results should not be interpreted as forecasts or predictions. The aim was to illustrate a range of possible solutions to demonstrate proof of concept as a basis for further discussion. Elements from different scenarios could be mixed, and other approaches that are not modelled here should also be considered in future policy development.

This exercise used the following models and status quo scenarios as described in section 6: ENZ – with projections from Concept Consulting (2026) and Parliamentary Commissioner for the Environment (2026a) – and NZUpy. These models and scenarios apply different optimisation processes and assumptions as follows:

- With ENZ, the status quo scenario and some other scenarios iterate through price paths while optimising for a long-run equilibrium stockpile of 50 million NZUs. Scenarios with more significant modifications to the NZ ETS (e.g. removing forestry) optimise for net emissions aligned with New Zealand's 2050 target. This model assumes landowners under stock change accounting can switch from production to permanent forest.
- NZUpy iterates through price paths to minimise the difference between supply and demand through to a defined end-year (e.g. 2050). This model assumes that, unlike current policy, NZ ETS forestry participants under stock change accounting cannot dynamically switch from production to permanent forest.

The models do not account for non-linear policy transition effects (e.g. near-term market responses to new policy announcements). Current target accounting methodologies apply.

10.2 Illustrative scenario for a RIM

The RIM set out in this section is an illustrative design used to scope potential scales and costs of the removals needed to meet climate targets alongside alternative versions of the NZ ETS. It is not a proposal for how a RIM should be designed. Its settings, such as the mix of forest types, payment rates, and payment durations, are one plausible combination among many. Other designs

could differ substantially and would deliver different net benefits and outcomes. The costings are best read as indicating the scale of funding required, and how the net fiscal position of the Crown varies with its choices on NZ ETS reform.

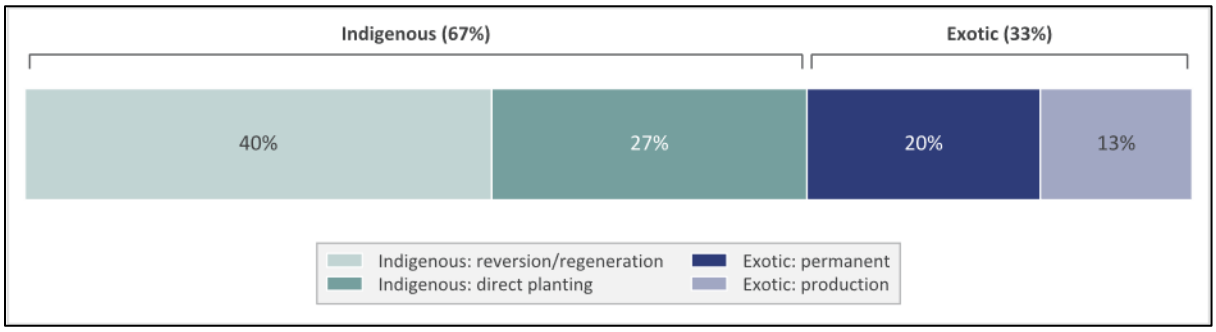
In the illustrative RIM developed for this scenario analysis, two distinct streams of forestry-related funding were modelled:

1. Providing an ongoing incentive to forests that are transferred from the NZ ETS
2. Incentivising new afforestation.

While additional funding streams could be applied to other nature-based and engineered removals, these were not included in modelled scenarios at this stage of research. The modelling also provides no estimates of the broader nature-based benefits from alternative pathways. The modelling analysis also did not assess what level of funding would be required to operate the RIM indefinitely (i.e. funding new afforestation beyond 2050) or how that funding would be sourced.

The area of new afforestation funded was assumed to be distributed across four types of afforestation with differing economic and carbon sequestration profiles (see Figure 25).[188]

Figure 25: Assumed afforestation distribution in an illustrative RIM



Source: Data from Green (2026).

Exotic forests were assumed to receive recurring payments for carbon sequestration for a set length of time. Indigenous forests were assumed to receive both establishment and recurring payments. Establishment payments were assumed to cover full establishment costs. Relatively higher recurring payments were assigned to indigenous forests, providing for adequate forest management to realise both carbon and other benefits. The assumed payment structure and rates for the different forest types and additional modelling assumptions for the transfer of forests already registered in the NZ ETS are summarised in Tables 8 and 9. These assumptions are illustrative placeholders, not proposals or recommendations.

[188] The areas of each type of afforestation funded are assumed to match levels under the One Billion Trees initiative as reported in Te Uru Rākau (2025).

Table 8: Modelling assumptions for funding to landowners under an illustrative RIM

Variable	Indigenous reversion	Indigenous direct planting	Exotic permanent	Exotic production
Establishment payment	$3,000/ha	$20,000/ha	$0	$0
Recurring payment: sequestration	$50 per tCO_2e			
Recurring payment: additional	$40 per tCO_2e		n/a	
Payment length	50 yrs	50 yrs	50 yrs	16 yrs
Landowner discount rate	6%	6%	8%	8%
NPV term	60 yrs	60 yrs	60 yrs	30 yrs
Total payments received from RIM (present value)	$12,000/ha	$31,000/ha	$12,000/ha	$12,200/ha
Landowner NPV excl. opportunity cost	$6,050/ha	$6,650/ha	$7,400/ha	$11,500/ha[189]

Note: For more detailed information, see Green (2026).

Table 9: Additional modelling assumptions for transferring registered forests to an illustrative RIM

Modelling parameter	Assumption
Funding source	NZ ETS auction revenue
Government administration costs	20% increase relative to current NZ ETS
Costs for MRV, compliance, cost recovery, enforcement, and administration	Comparable to current NZ ETS
Reversal risk management	Not addressed
Government discount rate	Treasury's social rate of time preference (SRTP) of 2%,[190] with a mandatory sensitivity test of 8%
Funding period	2030 to 2050 (21 years)
Breakdown of exotic forests under stock change accounting	20% permanent and 80% production
Area of registered forest	Constant with transfer (no deregistration assumed)
Afforestation partnerships on Crown land	Continue independently from the RIM

Note: For more detailed information, see Green (2026).

[189] Includes net revenue from harvest.

[190] The SRTP of 2% applies to non-commercial proposals for years 1–30. The rate decreases to 1.5% for years 31–100, and 1% for years 101+. See The Treasury (2025b).

Outcomes with and without a RIM were considered for each of the status quo (unconstrained removals in the NZ ETS), Pathway 2 (constrained removals in the NZ ETS), and Pathway 3 (a gross-emissions NZ ETS). Modelled pathways for the RIM were evaluated with the objective of achieving two levels of the 2050 target for gases excluding biogenic CH_4:

- New Zealand's current net-zero target
- The Climate Change Commission's recommended target of -20 $MtCO_2e$.[191]

Key insights from the modelling analysis are provided below for each pathway and for landowners investing in exotic or indigenous forestry.

10.3 Status quo (unconstrained removals in the NZ ETS) with and without a RIM

10.3.1 Status quo NZ ETS without a RIM

Modelled outcomes under the status quo without a RIM are detailed in section 6. All seven scenarios examined would achieve the budget for EB2 (2026–2030), but only one scenario would achieve the budget for EB3 (2031–2035), and no scenarios would achieve the emissions budget for EB4 (2036–2040) recommended by the Climate Change Commission in 2024. Some scenarios would reach the 2050 target for gases excluding biogenic CH_4 in the year 2050 – but others would not.

Scenarios that reach the 2050 target in 2050 are influenced by differences between NZ ETS and climate target accounting for forests. The additional emissions offset due to accounting differences may reduce due to changes in government policies (e.g. the inclusion of harvested wood products in the NZ ETS) or market trends, and so should not be relied on to offset long-lived GHG emissions outside the NZ ETS in the long term.

Beyond 2050, modelling suggests New Zealand would be unable to sustain net-zero GHG emissions, a requirement of the current target, due to falling NZ ETS emissions prices. While some auctioning would be projected during EB2 or EB3, no auction revenue would be projected from EB4 onwards, as the market would be fully supplied with units from industrial allocation and forestry removals. Similar outcomes would be expected for Pathway 1 (not modelled), which would boost removals relative to the status quo.

10.3.2 Status quo NZ ETS with a RIM

The illustrative RIM could be used to meet the Commission's -20 $MtCO_2e$ 2050 target for gases excluding biogenic CH_4 under status quo pathways for the NZ ETS. Modelling was analysed for

[191] See Climate Change Commission (2024e).

two scenarios: NZUpy: illiquid market and PCE: status quo. The respective target gaps are presented in Table 10.

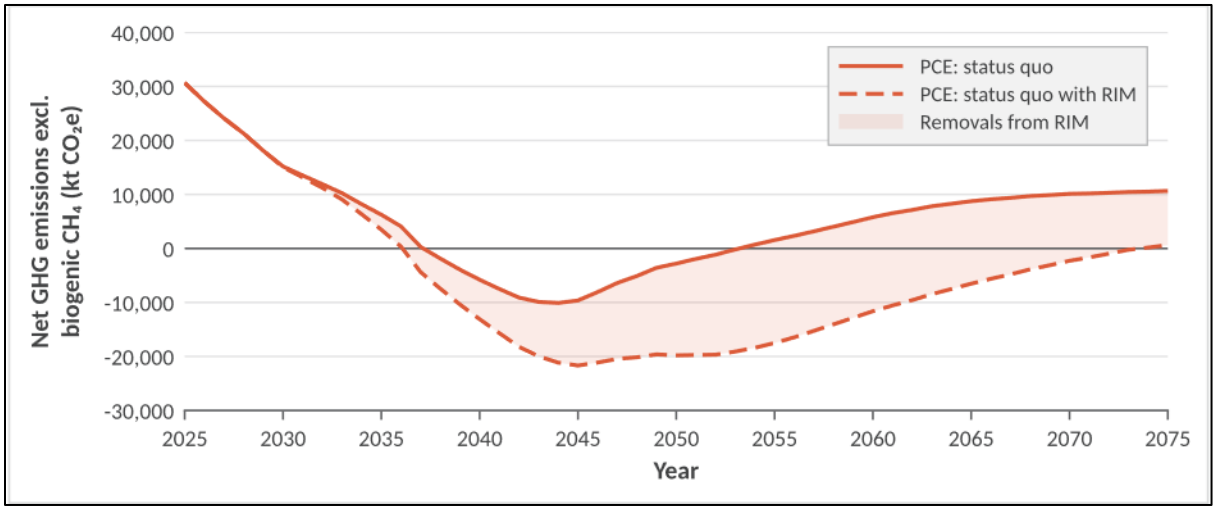
Table 10: Gaps in 2050 for the 2050 target for gases excluding biogenic CH_4 met by an illustrative RIM under the status quo NZ ETS

2050 target / Scenario	PCE: status quo	NZUpy: illiquid market
-20 $MtCO_2e$ by 2050 (Commission)	17 $MtCO_2e$	22 $MtCO_2e$

Source: Data from Green (2026).

Although the addition of a RIM to PCE: status quo would support meeting the Commission's recommended -20 $MtCO_2e$ 2050 target, net emissions excluding biogenic CH_4 would still rise post-2050 due to the inability of the NZ ETS to drive further gross emissions mitigation (with the system fully supplied by forestry). This is shown in Figure 26 below.

Figure 26: Net GHG emissions (excl. biogenic CH_4) under PCE: status quo and PCE: status quo with RIM tailored to meet -20 $MtCO_2e$ 2050 target at 2050



Source: Green (2026).

The RIM would add significant additional afforestation to status quo outcomes from the NZ ETS. In NZUpy: illiquid market, New Zealand would see 2.05 Mha afforestation from 2025 to 2050, consisting of 1.12 Mha exotic afforestation and 0.93 Mha indigenous afforestation (with the latter almost solely delivered through the RIM). PCE: status quo would deliver 1.71 Mha of total afforestation by 2050 through the RIM and NZ ETS combined, formed of 0.99 Mha exotic and 0.72 Mha indigenous afforestation.

Modelling shows the status quo NZ ETS would raise little auction revenue through 2050. As a result, funding the RIM under the status quo would come at a significant cost to the Crown (see Table 11).

Table 11: Net fiscal impact of NZ ETS auction revenue and RIM costs for new forests to meet the Commission's -20 $MtCO_2e$ 2050 target under PCE: status quo and NZUpy: illiquid market (real 2025 NZD, undiscounted)

Budget period	PCE: status quo (billion real 2025 NZD)			NZUpy: illiquid market (billion real 2025 NZD)		
	NZ ETS revenue	*New forests RIM*	*Net fiscal impact*	*NZ ETS revenue*	*New forests RIM*	*Net fiscal impact*
EB2 (2026–2030)	$0.33	($0.3)	$0.1	$0.6	($0.3)	$0.3
EB3 (2031–2035)	$0.05	($1.7)	($1.7)	$0.2	($2.2)	($2.0)
EB4 (2036–2040)	-	($2.6)	($2.6)	-	($3.3)	($3.3)
EB5 (2041–2045)	-	($3.7)	($3.7)	-	($4.8)	($4.8)
EB6 (2046–2050)	-	($4.8)	($4.8)	-	($6.2)	($6.2)
Total (2026–2050)	$0.38	($13.1)	($12.7)	$0.8	($16.9)	($16.1)
Present value impact (discounted)						
2026–2050	SRTP	($9.1)		($11.5)		
	8%	*($3.8)*		*($4.7)*		
Lifetime impact	SRTP	($25.2)		($32.4)		
	8%	*($5.5)*		*($6.8)*		

Note: Figures may not sum to totals due to rounding. Source: Green (2026).

In the two scenarios examined, the net fiscal impact through 2050 of meeting the Commission's recommended 2050 target would range from -$9.1 to -$11.5bn (SRTP), highlighting that the status quo would present a significantly more challenging fiscal position for the Crown when net-negative long-term targets were sought.

10.4 Pathway 2 (constrained removals in the NZ ETS) with and without a RIM

The analysis included four scenarios under Pathway 2 (see Table 12). The analysis considered what the outcomes would be under each of those scenarios relative to the status quo without a RIM, and then how the addition of a RIM would affect outcomes when set to achieve two levels of the 2050 climate target for gases excluding biogenic CH_4.

Table 12: Modelled scenarios for Pathway 2

Pathway	Scenario	Description
Pathway 2.1: Constrain removals supply	native_only_future	Previously registered exotic forestry remains in the NZ ETS, while only indigenous forestry may register in future.
	afforestation_limit	A fixed-rate ballot is specified for new registrations of exotic forestry (e.g. 20,000 ha/yr total), while no limit applies to new registrations of indigenous forestry. The afforestation limit applies from 2027.
	native_and_gross_only	All exotic forestry is removed from the NZ ETS, while existing and newly registered indigenous forestry remains in the scheme.
Pathway 2.2: Constrain removals demand	2for1forestry	Exotic forests are paid 50% of the NZU price, while indigenous forests receive the full NZU price. Because of model limitations, this scenario is modelled stylistically using a 50% price.

Source: Green (2026).

10.4.1 Pathway 2.1: native_only_future relative to the status quo

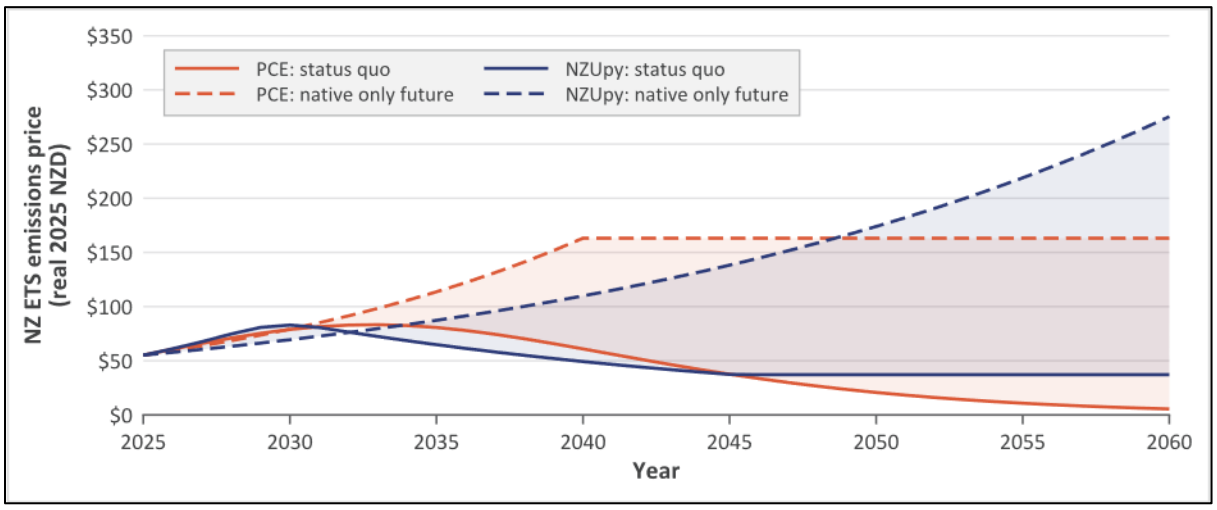
Under this pathway, which would retain previously registered exotic forests but limit new forest registrations to indigenous forest, emissions prices would rise relative to the status quo using both models. Nevertheless, outcomes for emissions prices and net emissions would diverge due to the models' differing optimisation processes and assumptions (see Figures 27 and 28).

