Carbon Financed Indigenous Reforestation at Scale

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Indigenous Reforestation For:

- Erosion-prone lands
- Riparian lands
- Marginal farmland

Purpose:

- Climate resilience
- Water quality enhancement
- Biodiversity protection
- Supporting local communities

At Scale
Building climate resilience in order to cope with future climate change threats necessitates actions at scale, and these actions need to be financed. Such actions are best implemented prior to the onset of the worse climate change challenges. These include more intense drought, sea level rise, high rainfall events and associated floods, and pest outbreaks that in aggregate pose a significant threat to human wellbeing, the economy and future remedial cost.

“Stitch in time” early action solutions that help to “future-proof” the regional economy can be significantly lower in cost than:

a) Repair, rebuilding and possible litigation following catastrophic extreme weather events (e.g. flood, sea level rise and storm surge events that breach flood defences).

b) Lost productivity as a result of catastrophic events (e.g. floods and severe droughts).

c) Large scale future engineering solutions that could otherwise be avoided or significantly delayed.

7.2.1 Performance-Based Financing

A performance-based model for climate resilience outcome delivery is favoured, for a number of reasons. Firstly, performance-based financing focuses the activity business model on the delivery of measurable outcomes rather than activities and effort. This is in line with the Public Service Commission guidelines on performance measurement. This also has the effect of driving out inefficiencies and focusing on innovation in order to deliver the greatest gains at the least cost.

Secondly, a performance-based model ties performance measurement to financing. This reduces non-delivery risk to the buyer/funder by shifting a larger share of risk to the outcome provider. In turn, this supply side risk can be reduced through development of supply side standards and quality control and quality assurance protocols. This also enables measurement, reporting and verification (MRV) to become embedded into activities, with consequent benefits for transparency and accountability.

Examples:

- Large: Hawke’s Bay
- Medium: Corporate insetting
- Small: Tasman District
Hawke’s Bay Example
200,000 ha reforested by 2030

We need to turn this...  ...into this

Baseline Revenue = Beef & Lamb

Project Revenue = ?
Hawke’s Bay Example
200,000 ha reforested by 2030

Problem

The economics of indigenous forest carbon don’t work

(I wish they did)

Project Revenue = ?
Problem

The economics of indigenous forest carbon don’t work

(I wish they did)

Hawke’s Bay Example

200,000 ha reforested by 2030

I’m not gonna retire my back paddocks unless carbon can match my beef & lamb income
Hawke’s Bay Example
200,000 ha reforested by 2030

Net Investment = $620m
IRR = 0%
Paid for itself by = after 2050
Paid farmer & conservation = -$217m (NPV)

Indigenous
Nursery Crop
NZ ETS rules allow for widely spaced exotic hardwoods

Table 7.4.1 Cumulative carbon stock per hectare for different forest types (tCO2/ha). Source: MPI Carbon Look-up Tables for forestry emissions in the NZETS.

Two broad options exist in practice that can enable business models sufficient to enable carbon financed indigenous reforestation at scale:

1. Passive indigenous regeneration
2. Using a nursery crop of exotic hardwoods

7.4.1.1 Passive Indigenous Reforestation

Passive indigenous forest reforestation involves protecting a site from pest, weeds and fire, and then letting nature do the planting. This significantly reduces forest establishment and management costs and even with relatively low carbon yields can (and do) lead to cost-effective indigenous forest carbon projects. The key is to undertake this kind of activity on lands with a robust localized indigenous forest seed source, and ideally use eligible land that is already scrub land. Scrub land is a common feature of hill country back paddocks, particularly when beef and/or lamb/wool prices are low. Instead of the farmer spending money and effort to deforest scrub land, there is an option to keep stock out and let nature take its course and reforest the area passively at a low cost. If the scrub is already composed of significant proportions of manuka, a carbon/manuka revenue stream can be sufficient to address opportunity costs for farmers and enable indigenous reforestation to be economically viable at smaller scales.

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Douglas-fir</th>
<th>Exotic softwoods</th>
<th>Exotic hardwoods</th>
<th>Indigenous forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>0.1</td>
<td>1</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>0.4</td>
<td>3</td>
<td>13</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>12</td>
<td>34</td>
<td>4.6</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>26</td>
<td>63</td>
<td>7.8</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>45</td>
<td>98</td>
<td>12.1</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>63</td>
<td>137</td>
<td>17.5</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>77</td>
<td>176</td>
<td>24.0</td>
</tr>
<tr>
<td>9</td>
<td>33</td>
<td>87</td>
<td>214</td>
<td>31.6</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>95</td>
<td>251</td>
<td>40.2</td>
</tr>
<tr>
<td>11</td>
<td>69</td>
<td>106</td>
<td>286</td>
<td>49.8</td>
</tr>
<tr>
<td>12</td>
<td>90</td>
<td>118</td>
<td>320</td>
<td>60.3</td>
</tr>
<tr>
<td>13</td>
<td>113</td>
<td>132</td>
<td>351</td>
<td>71.5</td>
</tr>
<tr>
<td>14</td>
<td>138</td>
<td>147</td>
<td>381</td>
<td>83.3</td>
</tr>
<tr>
<td>15</td>
<td>165</td>
<td>163</td>
<td>409</td>
<td>95.5</td>
</tr>
</tbody>
</table>

