Investment barriers to indigenous forest climate solutions

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Figure 1: The long-term goal of carbon-financed indigenous reforestation

Abstract

In a climate emergency, a country needs to do three things: 1) reduce carbon emissions, 2) enhance carbon removals, and 3) adapt to a changing climate. Forestry plays an important role in all three components of this agenda. Reducing deforestation and forest degradation will help to reduce emissions in land use, land-use change and the forestry sector (LULUCF), which according to the IPCC 5th Assessment Report (IPCC, 2014) is responsible for 20–25% of global greenhouse gas (GHG) emissions. Reforestation delivers carbon emission removals by LULUCF sinks. Permanent reforestation and continuous cover forest management are important components of building climate-resilient landscapes. The New Zealand Climate Change Commission (CCC) has promoted the use of exotic and indigenous forests in this country's climate action response agenda (CCC, 2021), emphasising the many biodiversity and climate resilience co-benefits delivered by indigenous forests.

The investment barriers to carbon-financed indigenous reforestation are plentiful. They include slow carbon credit production rates (and consequent low-carbon revenues), expensive forest establishment costs, bureaucratic delays, and now a government policy proposing to ban the use of exotic species in the permanent forest category of the New Zealand Emissions Trading Scheme (NZETS), including exotic species used to fund indigenous reforestation in private investment models. This paper explores these investment barriers through the lens of a climate emergency.

Slow carbon credit production

When developing a commercial venture that requires investment, the investor will rightly ask detailed questions about revenues and costs. In carbon-financed restorative reforestation, a key revenue component is the carbon credit yield curve. Projects smaller than 100 ha must use the Ministry for Primary Industries (MPI) Look-up Tables for carbon sequestration rates, which are the slowest and lowest of all forest types in the tables. Larger projects must measure the actual sequestration rates in the forest. Nationwide, publicly available data on indigenous forest carbon sequestration rates are sparse. Also, forest industry actors who use the Field Measurement Approach (FMA) for indigenous forest carbon accounting have found that measured growth rates of indigenous forests are commonly significantly

lower than the MPI Look-up Tables (David Janett, pers. comm., March 2022).

A recent report by Tane's Tree Trust and Pure Advantage (Kimberley et al., 2021) highlights new research indicating that well-managed indigenous planted forests can sequester carbon much faster than the MPI Look-up Tables suggest. Here, carbon sequestration rates for several indigenous species are 10 to 16.4 tonnes of CO_2 equivalent (tCO_2e) per hectare per year, as a mean annual increment over 50 years (Ibid). At the top end, this is comparable with the carbon sequestration rates delivered by exotic hardwoods.

These potentially high-carbon sequestration rates are (in theory) currently available for any project using the FMA to measure actual carbon sequestration rates. The challenge for carbon-financed indigenous reforestation business models is the lack of local data in different parts of the country where projects are being pursued. Validating potentially higher growth rates associated with certain management regimes requires nationwide trial data that does not currently exist. Carbon forestry that relies on new growth rate research that is not yet tested and proven throughout the country will not convince prudent investors to part with their money. Even if the carbon sequestration rates reported by Tane's Tree Trust are possible in other parts of the country, there is currently no way for an investor or project developer to undertake due diligence on this possibility. In the absence of local site-specific due diligence options, capital investment for such ventures is unlikely to be available at any meaningful scale.

One way of mitigating investment risk is to use well-established datasets available for exotic forests, combined with the lower cost and higher carbon sequestration rates delivered by them. If the purpose of the reforestation is to deliver permanent indigenous forest, a continuous cover exotic forest element can be used to lift the financial performance of the overall business model. This will enable the planting of more financially risky indigenous forest areas and the transitioning of the exotic forest to indigenous forest through time. In this way, the business model can reap the benefits of the reliable sprinters (exotic forests) to enable the commercial funding of the long-distance runners (indigenous forests). A continuous cover forest management regime can also include adaptive management to mitigate the risk of the indigenous forests sequestering carbon more slowly than projected. This adaptive management can enable the exotic forest element to be kept in the system longer (through harvest and replacing like tree species with like) to accommodate the slower-growing indigenous forest component, or to be kept in the system in perpetuity for the ongoing production of exotic wood fibre.

