



RECLØAKING
PAPATŪĀNUKU

PureAdvantage™



Ō Tātou Ngahere
RECLØAKING PAPATŪĀNUKU

SHAPING THE BUSINESS CASE
November 2023

PureAdvantage™



AND A GROWING ALLIANCE OF SIGNATORIES

Executive Summary

Preliminary

Pressures

- **Papatūānuku, our Earth mother, is in trouble. And so are we, her people.**
- Aotearoa New Zealand, like the rest of the world, is facing a number of interlinked ecological challenges.
 - Many of our **Indigenous species are declining** with a growing number at risk of extinction.
 - **Sediment** from extensive erosion is the primary cause of **contamination** in our rivers, lakes and estuaries, with significant adverse effects on freshwater and marine species, habitats, and ecosystems.
 - **Pests and weeds are overwhelming** our old growth Indigenous forests, impacting their ability to regenerate and threatening indigenous biodiversity.
- Climate change is exacerbating all of these challenges, and creating new ones.

Recloaking Papatūānuku: An ambitious Nature-based Solution

- Guided by mātauranga and te ao Māori (indigenous knowledge, values and wisdom) and science-based research, **Recloaking Papatūānuku (RP)** is an ambitious but cost-effective and achievable Nature-based Solution designed to address these interrelated issues together, provided we act now, and with the visionary political commitment and support necessary to do so.
- The ultimate goal is to **restore Papatūānuku's mauri** - her ecological balance and life force - and create an intergenerational nature-positive legacy, for us, our mokopuna, and all living things.
- RP is not a substitute for urgent and deep gross emissions reductions. Rather, it recognises that **enduring, high-integrity, co-beneficial carbon sequestration and storage will be needed alongside those reductions to draw down historic and hard-to-abate emissions and to realise a net-negative emissions, nature-positive future from 2050 and beyond.**
- Aotearoa's Indigenous forests are some of the highest sequestering in the world, but many are deteriorating due to absent or inadequate weed and pest control.
- RP aims to **strategically restore and enhance at least 2.1 million hectares of indigenous forests across Aotearoa New Zealand over the next 10 years.**

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Recloaking Papatūānuku: An ambitious Nature-based Solution

- By restoring degraded, and strategically weaving new, indigenous forests across our landscapes, Aotearoa New Zealand can, among multiple co-benefits:
 - Build **climate and ecological resilience** and reduce the vulnerability of our communities and ecosystems to increasingly frequent and severe climate-related risks;
 - Secure an **intergenerationally** enduring and regenerative carbon sink;
 - Heal our **soils and waterways**;
 - Create **regional employment**; and
 - Restore the richness of our unique indigenous **biodiversity and preserve our taonga species**.

Comparative investment analysis

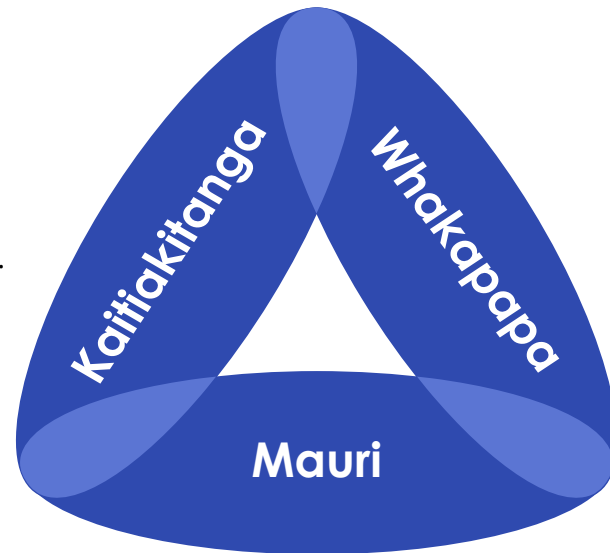
- Based on carbon sequestration opportunities alone, Recloaking Papatūānuku would support Aotearoa's future Nationally Determined Contributions (NDCs) under the Paris Agreement at a **lower average abatement cost of ~\$32/TCO₂**, compared to the average abatement cost of international offsets, which are currently priced around \$60/TCO₂.
- Currently, the Treasury estimates Aotearoa could spend up to \$24 billion on international offsets to meet its first NDC, the period for which ends in 2030. By way of comparison, the **total expected cost of RP is in the region of \$8.5-12.1 billion by 2050**.
- The programme is expected to **capture ~1,500 million TCO₂ between 2024 - 2100**, the equivalent of approx. 20 years of NZ's current emissions (76.8 million TCO₂ in 2021), which is likely to be well in excess of what will be needed to meet Aotearoa's future NDCs and therefore could provide investment opportunities in international carbon markets for high-integrity offsets.

Indigenous context: Māori values key to framing and delivering Recloaking Papatūānuku

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- Many pūrākau (stories) are integral to understanding te ao Māori (Māori worldview), one of which is the separation of *Papatūānuku* (Earth Mother) and *Ranginui* (Sky Father) from their embrace during the creation of the world, which brought the world of light (*Te Ao Mārama*).
- These narratives inform indigenous knowledge and understanding of the reciprocal dynamic between actions on land (*Papatūānuku*) and their short- and long-term effects on climate (which is the realm of *Ranginui*), and help us orient pathways to restoration and climate resilience.

Kaitiakitanga, or guardianship, which is about applying ancestral knowledge alongside new knowledge and technology to restore well-functioning ecological and climate systems.



Whakapapa, a genealogical term that is about understanding and ongoing reflection on our past and present to best inform a restorative pathway to a thriving future.