- Under PCE: native_only_future, rising emissions prices (shaped by an assumed two-phase growth curve) would trigger the switching of previously registered stock change forests from production to permanent. This would free up additional supply of exotic forestry NZUs, enabling the current 2050 target to be met due to forests that have converted to permanent management and are still sequestering carbon.
- Under NZUpy: native_only_future, emissions prices would continue to rise (reaching $174 by 2050) but, in the absence of switching from production to permanent exotic forestry, the

supply of removals from new indigenous forestry would be insufficient to meet the current 2050 target, resulting in higher net emissions than under the status quo.

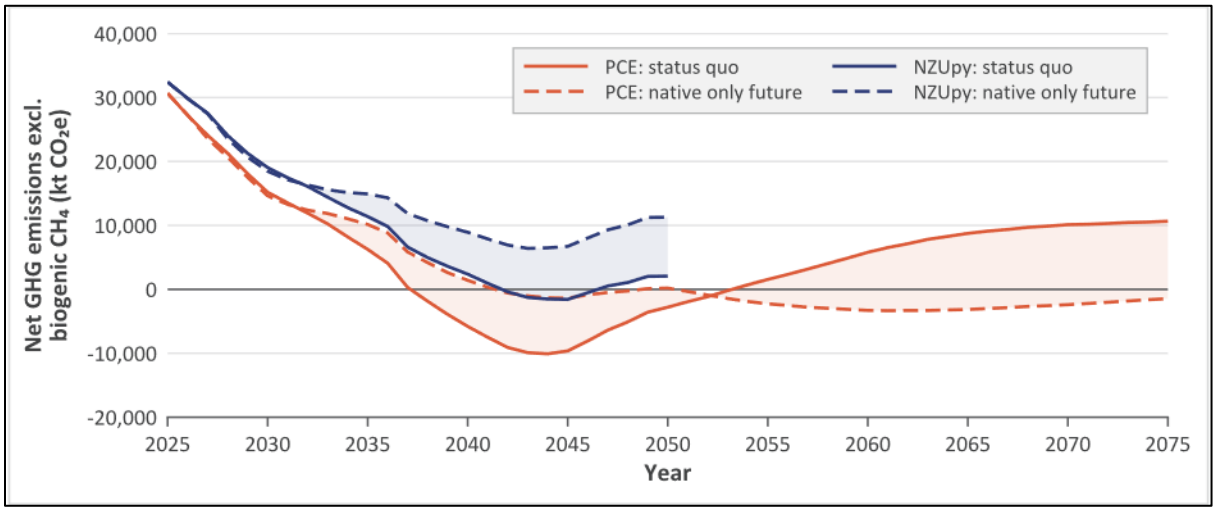
Switching land use involves complex decisions, and the associated modelling assumptions are subject to uncertainty. If desired, the Government could choose to introduce restrictions on switching between production and permanent forest.

Figure 27: Comparison of NZ ETS emissions price (real 2025 NZD) under status quo and modified net NZ ETS preventing future registration of exotic species in PCE (2026) and NZUpy, 2025–2060



Note: Data from Parliamentary Commissioner for the Environment (2026a) and NZUpy. Source: Green (2026).

Figure 28: Net GHG emissions (excl. biogenic CH_4) under status quo and modified net NZ ETS preventing future registration of exotic species in PCE (2026) and NZUpy, 2025–2075



Note: Data from Parliamentary Commissioner for the Environment (2026a) and NZUpy. Source: Green (2026).

In the PCE: native only future scenario, no auctions would clear after 2031, as the market could satisfy demand by drawing on the stockpile and buying units from stock change foresters who have converted to permanent forestry. Auction revenue would total just $182m to 2050 (real 2025 NZD, undiscounted). As this scenario's price path is optimised to reach net zero rather than to balance supply and demand, the stockpile would grow to several times annual demand by 2050, so this net-zero outcome should be treated with caution. In the NZUpy: native only future scenario, auctions would begin clearing again from around the mid-2030s, with the full allowed volume clearing from then through to 2050, where auction volumes were assumed to be set in line with the Commission's EB4 demonstration pathway scenario. Auction revenue would total $17.4bn to 2050. This outcome would require a rule change to prohibit switching stock-change production forests to permanent forests.

10.4.2 Pathway 2.1: native_only_future with a RIM

Under NZUpy: native only future (Table 13), auction revenue would be sufficient to cover the costs of a RIM closing the gap to a net-zero 2050 target through 2050, with $17.4bn revenue against $8.4bn in costs for the RIM. Extending the RIM to achieve a -20 $MtCO_2e$ 2050 target, however, would impose a net cost, with a fiscal impact of -$5.1bn (SRTP) from 2026 to 2050.

Table 13: Net fiscal impact of NZ ETS auction revenue and RIM costs for new forests under NZUpy: native only future (real 2025 NZD, undiscounted)

Budget period	NZUpy: native only future (billion real 2025 NZD)				
	NZ ETS revenue	RIM calibrated to net-zero 2050		RIM calibrated to -20 $MtCO_2e$	
		New forests RIM	*Net fiscal impact*	*New forests RIM*	*Net fiscal impact*
EB2 (2026–2030)	-	($0.2)	($0.2)	($0.5)	($0.5)
EB3 (2031–2035)	-	($1.1)	($1.1)	($3.2)	($3.2)
EB4 (2036–2040)	$4.4	($1.7)	$2.7	($4.7)	($0.4)
EB5 (2041–2045)	$6.7	($2.4)	$4.3	($6.7)	($0.0)
EB6 (2046–2050)	$6.3	($3.1)	$3.2	($8.8)	($2.4)
Total (2026–2050)	**$17.4**	**($8.4)**	**$8.9**	**($23.8)**	**($6.4)**
Present value impact (discounted)					
2026–2050	SRTP	**$6.1**		**($5.1)**	
	8%	*$1.9*		*($2.9)*	
Lifetime impact	SRTP	**ne**		**ne**	
	8%	*ne*		*ne*	

Note: Figures may not sum to totals due to rounding. Source: Green (2026).

NZUpy: native only future would not allow endogenous switching of forests on stock change accounting to permanent forestry management, which should occur in such a scenario if existing registered forests were allowed to freely switch. Thus, figures presented in Table 13 would be conditional on the Government constraining the ability of stock change foresters to freely switch to permanent forestry at any time.

In contrast, the PCE: native only future scenario would allow dynamic forest management switching by stock change forests and so would generate auction revenues through 2050 of just $182m. Under this scenario, the net-zero 2050 target would be met without the need for a RIM. A RIM used to meet the -20 $MtCO_2e$ target would be largely unfunded by auction revenues (Table 14), incurring a large net fiscal cost.

Table 14: Net fiscal impact of NZ ETS auction revenue and RIM costs for new forests under PCE: native only future (real 2025 NZD, undiscounted) calibrated to -20 $MtCO_2e$ 2050 target

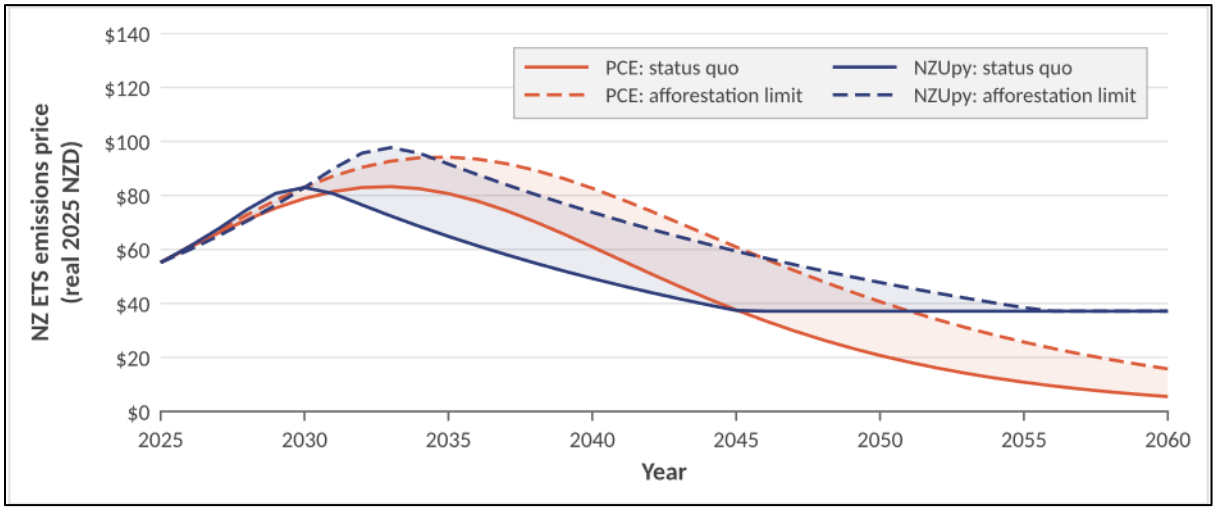
Budget period		**PCE: native only future** (billion real 2025 NZD)		
		NZ ETS revenue	*RIM calibrated to -20 $MtCO_2e$*	
			New forests RIM	*Net fiscal impact*
EB2 (2026–2030)		$0.13	($0.3)	($0.2)
EB3 (2031–2035)		$0.05	($2.0)	($2.0)
EB4 (2036–2040)		-	($3.0)	($3.0)
EB5 (2041–2045)		-	($4.3)	($4.3)
EB6 (2046–2050)		-	($5.7)	($5.7)
Total (2026–2050)		**$0.18**	**($15.4)**	**($15.2)**
Present value impact (discounted)				
2026–2050	SRTP	**($11.0)**		
	8%	*($4.7)*		
Lifetime impact	SRTP	**($29.9)**		
	8%	*($6.7)*		

Note: Figures may not sum to totals due to rounding. Source: Green (2026).

10.4.3 Pathway 2.1: afforestation limit relative to the status quo

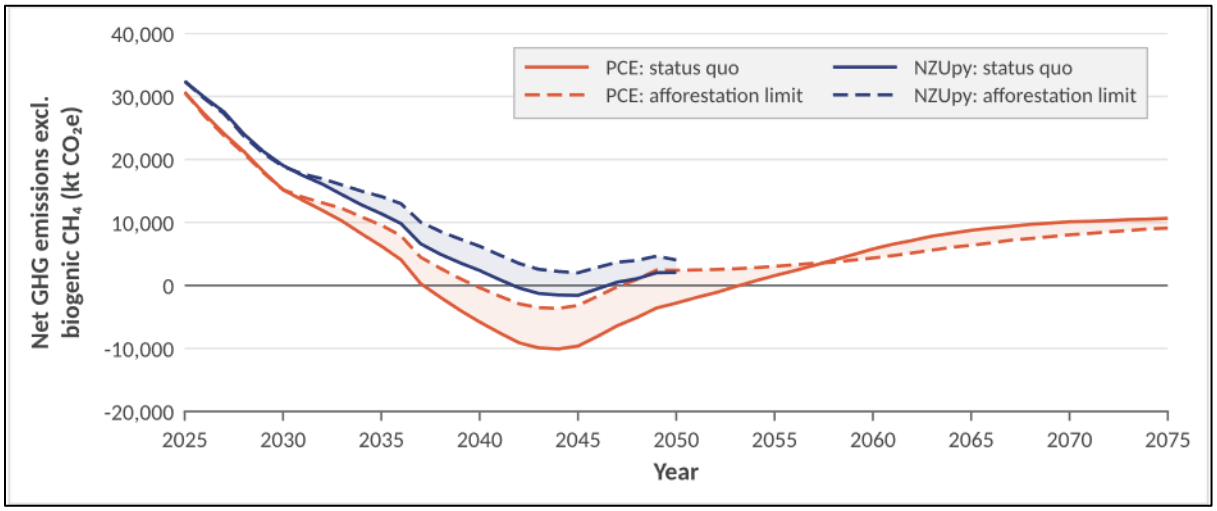
Under this pathway, which would retain previously registered exotic forests but place an annual limit on new registrations of exotic forest, emissions prices would peak more slowly and at higher levels than under the status quo, but then decline markedly. The 2050 target would not be achieved under either model. See Figures 29 and 30.

Figure 29: Comparison of NZ ETS emissions price (real 2025 NZD) under status quo and modified net NZ ETS with 20,000 ha/yr exotic afforestation limit in PCE (2026) and NZUpy, 2025–2060



Note: Data from Parliamentary Commissioner for the Environment (2026a) and NZUpy. Source: Green (2026).

Figure 30: Net GHG emissions (excl. biogenic CH_4) under status quo and modified net NZ ETS with 20,000 ha/yr exotic afforestation limit in PCE (2026) and NZUpy, 2025–2075



Note: Data from Parliamentary Commissioner for the Environment (2026a) and NZUpy. Source: Green (2026).

Auction volumes would rise slightly in NZUpy: afforestation_limit, with 7.4 million NZUs sold in EB3 compared with 3 million under the status quo, while under PCE: afforestation_limit, no additional NZUs would be sold. Neither model would see auctions clear from EB4 onwards. NZUpy: afforestation_limit would also see greater borrowing from the stockpile through the 2030s and 2040s. This would be commercially advantageous for stockpile holders under a declining price path but add to the risk of New Zealand missing its 2050 target.

10.4.4 Pathway 2.1: afforestation_limit with a RIM

Under NZUpy: afforestation limit, meeting New Zealand's net-zero 2050 target would impose a net fiscal cost from 2026 to 2050 of -$1.3bn (SRTP), and the discounted lifetime impact would be -$5.1bn (SRTP). Simply limiting new afforestation in the NZ ETS alone would provide minimal additional auction revenue for funding complementary measures (e.g. the RIM) and worsen New Zealand's fiscal position to meet its net-zero 2050 target. Increasing target ambition would also be cost-prohibitive for this version of a modified net NZ ETS, with the net fiscal impact from 2026 to 2050 of meeting a -20 $MtCO_2e$ 2050 target rising to -$12.5bn (SRTP).

Table 15: Net fiscal impact of NZ ETS auction revenue and RIM costs for new forests under NZUpy: afforestation_limit (real 2025 NZD, undiscounted)

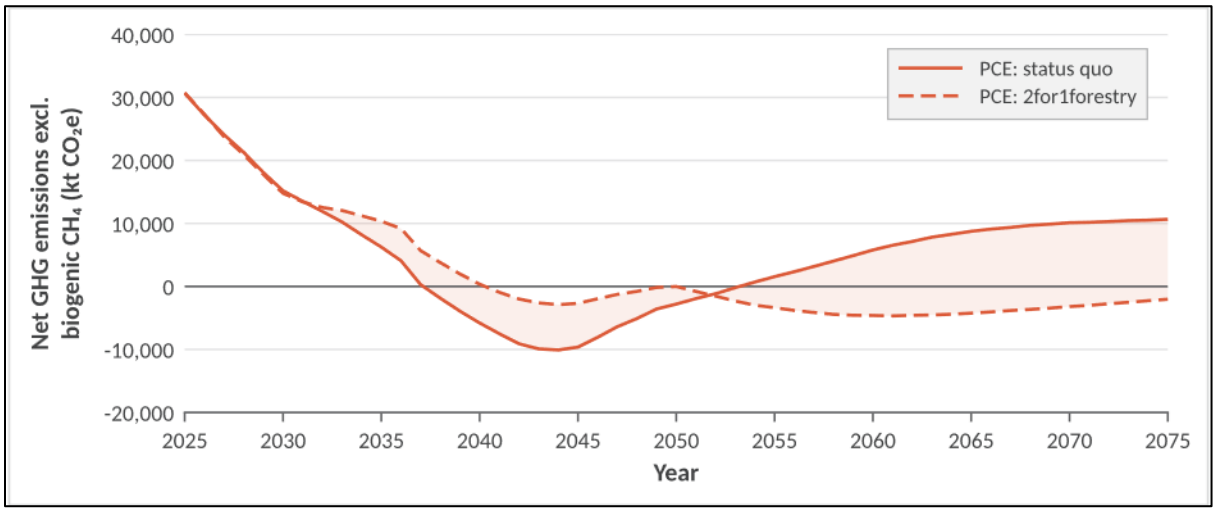
Budget period	**NZUpy: afforestation limit** (billion real 2025 NZD)				
	NZ ETS revenue	**RIM calibrated to net-zero 2050**		**RIM calibrated to -20 $MtCO_2e$**	
		New forests RIM	*Net fiscal impact*	*New forests RIM*	*Net fiscal impact*
EB2 (2026–2030)	$0.3	($0.1)	$0.3	($0.4)	$0.0
EB3 (2031–2035)	$0.7	($0.4)	$0.3	($2.4)	($1.8)
EB4 (2036–2040)	-	($0.6)	($0.6)	($3.6)	($3.6)
EB5 (2041–2045)	-	($0.9)	($0.9)	($5.2)	($5.2)
EB6 (2046–2050)	-	($1.1)	($1.1)	($6.8)	($6.8)
Total (2026–2050)	**$1.0**	**($3.1)**	**($2.1)**	**($18.4)**	**($17.4)**
Present value impact (discounted)					
2026–2050	SRTP	**($1.3)**		**($12.5)**	
	8%	*($0.3)*		*($5.1)*	
Lifetime impact	SRTP	**($5.1)**		**($35.2)**	
	8%	*($0.7)*		*($7.5)*	

Note: Figures may not sum to totals due to rounding. Source: Green (2026).