Continuous cover forest management is a standard form of forest management in many countries worldwide. For example, a recent survey concluded that between 22% and 30% of European forests are managed through continuous cover forestry (Mason et al., 2022). Silvicultural systems considered compatible with continuous cover forestry include single stem selection, group selection, irregular shelterwood, group shelterwood and uniform shelterwood (Ibid). Such adaptive continuous cover management regimes can include transitioning exotic forests to indigenous forests through harvest and replacement and supporting natural regeneration in canopy gaps. In some situations, exotic species can be used as a nursery crop for indigenous forest establishment.

In 2021, Te Uru Rākau commissioned a report entitled *Transitioning Exotic Plantations to Native Forest: A Report on the State of Knowledge* (Forbes & Norton, 2021). The Terms of Reference for this piece of research were very narrowly defined, seeking only 'the state of knowledge of how best to transition *non-harvest exotic forest* to indigenous forest' (Ibid, p.7, my emphasis). A more appropriate Terms of Reference for reviewing the potential to transition from exotic to indigenous forest would have included a review of domestic and international evidence for continuous cover management and its ability to transition from one forest type to another through time. For example, Wilson et al. (2021) document the transformation of Sitka spruce plantations to multi-species continuous cover forestry in Ireland. A review of continuous cover forestry could then draw upon the work of the New Zealand Farm Forestry Association, John Wardle's operation in Canterbury, the Government's work on indigenous continuous cover forestry in the 1990s, and the multitude of continuous cover forestry operations internationally.

The underlying point here is to validate exotic species as part of a management regime designed for indigenous forest restoration in the long term, but where the exotic component is used to generate revenue (and sometimes provide physical nursery crops) for the indigenous forest component.

Eligible area and bureaucratic delays

The economic viability of an indigenous forest carbon project depends on the carbon returns paying back the debt to plant the forest, covering operating costs for forest management including pest and weed control, and any opportunity costs for the landowner (e.g. giving up pastoral revenues on the same land). The ability to repay this debt depends on the carbon returns from the entire area that is planted. However, to get confirmation of the eligible carbon project area there are two options:

1. Submit an application for an 'Emissions Ruling' for a legally binding assessment of the land eligibility before planting (i.e. confirmation that the land was not 'forest land' as of 31 December 1989). This can take a year between the submission and receiving the ruling.
2. Plant the forest (because waiting a year is too long) and then submit an NZETS registration application and receive the ruling a year later.

When option 2 is pursued, it is common for MPI to rule that a significant proportion of the area planted is not eligible to register because the land is deemed to have been 'forest land' as of 31 December 1989. This is despite the project undertaking an NZETS eligibility assessment before planting that shows the boundaries of eligible and non-eligible areas using government aerial imagery datasets.

This means that the investor has planted and paid for the ineligible land but will not generate any returns from carbon credits. Also, MPI asserts that they generally accept 80% of applications as eligible carbon project areas. This is less problematic for the wood fibre industry because these investment models are focused primarily on wood fibre revenues with a carbon credit co-benefit. The loss of 20% of the carbon revenue from a wood fibre investment is not typically a deal-breaker.

However, for a carbon-financed indigenous reforestation project the loss of even 5% of the carbon revenues can cause a major problem because: 1) the indigenous reforestation investment uses carbon credits as the primary revenue stream in the first several decades, 2) the slow growth rates of indigenous forests generate a relatively low-carbon credit yield per hectare, and 3) establishing indigenous forest is considerably more expensive than exotic forest establishment. The financial consequence of these realities is that it is very difficult to make an investment model work and it requires a low cost of capital with little (or no) room for cost overruns or revenue reductions. The only option available to such projects is to not plant any forest, including not planting any exotic forest components to fund the indigenous component, until after an Emissions Ruling has been obtained.