Mauri, which is about the healthy equilibrium of an energy system within (and of) an environment - in essence, its life spark or force. Understanding the factors that have interfered with the mauri of a thing or being will help determine appropriate responses to restoring it.

- These principles transcend the singular lens of economic approaches to solving multi-layered challenges. Instead they help to situate and frame up responses in ways that better recognise their complexity and support truly holistic and transformative solutions, such as Recloaking Papatūānuku.

Economic Snapshot

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Context

- Recloaking Papatūānuku (RP) is a plan to **recloak Aotearoa in 2.1Mha of indigenous forests**
- Aotearoa is on track to spend up to **\$24bn on offshore offsets** to 2030 – a major transfer of New Zealand's wealth
- RP would provide a better way for Aotearoa to meet decarbonisation targets while avoiding a large wealth transfer and delivering **economic** and **biodiversity benefits** to local and rural communities while increasing economic and disaster **resilience**

Suggested plan

- RP could reforest 2.1Mha with a diverse mix of **Indigenous** tree and shrub species over a **10-year programme starting in 2024**, with ongoing maintenance and predator control between 2024-2050

Costs

- The RP programme supports Aotearoa's future NDCs at a lower average abatement cost of **\$32/TCO₂** compared to international offsets **~\$60/TCO₂**, with a total expected cost of **~\$11.8-12.1bn** by **2050**
- When **discounted** to its present value, the programme is expected to cost **\$8.5-9.5bn** by **2050**

Sequestration

- The programme is expected to capture **~1,500 million TCO₂** between **2024 and 2100**, the equivalent of approx. 20 years of NZ's current emissions (76.8 million TCO₂ in 2021)
- Our calculations are built on conservative sequestration rates and do not capture the methane reductions possible from reducing ungulate populations

Additional benefits

- RP could deliver **employment benefits** through the creation of thousands of seasonal jobs per year to complete planting and through additional job creation in later years for forest management, along with education benefits that come from community-driven involvement and ownership.

Policy options

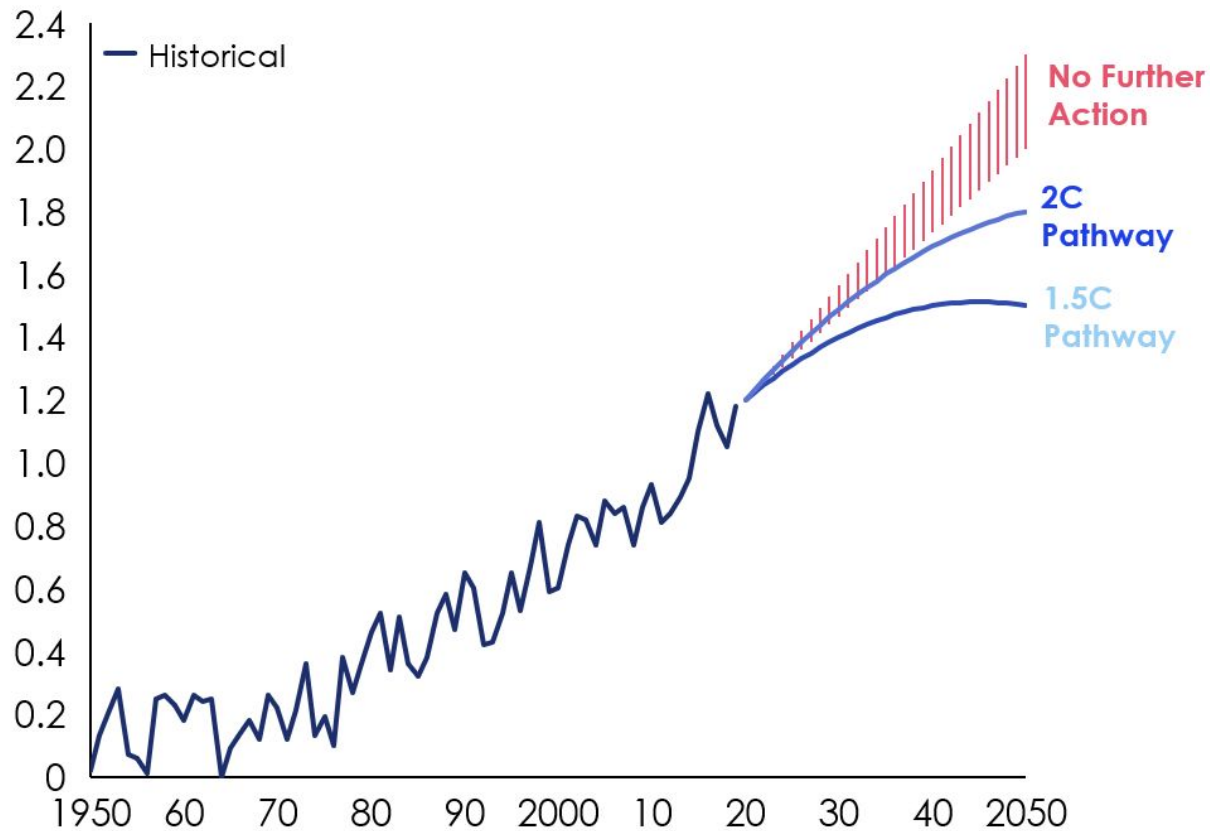
- **The RP programme could be structured under one of three policy options: (1) Landowners receive Crown financing** to reforest land, repaying it through ETS income. They own ETS revenues and repay Crown loans; **(2) Landowners get an upfront grant for reforestation, sharing costs with the Crown.** They use ETS income or carbon credit sales, sharing revenues with the Crown, which has a right of first refusal; **(3) Crown funds reforestation** and gets carbon credits in return. Crown covers all upfront costs, and landowners receive a yearly incentive payment to support land use change.
- **We propose developing option 3.** Further work is underway on incentive design, policy evaluation, market development, and implementation planning