10.4.5 Pathway 2.2: 2for1forestry relative to the status quo

Under this scenario using the ENZ model, exotic forestry would receive 50% of the emissions price in the rest of the system, which would rise at a constant rate to reach $250 (real 2025 NZD) by 2040 and be flat thereafter. Net GHG emissions other than biogenic CH_4 in this scenario were optimised to meet New Zealand's net-zero 2050 target, and this would be sustained beyond 2050 (see Figure 31). Note that ENZ does not pick up the policy's effects on stockpile dynamics in the late 2020s and early 2030s (where this policy would significantly exacerbate the relative shortage in supply expected over this period). As with PCE: native only future, the price path is optimised to reach net zero and the stockpile would grow to several times annual demand by 2050, so this net-zero outcome should also be treated with caution.

Figure 31: Net GHG emissions (excl. biogenic CH_4) under status quo and modified net NZ ETS with forestry devalued by 50% in PCE: 2for1 forestry, 2025–2075



Note: Data from Parliamentary Commissioner for the Environment (2026a). Source: Green (2026).

As with the PCE scenario in which no new exotic forests would be allowed to enter the scheme, auction revenues would be low for the modelled option devaluing exotic forestry units, with $645m in revenue generated from auctions (real 2025 NZD), and no auctions cleared after 2031. Given the model limitations, this revenue estimate should be treated with caution.

10.4.6 Pathway 2.2: 2for1forestry with a RIM

Under PCE: 2for1forestry, New Zealand's net-zero 2050 target would be met without the need for a RIM, but a gap of close to 20 $MtCO_2e$ would remain to reach the Commission's recommended -20 $MtCO_2e$ 2050 target. Little auction revenue would be raised ($645m), as stock-change forests switching to permanent forestry would reduce the need for auctioned units. A RIM

to close this gap would therefore go largely unfunded, with a net fiscal impact from 2026 to 2050 of -$10.6bn (SRTP) (Table 16).

Table 16: Net fiscal impact of NZ ETS auction revenue and RIM costs for new forests under PCE: 2for1forestry (real 2025 NZD, undiscounted) calibrated to -20 $MtCO_2e$ 2050 target

Budget period		**PCE: 2for1forestry** (billion real 2025 NZD)		
		NZ ETS revenue	RIM calibrated to -20 $MtCO_2e$	
			New forests RIM	*Net fiscal impact*
EB2 (2026–2030)		$0.6	($0.3)	$0.3
EB3 (2031–2035)		-	($2.0)	($2.0)
EB4 (2036–2040)		-	($3.0)	($3.0)
EB5 (2041–2045)		-	($4.3)	($4.3)
EB6 (2046–2050)		-	($5.7)	($5.7)
Total (2026–2050)		**$0.6**	**($15.4)**	**($14.7)**
Present value impact (discounted)				
2026–2050	SRTP	**($10.6)**		
	8%	*($4.3)*		
Lifetime impact	*SRTP*	**($29.5)**		
	8%	*($6.2)*		

Source: Green (2026).

10.4.7 Pathway 2.1: native_and_gross_only relative to the status quo

Under this scenario, all exotic forests would be removed from the NZ ETS (but not incentivised elsewhere) and only new indigenous forests could be registered. As shown in Figure 32, the emissions price would reach $381, higher than under the scenario PCE: gross_ETS_forestry_outside (discussed further below), in which all forests would be removed from the NZ ETS and the emissions price would rise to $250 by 2050.

10.4.8 Pathway 2.1: native_and_gross_only with a RIM

Estimates of the net fiscal impact of a RIM are not provided for PCE: native and gross only. In the PCE's modelling of this scenario, existing exotic forests would no longer earn units but must still surrender units when they harvest, so a large share of auction revenue would be paid by foresters rather than gross emitters. This is not comparable with the other options.

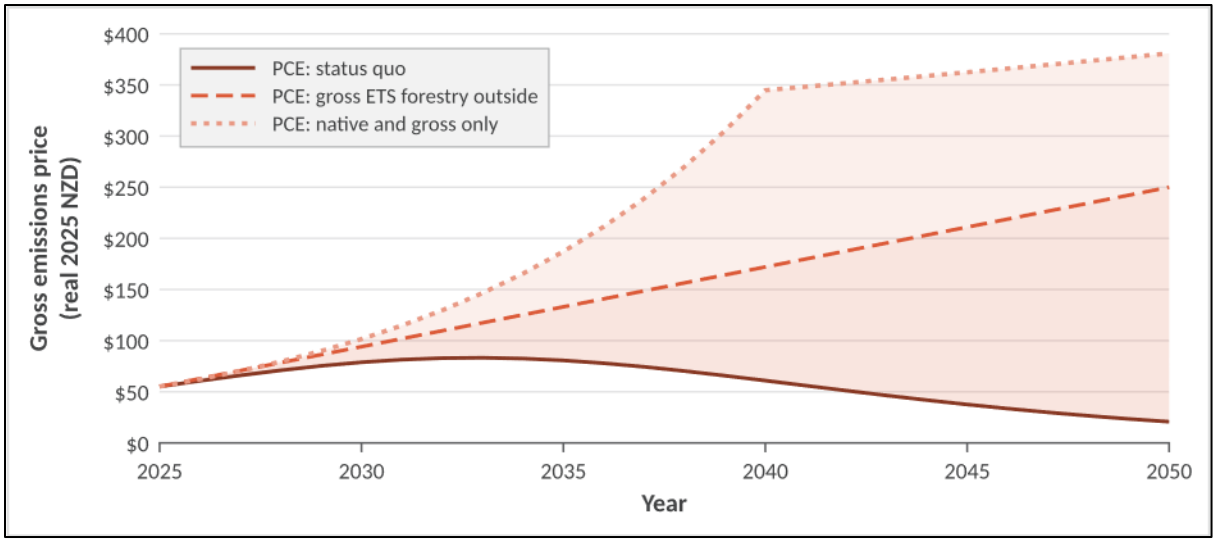
10.5 Pathway 3 (no removals in the NZ ETS) with a RIM

Under Pathway 3, all forestry removals would be transferred from the NZ ETS and incentivised externally. The analysis of Pathway 3 options considered two sets of scenarios: PCE: gross ETS forestry outside, and the Climate Change Commission's EB4 demonstration pathway and HTHS[192] scenarios.

10.5.1 PCE: gross ETS forestry outside scenario

Under PCE: gross ETS forestry outside, the emissions price in a gross-emissions NZ ETS would reach $250 in 2050, with forestry removed and incentivised elsewhere (Figure 32). The emissions price would rise less than under PCE: native_and_gross_only. The higher emissions price would deliver only marginal improvements in gross emissions outcomes across sectors, as shown in Figure 33. Both scenarios assume policies outside the NZ ETS that are broadly consistent with the status quo, and so implicitly leave the heavy lifting on mitigation to emissions pricing, even in sectors with a highly inelastic response to emissions price. This reliance would be an implied policy choice rather than an inevitable feature of a gross-emissions NZ ETS.

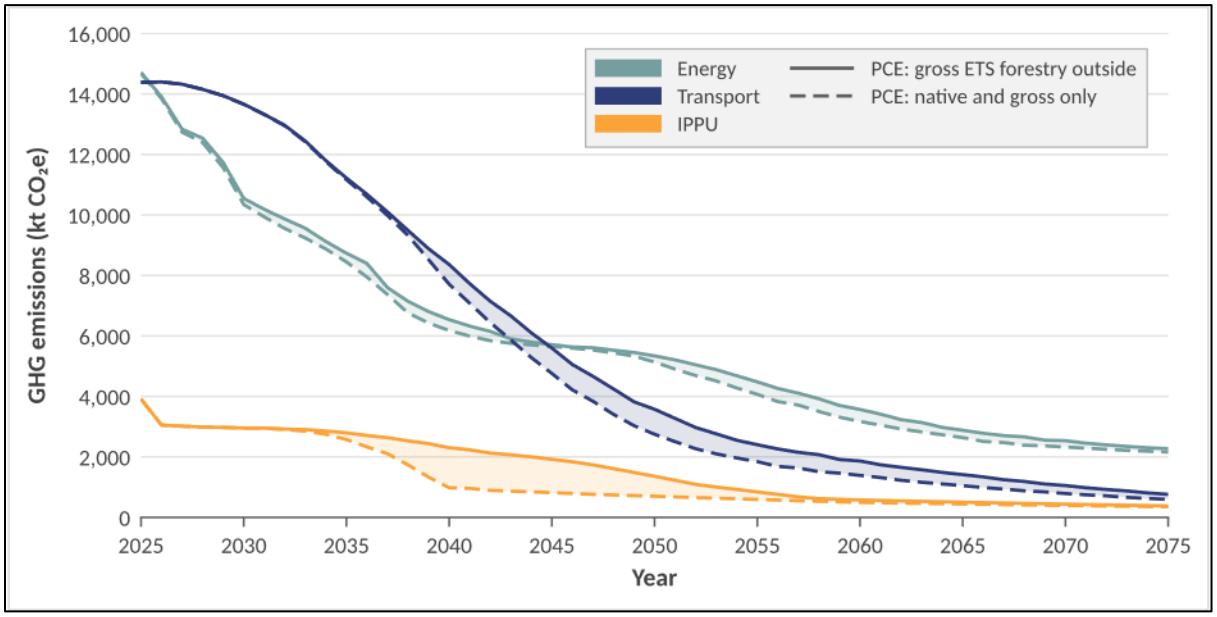
Figure 32: Emissions price (real 2025 NZD) outcomes in a gross emissions NZ ETS and a modified net NZ ETS with exotic forestry removed from PCE (2026)



Note: Data from Parliamentary Commissioner for the Environment (2026a). Source: Green (2026).

[192] High technology, high systems change.

Figure 33: Gross GHG emissions per sector ($ktCO_2e$) for scenarios rising to $250 by 2050 (PCE: gross ETS forestry outside) and $381 by 2050 (PCE: native and gross only)



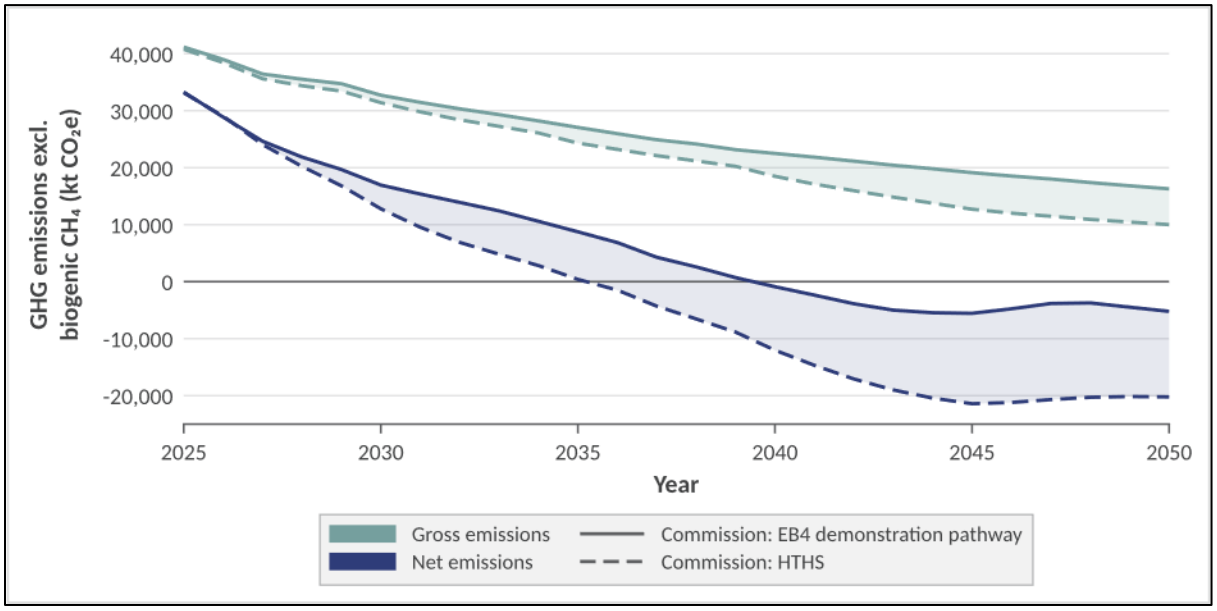
Note: Data from Parliamentary Commissioner for the Environment (2026a). Source: Green (2026).

The prices seen in PCE: gross ETS forestry outside and PCE: native and gross only would be generally in line with or below modelled scenarios for the European Union Emissions Trading Scheme (EU ETS) and the UK Emissions Trading Scheme (UK ETS). For further discussion, see Green (2026).

10.5.2 Commission: EB4 demonstration and Commission: HTHS scenarios

The pathways in Climate Change Commission (2024c) – used to support its recommendations for the EB4 volume and New Zealand's 2050 target – demonstrate the impact of complementary measures alongside emissions pricing. In the Commission's EB4 demonstration pathway and HTHS scenarios, the effective emissions price would rise to $245 (real 2025 NZD) by 2050, but greater implied effort alongside the NZ ETS would help lead to lower emissions outcomes in the Commission: HTHS scenario (see Figure 34), bringing more ambitious long-term targets into play (e.g. -20 $MtCO_2e$ in 2050). Given their differing levels of ambition for gross emissions, these two scenarios were used in place of PCE: gross ETS forestry outside to estimate auction revenue under a gross-emissions NZ ETS, and as the basis for the illustrative RIM under Pathway 3.

Figure 34: Gross and net GHG emissions ($ktCO_2e$) excl. biogenic CH_4 in Commission: EB4 demonstration pathway and Commission: HTHS scenarios



Note: Data from Climate Change Commission (2024c). Source: Green (2026).

Under a gross-emissions NZ ETS, auction revenues were inferred from each of the Commission: EB4 demonstration pathway and Commission: HTHS scenario (with higher ambition) using each scenario's effective emissions price pathway, and emissions for gross emitting sectors within the NZ ETS. The same price pathway applies in both scenarios: emissions price values are an exogenous input to the Commission's ENZ model, drawn from government projections rather than solved for, and so do not vary with scenario ambition. Industrial allocation volumes were subtracted from each emissions pathway to provide the estimated auction units cleared each budget period. Modelled auction volumes and revenue are presented in Table 17.

Table 17: Estimated auction volumes sold and revenues (real 2025 NZD) for a gross-emissions NZ ETS from 2026–2050 for Commission: EB4 demonstration pathway and Commission: HTHS scenarios

Budget period	Commission: EB4 demo. pathway		Commission: HTHS	
	Auction units sold	*Revenue*	*Auction units sold*	*Revenue*
EB2 (2026–2030)	7m	$0.7bn	7m	$0.7bn
EB3 (2031–2035)	88m	$11.9bn	85m	$11.4bn
EB4 (2036–2040)	65m	$10.8bn	60m	$9.9bn
EB5 (2041–2045)	50m	$9.6bn	33m	$6.3bn
EB6 (2046–2050)	38m	$8.5bn	16m	$3.5bn
Total (2026–2050)	248m	$41.6bn	200m	$31.9bn

Note: Projection for Commission: HTHS assumes custom 5% industrial allocation phase-out rate for 2031–2040, 3% for 2041–2050.[193] Commission: EB4 demonstration pathway assumes current industrial allocation phase-out rates. Figures may not sum to totals due to rounding. Data from Climate Change Commission (2024c). Source: Green (2026).

Because the same emissions price pathway applies to both scenarios, the higher ambition of the Commission: HTHS scenario would leave fewer units to be auctioned at the same price. The gap would widen over time, from a modest difference in EB3 to $3.5bn against $8.5bn over 2046–2050. These estimates therefore assume that complementary effort in HTHS would materialise alongside the NZ ETS to achieve enhanced levels of mitigation; without those complementary measures, a higher emissions price would be needed.

Leaving decisions on potential reform to the NZ ETS to later decades (e.g. reforms taking place in the mid-2030s or 2040s) would significantly reduce potential auction revenues through to 2050. Delaying reforms to EB4, for example, would mean forgoing ~$11–12bn in potential revenue from 2031–2035 that could be used to fund complementary measures, the RIM, other government spending, or tax relief. A significant portion of these forgone revenues would be captured by forestry participants, speculators, landowners, and other NZU suppliers in the form of rents if reform were deferred to later decades.

In its 2024 advice, the Climate Change Commission assessed the economic and social impacts of higher mitigation costs under its recommended pathways for EB4 and a revised 2050 target.[194] It concluded that the economy would continue to grow in both cases, and ensuring just transitions across sectors, regions, and socioeconomic groups would require supporting policies. Modelling

[193] This sees industrial allocation phased out for moderately emissions-intensive trade-exposed industries by 2040, and by 2050 for highly intensive trade-exposed industries.
[194] See Climate Change Commission (2024a, 2024c, 2024e).

suggests the recommended EB4 pathway would have a negligible impact on GDP growth compared to the reference case. Under the more ambitious revised 2050 target, GDP would be about 1% lower than the reference case in 2040 and about 5% lower in 2050. That revised target would result in around a third less warming in 2100 than the original 2050 target (subsequently weakened in 2025). The Commission's cost assessment did not account for additional productivity gains and co-benefits from greater decarbonisation, or the value of avoided climate damages.

