

Innovative Policies for New Zealand's Future Forest Sector

A Distillation of the 2015 to 2019 deliberations of the New Zealand Forestry Sector's Forest Policy Project Team. Assembled by Garth Cumberland (FPP Team Convenor) with technical and tactical advice from Dr Wayne Cartwright.

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Foreword

It is with pride that we commend to you these Forest Policies for Aotearoa New Zealand. Over one hundred people from the NZ forest sector have contributed to the work of the Forest Policy Project team through its carefully considered deliberations over five years. The result, this long-term and comprehensive forest policy document, is a grand outcome for the forest sector's efforts. It will provide a useful contribution to sector dialogue at a time when Te Uru Rakau (Forestry New Zealand) is seeking to formulate strategy. The purpose of its strategy is to provide guidance to the sector as a new future is developed for forestry – specifically and urgently aimed at benefiting the economy and land use. Although these Forest Policies align with Te Uru Rakau's strategy work, they have been developed independently. From its inception the Forest Policy Project determined to maintain its autonomy; remaining free from external expectations and influence.

Introduction

These forest policies are derived from research and viewpoints provided by professional members of New Zealand's forestry community. They have developed this document with the specific objective of providing a set of policies to optimise land use and provide benefits to New Zealand from forests over the next century. This represents the considered judgements of over one hundred foresters. They address the future roles that trees should play in New Zealand's land use, economy and wider society.

The document is intended to serve as guide for all manner of institutions which need policies relating to land use and forestry. It is the result of the unbiased deliberations of forest professionals. They worked with the objective of prescribing how to utilise all the multiple benefits of trees.

For several decades, the NZ Government has not had a cohesive Forest Policy to guide the development, protection and utilisation of New Zealand's trees and forests. It is anticipated and hoped that this document will contribute to efforts to rectify this deficiency. It will prove useful for all 'colours' of Government because it is not aligned with any particular political perspective – solely with maximising benefits from forests.

This is a policy for forests in the future, setting out what they can provide to the country.

This is a 'living' document intended to be continually updated and refreshed.

Terminology

This document uses the following terminology:

1. A **forest** is an area of trees of any age, regardless of species, tenure or the purpose for which the trees are managed.
2. The **forest sector** is comprised of the persons who contribute to, make use of, or have an interest in forests in any way.
3. A **forest policy** is a set of enduring and visionary statements encompassing matters concerning New Zealand forests and their uses. Forest policies guide formation of **strategies** and **action plans** that have targeted outcomes and timeframes.
4. **Forestry** is the science and practice of creating, managing, using, conserving, and regenerating forests to achieve human and environmental benefits. Forestry is practiced in **plantations** and natural **stands**. Forest policies state or imply future roles for both.

Core Principles

These policies for future forests are based on innovative core principles:

Core Principle: The Future NZ forest sector will encompass a wide scope:

1. Establishing and operating commercial forests and wood processing that provide direct economic benefits to New Zealand.
2. Establishing and sustaining forests that sequester carbon dioxide, with or without other purposes.
3. Sustaining and expanding forests that conserve, protect and regenerate biodiversity and ecosystems.
4. Establishing and sustaining forests that mitigate risks of erosion and flooding.
5. Managing forests that provide sustained aesthetically attractive landscapes, and opportunities for recreation, tourism, Maori interests and sociocultural wellbeing.
6. Mitigating in all forests the future risks from predators, pests and pathogens.
7. Managing forests in ways that align with priorities of regional development through generating employment, growth and other economic benefits.

This is the scope of the forest sector that can be identified at present. Additions that have merit may well emerge in the future.

It is emphasised that this view of the future scope of the forest sector encompasses all New Zealand forests (exotic and indigenous, industrial and protection). Policy impacts all members of the New Zealand forest community – those who work in and with forests and who process and trade their products. It is logical to include all forests in a co-ordinated forest sector policy because they already have similarities and they will play increasingly important complementary roles in the changing environmental conditions brought about by global climate change.

Core Principle: Government adopts an enduring set of forest sector policies that have the objective of achieving the outcomes that are best for New Zealand, through both the actions of the private sector, and directly by Government.

New Zealand needs a comprehensive and effective forest sector policy that establishes and maintains a sound basis for decisions made by both Government and private enterprise. This document would serve well as a contribution to formation of this Government policy.

Core Principle: Forest sector policies are developed and implemented jointly by several parts of Government including economic development, regional development, climate change (both adaptation and mitigation), energy, conservation, ecosystem recovery, biosecurity, Maori interests, and tourism.

The various aspects of forest policy span across several or all of these parts of Government. Hence a collaborative and coordinated approach is necessary.

Core Principle: The land-use aspects of forest policies are regarded as an important part of overall land use policy.