Globally, major changes are needed to meet the targets of the Paris Agreement, limiting global warming well below 2.0°C, and pursue efforts to limit global warming to 1.5°C

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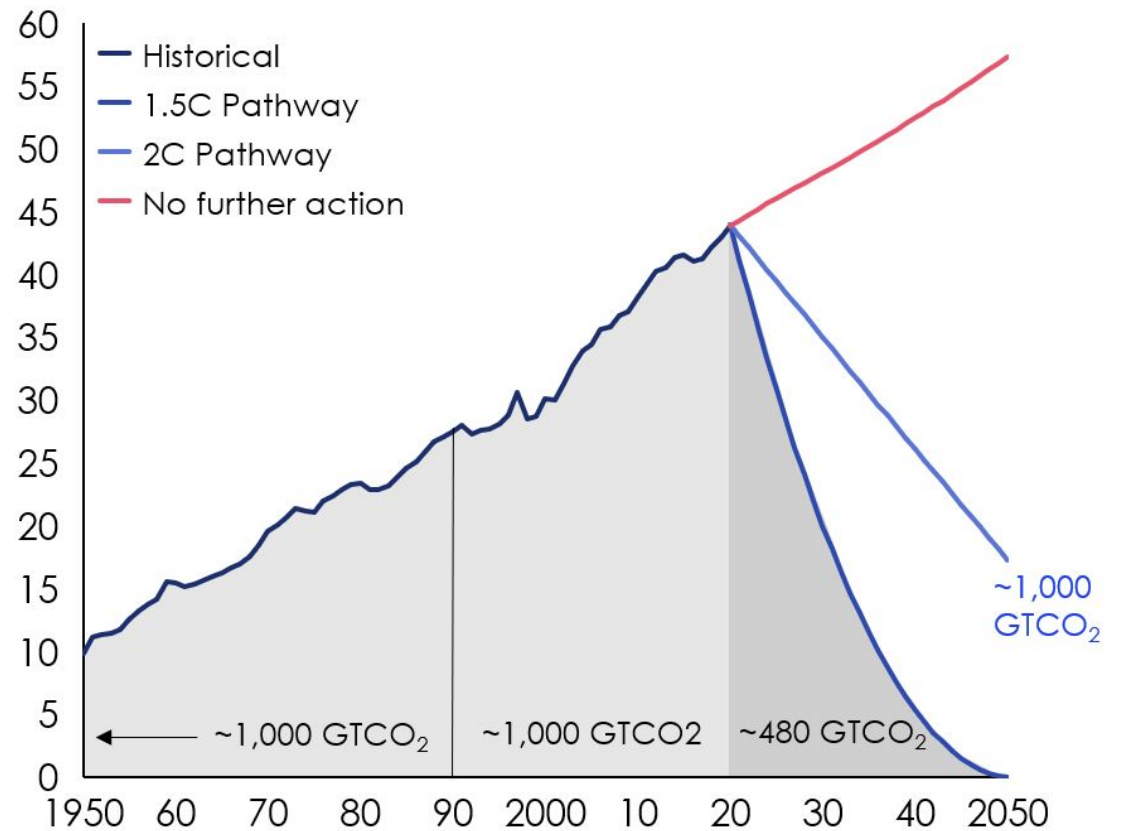
Resilience and adaptation

Rise in average global temperature (°C)



Mitigation

Annual CO₂ emissions (Gt CO₂)



Source: CO₂ emissions: Carbon Dioxide Information Analysis Centre, Oak Ridge National Laboratory. Friedlingstien et al. "Global Carbon Budget 2019." Earth Systems Science Data. (2019). Forward projections are illustrative, based on carbon budgets estimated from Rogelj et al (2019) and the IEA CP Scenario, following Hausfather and Peters (2020). Temperature Record: NASA Goddard Institute for Space Studies (GISTEMP -2019) . Warming for "No further action" is the range between RCP8.5 and RCP4.5 ranges, as IEA CPS plus estimates for non-energy emissions following Hausfather and Peters (2020) puts cumulative emissions roughly 3/4ths of the way between RCP8.5 and RCP4.5.

Urgent & deep gross emissions reductions are essential & must be prioritised - reforestation is key to durable CO₂ removal from the atmosphere at scale

Preliminary



Nature-based



Reforestation

CO₂ removal solutions
(not exhaustive)

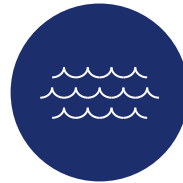
Viability and readiness to scale

High. Reforestation is low cost, low-tech, and can be done globally



Soil carbon enhancement

Mid. The exact on-farm practices that add capture carbon in soil vary with soil type and weather, and thus location. CO₂ is easily re-released from soil.



Peat and coastal wetlands

Low-Mid. The side-effects of wetland and ocean sequestration is not fully understood (e.g. ocean acidification, increase of wetland methane emissions). Further research would be required before scaling these solutions.



Ocean sequestration



Technology-based



BECCS¹

Low-Mid. The challenge with technology-based CO₂ removal is the speed of deployment, limited by technical readiness in the case of DACCS, and availability of sustainably-harvested biomass for BECCS (limit up to 1-2 GT/yr removal CO₂). Transportation and storage of CO₂ is logistically complex and expensive, and DACCS requires a lot of energy to operate



DACCS²

1. Bioenergy power generation with carbon capture and storage (largely in geological reservoirs). BECCS is supply constrained by available biomass, which is also needed for transport and industry to reach net-zero
 2. Direct air capture with carbon capture and storage (largely in geological reservoirs). DACCS is an emerging technology that is not at any commercial scale as of 2023. Also, there is moral ambiguity of CCS tech: known use by oil and gas to help further oil prospecting/extraction.