Using the Commission's two scenarios for gross emissions (EB4 demonstration pathway and HTHS), the illustrative RIM would be assumed to bridge the gap under two options for the 2050 target excluding biogenic CH_4 (net zero and -20 $MtCO_2e$). The four sets of target gaps in 2050 are presented in Table 18.

Table 18: Gaps in 2050 for the 2050 target for gases excluding biogenic CH_4 met by an illustrative RIM under Pathway 3

2050 target / Scenario	EB4 demonstration pathway	HTHS
Net zero by 2050 (current)	3 $MtCO_2e$	0 (target met)
-20 $MtCO_2e$ by 2050 (Commission)	23 $MtCO_2e$	17 $MtCO_2e$

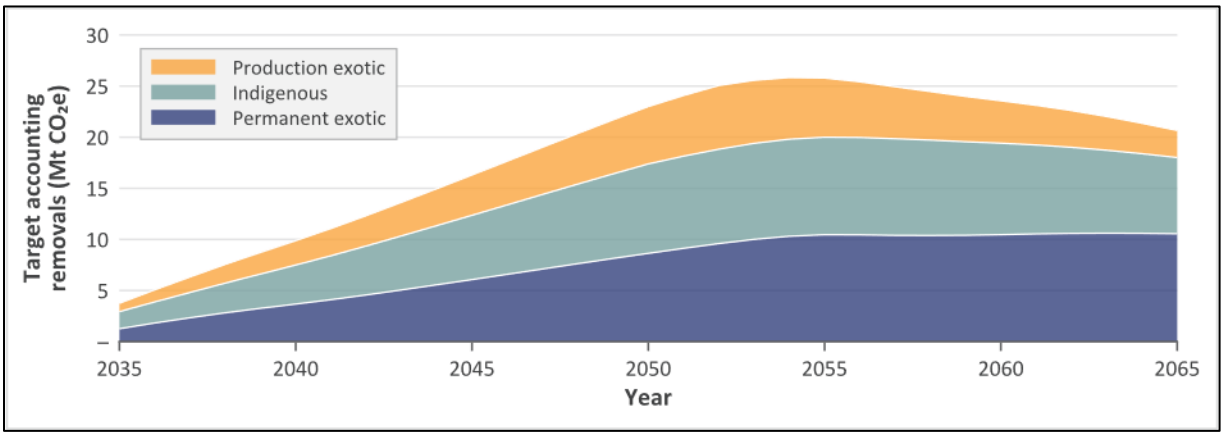
Note: These estimates assume agricultural N_2O consistent with the Government: WAM-central scenario, and new registrations of forestry in the NZ ETS continuing through to the end of the current MERP (2030). They should not be read as a strict replication of the Commission's pathways themselves (which see greater mitigation effort taken on emissions outside the NZ ETS). Greater action on agricultural N_2O than assumed here would reduce both the funding needed for a RIM and the scale of afforestation required. Source: Data from Green (2026).

Figure 35 illustrates the modelled results from applying the RIM to bridge the gap for the -20 $MtCO_2e$ 2050 target for gases excluding biogenic CH_4 using the Commission: EB4 demonstration pathway scenario. This would require 1.37 Mha of afforestation under the EB4 demonstration pathway scenario and 1.01 Mha under the HTHS scenario from 2030 to 2050. Indigenous afforestation would contribute around 38% of removals for the new forest component of the RIM in 2050.

If no funding continued past 2050, then removals counted towards New Zealand's target would decline after 2050, with removals contributed by production exotic forests dropping most quickly. However, this result is based on the current post-1989 natural forest yield tables used for target accounting, which reflect the high predominance of shrubs (e.g. mānuka) in afforestation to date. If the RIM incentivised greater rates of afforestation of tall indigenous species with longer growth periods (e.g. tōtara, kauri, kahikatea, rimu, beech), updates to New Zealand's yield tables to reflect this could mean less of a decline in sequestration than forecast. For example, when removals counted towards the target were evaluated using the yield tables used for costing the recurring

payments to indigenous forests, sequestration rates continued rising through to 2065 (even without any funded afforestation after 2050).

Figure 35: Target accounting removals ($MtCO_2e$) contributed by indigenous, permanent exotic, and production exotic forests funded by the RIM to meet the Commission's -20 $MtCO_2e$ 2050 target for gases excluding biogenic CH_4 assuming gross emissions from Commission: EB4 demonstration pathway



Source: Green (2026).

Table 19 shows the net fiscal impact to the Crown of the RIM under both modelled scenarios to reach the Commission's -20 $MtCO_2e$ 2050 target for gases excluding biogenic CH_4. This shows that total forecast auction revenues raised for a gross-emissions NZ ETS, under both the Commission: EB4 demonstration and Commission: HTHS scenarios, would be sufficient to cover RIM funding for both existing forests and new forests from 2026 to 2050. Under the Commission: EB4 demonstration pathway scenario with the RIM, the Crown would receive net revenue of $9.0bn using Treasury's SRTP discount rate and $5.1bn for an 8% sensitivity rate. Under the Commission: HTHS scenario, the net fiscal impact would be $5.6bn (SRTP) and $4.1bn (8% sensitivity) through to 2050. This reflects the reduced revenue base seen in the gross-emissions NZ ETS when action taken on gross emissions mitigation is increased.

Table 19: Net fiscal impact of NZ ETS auction revenue and RIM costs for existing and new forests to meet the Commission's -20 $MtCO_2e$ target for gases excluding biogenic CH_4

Budget period	Existing forests RIM	Commission: EB4 demo. pathway (billion real 2025 NZD)			Commission: HTHS (billion real 2025 NZD)		
		ETS revenue	*New forests RIM*	*Net fiscal impact*	*ETS revenue*	*New forests RIM*	*Net fiscal impact*
EB2 (2026–2030)	n/a	$0.7	($0.3)	**$0.4**	$0.7	($0.3)	**$0.5**
EB3 (2031–2035)	($4.9)	$11.9	($2.3)	**$4.6**	$11.4	($1.7)	**$4.7**
EB4 (2036–2040)	($4.1)	$10.8	($3.5)	**$3.2**	$9.9	($2.6)	**$3.2**
EB5 (2041–2045)	($2.3)	$9.6	($5.0)	**$2.3**	$6.3	($3.7)	**$0.3**
EB6 (2046–2050)	($1.5)	$8.5	($6.5)	**$0.6**	$3.5	($4.8)	**($2.7)**
Total (2026–2050)	**($12.8)**	**$41.6**	**($17.7)**	**$11.1**	**$31.9**	**($13.1)**	**$6.0**
Present value impact (discounted)							
2026–2050	**SRTP**	**$9.0**			**$5.6**		
	8%	*$5.1*			*$4.1*		
Lifetime impact[195]	**SRTP**	**$12.2**			**($3.4)**		
	8%	*$5.9*			*$3.3*		

Note: Figures may not sum to totals due to rounding. Existing forest RIM component excludes the cost of administration, as this is assumed to be equivalent to the status quo for NZ ETS forests. Source: Green (2026).

10.6 Implications of a RIM for landowners

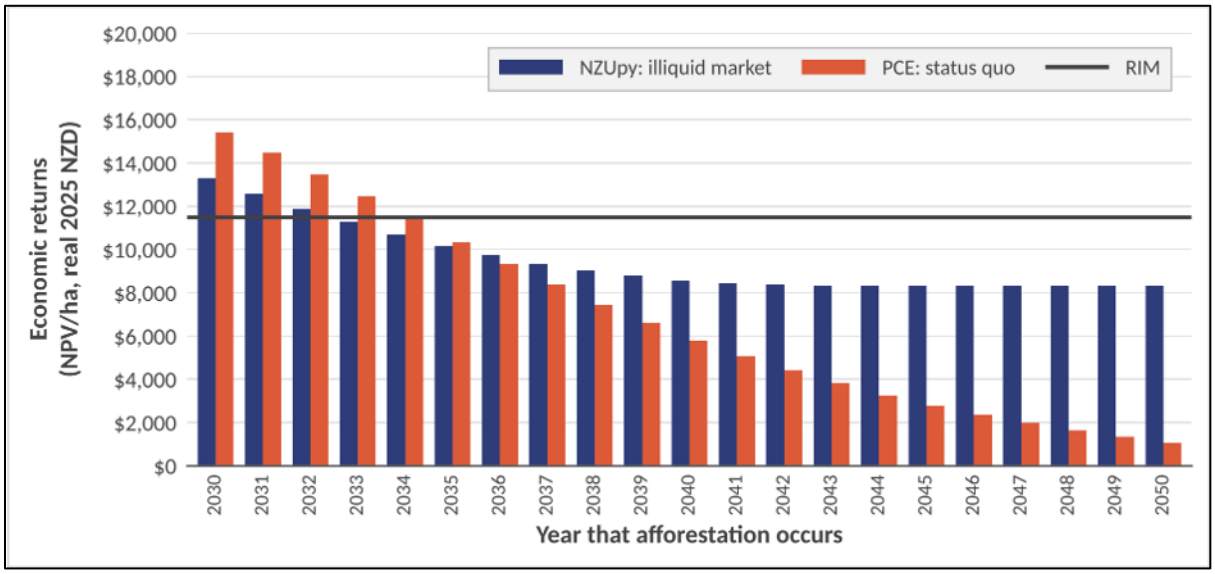
A RIM could potentially provide landowners with more predictable demand and price outcomes for forestry removals relative to the status quo NZ ETS. The outcomes for exotic and indigenous afforestation under the illustrative RIM relative to the status quo vary by modelled scenario across alternative NZ ETS pathways. The modelled outcomes are not forecasts or predictions.

[195] Auction revenues and costs for the existing NZ ETS forests transferred to a RIM are only forecast through to 2075, as these are limited by available gross emissions and yield tables data. The new forest RIM component is forecast through to 2100.

10.6.1 Exotic production forests

For exotic production forests, the status quo NZ ETS would initially provide higher returns than the modelled RIM, but in status quo scenarios with declining NZU prices, exotic afforestation would be better off in the RIM from the mid-2030s (see Figure 36).

Figure 36: Economic returns (NPV/ha, real 2025 NZD) for production exotic forest planted at different future years under modelled RIM, and two scenarios for status quo NZ ETS



Source: Green (2026).

The Pathway 2 (constrained removals) options that significantly increased NZU prices would improve returns for the forests remaining in the NZ ETS relative to the status quo and the RIM. Emissions prices would reach around \$160–\$175/tCO_2e by 2050 in PCE: native only future and NZUpy: native only future, whereas new exotic forests would receive only \$50/tCO_2e through the RIM. Under PCE: 2for1forestry, the effective emissions price would reach \$125 by 2040, well above the status quo and the rates assumed for the RIM. However, these types of outcomes would raise substantial equity concerns, with some post-1989 forests in the NZ ETS receiving well above what might be paid for new afforestation through the RIM (or for additional carbon stored by pre-1990 forests). This would significantly distort rural land values, creating stark winners and losers. Resulting market distortions would likely increase price volatility and make it significantly harder to align NZ ETS outcomes with New Zealand's EBs and 2050 target.

10.6.2 Indigenous reversion/regeneration and direct planting

For indigenous afforestation (both reversion/regeneration and direct planting), landowners would be better off under the modelled RIM than the status quo NZ ETS (see Tables 20 and 21).

However, modelled returns would be highest under the Pathway 2 option in which exotic forests were entirely removed from the NZ ETS. Very high NZU prices would produce high returns for both indigenous reversion/regeneration and direct planting. These returns would be competitive even with some dairy farms, so this option could remove the need for a RIM altogether. However, the broader impacts on land prices, land-use change, nursery capacity, and workforce capability would be significant, and are not captured in the modelling. Returns would also be highly sensitive to future government choices on NZ ETS price settings, increasing uncertainty for indigenous foresters about the returns they can reasonably expect in practice. Under the Pathway 2 option in which new exotic forests were prevented from entering the NZ ETS but previously registered exotic forests remained, economic returns for indigenous reversion/regeneration would exceed those under the modelled RIM. However, direct planting of indigenous forest would not be cost-effective under this option. This reflects the high establishment costs of direct planting, which the NZ ETS does not fund but the modelled RIM would.

Table 20: Landowner economic returns (NPV/ha, real 2025 NZD) for indigenous reversion/regeneration at 2030, 2035, and 2040 under different policy options (without supplementary planting)

Policy option	Scenario	Landowner economic return per ha for afforestation in specified year (NPV/ha)		
		2030	*2035*	*2040*
RIM	n/a	$6,050		
Status quo NZ ETS	PCE: status quo	($1,900)	($3,300)	($4,450)
	NZUpy: illiquid market	($1,400)	($1,950)	($2,200)
Modified net NZ ETS	PCE: native_only_future	$9,550	$10,400	$10,600
	NZUpy: afforestation_limit	$200	($900)	($1,750)
	PCE: 2for1forestry	$5,400	$6,450	$6,750
	PCE: native_and_gross_only	$28,600	$32,900	$35,350

Source: Green (2026).

Table 21: Landowner economic returns (NPV/ha, real 2025 NZD) for indigenous direct planting at 2030, 2035, and 2040 under different policy options

Policy option	Scenario	Landowner economic return per ha for afforestation in specified year (NPV/ha)		
		2030	*2035*	*2040*
RIM	n/a	$6,650		
Status quo NZ ETS	PCE: status quo	($21,150)	($22,350)	($23,250)
	NZUpy: illiquid market	($18,900)	($19,250)	($19,400)
Modified net NZ ETS	PCE: native_only_future	($3,150)	($2,650)	($2,550)
	NZUpy: afforestation_limit	($18,100)	($19,200)	($20,100)
	PCE: 2for1forestry	($8,400)	($7,750)	($7,650)
	PCE: native_and_gross_only	$27,650	$31,400	$33,850

Source: Green (2026).

10.7 Comparison of modelled outcomes across NZ ETS pathways

This section summarises cross-cutting insights from the modelling analysis as follows:

- Figure 37 compares NZ ETS unit prices under alternative NZ ETS pathway scenarios to meet the current net-zero and -20 $MtCO_2e$ targets for gases excluding biogenic CH_4.
- Figure 38 shows gross emissions under alternative NZ ETS pathway scenarios to meet the current net-zero 2050 target for gases excluding biogenic CH_4.
- Figure 39 compares afforestation outcomes, and Figure 40 fiscal outcomes, for NZ ETS pathway scenarios to meet 2050 targets of net zero and -20 $MtCO_2e$ for gases excluding biogenic CH_4. Pathway results are simple averages across modelled scenarios.
- Figures 41 and 42 show the landowner economic returns for indigenous reversion/regeneration and indigenous direct planting (respectively) in 2030, 2035, and 2040 under different policy options.

Further benefits from removals could be achieved through scenarios (not modelled in this paper) that expand the RIM to include incentives for improved management of existing forest (both pre-1990 forest and post-1989 forest under averaging after reaching its long-term average carbon stock), other land-use activities like small-scale vegetation and wetland restoration, and engineered removals. It could also be configured to facilitate voluntary investment in nature and carbon markets.

Under all NZ ETS pathway options, including the status quo, additional policies would be needed for the economy to overcome non-price transition barriers, respond efficiently to emissions price signals, and achieve desired sectoral outcomes. Such policies would help avoid unnecessarily high emissions prices and support just transitions for sectors and communities. As an example, Beca and Sapere (2026) found that combining a credible and predictable emissions price with strategic sectoral policies and investment for decarbonisation could significantly boost benefits for GDP and the climate compared to an emissions price alone.

