Nature Carbon Programme

Restorative Forest Carbon Projects: Guidance Material for the Bay of Plenty Regional Council

June 2023

Quality information
Revision history

Version	Description	Date	Originator	Reviewers	Approver
2.0	Final	11 May 2023	Sean Weaver	Santiago Bermeo	Sean Weaver
Suggested bibliographic reference: Weaver, S.A., Hyland, A., May, R., Chand, N. 2023. Restorative forest carbon projects: Guidance material for the Bay of Plenty Regional Council. Report to the Bay of Plenty Regional Council, May 2023.					
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GLOSSARY OF TERMS

Term	Definition
Adverse events	Adverse events as including natural events such as windthrow, snow, flood, landslide or slip, drought, infection by disease, damage by pests and naturally caused fire (controlled burns becoming uncontrolled).
Appoint a representative	A form completed by the landowner to create an authorised representative for the project.
Averaging carbon accounting	A carbon accounting method under which carbon stock is measured an average for the long-term carbon storage of a forest land. With averaging accounting, you earn units until your forest reaches a certain age. You can then harvest your forest without having to pay units, as long as you replant.
Business case	Business case is a modelling different planting scenarios to help inform the landowner about the financial profile of the different scenarios in a discounted cash flow analysis.
CAA	Carbon Accounting Area.
Capital expenditure	Capital expenditures are expanses used to acquire or upgrade assets or equipment or establishing forest.
Carbon Accounting Area	Polygon that meets the NZETS requirements for Carbon Accounting Areas (CAAs). Minimum of 1 ha of land that meets the forest definition of the NZETS.
Carbon credit	Carbon credit represents a unit of carbon dioxide equivalent or CO_2e. This is a financial instrument that can be bought and sold.
Carbon registry	Carbon registry is like a bank where carbon units are hold and Carbon units' transactions are recorded.
Carbon stock	The tonnes of CO_2 equivalent stored in your forest.
Carbon yield	Carbon produced over time.
Clear felling	Clear felling is harvesting or other clearing that leaves less than 30% tree crown cover in any hectare.
Commitment period	The period covered by the mandatory emission return period.
Continuous cover forestry	Silvicultural systems that retain the forest canopy at one or more levels without clear felling are generally classed as continuous cover forestry systems.
Discounted cash flow	Discounted cash flow refers to a valuation method that estimates the value of an investment using its expected future cash flows.
Exotic hardwood	A class of exotic forest species that are gymnosperms or which have no fruits or flowers (e.g., trees with pine needles).
Exotic softwood	A class of exotic forest species that are angiosperm or flowering plant (e.g., leafy trees like poplar, oak, alder, eucalypt).
Field Measurement Approach	Mandatory methodology for direct measurement of forest carbon stock change.
FMA	Field Measurement Approach.
Forest Land	A land is called forest land if it covers at least 1 hectare in area, contains species that can reach at least 5 metres in height when mature in that location, have a crown cover of more than 30% in each hectare and be at least 30 metres across on average.
Free, Prior and Informed Consent (FPIC)	Free, prior, and informed consent (FPIC) is a set of guidelines operated by the Food and Agriculture Organization (FAO) to safeguard landowners and local communities (including indigenous peoples) in relation to economic development on their land.

Harvest liability	Harvest liability is a type of accountability you pay/surrender for harvesting a pre-1990 forest or ETS registered post 1989 forest.
Internal rate of return	The internal rate of return (IRR) is a metric used in financial analysis to estimate the profitability of potential investments. IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero in a discounted cash flow analysis.
Intrinsic value	A measure of what an asset is worth.
Land Use and Carbon Analysis System	A system of land use change reporting system designed to enable New Zealand to meet its reporting and accounting obligations to the United Nations Framework on Climate Change. Under LUCAS land use changes for the time periods 1990-2008, 2008-2012, and 2012-2016 has been tracked. The LUCAS is also used in the NZETS for defining land use types in the NZETS.
LUCAS	Land Use and Carbon Analysis System.
Mandatory Emissions Return	Emissions return that must be submitted to MPI by specified deadlines. These deadlines are typically 5-yearly (with some exceptions (e.g., relating to changes in international carbon accounting regimes)
MER	Mandatory Emissions Return.
MPI	Ministry for Primary Industries.
Net present value	Net present value, is how much an investment is worth throughout its lifetime, discounted to today's value.
New Zealand Units	Carbon credit unit issued by the New Zealand Emissions Trading Scheme.
NZETS	New Zealand Emissions Trading Scheme.
NZETS eligibility assessment	NZETS eligibility assessment is desktop assessment to identify land use classes based on Land Use and Carbon Analysis System.
NZU	New Zealand Units – the carbon credit type.
Operational expenditure	Operational expenditures are the expanses incurs through its normal business operations.
Opportunity cost	Opportunity cost is a forgone benefits that would have been acquired from the options not chosen.
Permanent Forest	Permanent forest is part the NZETS. Permanent forest is post-1989 forests that will not be clear-felled. That must remain in permanent forestry for at least 50 years.
Permanent Forest Sink Initiative	The 'Permanent Forest Sink Initiative' was the term used for Permanent Forest before 1 January 2023.
PFSI	Permanent Forest Sink Initiative
Planting density	Planting density is number of plants planted in one hectare of land.
Post-1989 forest land	Land which meets the forest land definition is considered post-1989 if it was established after 31 December 1989.
Pre-1990 Forest land	Pre-1990 forest land is a kind of land covered by the rules of the Emissions Trading Scheme (ETS). A forest land is called pre-1990 forest land if the land was forest land on 31 December 1989 (native or exotic forest species), and the land was forest land on 31 December 2007 and contained mostly exotic tree species. Also, it must meet the "forest land" definition.
Provisional Emissions Return	Emissions returns submitted to MPI in years in between Mandatory Emissions Returns. This type of return was previously known as a "Voluntary Emissions Return".
Silviculture system	A planned program of treatment during a forest stand's life cycle.

Stock change carbon accounting	A carbon accounting method under which carbon stock is measured at specific times and amount carbon stock is submitted to MPI.
Sub areas	Areas of forest with the same attributes are known as "sub-areas". When trees with the same characteristics were cleared at the same time, those areas also form a sub-area. Each sub-area must be at least a hectare in size.
Vegetation assessment	Vegetation assessment is an evaluation of age and species types of a vegetation on the project land.
VER	Voluntary Emissions Return
Voluntary Emissions Return	Emissions returns submitted to MPI in years in between Mandatory Emissions Returns. From 1 January 2023, the voluntary Emissions Return is known Provisional Emissions Return.

1 Introduction to the NZETS

The New Zealand Emissions Trading Scheme (NZETS) is a government tool that puts a monetary unit price on each tonne of carbon emitted. Businesses who generate emissions must buy these units to offset their emissions. Only a limited number of units is supplied by the government each year so that businesses are encouraged to come up with ways to emit less (e.g., switching a coal boiler to electric). Foresters and landowners who plant trees that sequester carbon are given units by the government to sell.

The Ministry for Primary Industries describes the NZETS as below.

- *The Emissions Trading Scheme (NZETS) was designed to:*
- *create incentives to reduce our greenhouse gas emissions in New Zealand*
- *help us meet international obligations under climate-change treaties like the Paris Agreement and the Kyoto Protocol.*

Forestry is one of the sectors covered by the NZETS. The NZETS encourages new forests to be planted, and older forests to be replaced if they are ever cut down.

The NZETS enables landowners to fund forest conservation through the creation and sale of carbon credits. The specific type of carbon credits issued in the NZETS are called New Zealand Units (NZUs). Sale of NZUs can be used to fund forest conservation such as forest establishment and on-going management such as pest and weed control, by replacing revenue lost when forests are planted. NZUs are created by establishing permanent forests.

There are six main options for permanent forest establishment including:

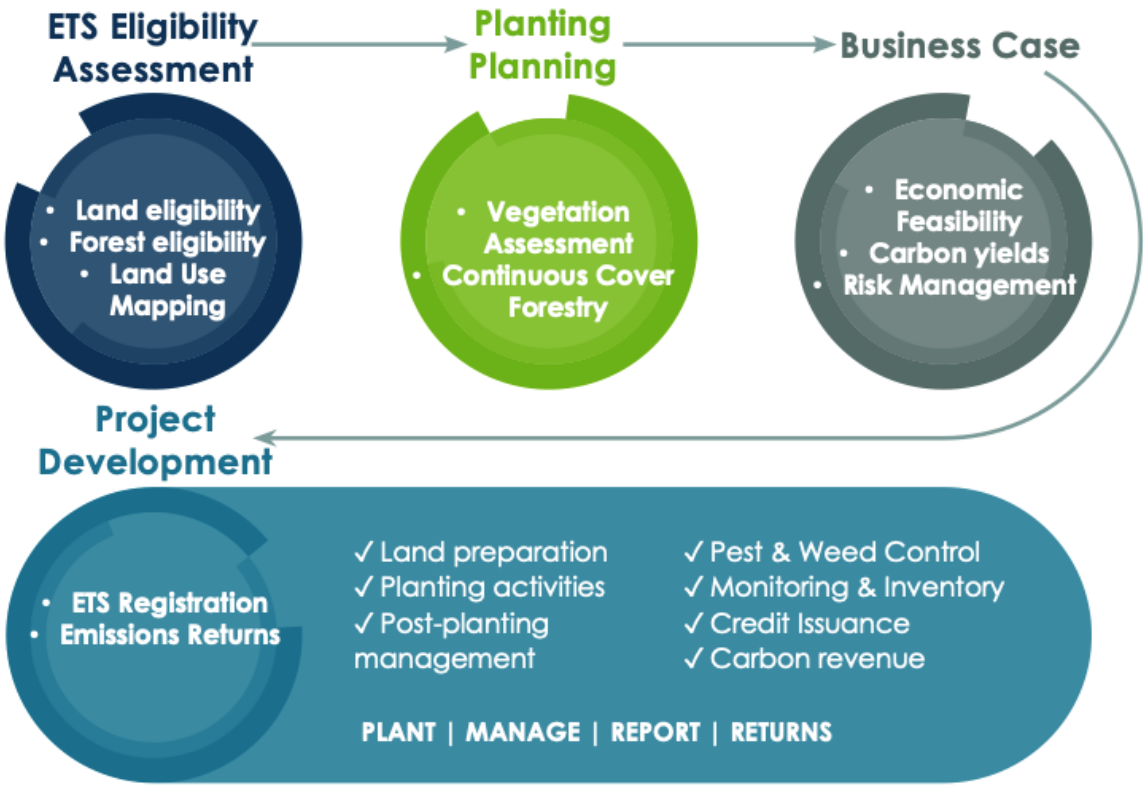
1. Natural regeneration.
2. Native reforestation.
3. A mix of native and exotic planting.
4. Exotic reforestation transitioning to native forest over time.
5. Exotic reforestation managed as continuous cover forestry.
6. Exotic reforestation left unmanaged (permitted by the NZETS but not supported by Ekos).

2 How Do Landowners Participate in the NZETS?

2.1 PROJECT CYCLE

As a landowner participant in the NZETS the first step to take is assessing the area of interest for land and forest eligibility. If the area of interest includes native regeneration it is likely that a field vegetation assessment will need to be carried out to further assess eligibility. Site visits like these can help with the planting planning process. A business case is valuable for a high-level analysis of different planting scenarios to understand the best options for you to take in terms of environmental and financial outcomes, leading to a great first step in forest carbon project development.

FIGURE 1. ACTIVITIES INVOLVED IN NZETS REGISTRATION AND PROJECT DEVELOPMENT



2.2 NZETS ELIGIBILITY

Registering a project in the NZETS necessitates meeting the eligibility requirements for NZETS registration. There are two main components to project eligibility under the NZETS:

1. Potential land eligibility – is the land classified as post-1989 land (i.e., was this land classified as non-forest land as of 31 December 1989)?
2. Forest eligibility – does the forest on the eligible land meet the 'forest land' definition in the NZETS?

2.2.1 Potential Land Eligibility

The first consideration for NZETS land eligibility is whether the land parcels are deemed (by the Ministry for Primary Industries) to have been 'forest-land' or 'non-forest land' as of 31 December 1989. Land deemed as 'forest-land' as of 31 December 1989 is not eligible for registration under the NZETS. Land that was not classified as 'forest land' as of 31 December 1989 is classed as 'post-1989 land' in the NZETS. To register land in the NZETS, however, it must also meet the 'forest land' definition at the time of registration (see the section on Forest Eligibility below).