Recloaking Papatūānuku reforests in a way that supports our international obligations and enhances New Zealand's future

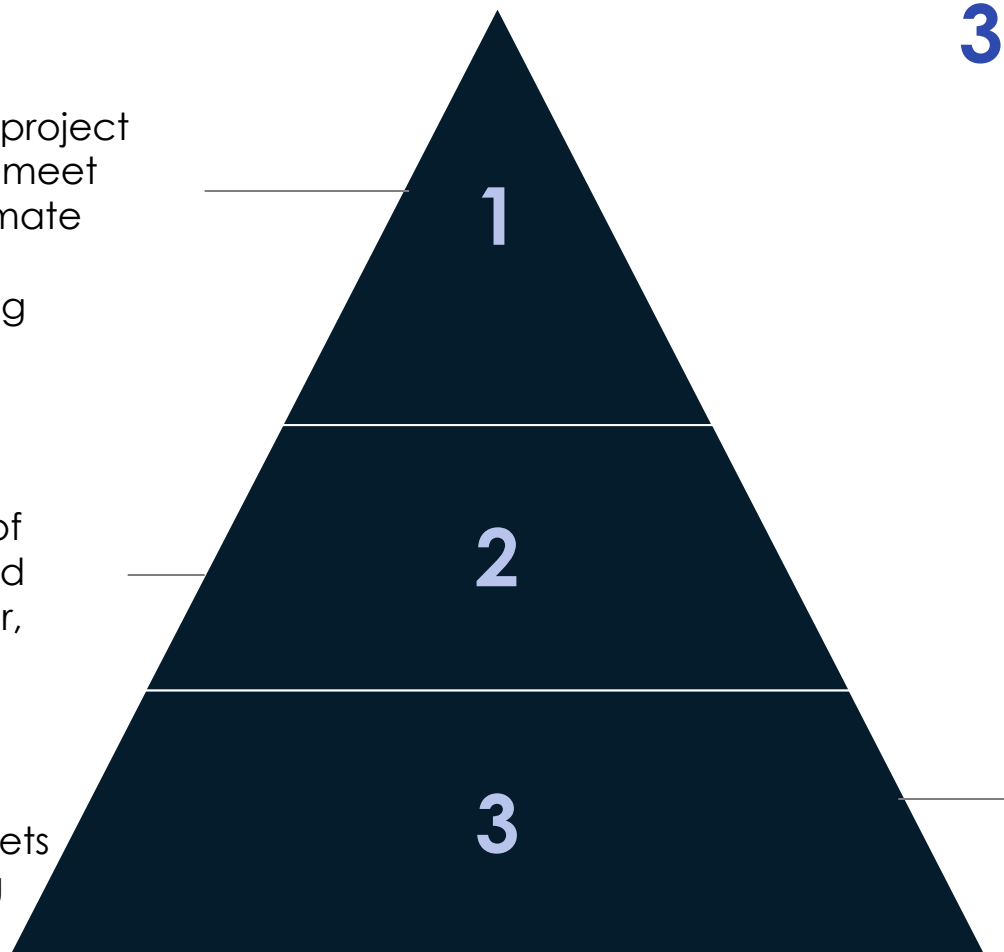
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1 Problem Statement

- How can a large-scale indigenous reforestation project support New Zealand to meet our intergenerational climate obligations and deliver biodiversity and wellbeing benefits

2 Optimization Problem

- Maximizing the number of right-placed trees for land parcel involved (weather, climate, economic and social considerations), subject to spending less than the cost of international carbon offsets over the medium to long term



3 Further Constraints

- We have further liabilities under NDC 2, NDC 3 and beyond
- We should target new bare or marginal land for reforestation, as this will have the biggest biodiversity wins
- Only a subset of land is suitable for reforestation, and only some of this is economically attractive
- Farmers (and the sheep & beef industries) are facing economic headwinds, placing pressure on farm budgets – there is an opportunity to support these communities
- We face capacity constraints: labour and nursery (nursery capacity is not a constraint provided key players can see a long term, sustainable demand to justify the capital investment required)

Recloaking Papatūānuku is a holistic strategy that enhances biodiversity, sequesters carbon, supports resilience to the physical impacts of climate change, strengthens rural communities and has positive tourism benefits.

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What is Recloaking?

A nature-based solution to the climate and biodiversity crisis that enhances and restores up to 5 million hectares of land in indigenous forest

A Mosaic Approach to Reforestation

Where strategic areas of farms are reforested as part of an integrated farm management strategy rather than whole farms being converted into forest

Papatūānuku (Mother Nature)

Government → Landowners

Recloaking Papatūānuku is a unique collaboration between Government, Landowners and Nature – where all stakeholders derive benefits, including:



Stabilise Hill Country and Reduce Sediment Loads



Enhance Biodiversity and Water Quality



Protect Terrestrial and Marine Ecosystems



Provide employment and nature-based income



Enhance food production and provide sustainable biomass



Enhance the mauri of our environment



Treatment 1
New Restoration Planting



Treatment 2
Supported Natural Reversion



Treatment 3
Enhancement of Existing Forest

RP uses a range of planting approaches, to get the right treatment for each land parcel

~1500 million TCO₂

Of sequestration potential at forest maturity (discounted up to 2100), whilst enhancing biodiversity, improving disaster resilience and supporting Aotearoa's climate response

~\$32/TCO₂

Programme abatement cost of Recloaking Papatūānuku is lower than the expected international cost of offsets.