Figure 37: Emissions prices (real 2025 NZD per tCO_2e) under NZ ETS pathway scenarios to meet the current net-zero and -20 $MtCO_2e$ 2050 targets for gases excluding biogenic CH_4, 2025–2050

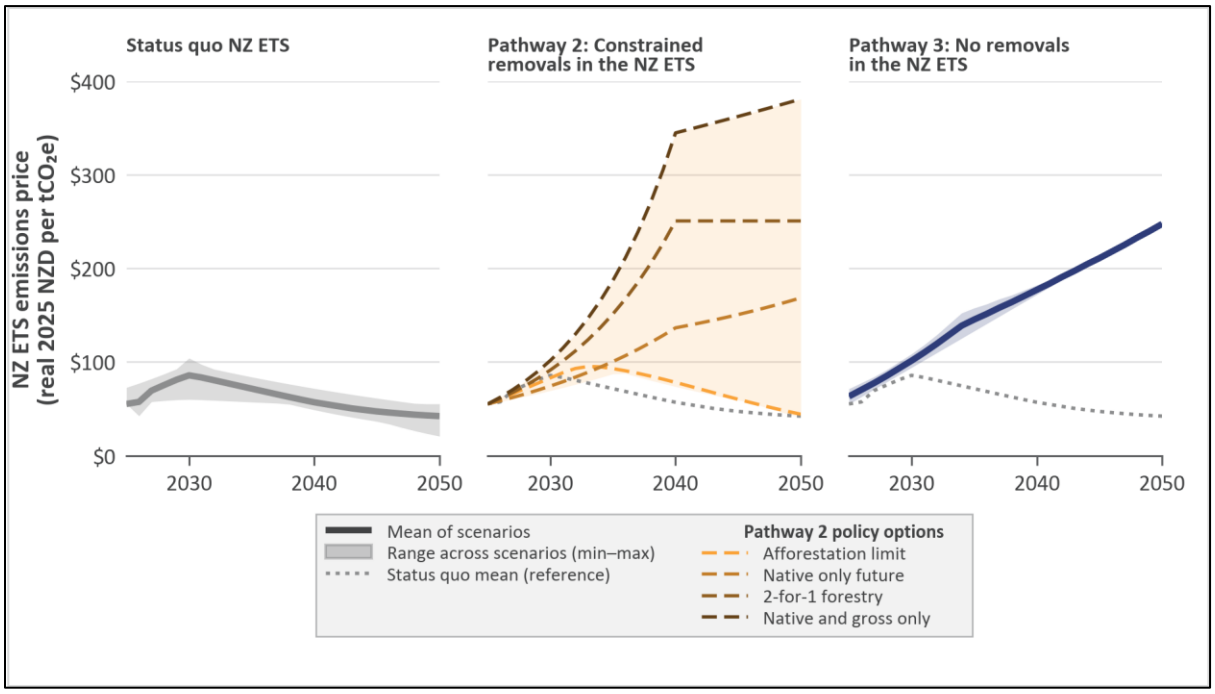
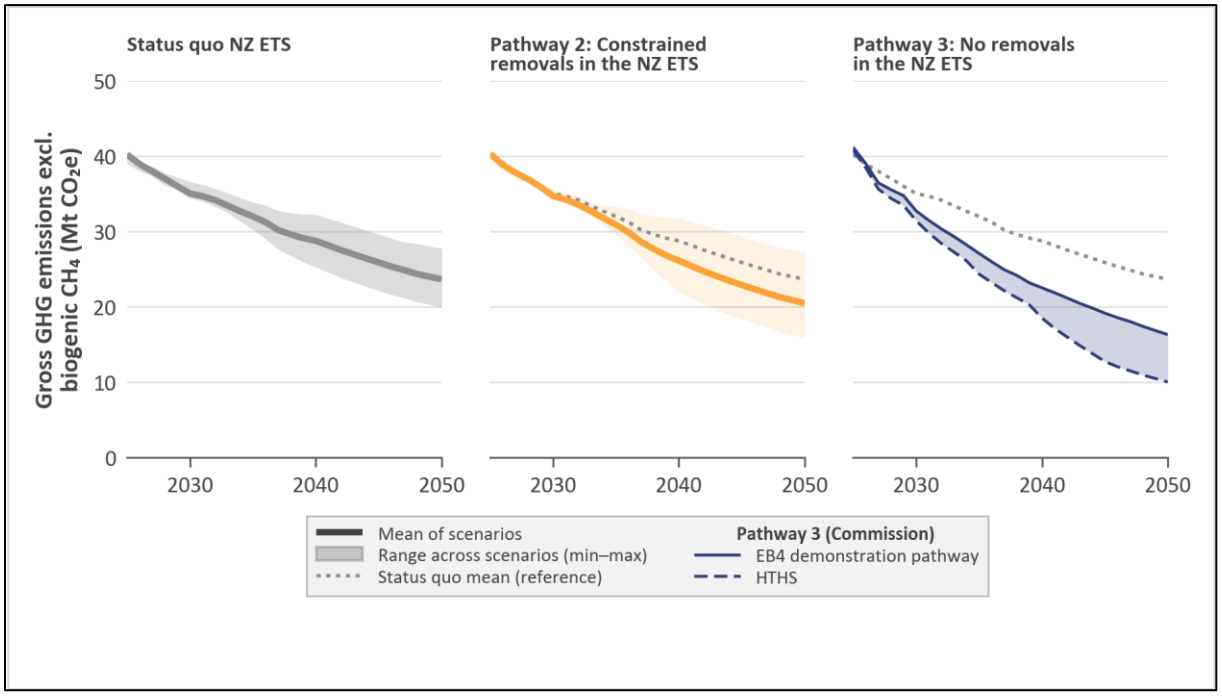
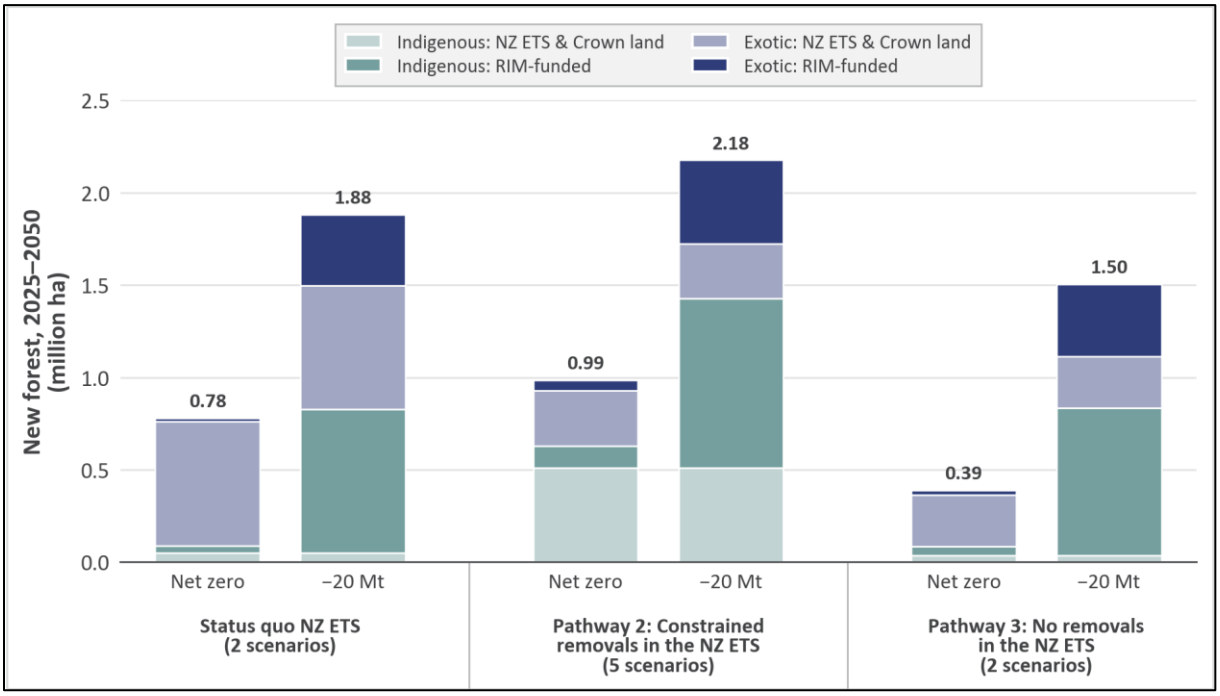


Figure 38: Gross emissions ($MtCO_2e$) under NZ ETS pathway scenarios to meet the current net-zero 2050 target for gases excluding biogenic CH_4, 2025–2050



Note: The HTHS pathway scenario is consistent with meeting a -20 $MtCO_2e$ 2050 target as recommended by the Climate Change Commission. The status quo mean averages NZUpy: illiquid market and PCE: status quo, and the shaded range covers the seven status quo scenarios. The Pathway 2 mean is a simple average of six scenarios (four from PCE and two from NZUpy), so differences relative to the status quo mean partly reflect model differences rather than policy effects.

Figure 39: Afforestation under NZ ETS pathway scenarios with a RIM to meet the current net-zero 2050 target and -20 $MtCO_2e$ 2050 target for gases excluding biogenic CH_4, 2025–2050 (million ha)



Note: Areas are totals across the NZ ETS, Crown land, and the RIM, and do not consider whether these rates of afforestation could be achieved in practice. Reaching -20 $MtCO_2e$ implies average afforestation of around 72,000 ha/yr for 26 years under the status quo, and around 96,000 ha/yr in the highest Pathway 2 scenario, and so may be unrealistic in practice.

Figure 40: Fiscal outcomes under NZ ETS pathway scenarios with a RIM to meet the current net-zero and -20 $MtCO_2e$ 2050 targets for gases excluding biogenic CH_4, 2026–2050 (billion real 2025 NZD, undiscounted)

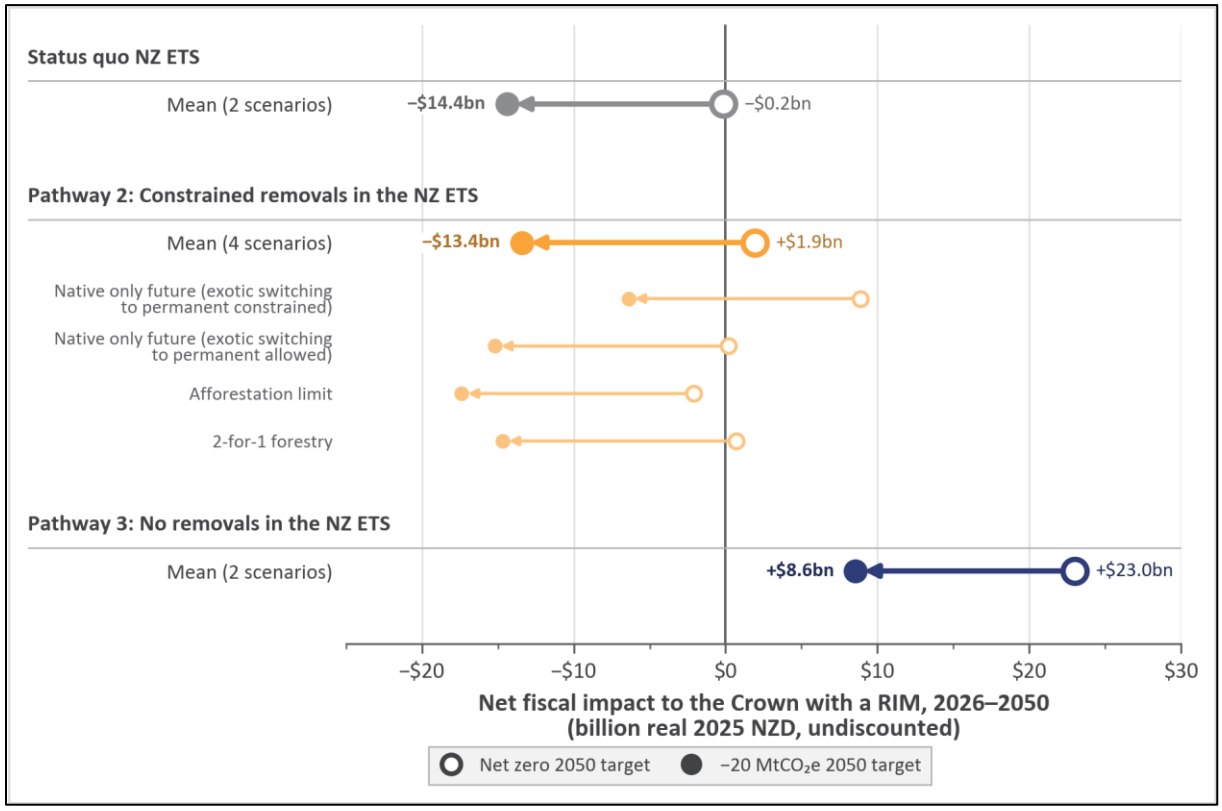


Figure 41: Landowner economic returns (NPV/ha, real 2025 NZD) for indigenous reversion/regeneration in 2030, 2035, and 2040 under different policy options

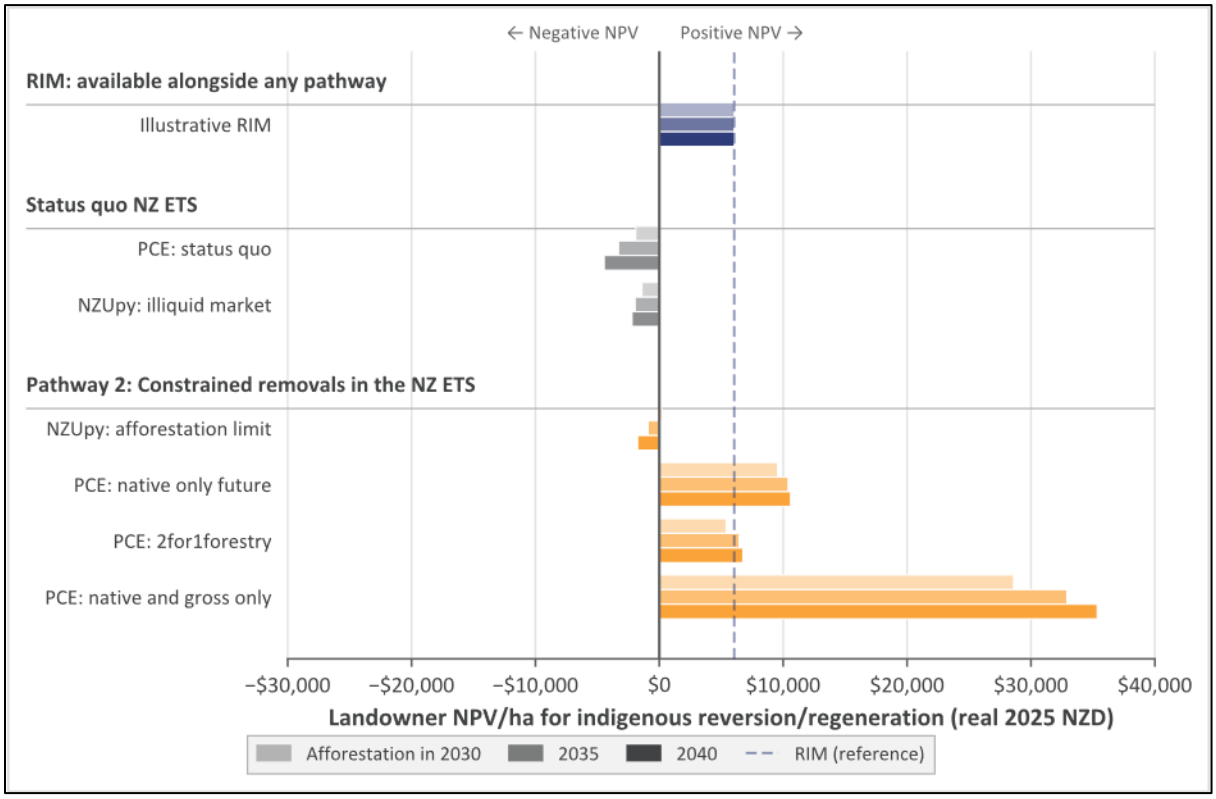
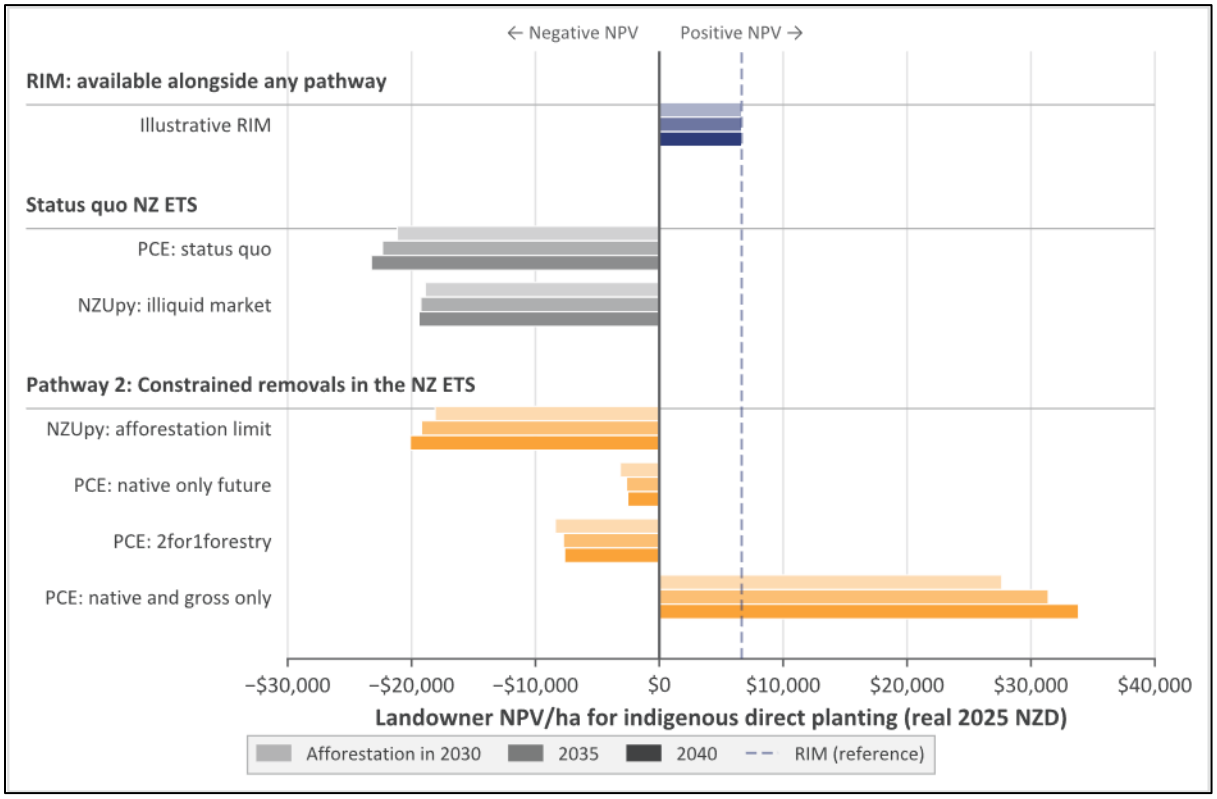


Figure 42: Landowner economic returns (NPV/ha, real 2025 NZD) for indigenous direct planting in 2030, 2035, and 2040 under different policy options



10.8 Modelling limitations for the illustrative RIM

This modelling was conducted as part of an initial scoping exercise, and there are limitations to the costing of the illustrative RIM under different pathways. These limitations are listed in Box 9. Further work in these areas would be helpful when refining the concept of a RIM.