A key resource in the determination of land eligibility in the NZETS is the Land Use and Carbon Analysis System (LUCAS). The LUCAS system defines a series of land classifications for the status of the land as of 31 December 1989. Irrespective of what vegetation is on the land now, the LUCAS classification will focus only on the status of the land on 31 December 1989.

Land categories in the LUCAS system relevant to NZETS project development are:

LUCAS land classes	Eligible	NZETS Activity	Remarks
Grassland – high producing	Yes	Afforestation	Straightforward afforestation
Grassland – low producing	Yes	Afforestation	Straightforward afforestation
Grassland – with woody biomass	Possible	Afforestation Natural regeneration	Requires vegetation age assessment
Natural forest	Possible	Natural regeneration	Requires vegetation age assessment
Post 1989 forest	Possible	Natural regeneration	Requires vegetation age assessment
Planted Forest – Pre 1990	No		

While final determination of eligibility to register in the NZETS will be decided upon by MPI, there are at least two land classes in the LUCAS system that remain ambiguous as to their eligibility. These include:

1. Grassland – with woody biomass.
2. Natural forest.

Both of these LUCAS land classes may be eligible to register in the NZETS or not, depending on:

- The age of the woody vegetation.
- The density of tree species present sufficient to meet the forest definition.

For example, a vegetation age assessment will sometimes provide evidence that land classified in the LUCAS system as 'Natural forest' or 'Grassland – with woody biomass' is eligible to register in the NZETS.

Also, a vegetation assessment of land classified as 'Grassland – with woody biomass' may prove that the land is post-1989 land and that there is a sufficient density of tree species already present (e.g., seedlings beneath gorse) to meet the 'forest land' definition in the NZETS (see below).

The LUCAS dataset and associated desktop NZETS eligibility assessments are not 100% conclusive about NZETS eligibility decisions by MPI. MPI will often assert that areas that are shown as eligible in the LUCAS system end up being classified by MPI as ineligible to register in the NZETS. This is why vegetation age assessments are often needed to provide high-resolution, site-specific data to support an eligibility assertion.

2.2.2 Forest Eligibility

Of the post-1989 land that is potentially eligible for NZETS registration, the next consideration is whether the land meets the 'forest land' definition in the NZETS at the time of NZETS registration.

The two main activity types for NZETS projects are:

- Afforestation (people do the planting).
- Natural regeneration (nature does the planting).

The ‘forest land’ definition in the NZETS requires the land to have the following attributes:

- Minimum of 1ha of contiguous forest.
- Minimum average width of 30m across each hectare.
- Minimum of 30% crown coverage at maturity.
- Woody vegetation containing tree species capable of reaching a minimum of 5m in height at this location.

2.2.3 MPI Decision

Any NZETS eligibility assessment by a project or consultant to a project uses government-supplied data together with any additional data/evidence supplied by the client. Final NZETS eligibility is determined by the Ministry for Primary Industries in response to an application to register a site in the NZETS.

The Ministry for Primary Industries may use their own data not available to the public to make its ruling on NZETS eligibility for any given site. If in any case they deem an area ineligible that the project proponent believes is eligible, a project can then make a counter-assertion by supplying additional data to MPI for (eventually) a final NZETS eligibility ruling.

2.2.4 Example of NZETS Eligibility Assessment

Ekos undertook NZETS eligibility assessments for four sites provided by the Bay of Plenty Regional Council. An example from one of those sites (Papamoa) is provided in Figure 2 below.

FIGURE 2. NZETS ELIGIBILITY MAP (PAPAMOA) USING LUCAS DATA

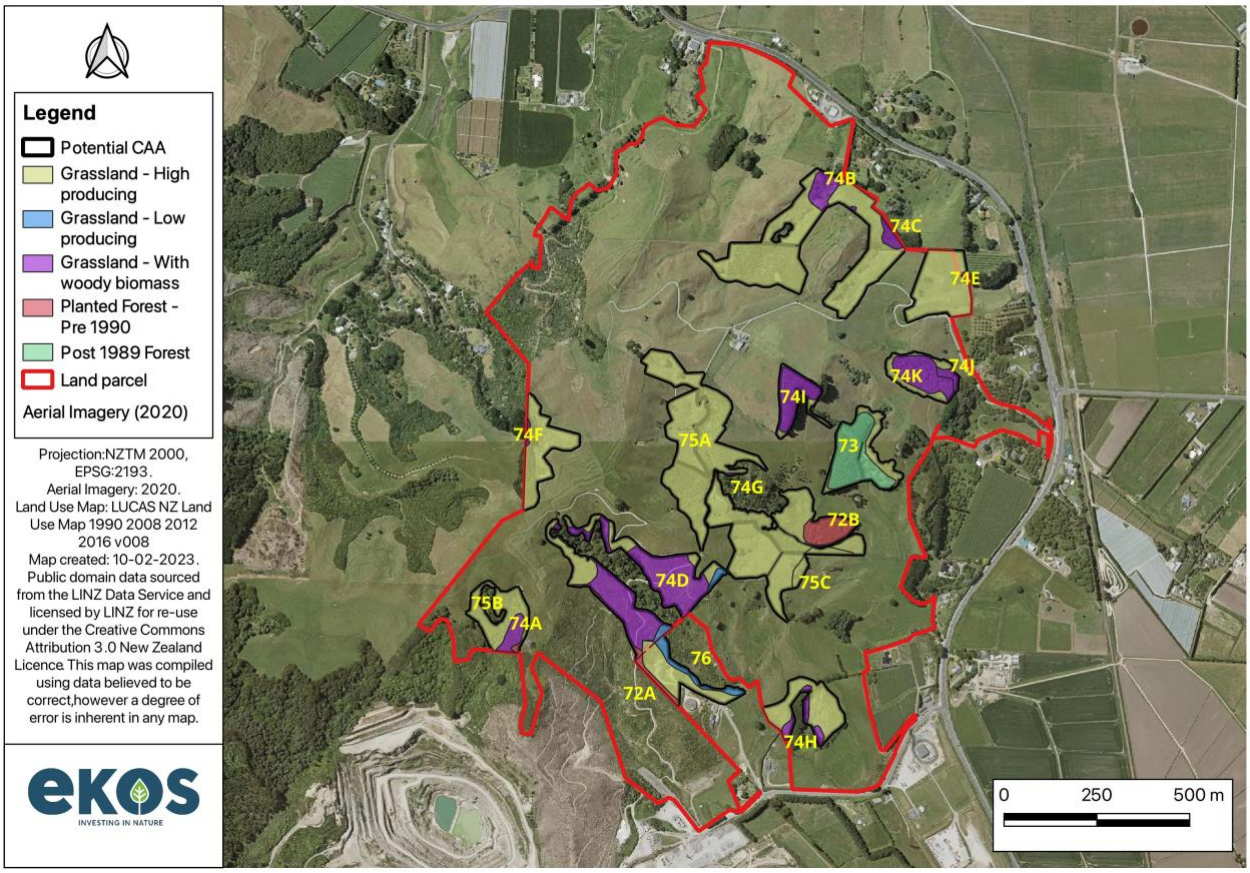
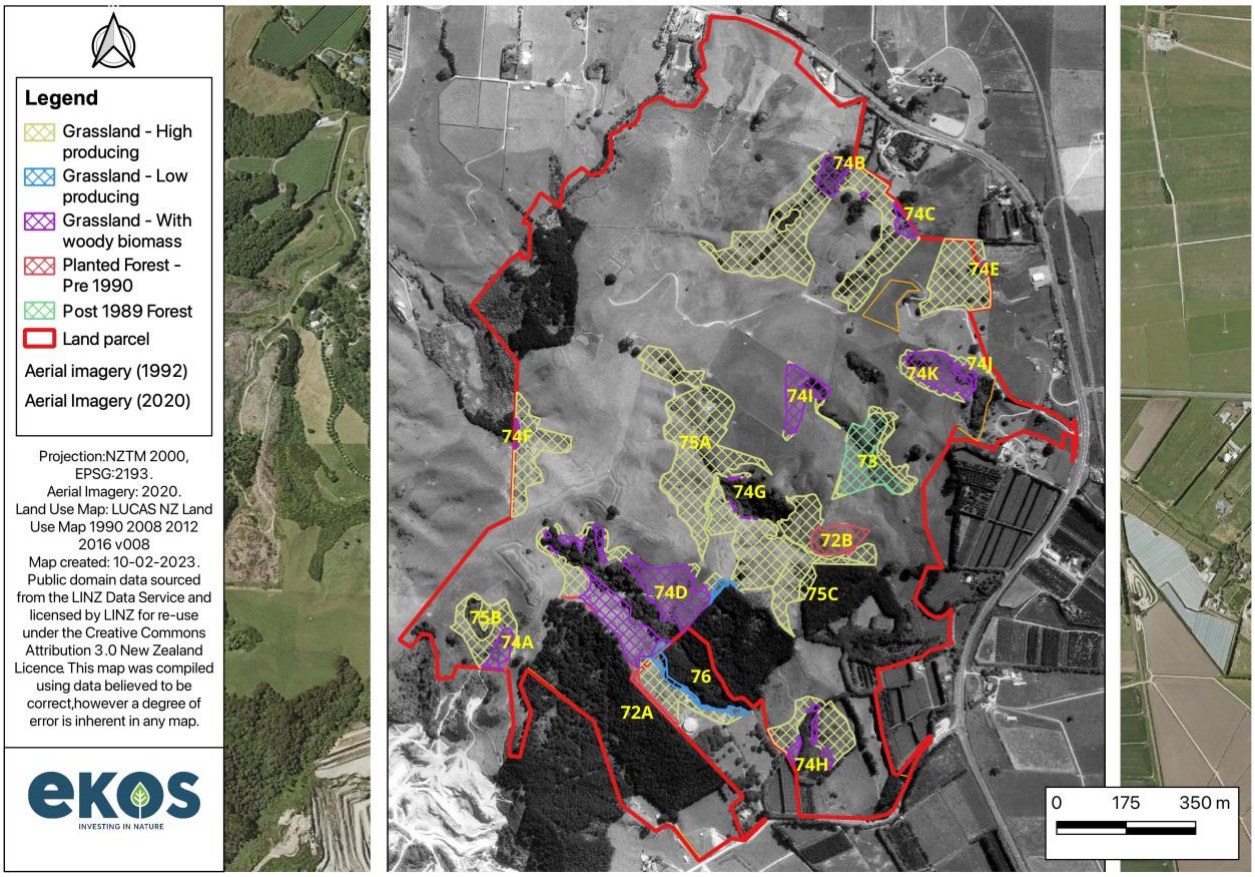


FIGURE 3. NZETS ELIGIBILITY MAP (PAPAMOA) USING 1992 AERIAL IMAGERY



2.3 CARBON ACCOUNTING METHODS

From 1 January 2023, two new methods of carbon accounting became available. These are:

- Permanent Forest.
- Averaging accounting.

The pre-2023 stock change method accounts for annual and/or 5-yearly changes in carbon storage. Using this method carbon units are earned as a forest grows and carbon units must be surrendered or deducted from the carbon gains when it is cleared.

Under averaging accounting, carbon units are earned based on the long-term amount of carbon a forest is expected to store. This is based on the average amount of carbon stored for many rotations. Averaging is best suited to those stands that are most likely to be clear-cut.

Forests that were approved and in the NZETS under the stock change system prior to 1st January 2023 will have the option of transferring to either of the two new systems or staying in stock change system. Forests that are approved and entered in the NZETS after 31st December 2022 must decide whether to enter under the Averaging category or the Permanent Forest category.

2.4 PERMANENT FOREST IN THE NZETS

On 1 January 2023, a category of forest called “permanent forest” became available for post-1989 forest land in the NZETS. This replaced the Permanent Forest Sink Initiative (PFSI). Permanent forest in the NZETS is for

post-1989 forest land that won't be clear-felled[1]. Clear felling and deforestation are restricted activities under the permanent forestry category. According to the MPI rule, limited clearing of permanent forests is allowed, but after the clearance, at least 30% of tree crown cover must remain in each hectare of forest. Emissions from the clearance must be accounted for. At the time of writing, MPI was still consulting over the development of specific rules for how to account for this limited clearance, using the MPI Lookup tables or the Field Measurement Approach (FMA).

At the time of writing the government had announced a review of the Permanent Category in the NZETS. As such, changes to this category for forest carbon project development may occur in the future.