The timeframe for such indigenous reforestation projects is worth noting:

- **Step 1:** An investor needs to know that the area planted is eligible to register in the NZETS, so an Emissions Ruling is required, which will take one year (year 1). Upon receiving the Emissions Ruling, the eligible area can be planted with confidence that 100% of what is planted will be included in project returns.
- **Step 2:** Placing a seedling order, but many indigenous seedlings must be ordered two years before planting. Place seedling order in year 2 for planting in year 4.
- **Step 3:** After planting the forest in year 4, the forest needs to be monitored for seedling survival early in year 5, and then later in year 5 seedlings that died in the first summer must be replaced (blanking). Once blanking is complete, the project can apply for registration late in year 5 (or early in year 5 if blanking is not needed). The NZETS application will usually take a year to be processed by MPI, meaning that the confirmation that carbon credit revenue flows will materialise is not received until year 6. It is also common for MPI to deem that part of the planted area is not eligible to register in the NZETS based on the NZETS registration application. This requires supplying additional supplementary information to prove that the forest has been planted correctly across all polygons.

This timeframe poses a major barrier to investment. This investment risk for indigenous reforestation projects was softened somewhat with the option of a 'preliminary assessment' of an NZETS registration application. Here, MPI would provide an initial ruling indicating whether there was sufficient evidence to support the application, and with an indication of the likely eligible area before high-resolution due diligence on eligibility. However, MPI removed this option in late 2021.

Carbon price

Another investment barrier to carbon-financed indigenous forest restoration has been a carbon price too low to cover project development and implementation costs. In 2015, the carbon price dropped to close to NZ$1/t$CO_2$e and then sat at around $25 from 2017 to 2020 ($25/tCO_2e is far from sufficient to cover indigenous reforestation project costs). During the latter part of 2021, the Government renewed its carbon price controls, lifting the price control ceiling to $70 in 2022 and then rising at around $8 annually to 2026.

This significant upward shift in the carbon price was good news for carbon-financed indigenous reforestation, but still insufficient to enable this reforestation to fund itself through carbon trading (unless the forest established naturally with low or no capital expenditure costs). Also, future changes in government may involve a reduction in the carbon price path as occurred in the past. As such, an investment model cannot rely on an assumption that the price path indicated by the current government price controls will endure without change across the investment period (e.g. 25 years) and the project period (e.g. 50–100 years). Note also that indigenous forests do not stop needing management even after 100 years (e.g. pest and weed control), which means that they need a source of revenue from a sustainable business model in perpetuity.

To remedy this problem, project developers can use exotic species to lift the financial and carbon sequestration performance of projects focused on indigenous forest restoration sufficient to gain access to private investment. Such an approach has been promoted by Mason and Enright (2021), and is the approach used by my own company, Ekos (Weaver, 2021) – a company I established to respond to the climate and biodiversity crisis. The Ekos approach allocates as many indigenous forest hectares as possible, including natural regeneration when it exists in the project area, and then allocates sufficient exotic hectares to lift the project's financial performance to the level required by an investor or landowner, and to support ongoing revenues for conservation management across the project period. Here some exotic forest areas are managed to produce timber and then transition to

productive or non-productive indigenous forests. Others are managed as continuous cover exotic forestry, depending on landowner preference.

This approach uses the stock change carbon accounting model applicable to the permanent forest category in the NZETS. By early 2022, this approach was beginning to work commercially and enabled restorative forest carbon programmes to be planned in collaboration with community organisations, catchment groups, carbon buyers, investors and some local government entities.

Then, in March 2022, the Government released a public discussion paper setting out possible reforms to the NZETS, proposing the prohibition of the use of exotic species in the Scheme's permanent forest category. These proposed reforms appear to be a knee-jerk reaction to calls for controls on 'plant and walk away' permanent carbon forestry that plants *Pinus radiata* and leaves it unmanaged. That this style of forest non-management was permitted in the NZETS is a product of government under-investment in NZETS forestry safeguards. The proposed prohibition of all exotic species from the permanent forest NZETS category threatens to replace one blunt instrument with another, creating a different type of collateral damage. Among other victims of this collateral damage are the private investments (i.e. funding that has not used taxpayers' money) in continuous cover indigenous forest restoration projects, which are now in limbo because of the regulatory uncertainty.

Climate resilience case study

One example of much-needed climate resilience measures is the need for the permanent reforestation of erosion-prone marginal pastoral land in the face of increasing intensities of extreme weather events like ex-tropical cyclones. To provide an example from one region, Hawke's Bay Regional Council wants to permanently reforest approximately 200,000 ha of steep erosion-prone lands to help that region cope with future climate change (Weaver, 2021). The cost to deliver this would vary, depending on what species were used in the reforestation effort.