~\$60/TCO₂

Projected cost of international carbon credits (in Scenarios 1-2 of Treasury's modelling range from \$41-95/TCO₂) to meeting our forecast NDC 1 shortfall of ~88-114.1 million TCO₂

The RP programme delivers 2.1Mha of new indigenous forest and sequesters carbon at a unit cost of \$32/TCO₂¹

Results shown for the RP programme to reforest 2.1Mha of native trees and shrubs over a 10-year delivery schedule




Scenario 1: flat 5% discount rate



1. Gross costs, not including fiscal returns from increased tax revenues from local investment or a quantification of non-carbon benefits (impacts on disaster resilience, local economic development, enhancement of biodiversity, etc).
 2. Programme costs include establishment costs, management and labour costs, and land costs.
 3. Plantation mix includes Totara, Kauri, Kahikatea, Rimu, Puriri, Beech, other broadleaves, other conifers, and mixed Indigenous shrubs, and natural regeneration. Trees and Shrubs are assumed to be planted based on the types of land available.

Each land type is unique, requiring a tailored reforestation scenario that responds to site soil conditions, seed stocks and predator levels

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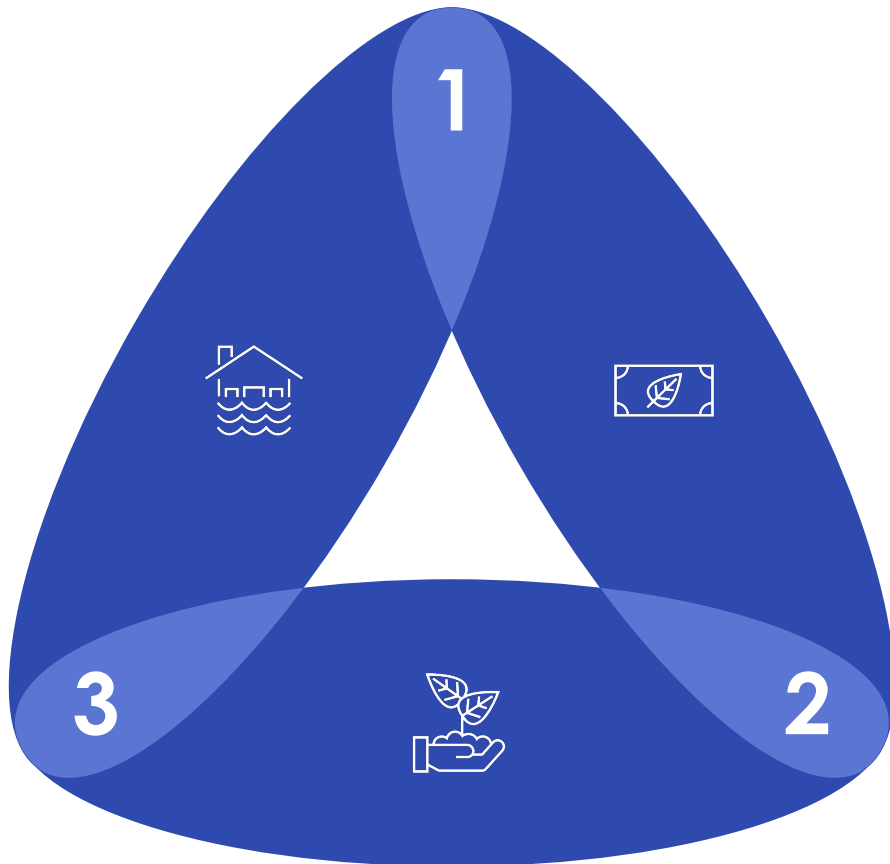
	Applied Land Types ¹	Stock Composition	Management Requirements	Impacts	<p>Further work is required to validate planting scenarios</p> <p>Viability of natural regeneration and reversion across different site conditions</p> <p>Catchment planning for mosaic landscapes with local geologies, climates and ecologies</p> <p>Selecting optimum seedling stock composition</p> <p>Developing a decision framework for selecting a planting scenario</p>
 <p>New Restoration Planting</p>	<p>Low Productivity Riparian Protected</p>	<p>Tall species (totara, rimu, kahikatea, tawa, beech) and nursery (manuku, kohuhu)</p>	<p>Weeding, ungulate control, fencing and enrichment planting</p>	<p>Build resilience, enhance biodiversity and sequester CO₂</p>	
 <p>Supported Natural Reversion</p>	<p>Marginal HC Crown</p>	<p>Enrichment planting of tall and nursery species, ensure sufficient seed sources</p>	<p>Enrichment planting and ungulate control</p>	<p>Build resilience, enhance biodiversity and sequester CO₂</p>	
 <p>Enhancement of Existing Forest</p>	<p>Public Forest Private Forest</p>	<p>Limited enrichment planting</p>	<p>Ungulate control and fencing</p>	<p>Enhance biodiversity and sequester CO₂</p>	

1. Detailed information on land type definitions, composition and underlying geospatial analysis is contained in the appendix materials

Farmers, Māori, landowners, Government & key stakeholders can collaborate in Recloaking Papatūānuku, creating a range of economic and biodiversity benefits while sequestering carbon

Preliminary

Triple Dividend of Climate Resilience¹



Avoided Losses

Disaster losses, erosion prevention, flood control



Induced Economic or Development Benefits

Regional New Zealand can realise opportunities in biodiversity management whilst helping lead our global climate ambitions