2.5 DEFORESTATION: DEFINITION AND OBLIGATIONS UNDER THE NZETS

Deforestation incurs carbon liabilities under NZETS. To avoid carbon liabilities, it is necessary to identify an appropriate silvicultural system that avoids these liabilities. This is particularly relevant to continuous cover forestry methods when using exotic species in the permanent category of the NZETS. Exotic species may be included in the planting preferences for some landowners, either because they want to include an exotic woodlot, or because they want to use the high carbon sequestration rates of an exotic woodlot to help fund native reforestation in another part of the project.

In New Zealand, deforestation is defined as the conversion of forest land to non-forest land. However, forest land is not considered deforestation if the land meets the following criteria[2].

4 years after clearing, the hectare must have:

- Been replanted with at least 500 stems per hectare of forest species; or
- Been planted with at least 100 stems per hectare of willow or poplars in a manner consistent with managing soil erosion.

Alternatively, the hectare must have:

- Regenerated a cover of at least 500 stems per hectare of exotic species.
- Regenerated native species growing in a way the hectare is likely to be forest land 10 years after it was cleared.

10 years after clearing:

- Predominantly exotic forest species are growing, and that hectare must have a tree crown coverage of at least 30 percent from trees that have reached 5 metres in height: or
- Predominantly native forest species are growing, and the hectare is forest land.

20 years after clearing:

- Predominantly native forest species are growing, and that hectare must have tree crown cover of at least 30 percent from trees that have reached 5 metres in height.

[1] "Clear-felling" is harvesting or other clearing that leaves less than 30% tree crown cover in any hectare.

[2] https://www.mpi.govt.nz/forestry/forestry-in-the-emissions-trading-scheme/deforesting-and-the-ets/deforesting-forest-land/

2.5.1 Liabilities in pre-1990 forest

Under the rules of the Emissions Trading Scheme (ETS) you are liable for the GHG emissions produced from any deforestation of pre-1990 forest land (unless exempt). Even if you have not registered as a participant into the ETS, this applies. Please click for further information on deforestation liabilities and exemptions.

2.5.2 Liabilities in post-1989 forest

This type of deforestation liability occurs when you register post-1989 forest in the ETS after harvesting. The liability from harvesting is repaid by waiting to receive carbon credits. The time you must wait to receive credits is equal to the time it takes for the carbon to accumulate above the level lost due to harvesting.

The alternative approach is to register in the ETS prior to harvesting, which would then require you to pay the deforestation liability by surrendering carbon credits immediately.

2.5.3 What is Clearing?

According to Ministry for Primary Industries (MPI) 'clearing' includes the felling, harvesting, burning, removing by mechanical means, and spraying with herbicide intended to kill the trees. Clearing also includes the felling, burning, killing, uprooting, or destroying by natural causes or events. Clearing does not, however, include pruning and thinning[3].

2.6 CARBON ACCOUNTING AREAS AND SUB-AREAS

According to the NZETS rule, post-1989 forest land must be mapped into different carbon accounting areas to register for the NZETS. A CAA is an area of forest land that is used for calculating carbon gains and losses. Carbon gains or losses are based on changes in the carbon stock of each CAA. Each CAA must be at least 1 hectare. It is easier to account for carbon gains and losses if a CAA contains the same species type and same age trees. However, in a situation where there is a mix of species types (e.g., mixed hardwood and softwood), the carbon accounting must be based on the species type with the greatest basal area per hectare. In situations where there are distinct areas of species type and age, it is best to make them separate CAAs.

In the NZETS, areas of forest with the same attributes are known as "sub-areas". A CAA could have sub-areas if the CAA is composed of different species types and ages say after harvesting a portion of the CAA. The amount of carbon stored in a CAA is the sum of the carbon stored in its sub-areas. Emission returns are filed on a CAA basis, but carbon stock calculations are on a sub-area basis[4]. A sub-area is:

- at least one hectare.
- has been subject to different management at a different time than the remainder of the CAA.
- composed of forest species of same age and same species type.
- In a single carbon look-up table or regional table (if the forest type is *Pinus radiata*).

MPI states that when an emissions return is prepared for post -1989 forest land for a certain period, the NZETS participant must calculate the amount of carbon in the forest land at the beginning and the end of this period. In that case, the sub-areas may be different for these two sets of calculations. This is because any clearing or planting that is done during the emissions return period changes the characteristics of the forest.

[3] https://www.legislation.govt.nz/act/public/2002/0040/latest/DLM158592.html

[4]https://www.mpi.govt.nz/forestry/forestry-in-the-emissions-trading-scheme/mapping-and-managing-forest-land-in-the-ets/choosing-and-mapping-carbon-accounting-areas-in-the-ets/

2.7 FOREST AREA THRESHOLDS IN THE NZETS

2.7.1 Less Than 100 ha

All continuous cover systems can be applied under the NZETS rules in principle. However, in some situations, the clear strip or patch system may not be eligible as a silvicultural system under the Permanent Forest category if the canopy opening is too large to meet the 'forest land' definition (e.g., where the canopy opening causes a hectare to not have a minimum of 30% canopy cover of tree species).

However, as long as each hectare of land leaves more than 30% tree crown cover all the time, it is not called "clearance". Hence, any size of strip or patch felling is allowable for each hectare as long as at least 30% crown cover is maintained on each hectare. Likewise, all variants of the shelterwood system and single tree selection system can be used provided that at least 30% crown cover is retained. The choice of silvicultural system depends on the landscape characteristics such as slope, aspect, and potential risk of erosion and natural hazards such as wind, fire, insects, and diseases (Kerr 1999) and the management objectives.

Emission returns are submitted in mandatory (MER) and voluntary (VER) returns. MERs must be submitted at least once in every emission return period (usually five years) and VERs can be submitted every other year. According to the NZETS rules, any clearing in a CAA undertaken in a Commitment Period and the corresponding carbon emissions must be reported to MPI when mandatory emissions returns are submitted. When mandatory emissions returns are reported, the NZETS participant must declare if the CAA is cleared. There is, however, no provision for NZETS reporting if a sub-area of the CAA is cleared. Similarly, only an increase or decrease in carbon stock in a CAA must be reported when voluntary reporting is undertaken and there is no provision for cleared area reporting. In both situations of reporting, an NZETS participant must report carbon stock loss due to clearing but there is no provision for reporting the amount of clearing.

According to Climate Change (Forestry Sector) Regulations 2008, the size of a sub-area is one or more hectares and emissions returns are filed on a CAA basis, but carbon calculations must be based on sub-areas. This means that activities that influence carbon stocks occurring within the sub-area must be reported if the size of the sub-area is equal to or greater than one hectare. However, the regulation is silent on how carbon gains or losses are to be calculated if the size of the strip or patch clearance is less than one hectare.

If the forest land area is less than 100 ha, no Field Measurement Approach (FMA) is required. The carbon stock is estimated using default carbon stock tables provided in the MPI Regulations (MPI Lookup Tables).

2.7.2 More Than 100 ha

If the total area of post-1989 forest land owned by a person or entity and registered in the Emission Trading Scheme is more than 100 ha, the NZETS participant must use the Field Measurement Approach to calculate forest carbon stocks. It is important to note that this total area can be non-contiguous and is based on land ownership. The FMA uses information collected about the forest to create participant-specific tables and then applies these tables to calculate the carbon stock of the forest. Under FMA, MPI provides locations of the sample plots based on the species type and area of the forest. In each plot, information related to stand structure - the number of trees, tree diameter, and height - are collected and submitted to MPI for creating a carbon stock table.

Forest inventory using the FMA approach must be conducted once in each mandatory emissions return period and just prior to the end of a Commitment Period (unless exempted). The number and location of the sample plots remain the same over successive surveys unless change in forest size. Whenever new forest land is added or removed from the existing forest land, the participant is required to inform the MPI, and new sample plots will be allocated from the MPI. Clearing of forest land for native conversion does not constitute clearance and so the location and number of sample plots remain the same.

In the situation when a part of CAA is cleared for native conversion, the carbon stock change due to clearing must be accounted for when mandatory and voluntary emissions returns are submitted to MPI. Again, even if a part of the CAA is cleared 30% canopy cover must be maintained in each hectare to avoid liabilities.

When a part of CAA is cleared for native conversion, clearing can occur fully or partially on the FMA plots. If that happens the Participant-specific carbon stock table will change and result in a reduction in the carbon stock per hectare. However, in lodging a VER during a Commitment Period, the forest owner (or their representative/agent) must use the most recent Participant-specific Table for calculating carbon gains and losses.

2.8 VEGETATION ASSESSMENTS FOR EXISTING NATIVE REGENERATION

A vegetation assessment is only necessary to assess eligibility of the vegetation on the project land if the age and species cannot be distinguished via aerial and historical imagery or from planting records (or both). It is essential to undertake a vegetation assessment under these circumstances to provide strong evidence of forest species and age alongside the MPI registration. This is particularly relevant to increasing the probability of gaining MPI approval of an application to register existing forest in the NZETS – particularly for naturally regenerating native forest.

A vegetation assessment is a field inventory to gather local vegetation type and age data sufficient to provide evidence to support an application to register land in the NZETS. The costs of vegetation assessments vary depending on the vegetation and the level of evidence both parties (landowner and Ekos) believe is necessary to convince MPI of the actual vegetation type and age.

A vegetation assessment addresses the following:

a) Whether the land meets the forest definition of the NZETS whereby the vegetation consists of forest species[5] occurring at a sufficient density (stems per ha) and that established after 31 December 1989. An example of this situation is land covered with gorse, but which may have native tree seedlings throughout.
b) The age of different parcels of eligible vegetation to enable mapping to delimit each age-class of regenerating vegetation. An example of this situation is land covered in different patches of native forest where some patches are different ages than other patches (e.g., older vegetation in gullies and younger vegetation on ridges).

The data gathered locally is used to 'ground truth' aerial imagery textures for mapping purposes. The data can be collected by Ekos, or by the landowner, or other third party using Ekos field methodologies. Note that the NZETS does not provide a required field methodology for vegetation assessments which is why Ekos has developed our own vegetation assessment methodology.

Alternatively, if documents such as land management records, burning permits, scrub cutting, weed spray, planting records, or any other relevant documentation are available that demonstrates the vegetation was established after 1989, the project can apply for NZETS registration without a vegetation assessment.

[5] A plant is considered forest species if that plant can reach 5 meters in height in that location at maturity (does not include trees grown primarily for fruit or nuts, gorse, broom, or native shrubs).

2.9 NZETS REGISTRATION AND RETURNS

2.9.1 Registration

Once your land has been deemed 'eligible' under section 2.1, the next step is to map the carbon accounting areas (CAA's), compile the evidence and then register your property along with submission documents.

The key parts to an NZETS registration are:

1. Mandatory: CAA map (shapefile) – uploaded at submission.
2. Optional: Evidence report – uploaded at submission.
3. Optional: 'Appoint a representative' form completed by the landowner - approved by MPI before submission.

It is important to understand that the final decision on NZETS eligibility is made by the Ministry for Primary Industries (MPI) upon an NZETS registration application. This application will only be accepted by MPI after a forest has been established on the land in question.

Ekos offer a service to help landowners register their properties into the NZETS on their behalf.

2.9.2 Emissions Returns

Once registered as a participant in the NZETS you need to submit routinely emissions returns. Emissions returns are a form of reporting regarding the changes in the carbon being sequestered in post-1989 forest land over time. It records the number of NZU's you earn or must surrender (pay) in certain time periods. Calculating emissions returns can be complex, Ekos offers a service that calculates your emissions returns for you and submits them on your behalf. See below the two types of emissions returns.

Mandatory ER

Mandatory emissions returns are required as a participant of the NZETS and must be submitted in line with MPI's schedule below for post-1989 forest land.

Provisional ER (optional)

Provisional emissions returns are optional and can be completed during a mandatory emissions return after the end of each calendar year.

TABLE 1. MANDATORY EMISSIONS RETURNS (MER) SUBMISSION DATES FOR EACH MER PERIOD

Period covered by MERP	When to submit an emissions return
2018–2022 (5 years)	1 January to 30 June 2023
2023–2025 (3 years)*	1 January to 30 June 2026
2026–2030 (5 years)	1 January to 30 June 2031
* The 2023–2025 MERP is 3 years long, but generally MERPs cover 5 years.	