Using the Hawke's Bay example, we can examine the potential costs and benefits of a government plan to ban the use of exotic species from the permanent forest category of the NZETS. This cost-benefit assessment compares what it would cost to reforest this entire 200,000 area in indigenous forest, using carbon credits to fund the reforestation, and what it would cost using exotic continuous cover forestry that transitions to 100% indigenous forest over 60 years. The carbon-financed reforestation assumptions for the exotics include a continuous cover 'harvest and replace' strip or group shelterwood model where the 'replace' element involves replanting in indigenous forest hectares. Here 10% of the exotic forest area is harvested and replanted with indigenous tree species in a five-yearly cycle starting in year 15. The carbon accounting includes harvest liabilities, harvest residues and the reduction in sequestration rates from the change from exotic canopy to indigenous replanting for each harvest/replant event.

For purposes of comparison only, the financial assumptions for both scenarios are presented in Table 1. Results of this cost-benefit analysis are shown in Table 2.

These results clearly show that using exotic species to fund a transition to indigenous forest using a continuous cover model for forest management clearly outperforms indigenous forest carbon projects. The continuous cover exotic forestry option delivers three times the carbon sequestration by 2030 at one-third of the cost of indigenous forest. For carbon-financed indigenous reforestation to work commercially on its own, it would need taxpayer subsidies of $2.5 billion per 100,000 ha planted, whereas continuous cover exotic forestry transitioning to 100% indigenous forest over 60 years needs no taxpayer subsidy.

Table 1: Financial assumptions for a comparison between an indigenous reforestation carbon project and a continuous cover exotic reforestation transitioning to indigenous forest carbon project

Fencing/tracking costs = $0	Interest rate on debt = 5%
Average land preparation costs = $845/ha	Investment period = 25 years
Indigenous tree planting density = 1,600 stems/ha	Cashflow period = 50 years
Average indigenous tree seedling price = $2.30	Average annual real carbon price increment = $4.75
Indigenous forest carbon sequestration rate = 120% of MPI Look-up Tables (to accommodate some of the higher growth rates claimed by Tane's Tree Trust)	Discount rate = 6%
Exotic planting density = 1,000 stems/ha	Carbon accounting method = stock change
Average exotic seedling price = $1 (to accommodate a range of exotic species)	Exotic management regime = continuous cover transitioning to indigenous forest through harvest and replacement described above
Exotic carbon sequestration rate = 100% of MPI Look-up Tables for 'other softwoods' (to be conservative)	

Table 2: Results of cost-benefit analysis – all monetary values are in NZ dollars and carbon credits are in tCO2e

200,000 ha reforestation for Hawke's Bay erosion control	Indigenous forest	Exotic forest transitioning to indigenous forest
Investment required	$3.2 billion	$1.1 billion
Starting carbon price required in 2023	$170	$78.40
Capital expenditure subsidy required	$2.1 billion	$0
Carbon price subsidy required	$2.9 billion	$0
Total subsidy required	$5.0 billion	$0
Carbon credit supply to 2030	5.76 million	15.4 million
Carbon credit supply to 2072	77.6 million	98.8 million

Perverse outcomes

The absence of forest management safeguards in the NZETS has led to the perverse outcome of 'plant and walk away' carbon forests and enabled short-term profit-taking while future management of these forests is uncertain. This has also led to the perception in rural New Zealand that 'carbon farming' is causing whole-farm conversions and the degradation of rural communities. This reaction against this type of legally sanctioned carbon-financed reforestation has tarred all exotic forestry, including commercial plantation forestry, with the same brush. Notably, types of forestry that are 'tarred' include: 1) efforts to cultivate a nature-based continuous cover exotic forestry sector, 2) the nature-based continuous cover management of exotics transitioning to permanent (unproductive) indigenous conservation forests, and 3) nature-based continuous cover management of exotic forest transitioning to continuous cover indigenous productive forests.