Additional Social and Environmental Benefits

Erosion prevention, flood control, disaster prevention, biodiversity, carbon sequestration, habitat restoration, species protection

1

More Productive Land

Land that is less exposed to disaster losses can be invested in, enhancing the productivity of our land

2

Stronger Rural Communities

Enhanced local environments together with new revenue sources builds the social capital of regional New Zealand




3

Less Acute Natural Disaster Impacts

A resilient environment better manages the impacts of natural disasters, preventing loss in the first instance

1. <https://www.wri.org/research/triple-dividend-building-climate-resilience-taking-stock-moving-forward>

Policy option 3 delivers Recloaking Papatūānuku with greater long-term stability and unlocks participation by a wider group of landowners

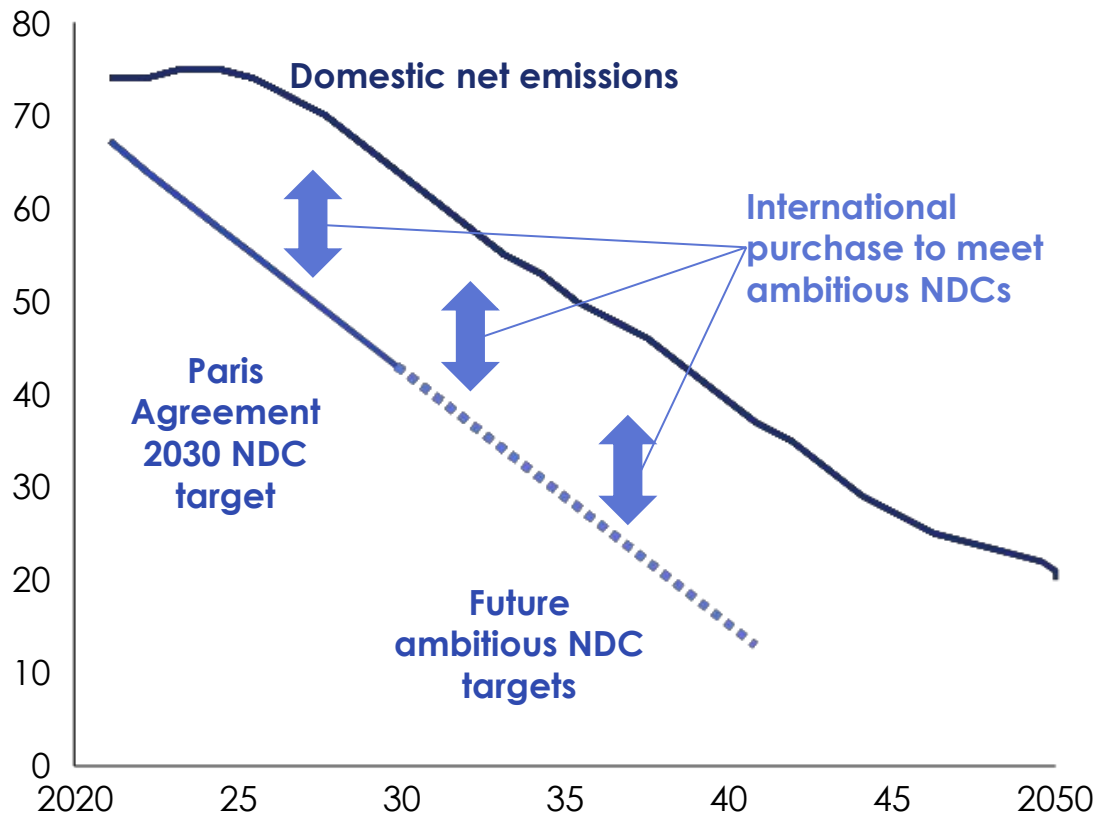
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Policy Option	Description	Establishment Costs ¹	Yearly Costs	Yearly Land Incentive ²	Risk Allocation	Revenue Share
1 Full ETS Inclusion 	Landowners get Crown financing to retire and reforest land, which they repay through ETS income earned by the reforested land. Assumes permanent forest category is only for indigenous forest	Landowner pays 100%, supported by Crown loan	Landowner pays 100% of yearly maintenance costs. Crown retains residual monitoring function	No yearly land incentive	Farmer carries risk of NZU value fluctuations There may be increased scepticism of the credibility of offset mechanisms	Landowner receives ETS revenues and repays any Crown loans
2 Hybrid Model 	Landowners are provided an upfront grant to assist in reforestation but meet remaining costs through ETS income (or sale of carbon credits generally)	Establishment Costs split 50/50 between Landowner and the Crown. Landowner has access to a Crown loan facility	Landowner pays 100% of yearly maintenance costs. Crown retains residual monitoring function	Land incentive adjusted to reflect extent of Crown contribution	Sharing of risk from carbon credit price fluctuation	Landowners and the Crown share ETS revenues Crown has right of first refusal to purchase carbon credits Crown provides an adjusted land rental to reflect Crown ETS interest
3 ETS Exclusion 	Crown funds reforestation in return for receiving carbon credits generated A government guaranteed income stream would provide benefits to Maori/Iwi who face challenges raising traditional finance due to fractional land ownership	Crown pays 100% upfront costs	Landowner pays 100% of yearly maintenance costs. Crown retains residual monitoring function	Crown pays a yearly land incentive to the landowner (currently modelled at 150% of the average productivity of their land) provided a permanent forest is maintained	Crown carries risk credits not needed to meet NDC	Crown receives carbon credits Landowners receive a yearly land incentive to support land use change and diversify their on-farm income