2.9.3 Process of Receiving Credits

Carbon credits will be issued once NZETS registration is completed, and an emissions return is verified by MPI. Whether you receive 'back dated' credits for your forest depends entirely on when you register your property within the mandatory emissions period.

For example, the current mandatory period is a three-year period from 2023-2025. If a property is registered in 2023 then that project cannot earn credits before 2023. However, if a property is registered in year 2025 the project will then receive credits from the first year of the mandatory period (2023) onwards.

2.10NES-PF & RMA

Continuous cover forestry is a commercial activity, and the forest will be harvested in a small-scale continuous cycle of harvest and replanting. This activity falls within the scope of the NES-PF regulations and the RMA.

2.10.1 NES-PF

The National Environmental Standards for Plantation Forestry (NES-PF) regulations to any forest of at least one hectare that has been planted specifically for commercial purposes and will be harvested.

The NES-PF regulations cover 8 core plantation forestry activities that have potential environmental effects:

- afforestation (planting new forest)
- pruning and thinning to waste (selective felling of trees where the felled trees remain on site)
- earthworks
- river crossings
- forestry quarrying (extraction of rock, sand, or gravel within a plantation forest or for operation of a forest on adjacent land)
- harvesting
- mechanical land preparation
- replanting.

2.10.2 RMA

Any exotic plantings as part of a forest carbon project may be subject to the provisions of the Resource Management Act (RMA). The NES-PF regulations require those undertaking an activity in a forestry block greater than one hectare to give notice to Council. These activities include afforestation, forestry quarrying, river crossings, earthworks and harvesting.

3 Developing an NZETS Project

The design of a forest carbon project and the costs of a project are interdependent. Different scenarios of high-level design preferences can be costed which will, in turn, enable a refinement of design. This allows design to be informed by cost considerations. Project design is also impacted by the requirement to meet the forest definition in the NZETS.

3.1 FOREST TYPES

Different forest types are eligible to register in the permanent category of the NZETS. This includes:

- Native forest
- Exotic softwood forest (including, but not limited to *Pinus radiata*)
- Exotic hardwood forest.

3.1.1 Native Forest

New Zealand native (indigenous) forests are natural systems with high intrinsic value and also a form of 'ecological infrastructure' capable of providing a wide variety of ecosystem service benefits to the economy. Good examples of these ecosystem services include biodiversity, water quality, soil water retention, flood protection, erosion control, and climate resilience.

FIGURE 4. EXAMPLE OF NEW ZEALAND INDIGENOUS FOREST

3.1.2 Exotic Softwood Forest

Exotic softwoods are conifers that do not naturally occur in New Zealand. Prominent examples in New Zealand forestry include pines, redwoods, douglas fir, and macrocarpa. These well-proven forestry species are logistically relatively easy to plant and manage, low cost to establish and relatively low cost to maintain.

The biodiversity co-benefits of exotic softwood plantations are relatively low in comparison with native forest. The sustainable land management impacts of exotic softwood forests can be both positive and negative. Sedimentation to stream can be significantly reduced under exotic softwood compared with pasture when the forest is growing, but this reverses during clear-cut harvesting on steep land. Maintaining soil conservation values under exotic softwood forests is enhanced if the forest is not clear-cut harvested but instead maintained as a continuous canopy or in multi-aged forest made up of smaller coup sizes (more relevant on steep lands).

FIGURE 5. EXAMPLE OF EXOTIC SOFTWOOD FOREST

3.1.3 Exotic Hardwood Forest

Exotic hardwoods are leafy trees (angiosperms) that do not naturally occur in New Zealand. There are very many examples to choose from, but perhaps the most prominent example in New Zealand forestry is eucalyptus.

Like exotic softwood plantations, exotic hardwoods can be planted for a clear-cut and replant cycle, managed for continuous canopy harvesting, or managed without harvesting as permanent forests.

FIGURE 6. EXAMPLE OF EXOTIC HARDWOOD FOREST

3.2 PLANTING DESIGN

The way you plant impacts your costs and your carbon revenue. It is important to get the right tree in the right place considering vegetation types, long-term forest outcomes, co-benefits, credit production and planting densities. For a comparison of establishing native versus exotics see below.

3.2.1 Native & Exotics

Landowners may be interested in establishing exotic and/or native forests on their properties to manage erosion and achieve wider benefits. New Zealand native forests are natural systems with high intrinsic value and comprise a form of 'ecological infrastructure' capable of providing a wide variety of beneficial ecosystem services. Good examples of these ecosystem services include biodiversity, water quality, soil water retention, flood protection, erosion control, and climate resilience.

Well managed exotic forests, particularly with continuous cover forest management regimes, can provide considerable ecosystem service benefits, including erosion control and sediment reduction relative to pasture.

Native forests sequester carbon at a relatively slow rate compared with many exotic species and are typically more expensive to establish. This can make the economics of native forest carbon projects challenging, including failing to be financially self-sustaining (i.e., economic benefits fail to cover project costs or fail to pass a landowner/investor cost/benefit threshold).

In contrast, the sequestration rates of exotic forests mean that exotic forests are more likely to be financially self-sustaining for a forest carbon project. If a landowner wishes to establish native forest and the economics of a native forest carbon project fail to pass a landowner/investor cost/benefit threshold, it is possible to introduce exotic forest areas into the overall project design. This approach uses the faster growth rates of exotic species and lower costs of forest establishment to lift the overall economic performance of the entire project. In other words, exotic forest areas can be used to fund native reforestation and enable the entire project to be financially self-sustaining.

3.2.2 Forest Type Selection

The forest types available for forest carbon projects include the following:

TABLE 2. FOREST TYPES AND DESCRIPTION

Forest Type	Description
Mixed natives	Several different native species planted.
Natural regeneration	Nature has done the planting.
Exotic softwoods	Conifers (e.g., trees with pine needles) permanent forest managed as a continuous canopy in perpetuity.
Exotic hardwoods	Exotic hardwood (e.g., leafy trees like poplar, oak, alder, eucalypt) permanent forest managed as a continuous canopy in perpetuity.
Exotic hardwoods mixed with natives	Exotic hardwoods interplanted 50:50 with natives. Hardwoods managed as a continuous canopy but adaptively managed to facilitate transition to natives.

For each project type there are different short-term and long-term outcomes, co-benefits, and costs. Restoration of permanent forest cover has a range of co-benefits including sustainable land management, climate resilience, biodiversity conservation, erosion control, waterways conservation and water quality enhancement. Native regeneration is the best way to achieve high co-benefits at a low cost whilst generating a long-term permanent native forest. Exotic forests tend to have less co-benefits whilst having lower cost and higher financial returns.

TABLE 3. PERMANENT FOREST ACTIVITY TYPES WITH OUTCOMES, CO-BENEFITS, AND COST INDICATION

	Project Type	Short-Term Outcome	Long-Term Outcome	Co-Benefits	Cost
1	Native reforestation	Permanent native forest	Permanent native forest	High	High
2	Natural native regeneration	Permanent native forest	Permanent native forest	High	Low
3	Exotic continuous cover forestry (CCF) in perpetuity	Plantation that is managed in a continuous harvest and replacement cycle using single tree, patch or strip harvesting and without clear-cutting the forest.	Plantation forest cycle	Medium	Medium
4	Exotic CCF transitioned to native production forest	Starting with exotic CCF but where the harvest/replacement cycle replants in productive native	Permanent native productive forest	Medium to high	Medium

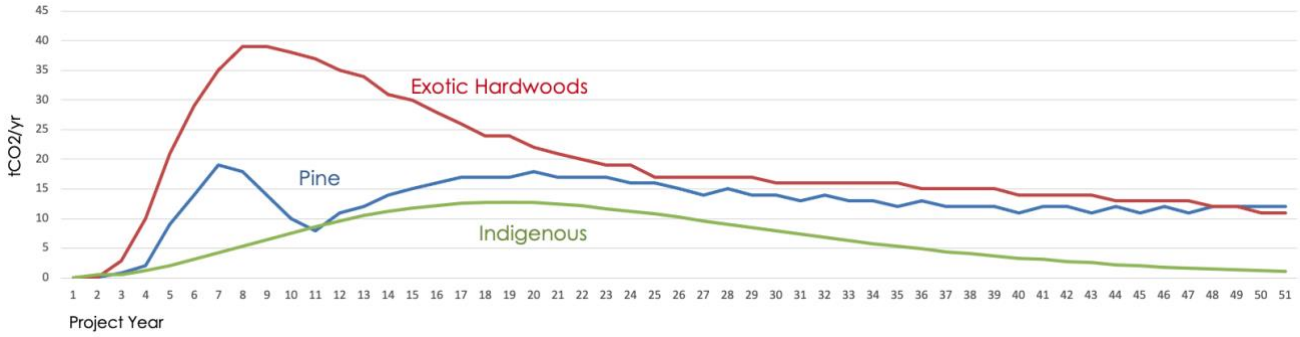
		forest, and where the native forest is eventually managed as native CCF through harvest/replacement.			
5	Exotic CCF transitioned to non-productive native forest	Starting with exotic CCF but where the harvest/replacement cycle replants in native forest that is protected from any future harvesting.	Permanent native forest	High	Medium

Note that there is a fundamental trade-off in carbon forestry: The higher the environmental co-benefits delivered, the lower the economic performance of the project. This can impact significantly on the cost-benefit dynamic for a carbon forest and is a key factor in carbon forest design where maximising co-benefits in an affordable manner is a target outcome.

3.3 CARBON PRODUCTION IN DIFFERENT FOREST TYPES

Different forest types sequester carbon at different rates producing different carbon credit yield curves. For most small project (i.e., less than 100 ha) the project is required to use the MPI Lookup Tables to determine the carbon sequestration rate. Figure 7 shows the different carbon credit yield curves for three forest types using the MPI Lookup Tables (exotic hardwoods, pine, and indigenous forest).

FIGURE 7. DIFFERENT CARBON CREDIT PRODUCTION RATES FOR DIFFERENT FOREST TYPES (RED, BLUE, AND GREEN LINES) USING THE MPI LOOKUP TABLES.



As can be seen above native forests has the lowest/slowest carbon credit yield rate compared with pine (exotic softwood) and exotic hardwood (e.g., eucalyptus, oak, alder).

3.4 FINANCIAL CONSIDERATIONS IN PROJECT DESIGN

The next element to consider in selecting forest types is the difference in establishment costs and projected financial returns associated with planting different forest types. The projected financial returns are not necessarily about making more and more profit, it is also about enabling the project to break even. As such, project design needs to be informed by project financial performance because some project design options may be unaffordable.

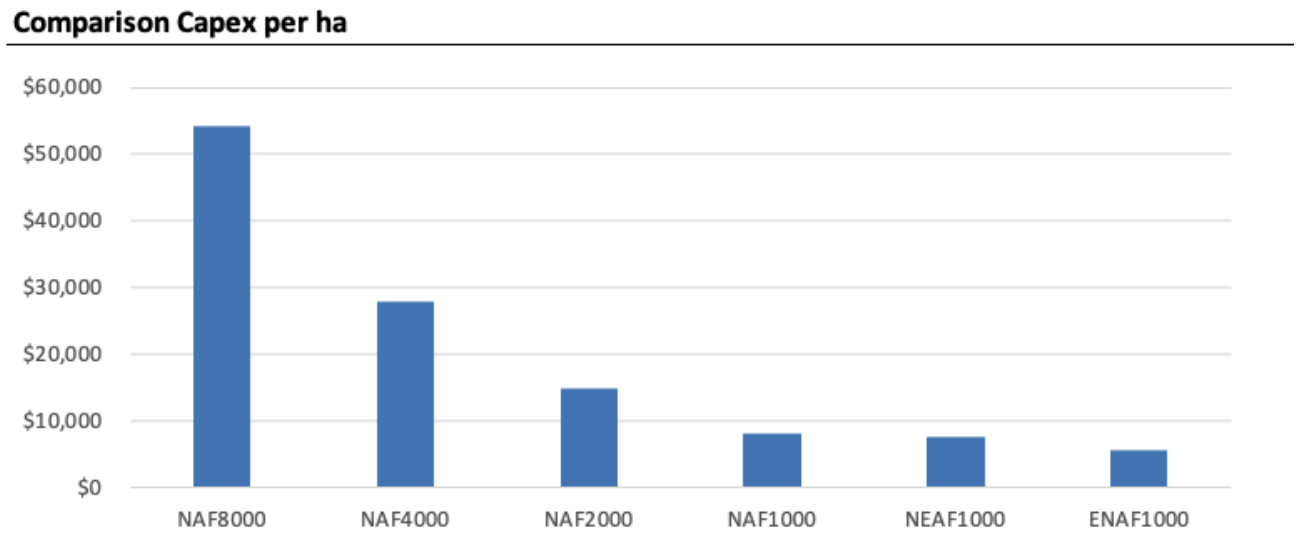
Figures 8 and 9 below show the comparative capital expenditure per ha, and the internal rate of return (IRR) for six different planting models as shown in Table 4:

TABLE 4. REFORESTATION SCENARIOS MODELLED IN THIS GUIDANCE SHOWING IMPACT OF DIFFERENT PLANTING MODELS

Code	Description	Remarks
NAF8000	Native afforestation at 8,000 stems per ha (sph)	A common planting density for ecological restoration plantings.
NAF4000	Native afforestation at 4,000 sph	Also, a common planting density for ecological restoration plantings.
NAF2000	Native afforestation at 2,000 sph	A common planting density for carbon projects needing to limit stem density to keep costs down.
NAF1000	Native afforestation at 1,000 sph	A low planting density for carbon projects needing to limit stem density to keep costs down, but still well within the NZETS 'forest land' definition.
NEAF1000	80% of the project area planted in native trees at 1,000 stems per ha, and 20% of the project area planted in exotic softwoods at 1,000 sph.	A hybrid project that uses an exotic woodlot to lower project costs and lift project financial performance. Minimising exotic planting.
ENAF1000	20% of the project area planted in native trees at 1,000 sph, and 80% of the project area planted in exotic softwoods at 1,000 sph.	Another hybrid using an exotic woodlot to lower project costs and lift project financial performance. Maximising exotic planting.