In the government discussion document proposing the banning of exotic species from the permanent category of the NZETS, MPI states that 'permanent exotic afforestation contributes less export earnings and fewer jobs to the economy' (MPI, 2022, p. 13). An independent report by PricewaterhouseCoopers Consulting (PWC, 2022) concluded that the local labour full-time equivalents (FTEs) per 1,000 ha were as follows:

- Permanent ('plant and walk away') carbon forestry = 2 FTEs/1,000 ha
- Sheep and beef farming on low-productivity land (i.e. equivalent land to continuous cover carbon farming) = 4.7 FTEs/1,000 ha
- Continuous cover transitioning from exotic to indigenous forests = 6.3 FTEs/1,000 ha.

In summary, the jobs per hectare for continuous cover exotic forests transitioning to indigenous forests (6.3 FTEs/1,000 ha) delivers more FTEs per 1,000 ha than sheep and beef farming on equivalent land (4.7 FTEs/1,000 ha). This study did not look at export earnings. However, when there is a wood fibre harvest component (as there is in continuous cover forestry), and if that wood fibre is exported, then export earnings can also be calculated.

If the Government decides to ban the use of exotic species in the permanent category of the NZETS it will reduce rural jobs on low-productivity land. If this ban is applied to existing exotic forest registering in the permanent post-1989 category of the NZETS, it will also cause all exotic forests already planted with continuous cover forestry management plans to be clearfelled. This is because the longer-term carbon credit cashflows that fund long-term continuous cover management will suddenly not be available under averaging. Instead, they will be restricted to a window of 12 to 22 years, depending on the forest type. This will force the forest management model to move away from continuous cover forest management to a clear-cut wood supply model (necessary to make good on the investment terms). This will lead to the clear-cutting of over 100,000 ha of exotic forests and 30–40 million tCO_2e emissions. These emissions are the opposite of what needs to happen in a climate emergency.

A climate policy approach aiming to maximise beneficial climate emergency response impacts should steer the climate change mitigation solution to maximise domestic climate change adaptation and resilience outcomes and minimise costs to the taxpayer. Perverse outcomes of a decision to ban exotic species from the permanent forest category of the NZETS include: 1) the undermining of the Government's national Emissions Reduction Plan, and 2) the additional cost to the taxpayer required in a pivot to an indigenous-only permanent forest NZETS strategy.

The UNEP Emissions Gap Report (UN Environment Programme, 2020) assessed the gap between: a) estimated future global GHG emissions if countries implement their climate mitigation pledges, and b) the global emissions levels from least-cost pathways aligned with achieving the Paris Agreement goals on global temperature. The emissions gap is the difference between where we are likely to be and where we need to be globally. In their words: 'Are we on track to bridging the gap? Absolutely not' (Ibid: XIV). Global GHG emissions have continued to grow in consecutive years, reaching 59.1 $GtCO_2e$ in 2019 (Ibid). In Aotearoa New Zealand, gross GHG emissions increased by 26% between 1990 and 2019 (MfE, 2021). The provisional emissions budget for the New Zealand Nationally Determined Contribution

(NDC) to the Paris Agreement is 571 million tCO_2e, but the domestic emissions budget for the 2021–2030 period is 672 million tCO_2e, leaving an emissions gap of 101 million tCO_2e. The Government proposes to close this emissions gap through offshore mitigation through the Internationally Transferrable Mitigation Outcomes (ITMO) provisions of Article 6 of the Paris Agreement.

According to the Climate Action Teams initiative (CAT, 2021), the Government will likely attempt to acquire this offshore mitigation at a lower price than the 2050 domestic marginal abatement cost of US$175/$tCO_2e$. Independent economic consultancy Infometrics (2022) calculated that banning exotics from the permanent category of the NZETS would transfer $35 billion offshore and take more than $64 billion out of the economy over 15 years.

The loss of high near-term carbon sequestration rates provided by nature-based continuous cover exotic forests transitioning to indigenous forests will either: 1) further raise the requirement for offshore mitigation, or 2) require the expansion of the permanent indigenous reforestation estate into productive farmland (against the interests of farming groups).

The earlier Hawke's Bay example (Table 2) shows that indigenous reforestation would (by 2030) underperform by 10 million tCO_2e compared with nature-based continuous cover exotics transitioning to indigenous forests, and cost an additional $2.5 billion in taxpayer funding per 100,000 ha planted. A 2030 emission removal target that used only indigenous reforestation would require approximately three times the land area of continuous cover exotic (transitioning to indigenous) forestry.