While the scenario for an illustrative RIM presented in this paper is limited by modelling constraints and simplified assumptions, it does shed light on a possible direction for New Zealand's climate change policy for the NZ ETS and removals that could improve outcomes for climate, nature, the economy, and communities.

Box 9: Limitations of the costing of an illustrative RIM

1. Payment rates are calibrated so that each forest type is viable from the landowner's perspective. The costing therefore shows what the assumed level of afforestation would cost if delivered but does not consider whether the payment rates assumed are sufficient to guarantee adequate interest and uptake.
2. Additional potential funding streams for the RIM (e.g. enhancement of carbon stores in existing forests) are not costed.
3. Any increase to New Zealand's yield tables due to the RIM, for example increases to the post-1989 natural forest yield table due to a higher predominance of forests with tall indigenous species, is not captured. This reflects the difficulty of forming assumptions for how these yield tables may change over time as a result of a differing mix of afforestation incentivised.
4. No cost is attached to reversals or loss of carbon in RIM-funded forests. The design of mechanisms to deal with reversals is left to a future policy process, and the cost of any such mechanism may be additional to the estimates presented here.
5. For the transfer of existing forests from the NZ ETS to the RIM (under the shift to a gross-emissions ETS), the registered forest area is held constant. In practice, some forests may deregister at the point of transfer, so the long-term costs for payments to existing NZ ETS forests moved to a RIM are indicative of scale rather than a forecast.
6. No learning-by-doing effects are assumed for indigenous afforestation costs. In practice, a sustained level of funding for indigenous afforestation may help to reduce costs over time, whereby seedling nurseries are able to rely on more consistent ongoing demand for indigenous seedling varieties to reduce costs per seedling. Learning-by-doing effects could be enhanced through funding alongside the RIM targeting improvements to nursery capacity, genetics research, and workforce training, as was seen with the One Billion Trees' partnership fund. Such funding is not considered in this paper.
7. In practice, the Government could consider enabling more complex funding arrangements linked to carbon or nature markets, placing obligations on certain sectors to pay for some of the removals delivered, or co-funding with councils. These are not considered further given the wide range of permutations as to how the Government could seek to encourage supplementary investment, and given that the primary focus of this paper is to provide an illustrative costing of different future scenarios for the NZ ETS.
8. Administration costs for the RIM will depend on the specifics of its design and the extent to which it relies on existing NZ ETS forestry administrative processes, and so may vary substantially from the estimates provided in this paper.

11 What other advanced economies are doing

New Zealand is not alone in facing these challenges, but its current policy framework for the NZ ETS and removals is unique in many regards. This section provides examples of how selected advanced economies are adapting their climate targets in the direction of net-negative outcomes and developing enabling policies for upscaling removals.

11.1 Evolving climate change mitigation targets

Among advanced economies,[196] the UK and seven European countries have committed to net-negative emissions targets and/or separate targets for GHG removals in addition to overall gross emissions reductions (Table 22).[197] The scope, timing, and accounting methods for these targets vary. Removals targets are point-year and expressed either as a percentage of emissions relative to 1990 levels or in $MtCO_2e$.

Under legally binding targets, Finland has committed to turn net negative from 2035, and Switzerland and Germany from 2050. Sweden comes closest to having both a legally mandated timeline for becoming net negative (from 2045) and a removals target, implicit in the commitment to implement 15% of the emissions reductions relative to the 1990 baseline (approximately 11 $MtCO_2e$) through forests, CCS, and efforts outside Sweden.[198] Denmark also has a set timeframe for becoming net negative (by 2050) and an implicit removal target (10%), but neither has been enshrined in law (Table 22). In addition to its 2050 net-negative target, Germany has legislated removal targets for LULUCF that exceed binding EU commitments (Table 22). If approved, its *Long-Term Strategy for Negative Emissions* will establish world-leading removal targets in terms of their level of detail, including specific targets for engineered CDR.[199] France and the UK lack formal commitments to become net negative, but feature removals targets in their strategies. Like Germany, France has committed to LULUCF removals beyond those required by the EU. The UK has

[196] Some developing countries with large forested areas, such as Bhutan, Gabon, Panama, and Suriname, already have net-negative emissions and intend to maintain them (Government of Suriname, 2025; República de Panamá, 2025; Royal Government of Bhutan, 2025; The Government of the Republic of Gabon, 2025).

[197] Countries were identified through an initial search on Carbon Gap (https://carbongap.org/), Google Scholar, and AI, followed by a detailed AI enquiry covering NDCs, climate strategies, acts, and policies of >45 potentially relevant countries from around the world. Official government documents indicating net-negative targets or separate removal targets were analysed in more detail.

[198] See Ministry of Climate and Enterprise (2021).

[199] See Federal Ministry for Economic Affairs and Climate Action (2024).

the most detailed removals targets to date, which separate nature-based and engineered removals and, for the latter, stipulate future aims for 2035 and 2050 (Table 22).[200]

11.2 Strategies for incentivising removals

In some other countries, governments are supporting carbon removals through a range of approaches, with mechanisms and preferred CDR methods reflecting different countries' objectives, geography, technological development, economic sectors, and resources.[201] Some examples are described below, with details in the Appendix.

Australia and (from 2028) Japan have **compliance-market crediting** mechanisms for nature-based removals. The EU and UK are proposing to incorporate credits from permanent engineered CDRs into their compliance-market schemes. Similar engineered CDR incentives are well-established in California and Switzerland but limited to compulsory offsetting of fuels. In both cases, CCS aimed at emissions reduction is generating the offsets, with BECCS and DACCS credits allowed but not yet utilised.[202]

One of the most common incentives is **domestic credit certification for the VCM**, which can incorporate credits into compliance-market mechanisms or else retain them solely in the voluntary market. Examples of the latter include France's Label Bas-Carbone, the UK Woodland Carbon Code, Japan Blue Credits (a separate certification exclusively for blue carbon), and the EU Carbon Removals and Carbon Farming Regulation. These schemes differ in terms of eligibility, additionality, quantification, permanence, co-benefits, verification requirements, processes, and crediting periods. However, they all accredit various emissions reduction and removal methods, have flexibility to incorporate new methods, and rely on approved but independent third-party verifications.[203]

[200] The UK has the earliest and most ambitious removals target based on engineering methods (>5 $MtCO_2e$/yr by 2030), but only 0.51 $MtCO_2e$/yr is projected to be achieved by 2032. See UK Government (2025).
[201] This section is based on general observations from a literature review of 17 countries/jurisdictions with developed economies and large, well-established or innovative CDR incentives, and a selection of 22 schemes from 13 countries researched in more detail (Appendix).
[202] See Clean Energy Regulator (2025), Federal Office for the Environment (2025), HM Government (2021), International Carbon Action Partnership (2026b), Mohanty and McNamara (2023), and Offset8 Capital (2026).
[203] See Japan Blue Economy Association (2025), Label Bas Carbone (2025b), Regulation (EU) 2024/3012 (2024), and Woodland Carbon Code (2025).

Table 22: Countries with net-negative emissions targets and/or distinct removals targets

Country	Net-negative target	Removals target (point-year)	Reference
Finland	After 2035 (in law)	-	Ministry of the Environment (2026)
Sweden	After 2045 (in law)	Up to 15% vs 1990 gross CO_2e in the year 2045, approx. 11 $MtCO_2e$ (in law; through supplementary measures, including removals)	Ministry of Climate and Enterprise (2021)
Switzerland	After 2050 (in law)	-	Swiss Confederation (2025)
Romania	By 2050 -105% vs 1990	-	EU Directorate-General for Communication (2024)
Denmark	By 2050 -110% vs 1990 (not yet in law)	10% vs 1990 net CO_2e in the year 2050, approx. 8 $MtCO_2e$ (not yet in law)	The Danish Council on Climate Change Secretariat (2024)
Germany	After 2050 (in law)	Only LULUCF removal targets (in law)*: 35 $MtCO_2e$ net in the year 2040 40 $MtCO_2e$ net in the year 2045	Federal Ministry of Justice and Consumer Protection (2024)
France		Only LULUCF removal target*: 23 $MtCO_2e$ net in the year 2050	Ministries of Ecological Transition, Spatial Planning, Transport, Urban Development and Housing (2026)
UK		Engineered: >5 $MtCO_2e$ gross in the year 2030 23 $MtCO_2e$ gross in the year 2035 (aim) 75–81 $MtCO_2e$ gross in the year 2050 (aim)	HM Government (2021)

Note: If not marked as “in law,” the target is set in a strategy. *All EU Member States are assigned a binding 2030 national LULUCF net emissions reduction or removals target. The LULUCF sector includes forests, cropland and grassland, wetlands, loss of soil/vegetation from settlements, and harvested wood products. This table only lists additional country-specific commitments that go beyond the shared EU baseline.

Another common incentive is direct government funding through **establishment grants**. For example, Canada, England, and Ireland operate large funds for afforestation/reforestation that pay for planting and 8–20 years of annual maintenance. In England and Ireland, land under this scheme must legally remain forested in perpetuity. In Ireland, producing high-quality timber is an objective, whereas in Canada and England traditional commercial forestry is not eligible. Issues like loss of forest to storms and wildfires, funding cuts, and low uptake are common, and have caused the scheme to be wound down in Canada.[204]

There are also large establishment grants for engineered CDRs, like those aimed at CCS, including DACCS and BECCS. A notable example is the Longship project in Norway, which covers the full capture, transport, and geological injection chain. Two thirds of the cost is paid by the Government, and the remainder by private companies and the EU. Another scheme has been developed in Switzerland, where the Government covers half of the investment and/or seven years of operational costs of companies with net-zero roadmaps.[205]

Governments can **guarantee a price for carbon removed,** either via a direct subsidy or by purchasing credits, with contracts sometimes awarded through **reverse auction**. Most examples are not fully operational at present. For instance, an Australian scheme allowing projects to reverse bid for contracts to sell carbon credits at a fixed price to the government closed to new applications in 2026 because of a conflict of interest. A similar scheme in England for new woodland creation closed after four years, with the last auction having only three bidders. Denmark has a tender for the price of biogenic and atmospheric CO_2 captured and geologically stored, but there have also been few applicants because the conditions are difficult to meet.[206]

Sweden is starting a parallel scheme for BECCS while allowing companies to claim the same removals on the voluntary market. Other examples planned for the next couple of years include a Danish subsidy per tonne of CO_2 stored in agricultural soil through biochar; and the UK Greenhouse Gas Removal Business Model, which will support DACCS and BECCS through carbon units that can be sold either to the government (through a 15-year two-way contract for difference) or on the voluntary market.[207]

Canada and the USA have income **tax credits** for CCS, including DACCS and BECCS. The American system works through credits per tonne of carbon permanently stored, while Canadian claims are for a percentage of the capital expenditure on equipment. Tax levers seem to be

[204] See Borts-Kuperman (2025), Department of Agriculture, Food and the Marine (2025, 2026a, 2026b), Forestry Commission (2026), House of Commons Environmental Audit Committee (2023), Natural Resources Canada (2025), and Office of the Auditor General of Canada (2023).
[205] See Federal Office for the Environment and Swiss Federal Office of Energy (n.d.) and Ministry of Energy (2025).
[206] See Clean Energy Regulator (2026), Danish Energy Agency (2024), Department of Climate Change, Energy, the Environment and Water (2026), and Forestry Commission (2025).
[207] See Department for Energy Security and Net Zero (2025), Dufour et al. (2024), Ministry of Climate, Energy and Utilities (2024), and Strauss (2025).

uncommon for nature-based CDRs. Iceland is unique in allowing businesses to deduct financial contributions/gifts to organisations running carbon removal projects from their taxable income.[208]

Many of the CDR incentives reviewed here can be used complementarily. This is exemplified by the UK, which has implemented all of them except tax levers. Thus, the Greenhouse Gas Removal Business Model for engineered CDR includes an accreditation system that can be used in the VCM; offers a government-guaranteed price through a contract for difference; may eventually feed into the UK's compliance market; and is compatible with other construction grants. For nature-based CDR, reforestation projects in England (that meet the requirements of all the schemes) can benefit from establishment grants; earn carbon units for the VCM; and, through reverse auction, can win contracts to sell credits to the Government at a fixed price.[209]

Other cap-and-trade systems that currently allow forestry offsets tend to limit their use to a relatively small percentage of surrenders (typically 5–10%). Key examples are the systems in California and Québec, Canada (federal), China, Japan, the Republic of Korea, and Washington. The US-based Regional Greenhouse Gas Initiative will remove offsets from 2027. Australia's Safeguard Mechanism (a baseline-and-credit system), which accepts Australian Carbon Credit Units (ACCUs) from vegetation and soil carbon, does not apply a hard limit, but usage above 30% needs to be explained.[210]

These examples highlight that many features of New Zealand's approach to removals in the NZ ETS are globally unique. For example:

- Several systems use credit buffers that price reversal risk *ex ante*. In the NZ ETS, New Zealand applies perpetual reversal liabilities with averaging for production forests; this excludes harvesting reversals and shifts other reversal costs to landowners (or the Crown in the case of default) *ex post*.
- Several systems with offsets crediting use a counterfactual test for additionality, whereas the NZ ETS applies a base-year eligibility test.
- In several systems, public funding comes with conditionality to drive desired outcomes for removals and co-benefits, whereas outcomes from the NZ ETS are driven by emissions prices and liabilities decided by a market with full fungibility of removals and emissions reductions.

Overall, these examples show how in some forward-looking advanced economies, net-negative climate targets are emerging and policies are distinguishing between nature-based and

[208] See Canada Revenue Agency (2024), Credit for Carbon Oxide Sequestration (2021), and Reglugerð um frádrátt frá tekjum af atvinnurekstri eða sjálfstæðri starfsemi (2021).
[209] See Department for Energy Security and Net Zero (2025) and Forestry Commission (2025).
[210][210] See International Carbon Action Partnership (2026a).

engineered removals, applying diverse and/or complementary approaches to upscale removals, and linking public funding to public-good outcomes.

12 Conclusion

While emissions pricing remains critical to New Zealand's low-emissions transition and the NZ ETS market is functional, modelling suggests that status quo design and settings for the NZ ETS and removals will fail to deliver on New Zealand's climate targets and create uncertainties and risks across stakeholder groups in the longer term. The challenges facing the NZ ETS are significant but not insurmountable. They come from policy assumptions and design choices made nearly two decades ago, and those choices can be revisited. New Zealand now has a clear opportunity to build a policy framework that will deliver what is needed for the decades ahead. Such a framework would recognise that emissions reductions and removals are both essential and would invest in each on its own merits. Doing so would send clearer long-term investment signals to emitters and removals producers alike. It would also restore the Government's ability to steer the NZ ETS towards New Zealand's climate targets and unlock a far wider range of removals than exotic afforestation alone. Those removals could deliver benefits for climate, nature, regional economies, and communities.

The analysis in this paper points to a promising direction. A RIM could be applied alongside any of the NZ ETS pathway options explored in this paper to achieve outcomes for removals and climate targets that would not be possible otherwise. Under illustrative modelling, a RIM could potentially be used to help meet and sustain New Zealand's current 2050 target and bring more ambitious future targets within reach. By enabling auctioning to continue, it could help maintain government control over climate targets and NZ ETS market stability and generate net revenue for the Crown. Separating demand and price signals for emissions reductions and removals could send clearer investment signals for emitters and foresters and improve outcomes for climate and nature. A RIM could potentially be designed in ways that maintain or increase the value of existing and new removals investments relative to the status quo NZ ETS. The RIM modelled in this paper is a hypothetical illustration for demonstrating proof of concept, not a proposal or recommendation, and more work is needed. This direction is consistent with what forward-looking advanced economies are already doing: setting removals targets and building diverse incentive portfolios alongside ambitious emissions reductions.

Policy development should begin as soon as possible, while the Government still holds the lever of auctioning and before low emissions prices lock in misdirected investments that will not

serve New Zealand in the longer term. Deferring policy reform beyond 2030 could forgo around $11–12 billion in auction revenue through to 2035 that could otherwise fund removals or other priorities. Government decision-making on the introduction of a RIM would need to be staged carefully; shaped and informed by inclusive processes with full regard to the rights, interests, and aspirations of iwi and Māori; and concluded well in advance of implementation. Process guardrails would be essential to build confidence in policy change and ensure a just transition for NZ ETS participants, iwi and Māori, broader stakeholders, and communities. Collective effort is needed to build on the findings of this paper and design an integrated policy framework for the NZ ETS and removals that works better for everyone.

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Appendix: International examples of CDR incentives

This appendix provides brief case studies highlighting examples of international CDR incentives. The profiled mechanisms are listed in Table 23.