The exotic woodlots modelled in the examples here are managed as continuous cover forestry (harvest and replacement) to transition to native forest across several decades (more information on this below).

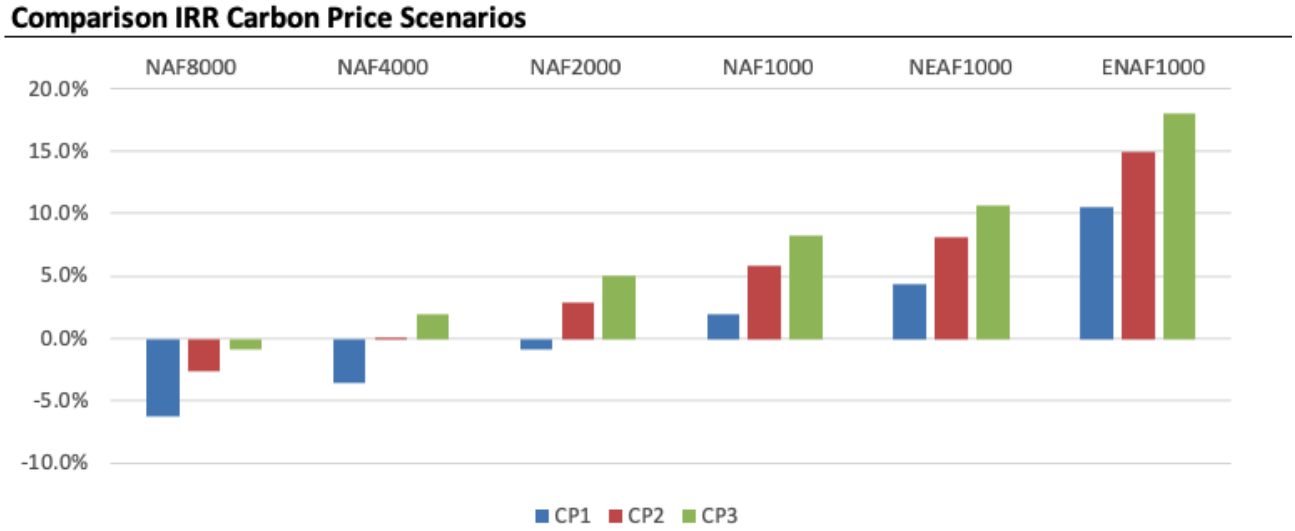
FIGURE 8. CAPITAL EXPENDITURE PER HA FOR DIFFERENT PLANTING MODELS FROM TABLE 4.



As shown in Figure 8 above, different planting models vary greatly in the capital expenditure costs to establish the forest. These costs can influence project design because a commercially funded project will need to cover its costs.

FIGURE 9. INTERNAL RATE OF RETURN (IRR) FOR DIFFERENT PLANTING MODELS FROM TABLE 4

This modelling uses three different carbon price change models (CP1, CP2 and CP3). CP1 = starting carbon price at $60 and rising at $1.50 p.a.; CP2 = same as CP1 but rising at $4.75 p.a.; CP3 = same as CP1 but rising at $8.00 p.a.[6]



The internal rate of return (IRR) is an indicator of profitability for a project and is used by investors to decide on whether to participate/invest in a project. A key decision for the investor is whether they are likely to get their money back, and whether this investment will be riskier (risk of not getting their money back) than an alternative investment (e.g., term deposit in a bank, housing, commercial forestry).

As shown in Figure 9 above, the financial performance of a project will vary greatly depending on the planting model applied. Projects with high capital costs (middle and left side of the graph) have negative and low IRR values, each of which may be too low to enable an investor to make a positive decision to invest. Projects with lower capital costs and higher returns (middle and right side of the graph) have positive IRR values and are more likely to attract an investor.

3.5 PLANTING DENSITY

The density of planting impacts not only the establishment costs of a project, but also the regulations governing the carbon management of a project as set by the Ministry for Primary Industries (MPI). A forest carbon project that is less than 100 hectares in area is required by MPI to use default tables for calculating carbon credit production rates. Projects that are equal to or greater than 100 ha in area (including several different sub-project areas on land owned by the same landowner) must measure the rate of carbon sequestration in the forest.

In practice this means that projects that are less than 100 ha in area get their carbon credit production rate regardless of how fast the forest is growing. Projects can use this rule to minimise the costs of forest establishment by only planting the bare minimum stems/ha required to meet the minimum eligibility criteria. In contrast, projects that are larger than 100 ha need to establish a forest that will sustain forest biomass and carbon growth rates sufficient to drive the carbon economics into sufficiently profitable to warrant the investment, the land allocation, and adequately compensate for the opportunity costs associated with giving up pastoralism on those lands.

[6] The NZU spot price at the time of writing was $54.00/tCO2e.

3.5.1 Planting Density vs Weed Control Intensity

There is a noteworthy trade-off between planting density and weed control. The suppression of weeds is an important part of habitat restoration plantings and if planting densities are low, this provides ample opportunities for weeds to out compete target species planted, thus increasing risk of planting failure. There are two ways to mitigate this risk:

1. Increase the planting density of target species.
2. Increase the intensity of weed control for a period of years after planting.

Both options add cost to the project. The question is: "what option is more cost effective?"

A comparative internal rate of return (IRR) analysis was undertaken for the following scenarios:

Scenario 1: Planting density of 4,444 stems per ha (sph) with releasing for two years after planting (priced at $0.50/stem) plus reduced intensity weed control for the remainder of the 25-year cashflow period (priced at $30/ha/yr). All other parameters remained equal.

Scenario 2: Planting density of 1,600 sph with releasing for three years after planting (priced at $1.00/stem) plus reduced intensity weed control for the remainder of the 25-year cashflow period (priced at $30/ha/yr). All other parameters remained equal.

Results shows that Scenario 2 was more cost effective assuming that both approaches prevented planting failure (see Figures 10, 11, and 12).

FIGURE 10. CAPITAL EXPENDITURE COMPARISON BETWEEN SCENARIO 1 AND SCENARIO 2

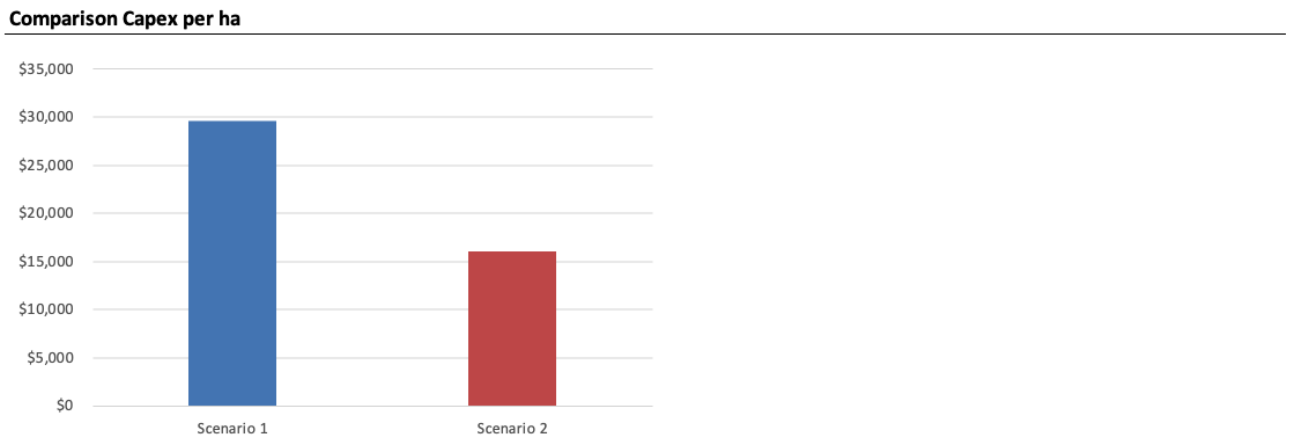


FIGURE 11. INTERNAL RATE OF RETURN COMPARISON BETWEEN SCENARIO 1 AND SCENARIO 2

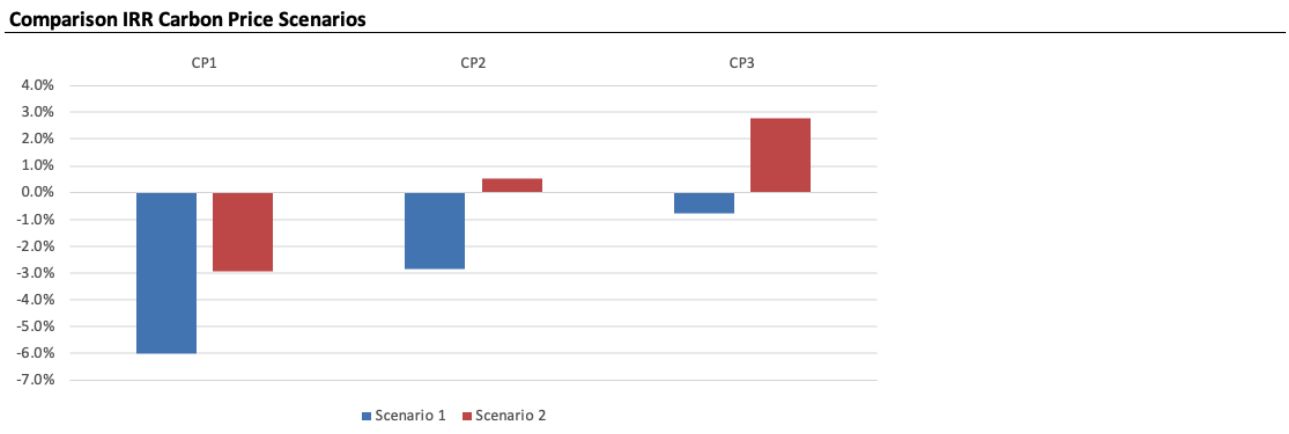
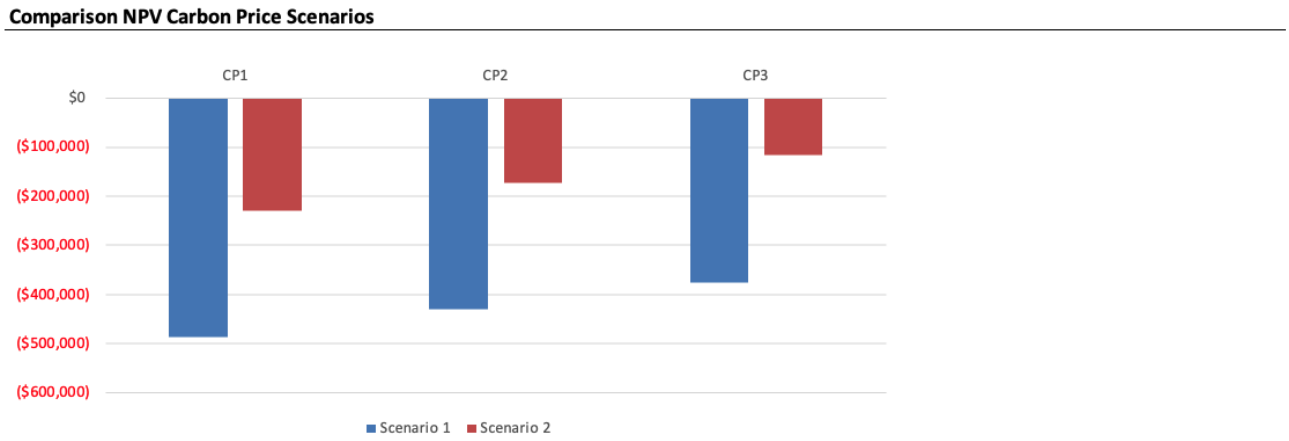


FIGURE 12. NET PRESENT VALUE COMPARISON BETWEEN SCENARIO 1 AND SCENARIO 2



Figures 10, 11, and 12 show consistently lower financial performance indicators for Scenario 1 in comparison with Scenario 2. This suggests that it is more cost effective to reduce the planting density but increase the weed control intensity in the early years after planting. A key difference between the two scenarios is the almost doubling of the capital expenditure costs for Scenario 1 compared with Scenario 2.