Notable is the need to deliver a climate emergency response against a backdrop of increasing pressures on taxpayer funds from a range of challenges, including a housing crisis, the COVID-19 response and recovery, a cost-of-living crisis, escalating fuel prices, a human resources crisis in the health and education sectors, under-resourcing of the police force amid growing demand for their services, and escalating costs from intensifying extreme weather events. The ordinary New Zealander needs an affordable climate action response – not a gold-plated one that would cause considerable additional hardship to the growing number of struggling families nationwide. A combined climate change mitigation and adaptation response involving a sensible middle path solution, which uses continuous cover exotic forestry transitioning to indigenous forest, would deliver a robust climate solution and cost the taxpayer nothing.

Market-based mechanisms for climate change action

When the scale of the global climate change mitigation and adaptation task is considered, there is simply insufficient finance at the disposal of the global public sector to meet this challenge (alongside all the other demands on taxpayer funds). For example, the OECD prices the climate-compatible delivery of the UN Sustainable Development Goals (SDGs) at US$6.9 trillion per year to 2030 (OECD, 2018). The World Bank estimates that the necessary global infrastructure investment for climate change solutions would cost US$90 trillion by 2030 (United Nations, n.d.). According to the UNEP Adaptation Gap Report (UNEP, 2016), the global cost of adapting to climate change will cost between US$140–300 billion per year by 2030 and rise to US$280–500 billion per year by 2050. On the upside, the Global Commission on the Economy and Climate (World Resources Institute, 2018) estimated that a low-carbon sustainable development pathway could deliver an economic windfall of US$26 trillion and create over 65 million new jobs by 2030.

It is a mathematical and financial certainty that insufficient funds are available for climate change mitigation and adaptation in the global public (taxpayer) sector. It is also a certainty that sufficient private sector funds are available to meet the global and domestic climate change challenge. This will necessitate redirecting a significant proportion of private sector investment into clean development. The global fund management industry is expected to manage US$145 trillion by 2025 (PWC, 2017). A significant proportion of these funds is currently invested in relatively liquid asset classes and they are therefore available to divest from carbon-intensive development and reinvest in climate change solutions.

However, there are important high-level investment barriers to overcome for clean development proponents, and key among these are financial risk and regulatory uncertainty. Clean development activities, such as indigenous forest restoration, usually carry more financial risk than traditional (less sustainable) development. This is because clean development often comprises technical and social innovations charged with inherent uncertainty because they are new activities without a long history of proven technical and financial performance (e.g. transitioning exotic forests to indigenous forests in a continuous cover forestry model). Such innovations may also lack support from institutions, laws and policies. Add low revenues, high costs, administrative barriers, and regulatory uncertainty to such investment classes, and access to capital markets at the scale required diminishes exponentially.

While private sector investment will be a necessary component of restorative forestry financing, it is also clear that this will require support by governments to help mitigate risk. One of the most important ways to reduce investment risk in restorative forestry for climate action is to avoid turning the domestic forest carbon market into a political football when an election is looming. For governments to support investment for climate action, the policy and regulatory goalposts need to be deeply rooted in cross-party agreements, clear and visible to all relevant sectors. As much as possible, they must remain unaltered to reduce uncertainty. This government support

Figure 2: The synergy between exotic and indigenous forests

allows the private sector to deliver beneficial public policy outcomes through financing models.

Included in the Government's proposed changes to the NZETS are possible new incentives for indigenous reforestation. If such incentives are part of a zero-sum game where exotic species are banned from the permanent forest category of the NZETS, they will need to be very expensive for the taxpayer and delivered in a manner that is compatible with private investment cycles. It is important to remember that this is about delivering climate change solutions at scale (i.e. hundreds of thousands of hectares with urgency) and not merely through small projects (e.g. 10 ha here, 40 ha there). To deliver at scale, there needs to be an industrial platform, and for an industrial platform to function, policy, legislation and investment settings need to be in alignment.

When business models for the agriculture sector were heavily integrated with government subsidies before the reforms of the 1980s, New Zealand was not a world leader in agricultural productivity and product quality. There was no incentive to do so. Subsidies disrupted the interaction of supply and demand, encouraged fertiliser use and land development that was decoupled from land productivity, and posed a barrier to comparative advantage. After subsidies were eliminated, the agricultural sector became more focused on identifying the most efficient ways to produce food. As a result, New Zealand became the agricultural world leader we are today.