Table 2: Carbon stock per hectare for Douglas-fir, exotic softwoods, exotic hardwoods and indigenous forest (expressed as tonnes of carbon dioxide per hectare)
To enable the carbon finance engine to work for sustainable land management and indigenous reforestation, we need to “fuel” it with other species. Some have argued that we need to use pine trees (exotic softwoods). Others say that we need to artificially inflate the carbon price for indigenous carbon projects. Ekos uses a middle path approach by means of a planting model that combines indigenous trees and exotic hardwoods (leafy trees such as eucalyptus).

Figure 2. Carbon accumulation rates of different forest types

Widely spaced exotic hardwoods inter-planted with indigenous tree species is a planting model that does work commercially (in principle). This is because exotic hardwoods accumulate carbon much faster than both indigenous forests and pine trees. For example, after 15 years indigenous forest will have accumulated 95 tonnes of CO₂, pines will have accumulated 163 tonnes, whereas exotic leafy trees (hardwoods) will have accumulated over 400 tonnes of CO₂. For this reason, exotic hardwoods that don’t create a wilding problem are the “jet fuel” we are looking for to drive the sustainable land management carbon engine.

4 Revenue from timber harvesting of exotic hardwoods remains an option in some situations - perhaps for some single tree extraction and on lands that are not erosion-prone.

NZ ETS rules allow for widely spaced exotic hardwoods

Ekos uses this model.
Hawke’s Bay Example
200,000 ha reforested by 2030

<table>
<thead>
<tr>
<th>Net Investment</th>
<th>$620m</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRR</td>
<td>0%</td>
</tr>
<tr>
<td>Payed for itself by</td>
<td>after 2050</td>
</tr>
<tr>
<td>Pay farmer &amp; conservation</td>
<td>$-217m (NPV)</td>
</tr>
</tbody>
</table>

Indigenous
Hawke’s Bay Example
200,000 ha reforested by 2030

Net Investment  = $400m
IRR  = 13.5%
Payed for itself by  = 2035
Pay farmer & conservation  = $136m (NPV)
Hawke’s Bay Example
200,000 ha reforested by 2030

Net Investment = $400m

HB Regional Council = $100m
Central Government = $200m
Private Sector = $100m (Green Bond)
Nelson Example: Wakapuaka
20 ha reforested by 2020

Net Investment = $190k
IRR = 0%
Payed for itself by = never
Pay farmer & conservation = -$150k (NPV)

Indigenous
Nelson Example: Wakapuaka
20 ha reforested by 2020

Net Investment = $170k
IRR = 5.6%
Payed for itself by = 2034
Pay farmer & conservation = $15k (NPV)
Nelson Example: Wakapuaka
20 ha reforested by 2020

Net Investment  = $120k
IRR  = 8.1%
Payed for itself by  = 2031
Pay farmer & conservation  = $61k (NPV)

Exotic Hardwoods

Indigenous

If no fencing
Nelson Example: Wakapuaka
20 ha reforested by 2020

Net Investment = $120k
IRR = 9.8%
Payed for itself by = 2030
Pay farmer & conservation = $110k (NPV)

If no fencing + Manuka honey

Exotic Hardwoods
Indigenous
This feasibility study involved testing the commercial viability of carbon credit projects for indigenous reforestation using an exotic hardwood nursery crop at four sites in the Tasman District: one each the Waimea, Marahau, Aorere, and Maruia catchments.

Indigenous reforestation of using an exotic hardwood nursery crop at these sites is commercially viable, whereas the same projects using only indigenous tree species is not commercially viable. The analysis showed that optimal scenario (highest return/least cost) involved planting but not harvesting the widely spaced exotic hardwoods.

<table>
<thead>
<tr>
<th>Landowner:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area:</td>
<td>3.4 ha</td>
<td>16.8 ha</td>
<td>41 ha</td>
<td>3.9 ha</td>
</tr>
<tr>
<td>IRR:</td>
<td>2.3%</td>
<td>14.5%</td>
<td>15.3%</td>
<td>10.5%</td>
</tr>
<tr>
<td>NPV:</td>
<td>($7,167)</td>
<td>$94,841</td>
<td>$229,475</td>
<td>$17,190</td>
</tr>
<tr>
<td>Capital required:</td>
<td>$16,279</td>
<td>$43,014</td>
<td>$98,912</td>
<td>$16,768</td>
</tr>
<tr>
<td>Capital required / ha:</td>
<td>$4,788</td>
<td>$2,560</td>
<td>$2,412</td>
<td>$4,300</td>
</tr>
<tr>
<td>Payback period:</td>
<td>26 yrs</td>
<td>9 yrs</td>
<td>9 yrs</td>
<td>11 yrs</td>
</tr>
<tr>
<td>Trees Planted:</td>
<td>3,155</td>
<td>8,064</td>
<td>19,680</td>
<td>1,872</td>
</tr>
</tbody>
</table>