3.6 PLANTING NEW FOREST

Each site will require a site-specific planting plan complete with map, numbered polygons when there is more than one planting area or management area, planned planting dates, planting species and stem density. This enables the calculation of seedling numbers required for planting the different polygons. Seedling orders for native forest are typically required to be placed at least one year ahead of planting and commonly 2 years for larger planting areas. See table 5 for an example of a planting plan data model.

TABLE 5. EXAMPLE OF PLANTING PLAN AREA DATA TABLE

Planting Plan

	Area (ha)	Planting Years 2024	2025	2026	2027	2028	2029	2030
Indigenous reforestation	-	-	-	-	-	-	-	-
Indigenous regeneration	-	-	-	-	-	-	-	-
Exotic CCF	-	-	-	-	-	-	-	-
Exotics transition	-	-	-	-	-	-	-	-
Total	-							

Existing Vegetation Establishment Years

Area/Tab Code	-	-	-	-	-	-	-
Area (ha)	-	-	-	-	-	-	-
Establishment year	-	-	-	-	-	-	-

3.6.1 Planting Activities

The forest establishment cycle will involve a number of pre and post planting activities including the following:

- Planning and design.
- Compliance (resource consent, NES-PF compliance – particularly for using any exotic forest).
- Seedling order.
- Land preparation (e.g., mechanical land clearance, weed spraying, fencing, pre-planting pest control, contour ripping).
- Planting.

- Post-planting management (e.g., survival monitoring, blanking, post planting pest control, releasing).
- Ensure that each parcel of forest is at least 1 ha in area and at least 30m wide on average.

Each of these elements are covered in the capital expenditure costs for the project.

3.6.2 On-Going Operational Activities

The main on-going operational activities for restorative forest carbon projects (and that need to be funded by project carbon credit sales revenues) include the following:

- Pest and weed control.
- NZETS compliance.
- Carbon insurance.
- Fire control.
- Silvicultural management (for continuous cover forestry).

3.7 BUSINESS CASE & BUSINESS PLAN

After undertaking initial project design and selecting the preferred planting model, a project will need to develop a business case. This will include the NZETS eligibility assessment, any results from a vegetation assessment (where relevant), a planting plan and an initial discounted cash flow (DCF) analysis. This will provide an indication of the financial performance of a proposed project.

3.7.1 Business Case

3.7.1.1 Draft Business Case

The first version of the business case is denoted: 'Draft Business Case' in the Ekos system of project development. This will include modelling different planting scenarios to help inform the landowner about the financial profile of the different scenarios in a discounted cash flow analysis (DCF). The Draft Business Case will use cost data from a low to medium resolution due diligence on project costs in a desktop study that delivers a detailed project cost estimate. This is to keep costs down for this part of the project cycle and enable the landowner to gain access to initial project business modelling necessary to make an informed decision on whether to proceed with project development or not.

The Draft Business Cases models key financial performance including:

- Project area.
- Species planted.
- Management regime.
- Capital expenditure.
- Operating expenditure.
- Opportunity costs.
- Carbon credit yield.
- Project timing.
- Internal rate of return.
- Net present value.
- Estimated investment required.

3.7.1.2 Final Business Case

If the landowner elects to proceed with the project, they will select a preferred scenario and upgrade the Draft Business Case to Final Business Case. This will typically involve a refinement of the details of the planting plan and the mapping, together with a corresponding refinement of the discounted cash flow analysis and

associated project financial performance projection. The key milestone delivered by the Final Business Case is investment readiness. This Final Business Case is then used as an investment proposal to an investor.

3.7.2 Business Plan

If the landowner and investor decide to proceed with the project, the next step is to undertake high resolution, site-specific due diligence on project costs to refine and upgrade the Final Business Case to a Business Plan. This involves getting quotes from all suppliers and subcontractors and refining all site-specific details to deliver a detailed project budget (i.e., upgrade from a project cost estimate in the Business Case) and finalising all project logistics. The detailed project budget delivered in Business Plan forms the 'Budget' element of a 'Budget and Actuals' comparison for project management purposes as project implementation and spending (actual costs) takes place. The key milestone delivered by Business Plan is implementation readiness. This Business Plan is then used as an action plan for project implementation and associated project management.

3.8 RIPARIAN REFORESTATION CARBON PROJECTS

Riparian reforestation is a common priority for stream restoration initiatives. Riparian reforestation projects are particularly challenging for NZETS project development because they:

- Are typically narrower than 30m wide and thereby do not meet the NZETS eligibility requirements for minimum average width.
- Are long and narrow and it takes a very long corridor to make up a single hectare.
- Require a lot of fencing which is costly.
- Are typically planted with a significant proportion of non-tree species.
- Are typically planted at a high planting density.

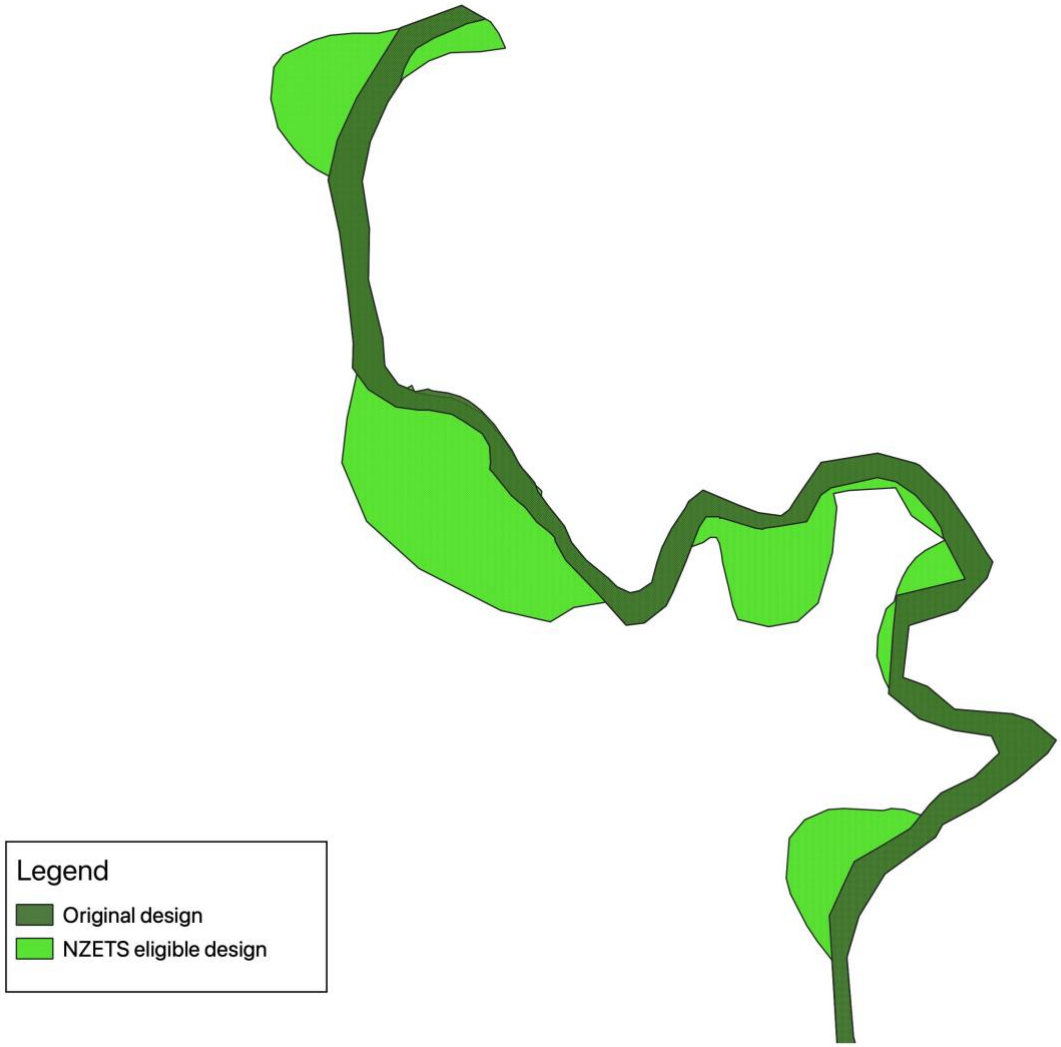
There are therefore, two main challenges:

1. Technical challenges (NZETS eligibility).
2. Financial challenges (costs can be very high per ha).

3.8.1 Technical Solutions

Riparian replanting can be designed to meet the NZETS eligibility requirements whilst remaining predominantly narrow. This can be achieved by including a wide bulge in the planting area for each hectare to enable the average width across each hectare to achieve the 30 m requirement (see Figure 13).

FIGURE 13. EXEMPLAR OF NZETS ELIGIBLE RIPARIAN PLANTING DESIGN



The original design for a riparian reforestation project shown in Figure 13 was too narrow to meet the NZETS eligibility rules for minimum width. The updated design includes bulges in the project design to enable the average width across each hectare to meet the 30m threshold.

Another technical solution is to ensure that the species selected for planting meet the forest definition of the NZETS.

3.8.2 Financial Solutions

To enable a riparian reforestation project to be cost effective as a forest carbon project it will need to keep its costs down where possible. Key areas where costs can be reduced whilst maintaining NZETS eligibility include:

- Excluding fencing costs from the forest carbon project finances (e.g., where fencing funding is provided from a separate budget).
- Reducing the stem density for plantings whilst increasing weed control intensity in early years.
- Reducing or excluding non-tree species selected for planting.
- Selecting the lower cost tree species for planting (e.g., manuka, kanuka, totara, cabbage tree).

It is noteworthy to mention that these cost-reducing measures are also applicable to any restoration forest carbon project.

4 Risks for the Landowner

No commercial project is without risk. Project risks can be minimised and managed when they are identified, understood and mitigated where possible. Key project risks for the landowner are:

1. Internal risk.
2. External risk.
3. Physical risk.

Table 6 below elaborates on risks and risk mitigation options.