Table 23: Selected examples of international CDR incentives

CDR incentive	Nature-based	Engineered (including BECCS)
Compliance-market crediting (fungible offsets)	Australia	Switzerland California
	Japan (compliance settlement from 2028)	
Government-guaranteed price + reverse auction	Australia (closed auctions) England (closed auctions)	Denmark Sweden
Government guaranteed price	Denmark (from 2027, pending approval)	UK (aim 2028)
Establishment grant	Ireland Canada (closed applications) England	Norway Switzerland
Domestic credit certification (e.g. for voluntary market)	France Japan UK Australia	UK (aim 2028)
	EU (registry from 2028)	
Tax lever		USA Canada
	Iceland	

INCENTIVE NAME

Australian Carbon Credit Unit (ACCU) Scheme / Carbon Farming Initiative (CFI)

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Compliance-market crediting (fungible offsets) + domestic credit certification for the voluntary market	Nature-based	Australia	Ongoing

Eligible businesses, landholders, farmers, local/state/territory government bodies, First Nations groups, and trusts can earn one ACCU per tonne of reduced or sequestered CO_2e and sell ACCUs in the secondary market. The Clean Energy Regulator assesses and monitors projects, and issues related ACCUs. Eligible projects fall into eleven categories covering different methodologies.[1] Those aimed at carbon removal[2] include: (a) a demonstrable increase in agricultural soil carbon by testing and sampling soil; (b) establishment, conversion, or transition to forestry plantations; (c) reintroduction of tidal flow to coastal wetland ecosystems for blue carbon storage; and (d) tree planting to store carbon. Vegetation projects must retain stored carbon for 25 or 100 years (Clean Energy Regulator, 2025).

Units can be used to offset emissions voluntarily. They can also be used to meet obligations under the Safeguard Mechanism, which arise when industrial emitters exceed their legal emission baselines. (Note that they can also run their own projects to earn ACCUs.) The price is set by the market; however, the government operates a Cost Containment Mechanism that sets a fixed price for reserve units acquired through carbon abatement contracts[3] (see below). The reserve units provide a price ceiling and can be bought if safeguard facilities cannot source ACCUs on the secondary market for a lower price (Clean Energy Regulator, 2025).

Notes:

1 CCS projects can earn credits, but BECCS and DACCS are not included.

2 The remaining categories involve emissions reductions and include: managing and planning emissions reduction activities for savanna fires that burn in northern Australia; ceasing harvesting of timber in public native forests to avoid emissions; injecting GHG emissions from oil and gas activities underground for permanent storage; collecting landfill gas and either combusting CH_4 to destroy emissions or upgrading biogas to biomethane, which is then used as a natural gas substitute; improving energy efficiency in industrial or commercial businesses; upgrading or replacing business heating or cooling appliances; and recycling and reusing animal waste through an eligible animal waste treatment facility.

3 There used to be carbon abatement contracts where the government could buy ACCUs at a fixed price through reverse auction. The scheme has ceased, with exit arrangements applicable since 1 July 2026.

INCENTIVE NAME

J-Credit Scheme

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Compliance-market crediting (fungible offsets) + domestic credit certification for the voluntary market	Nature-based and engineered	Japan	Ongoing, compliance settlement from 2028

In 2008, two parallel carbon crediting schemes were launched (J-VER and the Domestic Credit Scheme). In 2013, both were integrated into J-Credits under the joint administration of three ministries.[1] The scheme mostly targets small- and mid-sized companies, farmers, forest owners, and local governments that require financial support to reduce GHG emissions or capture carbon. There are 72 methodologies, including the following aimed at carbon capture: concrete that uses biochar; biochar addition to mineral soil in cropland/grassland; forest management (felling only if followed by reforestation); and afforestation and reforestation (prohibits standard cutting for 16 years, and final cutting during the certification period) (J-Credit Scheme, 2013; Offset8 Capital, 2026).

The mechanism operates via project registration, periodic monitoring at intervals chosen by the project developer (with self-reported emissions calculated according to the methodology), and third-party verification by designated authorities to examine the application and monitoring reports. Credits are issued after the verification of each monitoring period. The credit certification period is 8 years, and up to 16 years for forest activities. Extensions of up to 16 years are possible if carbon removal is still occurring relative to a new baseline determined by the methodology. J-Credits can be traded in the Tokyo Carbon Credit Market and are used for voluntary offsetting or to comply with the GX-ETS. The latter is a mandatory ETS that began in 2026 for companies emitting >100,000 tCO_2. Companies can use J-Credits to meet 10% of their

emissions obligations[2] (J-Credit Scheme, n.d., 2013; Ministry of the Environment, 2024; Offset8 Capital, 2026).

Notes:

1 Ministry of Economy, Trade and Industry (METI), Ministry of the Environment (MOE), and Ministry of Agriculture, Forestry and Fisheries (MAFF).

2 Credits from the Joint Crediting Mechanism (JCM), an international collaboration for GHG reduction projects, can also be used.

INCENTIVE NAME

Compensation Obligation under the CO_2 Act/CO_2 Ordinance (carbon offsetting for fuels)

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Compliance-market crediting (fungible offsets)	Nature-based (long-term storage) and engineered	Switzerland	Ongoing

Since 2013, distributors of fossil fuels (petrol, diesel, natural gas, and kerosene) whose products create over 10,000 tCO_2/yr of downstream emissions must partially offset those emissions. The offsetting requirement is 30% in 2026, gradually rising to 50% by 2030 through government-issued attestations. If distributors exceed the emissions limit, they must offset their emissions for the next three years, even if they drop back below the limit during that time (Federal Office for the Environment, 2025).

The federally run Compensation Office issues attestations for eligible carbon reduction or long-term carbon removal projects, including biological sequestration in wood products inside Switzerland; and carbon storage in the subsoil (geological storage)[1] or in non-organic materials like concrete, either nationally or internationally. Independent accredited third-party validators verify projects and attendant annual reports at the applicant's cost. Projects cannot be claimed elsewhere and must guarantee additionality and measurable carbon reductions. Project applicants sell attestations to the offsetting entities, who then submit them back to the government to fulfil their obligations. The price is set by the market, but fuel importers can only pass on compliance costs to consumers up to 5 c/L (Federal Office for the Environment, 2025; Federal Office for the Environment & Swiss Federal Office of Energy, 2025).

Notes:

1 There are no operational examples for BECCS and DACCS, although they are allowed.

INCENTIVE NAME

Low Carbon Fuel Standard (LCFS)

TYPE OF INCENTIVE	TYPE OF REMOVAL	STATE	CURRENT STATUS
Compliance-market crediting (fungible offsets)	Engineered	California	Ongoing

This programme, implemented in 2011, sets a declining benchmark for the carbon intensity of fuels in the transport sector,[1] tightening progressively from a 30% reduction by 2030 to a 90% reduction by 2045 (both relative to 2010). Regulated parties like fossil fuel producers/importers with a deficit at the end of the reporting year must offset the deficit with credits issued by the

California Air Resources Board (CARB). Credits can be obtained by low-carbon fuel producers, zero-emission vehicle infrastructure operators (which earn credits for unused fuelling capacity), or CCS projects. Where CCS aims to reduce emissions from fuel production, the fuel produced must be consumed in California. DACCS projects can be based anywhere.[2] The credit price is set by a closed market (prices can be volatile), but there is a price ceiling set by CARB. Surplus credits can be saved and used in subsequent years (California Air Resources Board, 2026; Mohanty & McNamara, 2023; Stillwater Associates, 2026).

Notes:

1 Alternative fuels that are not biomass-based or fuels supplied in volumes less than an amount equivalent to 3.6 million gasoline gallons per year are exempt from the LCFS regulation. Fuels used for military vehicles, aircraft, ocean-going vessels, and locomotives are also exempt from meeting the carbon-intensity standards for LCFS.

2 Although DACCS and BECCS are approved, they do not appear to be generating tradeable credits yet.

INCENTIVE NAME

Woodland Carbon Guarantee (WCaG)

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Government-guaranteed price + reverse auction	Nature-based	England	Applications closed

This £50m scheme is administered by the Forestry Commission to accelerate woodland planting rates and develop the domestic carbon market. Eight sealed-bid reverse auctions between 2020 and 2024[1] awarded new woodland creation projects in England[2] with a government guarantee to purchase carbon credits at a fixed price for 30–35 years. Projects are run by land managers (owner-occupiers, tenants, landlords, and licensors) with full control of the land for the duration of the contract.[3] They must use approved species and can receive separate establishment grants. Successful applicants registered under the Woodland Carbon Code, which provides carbon calculation tools, validation, and a verification framework. Units are issued every 5 or 10 years after verification and can be sold either to the government (as per the contract) or on the voluntary market (Forestry Commission, 2025).

Notes:

1 The programme is now closed to new applications. Unit prices ranged from £17.31 to £25.00. The last auction had the highest price and only three bidders.

2 Scotland, Wales, and Northern Ireland have separate mechanisms.

3 Land owned by public bodies or subject to a statutory restocking requirement is excluded.

INCENTIVE NAME

Carbon Abatement Contracts under the ACCU Scheme

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Government-guaranteed price + reverse auction	Nature-based	Australia	Applications closed

This programme – which is currently being wound down – is part of the ACCU scheme (originally the Emissions Reduction Fund) and run by the Clean Energy Regulator. Projects earning ACCUs (see above) could enter a Carbon Abatement Contract to sell an agreed number of units to the

government at a fixed price, either as a one-off transaction or in variable instalments over a maximum of ten years. Contracts were awarded based on reverse auctions for the price of one ACCU (with 15 auctions held between 2015 and 2023), with projects only able to hold a single contract at a time. Successful projects involving carbon removal include some soil carbon but mostly fall into the vegetation category (afforestation, reforestation, native forest protection, avoided deforestation, and regeneration), with the latter accounting for 154 $MtCO_2$ removed (Clean Energy Regulator, 2026).

There are two types of contracts. Projects with optional delivery contracts can choose to sell their ACCUs to the government by a scheduled milestone, but do not have to. Projects with fixed contracts must deliver the agreed number of ACCUs to the government but can – if the government agrees – source them from other projects. Upon delivery, they could compete for further contracts (up to three times, or ten times for one-off sales). Once 25% of the ACCUs have been delivered, they can be terminated with a discounted exit payment. While existing contracts are honoured, auctions have ceased and exit arrangement offers have been in place since 1 July 2026. The programme stopped because of a conflict of interest, with the Clean Energy Regulator being both the regulator and the buyer. New pathways for government ACCU purchases are being considered (Clean Energy Regulator, 2026; Department of Climate Change, Energy, the Environment and Water, 2026).

INCENTIVE NAME

Fund for Negative Emissions via Carbon Capture and Storage (NECCS)

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Government-guaranteed price + tender	Engineered	Denmark	Ongoing

This DKK2.5bn (€330m) fund is administered by the Danish Energy Agency but has only been partially implemented. It aimed to remove 0.5 $MtCO_2$/yr from 2026 through permanent geological storage of biogenic and atmospheric CO_2. Eligible carbon capture projects included biogas upgrading facilities, biomass-based power and heat plants, waste incineration plants (for the biogenic fraction of CO_2), and Direct Air Carbon Capture and Storage (DACCS) (Danish Energy Agency, n.d., 2024; International Energy Agency, 2023).

The fund operated through a competitive tender for the price of CO_2 captured and permanently stored, with multiple contracts awarded for an eight-year period. This scheme works as a direct subsidy and does not produce tradeable credits. Payment is subject to CO_2 storage confirmation and a clawback mechanism in case geological storage becomes part of the EU ETS. Only three contracts (no DACCS) delivering one third of the 0.5 Mt/yr target were awarded, owing to a lack of applicants able to meet the tender conditions and timing[1] (Danish Energy Agency, n.d., 2024).

Notes:

[1] Denmark also runs parallel tender processes for CO_2 captured and permanently stored through its CCS and CCUS funds, aimed at emissions reduction. BECCS projects are eligible.

INCENTIVE NAME **Reverse Auction for Bio-CCS**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Government-guaranteed price + reverse auction	Engineered	Sweden	Ongoing

This scheme, run by the Swedish Energy Agency, will invest €3bn between 2026 and 2046 to support bio-CCS (i.e. BECCS). Interested companies producing biogenic CO_2 emissions (e.g. pulp/paper mills, and heat and power plants) in Sweden compete in a reverse auction for a public subsidy per tonne of biogenic CO_2 captured, transported, and permanently stored.[1] The government pays the winning company the agreed price for a maximum of 15 years, which helps to cover investment and operating costs. Companies are allowed to claim the same removals independently to earn carbon credits for the voluntary market, thus lowering the price of permanently stored carbon credits to make them more commercially viable (Dufour et al., 2024; European Commission, 2024; Strauss, 2025).[2]

Notes:

1 They must have the capacity to store >50,000 tCO_2/yr, and for the 2026 auction, they must be able to store carbon within four years.

2 This creates a double-claiming issue, which remains unresolved.

INCENTIVE NAME **Subsidy for the storage of biochar in agricultural soil**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Government-guaranteed price	Nature-based	Denmark	From 2027, pending approval

This novel scheme, part of the broader Agreement for a Greener Denmark, exclusively covers carbon removal through biochar. It will be a subsidy paid per tonne of CO_2 stored in Danish agricultural soil in the form of biochar produced via pyrolysis.[1] Funding of DKK10bn (€1.3bn) through 2045 was agreed by the ruling coalition in 2024.[2] The scheme is planned to open in 2027, subject to EU state-aid approval. A policy design, methodology, and a national regulation for spreading biochar on agricultural soil are in development (Ministry of Climate, Energy and Utilities, 2024).

Notes:

1 Relevant biochar sources include biomass feedstocks from straw, digestate from biogas plants, woody parts of garden waste, and wood waste.

2 From 2030, revenue from the agricultural carbon tax is meant to contribute indirectly to the biochar subsidy.

INCENTIVE NAME **Greenhouse Gas Removal (GGR) Business Model**			
TYPE OF INCENTIVE	**TYPE OF REMOVAL**	**COUNTRY**	**CURRENT STATUS**
Government-guaranteed price (dual contract for difference) + domestic credit certification for the voluntary market + (potentially) compliance-market crediting (UK ETS)	Engineered	United Kingdom	Aim 2028

This programme, managed by the Department for Energy Security and Net Zero, supports engineered permanent carbon removal through DACCS and BECCS. It is developing a CDR crediting framework comprising carbon accounting methodologies, verification procedures, and an approved registry to issue GGR credits. Projects must be based in the UK, store carbon permanently and, in the case of BECCS, follow rigorous biomass sustainability criteria. Eligible projects can obtain GGR credits to trade in the voluntary market. The intention is to integrate GGR credits into the UK ETS by 2029 (Carbon Gap, 2025b; Department for Energy Security and Net Zero, 2025).

Under the business model, projects can also apply for a 15-year government contract to fix the price of GGR credits. Project selection is discretionary and includes a series of negotiations. Contracts cover a two-way carbon contract for difference relative to the negotiated unit base price and a price discovery incentive (i.e. the government will pay an extra 5% of the achieved sale price).[1] Large-scale BECCS projects (>100 MWe) also participate in a separate two-way contract for difference for the electricity generated (Department for Energy Security and Net Zero, 2025).

Notes:

[1] Projects can also access separate construction grants, and payments for transport and storage costs.

INCENTIVE NAME **Afforestation Grant and Premium Scheme 2023–2027**			
TYPE OF INCENTIVE	**TYPE OF REMOVAL**	**COUNTRY**	**CURRENT STATUS**
Establishment grant	Nature-based	Ireland	Ongoing

This is a €308m, five-year forestry grant administered by the Department of Agriculture, Food and the Marine (DAFM). Its objectives range from climate change, biodiversity, and rural economies to production of high-quality timber. Landowners, leaseholders, or joint managers submit applications to plant new trees to an independent DAFM-registered forester. Payments are tax free and cover up to 100% of the establishment costs (plus fencing),[1] as well as an annual premium per hectare for 20 years for farmers, 15 years for non-farmers, and 10 years for agroforestry businesses. Establishment grants and premiums vary based on forest type. There are 14 types (e.g. native forest, forest for water, broadleaf/oak-beech, forest on public land, seed orchards, diverse conifer, continuous cover forestry, and agroforestry). Land under the scheme must remain forested in perpetuity and is subject to a replanting obligation[2] (Department of Agriculture, Food and the Marine, 2026a; Representation in Ireland, 2023).

Notes:

1 The establishment grant works as a reimbursement, with a 75% instalment paid after planting and a 25% instalment paid four years later upon establishment confirmation.

2 Legal obligation under the Forestry Act 2014.

INCENTIVE NAME **England Woodland Creation Offer (EWCO)**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Establishment grant	Nature-based	England	Ongoing

This competitive grant scheme, established in 2021, is administered by the Forestry Commission and funded through the Nature for Climate Fund. From 2027, it will be gradually integrated into the Environmental Land Management framework. It is designed to support the establishment of new woodlands in England that store carbon. All landowners, land managers, and public bodies can apply individually or as a group. Land must be in England, under the applicant's management control, at least 1 ha in total (each forested unit >0.1 ha), and at least 20 m wide (10 m for riparian buffers and shelterbelts). New woodland can be created through tree planting and/or natural colonisation and must follow the UK Forestry Standard (Forestry Commission, 2026).