The same needs to happen in the climate forestry sector. However, the way to get there is not to be 'species-ist' by saying what species can and cannot be planted (apart from excluding tree weed species). Landowners need flexibility and removing exotics from the permanent forest category of the NZETS removes this. Instead, the task is to focus on legal, policy and regulatory settings to ensure that the market delivers forest management regimes capable of safeguarding against perverse outcomes. This can be delivered through appropriate safeguards, including a requirement for a detailed forest management plan for any forest registered in the permanent forest category of the NZETS. The management plan could be required to deliver:

- A managed continuous cover forest – exotic or indigenous or both
- Fire mitigation, pest control and weed control for the project period
- Details of how an exotic forest area will be managed to deliver a continuous cover of either exotic or indigenous species in perpetuity
- Details of how trees are harvested and replanted
- Details of how and when any exotic forest would be transitioned to indigenous forest
- Details of how any losses of carbon stocks will be managed

- Details of how all management interventions will be financed in the business model.

Verification of adherence to the registered management plan could be delivered through an audit at the participant's cost by a registered forestry consultant.

If anything is needed from the taxpayer, it is strengthening nationwide indigenous and exotic forest sequestration datasets, supporting additional research on continuous cover exotic forestry (including transitioning from one forest type to another), supporting innovation and possibly catalytic capital. Supporting innovation can include providing government funding to fill knowledge gaps and trials of forestry options designed to test the ability to deliver core benefits while avoiding negative impacts. Catalytic capital is a form of impact investment support that can enable private capital to crowd into an investment sector. This can involve measures capable of lowering the commercial cost of capital to leverage private sector investment and enable increased benefits of continuous cover exotic and indigenous forestry.

Conclusion

A government that has declared a climate emergency needs to ask itself whether it has appropriately aligned government policy with innovation and investment, particularly when the private sector is needed to play a leading role in delivering solutions at scale. The investment barriers to carbon-financed nature-based continuous cover forestry are abundant, but the Government can solve most of them. This includes streamlining and speeding up the process of NZETS eligibility determination and NZETS registration, and providing additional exotic and indigenous nationwide forest sequestration datasets.

Continuous cover forestry has a long history internationally and a shorter one in Aotearoa New Zealand, and there is still a long way to go to refine this approach to forestry in this country. But it is in the nature of pioneering that new things need to happen using the best information and experience at hand, and then improve the quality of information through time. The internationally accepted approach to national-level and project-based carbon accounting uses this approach. Globally we are all compelled to build this low-carbon aeroplane while we fly it because a technologically advanced, low-carbon, climate-resilient and biodiverse economy has not been done before. The mind that argues that we need decades of proof of a low-carbon innovation before venturing to practice and refine it is not the mind of a climate emergency responder. We may not get everything perfect, but the perfect is the enemy of the good in a climate emergency, and the bigger risk is that we fail to move fast enough and continue sleepwalking deeper into the climate crisis.

For those who have answered the call to climate action and put their shoulder to the wagon of ambitious emissions removals capable of helping the nation meet its international climate change obligations, the Government's proposal to ban exotics from the permanent forest category of the NZETS landed as yet another major obstruction to private sector investment in climate change solutions at scale.

What we need most is a sensible middle path that uses that magical little word 'and' – where we use exotics and indigenous species in the permanent forest category of the NZETS. This can emerge from the recognition that the problem of 'plant and walk away' carbon farming with radiata pine was not caused by the species, but by the lack of a robust management regime for continuous cover forestry. This little word 'and' can enable continuous canopy forestry to increase rural employment on marginal land, ensure a future indigenous timber industry, and expand continuous canopy exotic forestry for low-carbon building materials and timber exports. This will enable us to deliver our emission removals without a massively costly redistribution of taxpayers' money from other important areas of public spending such as the COVID-19 response and recovery, solving the housing crisis, the cost-of-living crisis for struggling families, the human resources crisis in the health, education and policing sectors, and driving down carbon emissions in the transportation and agricultural sectors. The same little word can then get to work to enable the nation to meet our Paris Agreement and net zero carbon goals and develop climate-resilient rural landscapes.

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