TABLE 6. PROJECT RISK AND RISK MITIGATION

Risk Factor	Mitigation
Internal Risks	
Project governance risk	Establish a project governing board with a mandate to make all project-related decisions for the landowner. The project governing board provides transparent mandates to proceed with the project, engage in project agreements, and provides management mandates to the management committee. The governing board should have a transparent mandate to represent the project owner. For small projects with single landowners, the governing board can be the same governance body for the land (if it has one) (e.g., a landowner, or farm ownership body such as the directors of the farm business).
Project management risk	Establish a Project Management Committee responsible for overseeing the delivery of project activities. For small projects the Project Management Committee can be the same people as the governing board but functioning in a management oversight role.
The health and safety of forestry sites.	Every operational component of project implementation is subject to a health and safety plan, captured in the Business Plan and project information platform.
External Risks	
Uncertainty of future carbon pricing.	Carbon prices gained via market trades will ultimately depend on the willingness-to- pay by carbon buyers. The Bay of Plenty Regional Council could provide carbon pricing leadership by signalling to the market a minimum (floor) price for carbon buyers seeking to participate on the demand side of projects being undertaken in association with the Bay of Plenty Regional Council. Ekos recommends using a carbon pricing benchmark no less than the mid-range of the Treasury shadow emissions values (see Appendix 3) (Treasury calculation of the social cost of carbon emissions).
Uncertain government policy settings for the domestic carbon market.	Landowners proceed with forest carbon project development with the understanding that government policy may change in the future and that such change may impact on the financial sustainability of the project. Changes to government regulations are commonly grandparented which would mean that there is a possibility that any such future changes do not impact projects initiated under the current regime.
Negative media exposure or loss of community support around the perceptions of forest carbon markets.	Proactively develop public communications collateral to represent the purpose of a project.
Negative community reactions if projects not genuinely contributing to forest conservation or sound forest management.	Make it compulsory for participants to adopt a forest management regime compatible with nature conservation and permanent forest management. See Appendix 1 for recommended management requirements. Include a requirement that forests entered into a programme with the BOPRC be legally protected by a conservation covenant. This covenant should be flexible to enable continuous cover forestry (for example) and could use a Memorandum of Encumbrance. Ekos recommends that the beneficiary of the MoE be the BOPRC. Align the purpose and safeguards in the Programme to the forestry recommendations contained in the report of the Ministerial Inquiry into land uses associated with the mobilisation of woody debris (including forestry slash) and sediment in Tairawhiti/Gisborne District and Wairoa District.

Negative community perception that carbon projects may cause negative social impacts for participants.	Include a requirement that projects follow a set of social integrity safeguards through: • Free, prior and informed consent (FPIC) of all relevant parties to the project. • Fair remuneration of those who are employed by or contracted by the project. • Enhancement of cultural values where possible. See Appendix 2 for detail on recommended social safeguards.
Physical Risk	
Damage to the forest from fire, disease, slips, floods etc.	Carbon insurance is optional in the NZETS. Ekos has priced carbon project insurance costs into the financial analysis presented in this report. This risk can be mitigated by each project participant taking out carbon insurance as a condition of participation in the programme. Ekos involvement as a project developer and programme operator requires its clients to take out carbon insurance to mitigate against this risk.
Temporary Adverse Events	If the forest is registered as a Permanent post-1989 forest the Temporary Adverse Events (TAE) regulations may apply to that forest. As a general principle, if an area is subject to the TAE regulations there will be no surrender liability for the area because of a TAE (e.g., fire). However, there will be no carbon credits earnt until the carbon stock returns to the pre-event level. The details of what is a TAE will be defined in the regulations (may be a positive list or a set of criteria), with the new regulations currently (at the time of writing) still under public consultation. Commercial insurance to a) insure the forest crop, and b) to insure the carbon credit production.

4.1.1 Temporary Adverse Events (TAE)

Temporary Adverse Event (TAE) land is the land affected by adverse events that cause a loss of forest land but from which the land is expected to be able to recover. A new provision provides a mechanism to allow the participant to suspend a) their liability to surrender carbon credits due to the emissions caused by the Adverse Event, and b) entitlement to receive carbon credits until the forest recovers to its pre-event carbon stock. This option will be available for CAAs using the stock change carbon accounting method in the permanent forest category of the NZETS.

An NZETS participant can apply to the Environmental Protection Authority for a Temporary Adverse Event suspension for the affected land. If a suspension is granted, while it remains Temporary Adverse Event land, the participant's liability to surrender units for emissions from the land (including emissions resulting from the adverse event) is suspended, as is any entitlement to receive units for the replanted forest. The risk of TAEs takes two forms in a carbon project business model:

a) Carbon credit liability and
b) Carbon revenue liability.

There remains the issue of adverse events not included in the TAE definition (as yet undetermined by MPI). These may be subject to a carbon credit surrender liability as was the case in the pre-2020 context. If a project is exposed to this kind of risk, it will need to manage this risk by either:

- Creating a carbon credit buffer in the project. A 'buffer' in carbon accounting is a form of self-insurance whereby a certain percentage of carbon credits are issued but not sold and placed into a reserve account for use against any credit surrender liability.
- Commercial insurance to a) insures the forest crop, and b) to insures the carbon credit production.
- Both.

4.1.2 Commercial Insurance

The investment model applied in this pre-feasibility analysis uses commercial insurance to cover risk. This is standard practice for forest carbon projects but optional under the NZETS. The financial model used in this pre-feasibility analysis has used a placeholder of $30/ha/yr as an insurance premium operating cost (informed by forest carbon insurance brokers).

Appendices

APPENDIX 1: RECOMMENDED FOREST MANAGEMENT REQUIREMENTS

Ekos recommends that participants in the Programme be required to adhere to a minimum set of forest management safeguards including:

Participating projects must produce and maintain a forest establishment and management plan for the specified project period, recognising that 'one size does not fit all' and that the plan should take a risk-based tailored approach to mitigating the impacts relevant to the forest project. Forest management plans must demonstrate the operation of a methodology for delivering:

a. **Target State**: Identify the target state for the restorative forest such as:

    i. indigenous forest for permanent protection;

    ii. indigenous forest for continuous cover productive forestry in perpetuity;

    iii. exotic forest for continuous cover exotic productive forestry in perpetuity.

b. **Methodology for delivering target state**: A management plan that is based on a scientifically plausible theory of change and accompanying methodology that is capable of delivering the target state such as:

    i. Pest and weed control of planted indigenous forest and/or naturally regenerating indigenous forest;

    ii. Continuous cover forest management methods (e.g., single tree, group, patch, or strip harvest and replacement), plus pest and weed control.

c. **Pest Control**: on-going animal pest control for the project period;

d. **Weed Control**: on-going weed control for the project period;

e. **Fire Mitigation**: on-going fire mitigation for the project period to minimise risk to neighbours, including a commitment to support and adopt the objectives and principles set out in the Rural Fire Charter[7];

f. **Fibre Supply**: when and how fibre from any will be utilised (where viable), including thinning's for processing as wood products, biofuels or biochemistry;

g. **Risk mitigation**: risk mitigation, including operational contingencies on how any relevant risks (including but not limited to loss of carbon stocks) will be managed and mitigated;

h. **Health & Safety**: compliance with all laws relating to health safety and welfare that are in any way applicable to the forest project, including the Health and Safety at Work Act 2015, all applicable legislative instruments, regulations, approved codes of practice and guidelines. In particular, this will include how thinning on steep inclines will be managed to minimise health and safety risk;

[7] https://www.nzfoa.org.nz/resources/file-libraries-resources/agreements-accords/703-plantation-forestry-rural-fire-control-charter/file

i. **Local Employment**: a local employment policy based first on qualifications and merit, but with the intention that:

    i. local people and businesses receive priority consideration for employment and contract opportunities;

    ii. where possible, access to training and retraining is provided to enable that local residents gains the skills and qualifications needed for employment; and

    iii. where possible, assistance is given to local businesses to identify future contract opportunities and to build the capacity necessary to benefit from those opportunities;

j. **Community Engagement**: community participation in the design and delivery of the Programme. This includes engaging with neighbours to ensure that any reforestation does not negatively impact on the community;

k. **Finance**: a general description of how the forest management plan will be financed throughout the project period, including a summary of debt and equity to be invested and proposed revenue sources;

l. **Validation**: validation of the forest management plan by an independent expert (e.g., supplied by the Bay of Plenty Regional Council);

m. **Monitoring**: monitoring and reporting of adherence to the forest management plan;

n. **Verification**: verification of the implementation of an adherence to the forest management plan by an independent expert (e.g., supplied by the Bay of Plenty Regional Council) through an audit of monitoring reports and associated evidence of compliance. Verification audits to take place with a maximum period of 5-yearly and ideally timed with each Mandatory Emissions Return (MER).

o. **Change Management**: a framework for adapting and amending the forest management plan in response to changing conditions over time. It is expressly acknowledged that a forest management plan is a 'live' document and applies principles of adaptive management i.e., amended regularly during a project period.

Individual forest management plans will be confidential, but some data may be aggregated by the Programme and publicly reported to demonstrate that permanent forestry in Programme is being managed to achieve the objectives of the Programme.

APPENDIX 2: SOCIAL SAFEGUARDS

Ekos recommends that participants in the Programme be required to adhere to a minimum set of social safeguards including:

- Free, Prior and Informed Consent (FPIC)
- Fair remuneration
- Protection of cultural values

FPIC

Free, prior, and informed consent (FPIC) is a set of guidelines operated by the Food and Agriculture Organization (FAO) to safeguard landowners and local communities (including indigenous peoples) in relation to economic development on their land. FPIC focuses on the right to self-determination and is a fundamental principle in international law, embodied in the Charter of the United Nations, the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights.

Ekos Nature Carbon Programme applies the principles of the FAO FPIC Manual, which is a tool to enable FPIC outcomes to be delivered in land management projects involving the interaction of multiple parties including landowners.

Remuneration

Projects must demonstrate that any paid work in the project is fairly compensated, and that any voluntary work is undertaken freely and without coercion.

Fair Compensation

Fair compensation requires that those employed or contracted to the project receive a minimum of the living wage as set by the New Zealand Living Wage Movement[8] and rates above the living wage for skilled labour. Skilled labour compensation rates shall be set at or above the minimum level for the skill level in the forestry sector as set by the Careers New Zealand Salary Guide.[9]

Voluntary Work

Projects using voluntary labour shall demonstrate that the use of voluntary labour does not amount to the exploitation of the labour providers.

Cultural Values

Projects must demonstrate that the project causes no cultural harm resulting from project development and implementation. This shall include ensuring that no cultural taonga on the project site are damaged or degraded as a result of the project.

[8] https://www.livingwage.org.nz/

[9] https://www.careers.govt.nz/job-hunting/whats-happening-in-the-job-market/salary-guide/

APPENDIX 3: TREASURY SHADOW EMISSIONS VALUES, NZD$ (2021) PER TONNE OF CO2-EQUIVALENT

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Low	42	48	55	61	67	73	79	85	91	97	101	105	108	112
Central	63	72	81	90	99	108	118	127	136	145	150	156	162	167
High	84	96	108	120	132	144	156	168	180	192	200	207	215	223

Year (cont.)	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Low	116	120	124	127	131	135	139	143	146	150	154	158	162	165	169	173
Central	173	179	184	190	196	201	207	213	218	224	230	236	241	247	253	258
High	230	238	245	253	260	268	275	283	291	298	306	313	321	328	336	343

Year (cont.)	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Low	175	177	178	180	182	184	186	187	189	191
Central	266	274	282	291	299	308	318	327	337	347
High	361	379	398	417	438	460	483	507	533	559

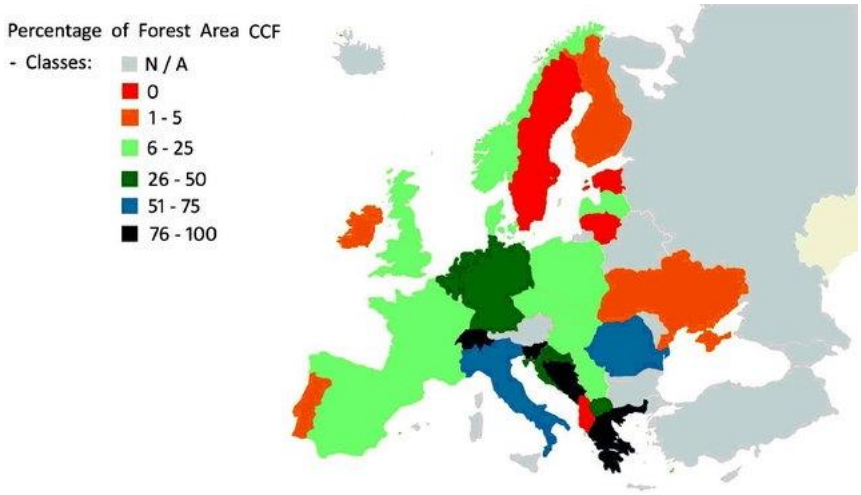
Year (cont.)	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Low	193	195	197	199	201	203	205	207	209	211
Central	357	368	379	391	402	414	427	440	453	466
High	587	617	648	680	714	750	787	827	868	911

Source: The Treasury 2021. CBAx Tool User Guidance. Guide for departments and agencies using Treasury's CBAx tool for cost benefit analysis. September 2021. (Appendix 5, p76.-

APPENDIX 4: ADDITIONAL INFORMATION ABOUT CONTINUOUS COVER FORESTRY

Continuous cover forest management is a standard form of forest management in many countries around the world. For example, a recent survey concluded that between 22% and 30% of European forests are managed through continuous cover forestry (Mason et al., 2022)[10]. 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 forest areas to indigenous forest areas through harvest and replacement together with supporting natural regeneration in canopy gaps, and in some situations the use of exotic species as a nursery crop for native forest establishment beneath.