1. All Establishment Cost options include an initial land access payment during the establishment season.
2. In all options legal title to the land remains with the landowner – reforestation is accomplished through covenants

Recloaking Papatūānuku bends the emissions path to make future ambitious Paris Agreement targets achievable domestically

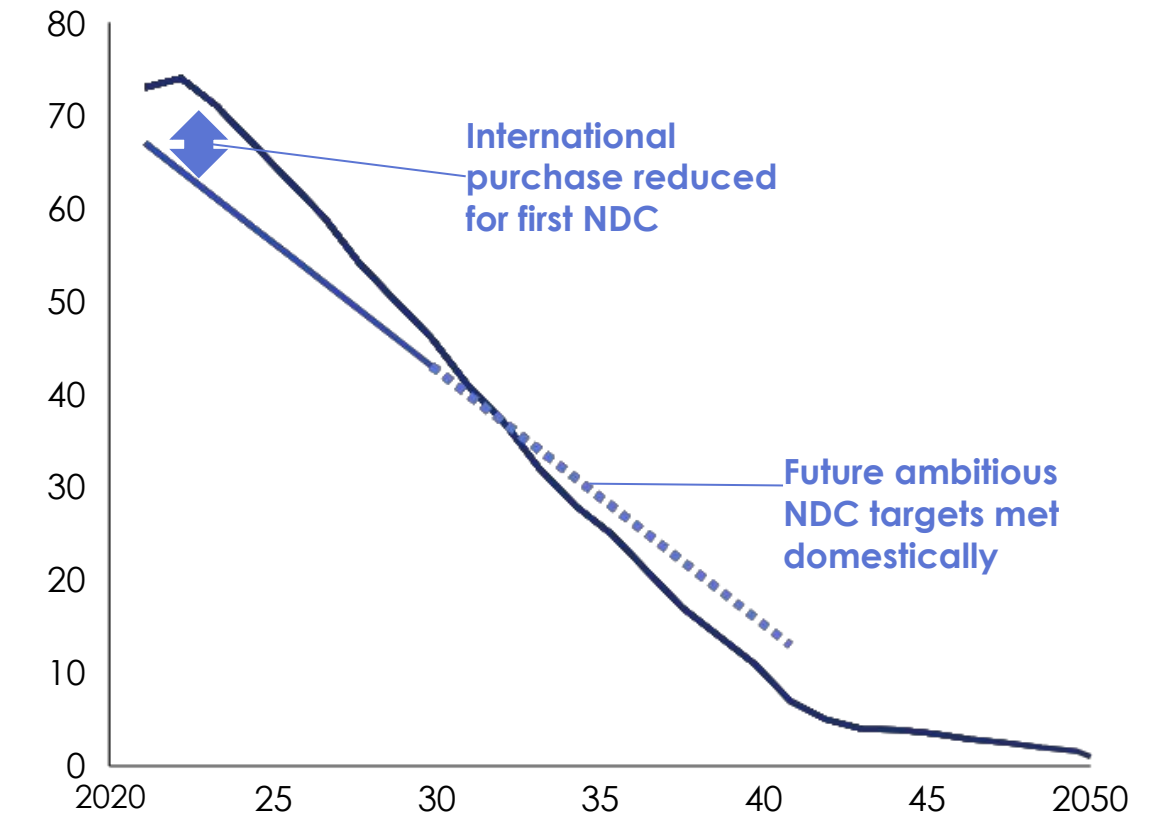
Current Domestic Net Emissions Path (Climate Change Commission Demonstration Path)

Annual net greenhouse gas emissions (MTCO₂eq)



Domestic Net Emissions with additional reductions from Recloaking Papatūānuku

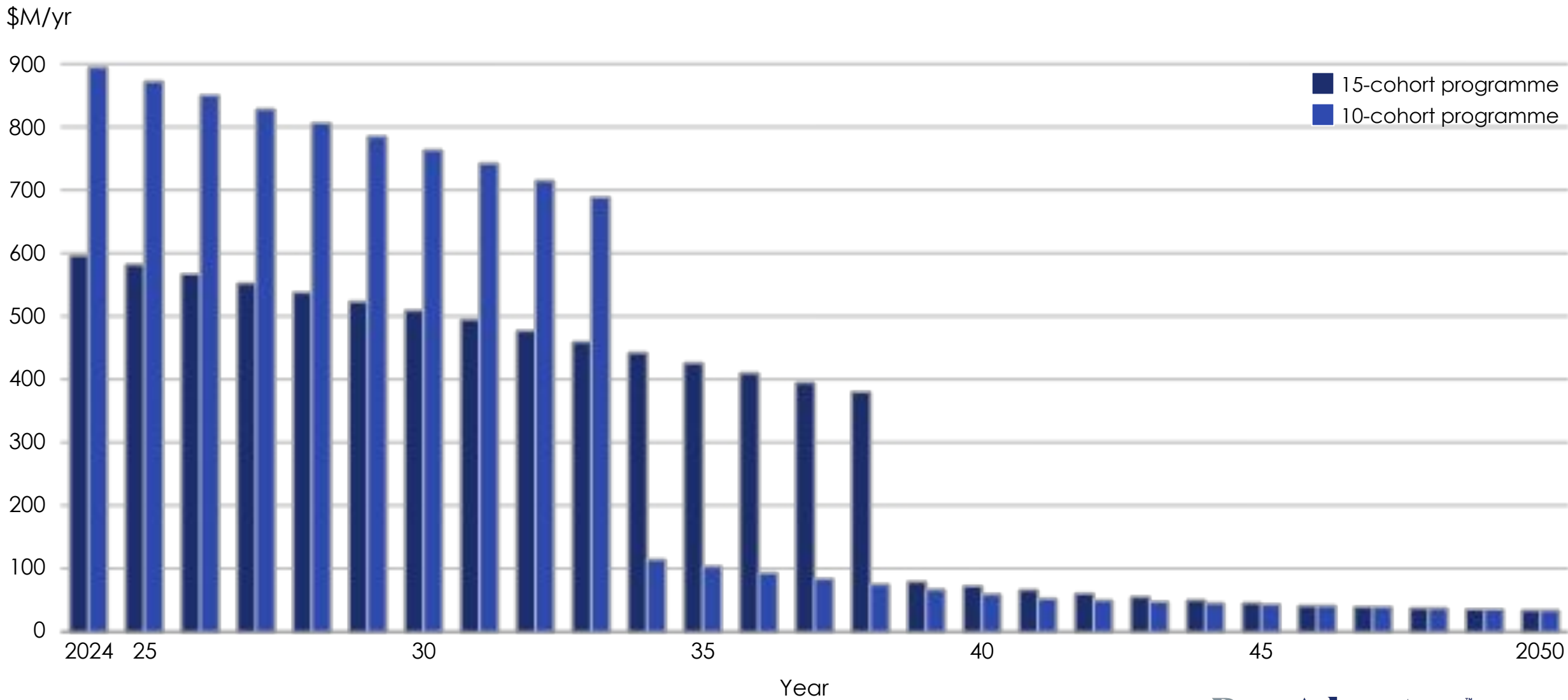
Annual net greenhouse gas emissions (MTCO₂eq)