Applications are ranked based on points awarded for environmental and social improvements, using low-sensitivity land (few environmental, ecological, heritage, or landscape issues), and use of private finance (with periodic review of the minimum point threshold). Those received before the seasonal deadline are funded in order until the annual budget is exhausted.[1] The scheme provides: up to £10,200/ha for standard capital cost items and establishment activities; £400/ha annually for maintenance for 15 years; and up to £12,700/ha in total between separate payments per public benefit (i.e. nature recovery, recreational access, riparian buffers, flood risk management, water quality, and woodlands close to settlements). Projects on low-sensitivity land can receive an extra £1,100/ha[2] (Forestry Commission, 2026; Forestry Commission et al., 2021).

Notes:

1 The first 2021 yearly budget was £15.9m.

2 The application form supports optional registration with the Woodland Carbon Code (WCC), for additional income by selling carbon units in the voluntary market.

INCENTIVE NAME **Two Billion Trees (2BT)**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Establishment grant	Nature-based	Canada	Closed to new applications

This CAD3.2bn programme (from the Natural Climate Solution Fund, administered by the Canadian Forest Service) was launched in 2021 to award competitive grants to plant trees. The objective is to enhance biodiversity, capture carbon, and improve human health. Local and regional governments, NGOs, businesses, Indigenous organisations,[1] and project aggregation administrators can apply for funding.[2] There are two streams for afforestation and reforestation

projects in rural and remote locations: mass planting for >500,000 trees/yr or long-term support for established organisations already planting trees; and small-scale planting of 50,000–500,000 trees/yr. There is also a stream for urban/suburban planting of >10,000 trees/yr. All streams allow for planting across different but defined sites (including riparian zones), habitat restoration, and project collaborations under a single proposal (Natural Resources Canada, 2021, 2025).

Assessment criteria include, among others, estimated tree survival for the next century, co-benefits, the tree species mix and its relation to the proposed sites, ability to secure seedlings, permanence (no legal provision), and GHG sequestration and reduction (e.g. minimal vegetation removal, local seedlings, reducing pesticides/herbicides, and limiting equipment use). Funding is delivered as a cost-shared, multi-year grant, and separate contribution agreements of up to CAD40m/yr for a maximum of eight years.[3] Financial support from additional programmes can stack up to 100% of the total cost, and priority may be given to projects seeking a lower 2BT contribution. This programme was intended to last ten years but underperformed and was closed to new applications in 2025 owing to budget cuts. Existing contracts are being honoured and aim to deliver one billion trees (Borts-Kuperman, 2025; Natural Resources Canada, 2021, 2025; Office of the Auditor General of Canada, 2023).

Notes:

1 Twenty-six percent of all projects are Indigenous-led.

2 Planting by individuals and provincial/territorial/federal government, legally required planting (e.g. following commercial activity), and business-as-usual commercial planting are not eligible.

3 For long-term planting, 100% of the seedling expenditure is covered up to a maximum of 50% of the total project cost.

INCENTIVE NAME

Longship Carbon Capture and Storage (CCS) Project

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Establishment grant	Engineered	Norway	Ongoing

This full-value-chain CCS project, run by the Ministry of Energy and operational since 2025, is the largest climate initiative in Norwegian industrial history. Carbon is captured at two coastal sites, transported by ship to an onshore terminal and by pipeline to a well, and finally pumped into an offshore geological reservoir. The state directly chose, and negotiated with, the three participants: a cement factory, a waste-to-energy plant using about 60% biogenic material,[1] and the Northern Lights company (owned by Equinor, TotalEnergies, and Shell).[2] The companies own and develop the project, but the government covered approximately two thirds of the capital and operating costs (about NOK22bn; €2.02bn) through grants and cost-overrun risk absorption. The government also set a requirement for some recipients to secure private and/or EU funding[3] (Gassnova, 2026; Ministry of Energy, 2025; Norwegian Ministry of Petroleum and Energy, 2020).

Notes:

1 This plant (Celsio's Klemetsrud), scheduled to be operational in 2029, will capture 0.4 $MtCO_2$/yr, of which 0.2 Mt are net CO_2 removals.

2 Northern Lights has signed commercial agreements with companies in the Netherlands, Denmark, and Sweden.

[3] The EU is providing €131m to Northern Lights.

INCENTIVE NAME **Climate and Innovation Act: CCS/CDR funding tied to Net-Zero Roadmaps**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Establishment grant	Engineered	Switzerland	Ongoing

This new funding scheme, operational since 2025, is administered by the Swiss Federal Office of Energy. It supports innovative technology for carbon removals and reductions, with CHF1.2bn (€1.28bn) available for the first six years. The first tender called for CO_2 removal and storage projects, particularly those combining several point sources or different energy sectors (e.g. electricity, heat, mobility), including BECCS and DACCS. Decisions are discretionary and based on criteria like the novelty of the technology, tonnage thresholds, and financial contributions (Federal Office for the Environment & Swiss Federal Office of Energy, n.d.).

Companies (individual or in groups) that have a net-zero roadmap (comprising a carbon footprint reduction target and a concrete action plan to reach net-zero emissions by 2050), or small companies[1] with an industry roadmap, can participate in tenders for new projects. Successful applicants receive up to 50% of investment and/or operational costs. Investment costs are paid after implementation (must finish by 2035), with early partial payments possible for cost-intensive measures. Annual operating subsidies cover the difference between the new and conventional technologies and are paid until 2037 for a maximum of seven years. Operators of public infrastructure for thermal networks and/or long-term seasonal heat storage are also eligible for insurance-like risk cover of up to 50% of eligible costs, capped at CHF5m (€5.33m) for up to 15 years (Federal Office for the Environment & Swiss Federal Office of Energy, n.d.).

Notes:

[1] Requirements are fewer than 250 employees, maximum heat consumption of 5 GWh/yr, and maximum electricity consumption of 0.5 GWh/yr.

INCENTIVE NAME **Woodland Carbon Code (WCC)**			
TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Domestic credit certification for the voluntary market	Nature-based	United Kingdom	Ongoing

This government scheme was launched in 2011 to ensure the quality and standard of woodland projects aiming to remove CO_2. It was run by the Forestry Commission until 2019 and is now run by Scottish Forestry on behalf of all four UK nations. Landowners, tenants with landowner consent, or third parties acting on behalf of either, can register planting, natural regeneration, and direct seeding under different management styles (from minimum intervention to regular clear-felling). Projects can provide social and/or environmental co-benefits and produce sustainable timber for buildings.[1] Projects must be registered before work begins, have a clearly defined duration of up to 100 years, involve a permanent land-use change to woodland cover, demonstrate that the woodland creation is not required by law and requires financial additionality, and be independently validated and verified by accredited organisations.[2]

Afterwards, a Woodland Carbon Unit (WCU) is issued per tonne of CO_2 removed. Units are sold on the voluntary market for offsetting (e.g. against reported UK-based emissions) or for making claims about net-zero journeys. To help companies plan future emission offsets, the WCC also issues Pending Issuance Units (PIUs) as a promise to deliver full WCUs in the future. Carbon sequestration is verified for the first time after five years, and then every ten years. Units are issued after each verification. Projects registered under the WCC often qualify for compatible grants and incentives (Forest Research, 2026; Woodland Carbon Code, 2025).

Notes:

1 In rotational forestry, carbon removal is calculated as the long-term average over several whole rotations of a given length.

2 The code accounts for GHG emissions caused in the creation of the woodlands or by the project outside the woodland boundary. It does not cover existing woodlands, carbon stored in forest products, or replacing fuel and building materials with wood.

INCENTIVE NAME
J Blue Credit

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Domestic credit certification for the voluntary market	Nature-based	Japan	Ongoing

This scheme, operational since 2020 and run by the Japan Blue Economy Association (JBE), is the first government-certified voluntary blue carbon credit system in the world. Fishers, municipalities, companies, and non-profit organisations working on marine ecosystem creation, restoration, or maintenance can earn carbon credits. Eligible projects include seagrass, seaweed beds, tidal flats, kelp forests, mangroves, and seaweed farming. Only carbon stored beyond 100 years outside the plant biomass (e.g. sequestered in sediment or exported to the deep ocean) is counted towards credits via standardised formulas.[1] An independent third-party committee verifies yearly CO_2 removal above the baseline (i.e. without intervention),[2] and JBE certifies and issues the credits. Credits are sold in the voluntary market for use in offsetting and contribution claims. Co-benefits for communities (e.g. 85% of projects are led by fishers) and biodiversity make these credits attractive, leading to high prices[3] (Japan Blue Economy Association, 2025; Kelp Forest Foundation, 2026).

Notes:

1 Other evaluation criteria include additionality, transparency, no double counting, details on permanence, governance, measurement of removals, sustainable development, and alignment with net zero.

2 Retroactive certifications for up to five years are allowed if there is clarity on past records.

3 Prices of up to USD400/tCO_2.

INCENTIVE NAME **Label Bas-Carbone (LBC)**			
TYPE OF INCENTIVE	**TYPE OF REMOVAL**	**COUNTRY**	**CURRENT STATUS**
Domestic credit certification for the voluntary market	Nature-based	France	Ongoing

This programme was launched in 2019 to certify projects sequestering carbon or reducing GHG emissions in all sectors. The scheme is regulated by the Ministry of Ecological Transition. Different types of projects are proposed by interested parties. The Directorate General for Energy and Climate (DGEC) approves the initial proposal, the method is developed by a mix of institutes and private companies, and final approval is given by the DGEC. Regional Directorates for Environment, Planning and Housing support projects and regional prefects issue the credits, based on monitoring reports from independent auditors (AiDA, 2025; Label Bas Carbone, 2025b).

There are currently 16 different methodologies, with new ones being considered (e.g. algae production and viticulture) and incorporated regularly. Approved CDR methodologies include afforestation, forest restoration, continued forest management, hedge management (soil and plant), orchard plantation, soil carbon storage, bio-based buildings,[1] seagrass meadows, trees in the city, and restoration of peatlands, mangroves, and swamps. Eligibility, quantification, and verification requirements are specific to each method. However, all projects must have co-benefits and meet financial additionality criteria, and only carbon removals/reductions beyond a reference scenario (i.e. business-as-usual) are considered for accreditation. Depending on the method, credits are issued before the actual carbon removal (after validation, based on the expected amount of carbon to be removed, e.g. by forestry) or afterwards (once verified, e.g. by hedgerows). Credits are sold through bilateral agreements at a negotiated price for voluntary offsetting and contribution claims (AiDA, 2025; Label Bas Carbone, 2025a, 2025b).

Notes:

1 Buildings must be large and use materials that store carbon for the duration of the building's life.

INCENTIVE NAME **European Union Carbon Removal Certification Framework (EU CRCF)**			
TYPE OF INCENTIVE	**TYPE OF REMOVAL**	**COUNTRY**	**CURRENT STATUS**
Domestic credit certification for the voluntary market + proposed indirect integration of DACCS and BioCCS into the EU ETS	Nature-based and engineered	European Union	Ongoing (registry from 2028; proposed BioCCS and DACCS in the EU ETS from 2031)

This EU-wide voluntary certification system for carbon removal projects covers three categories, each producing a specific type of unit: permanent carbon removal (DACCS, BioCCS, and biochar), carbon farming (agriculture and agroforestry on mineral soils, rewetting and restoration of peatlands and other organic soils, and afforestation[1]), and carbon storage in long-lasting products.[2] Activities must meet criteria for quantification, additionality, long-term storage, and sustainability. The operator must submit an application (accompanied by an activity and monitoring plan) to a Commission-recognised certification scheme; carry out the activity in

compliance with the relevant CRCF methodology; and undergo independent audits by an accredited certification body, after which the certification scheme issues the units. The units are then sold in the voluntary market, with the help of an emerging Buyers' Club that brings together buyers and suppliers. The units can only be used to meet EU climate objectives and NDCs[3] (Directorate-General for Climate Action, 2026; European Union Law, 2024; Regulation (EU) 2024/3012, 2024).

There is also a proposal to indirectly incorporate CRCF credits from BioCCS and DACCS into the EU ETS from 2031. The Commission would auction additional allowances and use the revenue to purchase (and retire) those credits (International Carbon Action Partnership, 2026b).

Notes:

1 Forest monocultures that are considered harmful for biodiversity are unlikely to meet eligibility criteria.

2 The methodology for carbon storage in long-lasting products is currently under development.

3 EU CRCF units cannot contribute to third-country NDCs and international compliance schemes (e.g. CORSIA).

INCENTIVE NAME
Act No 90/2003 on Income Tax: Deduction for Carbon Offsetting

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Tax lever	Nature-based and engineered	Iceland	Ongoing

Since 2021, businesses can deduct from their taxable income gifts and direct financial contributions to organisations running CDR projects. Eligible activities – most of which can also generate voluntary carbon credits – include afforestation, revegetation of wasteland and degraded land, stabilising and revegetating eroded sandy land, wetland and land-quality restoration, related activities like improved land use, and capture and disposal of GHGs (e.g. CO_2 injection into bedrock for mineralisation). Involved parties must not have any administrative control over each other, and individuals must not derive significant personal benefits. The deductible amount of the carbon offset is up to 1.5% of business income. A separate donation, also capped at 1.5%, can be made to non-profit afforestation and sandy-land revegetation projects under the public-benefit gift category. Deductions are self-reported without a public registry, and difficult to monitor at a national level (Carbon Gap, 2025a; Ministry of Finance and Economic Affairs, 2021; Reglugerð um frádrátt frá tekjum af atvinnurekstri eða sjálfstæðri starfsemi, 2021).

INCENTIVE NAME
US 45Q Tax Credit

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Tax lever	Engineered	USA	Ongoing

Section 45Q of the Internal Revenue Code is a US federal tax credit for carbon oxide (mostly CO_2) sequestration, enacted in 2008. Eligible project types include: (a) carbon capture at industrial or power-generation facilities with disposal in secure geological storage; (b) use of captured carbon

oxide as a tertiary injectant in enhanced oil or gas recovery (EOR) or other utilisation (e.g. as a manufacturing feedstock); and (c) direct air capture (DAC). Facilities must be in the United States, begin construction before 2033, meet minimum yearly emission capture rates,[1] and verify secure geological storage through a pre-defined reporting programme (Credit for Carbon Oxide Sequestration, 2021; Greenhouse Gas Reporting Program, 2026; Internal Revenue Service, 2025).

Income tax credits per tonne of carbon captured can be earned for a maximum of 12 years after a facility or equipment is placed in service. Before 2025, the USD value of the tax credit varied depending on end use (geological storage, EOR, or other utilisation). Facilities commissioned since then earn a fixed maximum amount of USD85 per tonne for industry and energy, and USD180 for DAC, adjusted for inflation after 2026. To earn the full credit, companies need to pay labourers at least the local prevailing wage and hire apprentices according to set requirements. The credits can be used to pay owed taxes, sold once to another company for cash at a negotiated price, or received as an elective direct payment for up to five years (12 years for tax-exempt organisations) (Carbon Capture Coalition, 2025; Credit for Carbon Oxide Sequestration, 2021; Internal Revenue Service, 2025, 2026).

Notes:

[1] For equipment placed in service after 2022 and construction beginning before 2033: 12,500 t/yr for industry; 18,750 t/yr with a minimum requirement to capture 75% of emissions for power generation; and 1,000 t/yr for DAC.

INCENTIVE NAME

Carbon Capture, Utilization, and Storage Investment Tax Credit (CCUS ITC)

TYPE OF INCENTIVE	TYPE OF REMOVAL	COUNTRY	CURRENT STATUS
Tax lever	Engineered	Canada	Ongoing

This is a federal tax credit refund for CCUS equipment. It is operational from 2022 to 2040 and administered by the Canada Revenue Agency and Natural Resources Canada. The credit is uncapped and estimated at CAD5.7bn in the first six years. It covers CCUS equipment for DAC, point-source capture (including BECCS), and transport, use, and storage of CO_2. Projects must operate for at least 20 years and direct >10% of the CO_2 captured to permanent storage in geological formations or in concrete. For the latter, 60% of the captured carbon must undergo mineralisation and meet an environmental management and technology verification. Canadian corporations (and their official partners) can claim a refund against tax owed for capital expenditure on equipment: 60% for DAC, 50% for other capture, and 37.5% for transport, storage, and use[1] until 2035, with refunds scheduled to halve after that.[2] If the claims surpass tax owed, companies receive the outstanding amount as payment. Although base operations can occur anywhere in Canada, geological carbon storage is limited to provinces with approved legislation and designation by the Ministry of the Environment (Alberta, British Columbia, Saskatchewan[3]). Projects claiming over CAD250m are required to contribute to public knowledge through a construction report and four annual operation reports (Canada Revenue Agency, 2024; Income Tax Act, 1985; International Energy Agency, 2026; Natural Resources Canada, 2023; Tossou et al., 2024).

Notes:

[1] There is a proposal to include enhanced oil recovery projects with a half-rate refund if 95% of the CO_2 used is permanently stored.

[2] Corporations need to pay prevailing wages and make efforts for 10% of work hours to be covered by registered apprentices. If these labour requirements are not met, the credit rate is lowered by 10%. If the requirements are claimed but not met, a 15% reduction is applied, or employees must receive top-up payments.

[3] Manitoba and Ontario have appropriate legislation, and Nova Scotia and Québec are developing theirs. Potentially, jurisdictions in the USA could also be designated.

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