The projected performance of these investments appears sufficient to attract impact investment from the public and private sector. The forest carbon investments described here provide the Tasman District Council with a useful strategic framework for the delivery of high priority sustainable land management goals, potentially through a public-private-partnership (PPP) model. Here the TDC could function as an impact investor alongside private impact investment. Such a model is capable of a four-fold amplification of ratepayer funds compared with the same result delivered by grant.

This would enable ratepayer funds to stimulate a market-based model for an ambitious regional sustainable land management programme, sufficient to reducing regional contingent liabilities associated with a warmer future climate with more frequent high intensity extreme weather events in coming decades.

It is time to start seriously addressing the climate resilience challenges faced by this region, with particular regard to erosion risk and waterways protection. The sustainable land management financing model applied in this study, and the feasibility studies contained herein, represent a 21st century solution to a 21st century problem.
**Tasman Example: 4,000ha**

<table>
<thead>
<tr>
<th>Project returns summary</th>
<th>Total Project</th>
<th>Farmer</th>
<th>Private Capital</th>
<th>Public Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Value of Discrete FCFs</td>
<td>$8,531,069</td>
<td>$2,840,846</td>
<td>$5,986,868</td>
<td>$(296,645)</td>
</tr>
<tr>
<td>Present Value of Terminal Value</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total NPV</td>
<td>$8,531,069</td>
<td>$2,840,846</td>
<td>$5,986,868</td>
<td>$(296,645)</td>
</tr>
</tbody>
</table>

**Internal Rate of Return (IRR)**

- IRR (explicit cashflows): 7.3% (Farmer), 13.0% (Public Capital)
- **Payback Period**
  - Total capital expenditure: $18,276,800 (Farmer), $3,551,775 (Public Capital)
  - Cashflow breakeven: 14 years (Farmer), 9 years (Public Capital)
  - Discounted cashflow breakeven: 22 years (Farmer), 22 years (Public Capital)

**Other tangible project benefits**

- Area (ha): 4,000.0
- Number of trees planted: 4,240,000
- Average carbon credits per year (yrs 1-10): 95,111
- Average carbon credits per year (yrs 11-20): 116,400
- Average carbon credits per year (yrs 21-30): 72,000

Reforestation area delivered by public grant

Reforestation area delivered by PPP
Carbon Insetting Project

Table 3.2.2.2a: NPV Net Zero Carbon by 2030 on 2,000 ha

<table>
<thead>
<tr>
<th>Description</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Insetting Project Costs (NPV)</td>
<td>($15,858,570)</td>
</tr>
<tr>
<td>Total Offsetting costs (NPV) (i.e. buying offsets only)</td>
<td>($2,936,691)</td>
</tr>
<tr>
<td>Cash Flow Winner: Offsetting (NPV benefit)</td>
<td>$12,921,879</td>
</tr>
<tr>
<td>Effective insetting carbon price</td>
<td>$58.25</td>
</tr>
</tbody>
</table>
**Carbon Insetting Project**

![Graph showing CO2e emissions](image)

**Table 3.2.3.1b: Leased Land - NPV Net Zero Carbon by 2025 on 600 ha (exotic hardwood & indigenous)**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Insetting NPV $m</th>
<th>Offsetting NPV $m</th>
<th>Effective Insetting Carbon Price$^5</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case$^1$</td>
<td>$(4.2)$</td>
<td>$(3.7)$</td>
<td>$13.04$</td>
<td></td>
</tr>
<tr>
<td>Severe downside$^2$</td>
<td>$(4.5)$</td>
<td>$(1.9)$</td>
<td>$13.91$</td>
<td></td>
</tr>
<tr>
<td>Moderate downside$^3$</td>
<td>$(4.3)$</td>
<td>$(2.8)$</td>
<td>$13.48$</td>
<td></td>
</tr>
<tr>
<td>Moderate upside$^4$</td>
<td>$(4.1)$</td>
<td>$(4.6)$</td>
<td>$12.61$</td>
<td></td>
</tr>
</tbody>
</table>

1. Market carbon price increasing by $1 annually; 2. 50% reduction in market price after year one and then increasing by $0.50 p.a. thereafter; 3. 25% reduction in market price after year one and then increasing by $0.75 p.a. thereafter; 4. 25% increase in market price p.a. All scenarios are calculated in real dollar terms. 5. Total project costs divided by total demand for carbon credits over a 50-year period.
Carbon Insetting Project

Area required for indigenous forest carbon project

Area required for exotic hardwood + indigenous forest carbon project
Because this replaces my beef & lamb income I’ll do it
Thanks

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