Assumptions: Recloaking Papatūānuku 10 year rollout, with all sequestration assumed additional to that in the Climate Change Commission's Demonstration Pathway.

Additional spend over time required to deliver proposed 2.1Mha programme (forecast to 2050)

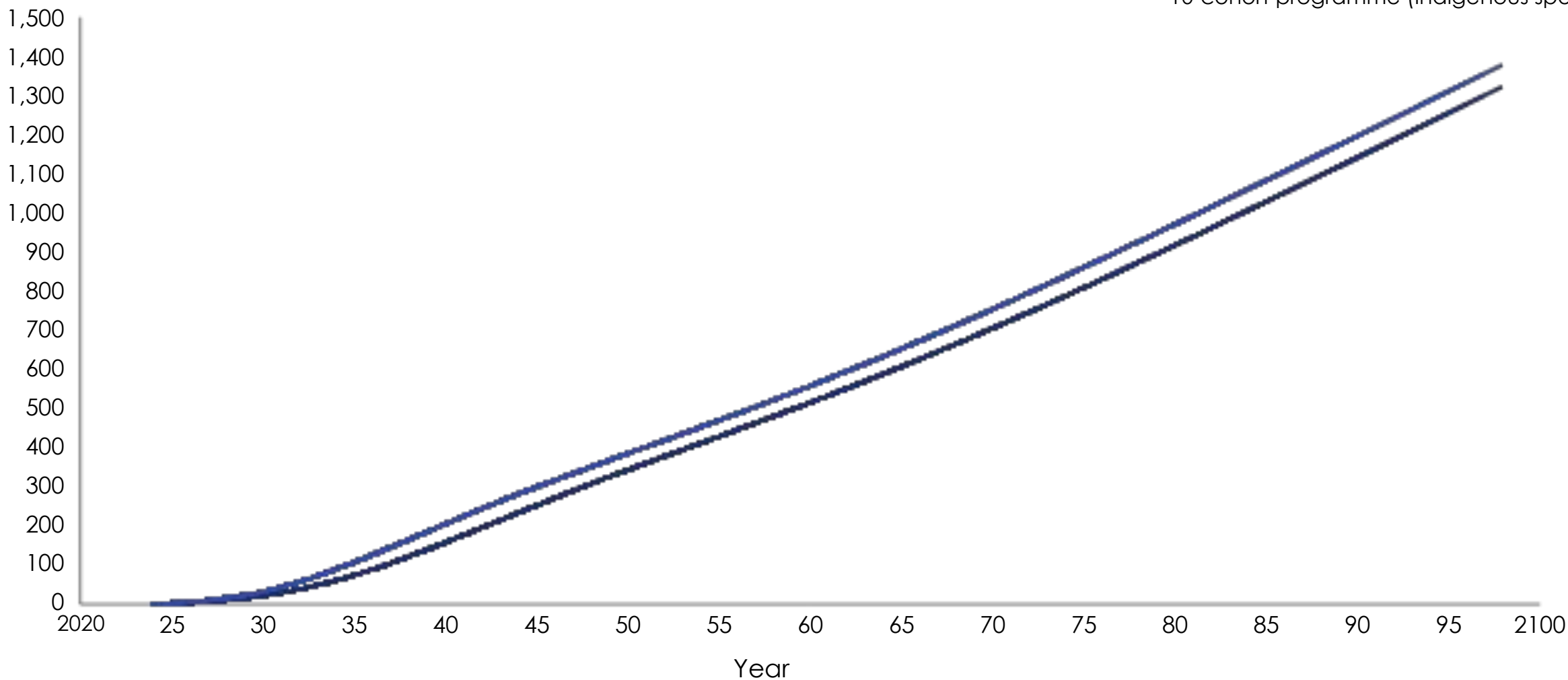
Assumes 5% discount rate and 2023 dollars



Cumulative carbon sequestration forecast to 2100 for proposed 2.1Mha programme

Millions tonnes

CO₂e





Ka ora te wai ā te whenua hoki,
ka ora te tāngata.

*When the water and land are well,
the people are well.*

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