FIGURE 14. CONTINUOUS COVER FORESTRY IN EUROPE AS A PERCENTAGE OF TOTAL FOREST AREA. SOURCE: MASON ET AL 2022.



A range of silvicultural systems sit on a spectrum from single tree selection to extensive clearcut with the most distinctive features being the size and arrangement of the cut areas and the method of regeneration. Silvicultural systems that retain the forest canopy at one or more levels without clear felling are generally classed as continuous cover forestry systems (CCF).

To achieve a continuous cover forest structure, felling is carried out continually or irregularly throughout the whole forest area followed by natural or artificial regeneration. Large scale clear felling is avoided, and replaced with clearing smaller areas (e.g., less than two tree heights in diameter Mason et al. 2003).[11]

CCF is not a single silvicultural system but encompasses a range of silvicultural systems under a common theme. Various silvicultural systems are used for continuous cover forest management based on the degree of stand intervention (see Figure 15). Silvicultural systems considered compatible with continuous cover forestry include single tree selection, group selection, irregular shelterwood, group shelterwood and uniform shelterwood (Ibid). Such adaptive, continuous cover management regimes can include transitioning exotic forest areas to indigenous forest areas through harvest and replacement together with supporting natural regeneration in canopy gaps, and in some situations the use of exotic species as a nursery crop for native forest establishment beneath.

[10] Mason, W.L., DiaCi, J., Carvalho, J. and S. Valkonen 2022. Continuous cover forestry in Europe: usage and the knowledge gaps and challenges to wider adoption. *Forestry*, 95: 1-12.

[11] Mason, B.; G. Kerr; A. Pommerening; C. Edwards; S. Hale; D. Ireland; and R. Moore. 2003. Continuous cover forestry in British conifer forests. *Forest Research Annual Report and Accounts* 2004:38-53.

The choice of a silvicultural system should be based on an understanding of species requirements, site potential, climatic limitations, and management objectives (Mason et al. 2003). Figure 15 provides a categorization of CCF silvicultural systems.

There is an opportunity to use revenue from exotic forest areas to fund the establishment of native forest areas. Here, a native reforestation project that cannot fund itself can be integrated with an exotic reforestation component whose profitability can be used to fund the native reforestation. Managing the exotic forest area with continuous cover forestry management practices can further enable this as the exotic forest area can be registered in the permanent forest category of the NZETS. In turn, this enables the exotic forest to earn carbon credits for many decades, and deliver ecosystem services benefits (e.g., erosion control) for many decades and/or in perpetuity. This can also include a form of continuous cover forestry that changes the forest type gradually through time from exotic to native forest.

FIGURE 15. CLASSIFICATION OF SILVICULTURAL SYSTEMS INCLUDING CONTINUOUS COVER FORESTRY SYSTEMS.

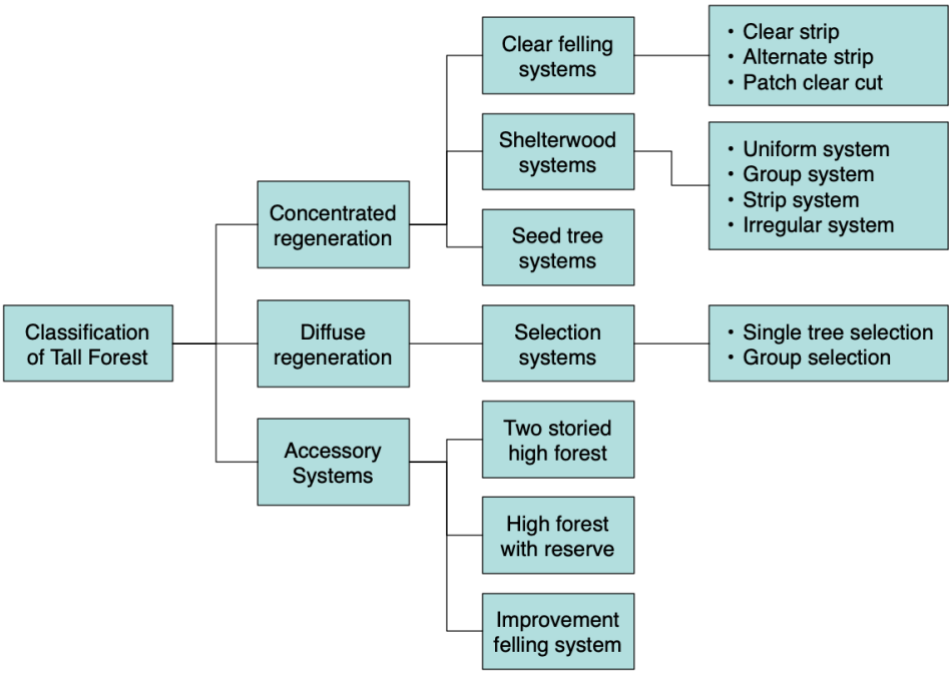
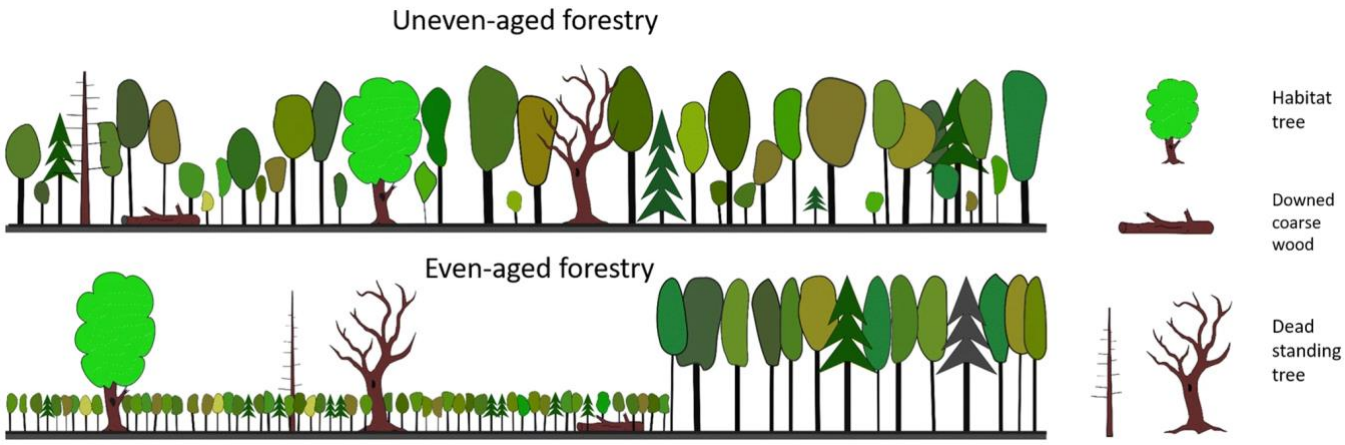


FIGURE 16. ONE EXAMPLE OF CONTINUOUS COVER FORESTRY (GROUP SELECTION) COMPARED WITH EVEN AGED (CLEAR-CUT) FORESTRY.

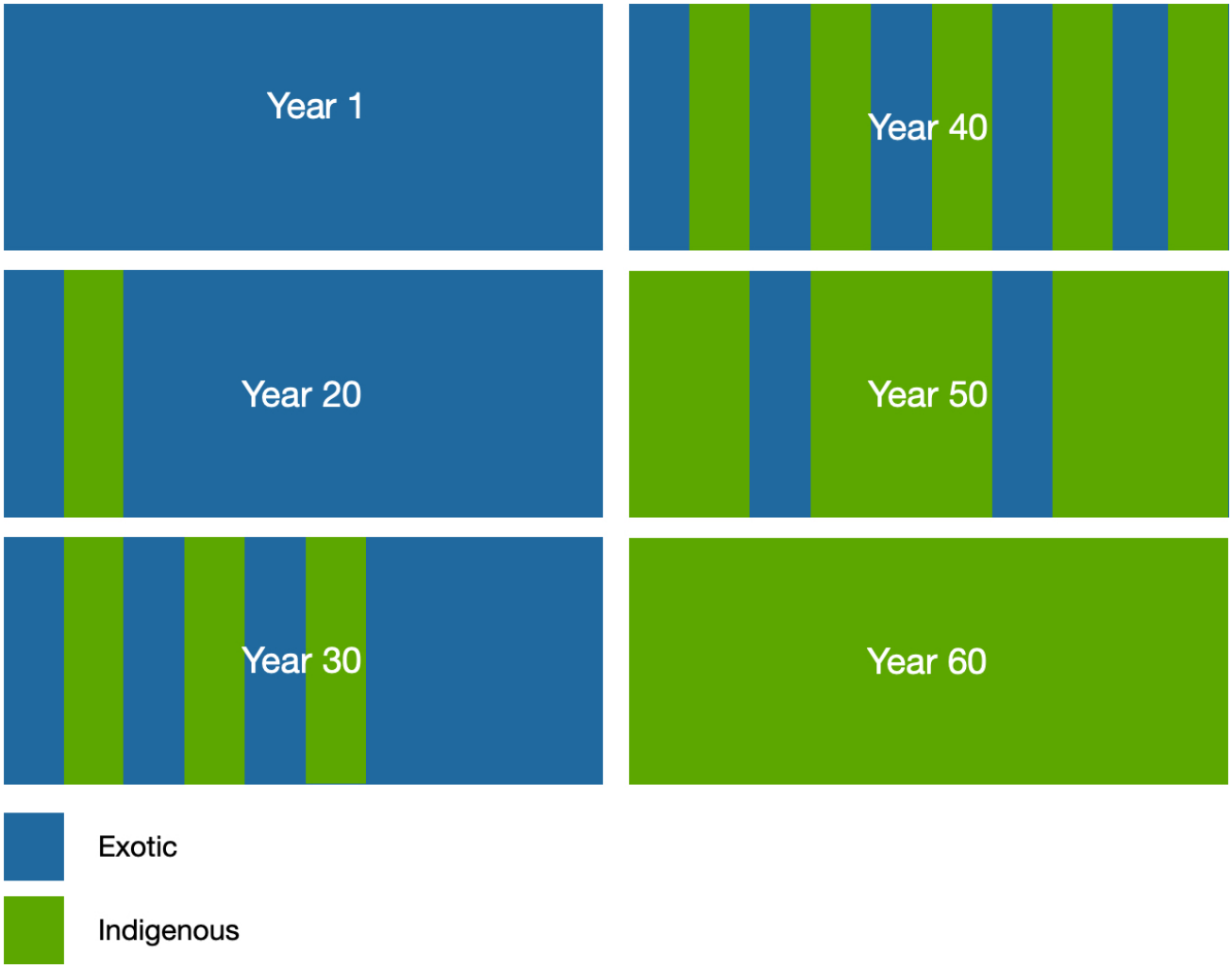


The approach to continuous cover forest management used in this assessment is clear strip or group shelterwood with the following attributes:

1. Year 0 plant exotic forest.
2. Year 4-12 Thinning (i.e., two thinning's)
3. Year 15 Harvest 10% of exotic forest area (including a net financial return for this harvest).
4. Year 16 Replant harvested area with next generation (exotics or natives depending on the silvicultural strategy).
5. Repeat harvest and replant in 5-yearly cycle.

This approach enables a transition of exotic forest to native forest across several decades (see Figure 17 for a concept diagram of strip harvest and replacement).

FIGURE 17. DIAGRAM OF TRANSITION FROM EXOTIC TO NATIVE FOREST ILLUSTRATED USING STRIP SHELTERWOOD APPROACH.



While continuous cover forestry is not yet common practice in Aotearoa, it is the norm in much of Europe, some developing countries, and for many federal forests in the USA.[12] The forest management techniques used in CCF (including forensic harvesting) are also routinely used in machine thinning operations in Aotearoa. As such, there is capability and technology already in this country to undertake this form of forestry. Moreover, the approach to CCF modelled here includes the following management options:

- No-harvest native reforestation.

[12] https://www.fs.usda.gov/research/treesearch/54261

- Single tree harvesting combined with portable milling.
- Canopy management through poisoning.

As such, there is every opportunity to plan afforestation and subsequent forest management so that areas unsuitable for some management techniques (e.g., machine harvesting) can be managed using other techniques/approaches.