Traditionally, commercial forests have competed for use of productive land – mainly with pastoral agriculture – on a strictly economic basis. Land use policy has now begun to widen to include introduction of forests to mitigate risks to land threatened by floods and erosion, and to provide watershed management that reduces the intensity of downstream flooding of land and settlements. In addition, land use policy is increasingly recognising the contribution of trees to sequestration of atmospheric carbon dioxide. In yet other land uses, non-monetised values from forests may result in them being introduced.

Hence, as a general principle, forest sector policies must align with and complement wider land use policies.

Core Principle: Forest sector land use policies are informed by complete and objective analysis of the merits of alternative uses of each category of land under consideration. Every analysis includes proper accounting of externalities that have previously been ignored.

This addresses the confusion and mistakes that have arisen in the past when, for example, assessment of the merits on conversion of forest to dairy farming ignored the effects of both alternatives on ecosystems, especially those associated with waterways. These assessments also ignored the impacts of the alternatives on GHG emissions and carbon sequestration.

Core Principle: Forest sector land use policies (and land use policy as a whole) recognise the value of ecosystem services – economic, social, and environmental – and use this information objectively in determining and reporting the value of each alternative use of land.

Ecosystem services from land use provide huge benefits to the New Zealand economy and its people. These services are often taken for granted and not recognized. Because they are not monetized, the benefits are not properly valued. Ecosystem services from land use by forests are subtle and diverse. They include storage of atmospheric carbon, reduction of soil erosion and stream contamination, controlling storm water flows, conserving native flora and fauna, and providing opportunities for recreation and tourism. It is thought that the combined value of ecosystem services to New Zealanders total many billions of dollars annually. More precise evaluation of forest ecosystems is in progress. The numbers emerging are significant, but forest owners rarely receive monetary reward for the ecosystem services that their forest investments provide to New Zealand.

Core Principle: Forest sector policies identify the roles for forests in the major adaptations and transformations that New Zealand will inevitably implement as it responds to profound future global change that will be beyond any recorded human experience.

Much of this profound change will be driven by global warming and climate change. These changes will arise through direct physical and biological impacts, and also indirectly through the effects on the New Zealand of major shifts and disruptions in the global economy and financial systems. Future insight about the physical and biological effects is now well-accepted, to the extent of several declarations of 'Climate Change Emergencies'. The indirect economic effects of climate change have received less attention as yet. The impact of them is likely to be very substantial.

These forest sector policies ensure that they contribute to positive outcomes for New Zealand through assisting with adaptation and mitigation and by contributing to the transformative adjustments in the economy that will be needed.

Other substantial economic, social and geopolitical changes will arise globally from shifts in the sources of energy and their cost, reduced availability of water, declining capacity for land-based food production and fisheries in the face of ecosystem degradation, and global population growth. All will impact substantially on New Zealand, including its forest sector.

Forest Sector Policies

The following sections establish policies for each of the seven aspects of the forest sector that are listed in Principle 1 above. Reflecting the very essence of forests, all policies are long-term. Nevertheless, many of the policies should be implemented immediately and will have short term effects as well as enduring relevance and outcomes.

Policy Section 1:

Establishing and operating commercial forests and wood processing enterprises that provide direct economic benefits to New Zealand

This section first reviews the seven aspects of commercial forests and wood processing, then proposes two sets of policies – one set for production and the other for processing.

Commercial forest size and economic outcomes

New Zealand has 9.5m hectares of forests. Of this, 7.8m hectares are native indigenous forests and 1.7m hectares are exotic plantations, upon which most of the sector's commercial operations are based. Ninety percent of the present 1.7m hectares of plantations are monocultures of *Pinus radiata*. The majority are privately owned, with just 6% in central or local Government ownership.

Large plantations account for 64% of exotic forests, while 36% is in stands of between 5 and 40 hectares that are operated by an estimated 14,000 foresters. The smaller woodlots provide the greatest volume of logs from 'alternative' exotic tree species – other than *Pinus radiata*. Small forests are anticipated to increase numerically and produce a large proportion of the expansion of New Zealand commercial forests.

In addition to profits returned to New Zealand forest owners, the economic benefits to the nation from forests include:

- (a) Employment - 9,500 jobs in forest growing, logging and associated services, and 12,000 jobs in processing and manufacturing beyond the forest gate.
- (b) Supply of local inputs at all stages in forest-based value chains.
- (c) Vegetative cover for water catchments that reduces pollution of water from erosion and mitigates flooding of downstream farmlands and urban areas. It is believed that these benefits are worth billions of dollars annually.
- (d) When free of clear felling, forest landscapes are visual resources that appeal to tourists, adding in a general way to the appeal of New Zealand as a tourism destination and thereby contributing to the size of economic benefits from tourism.

It is noted that profits taken offshore from the high proportion of large commercial forests that are in foreign ownership do not benefit the New Zealand economy.

Commercial forests earn more than \$5b from exports and \$3b from domestic sales. Unprocessed logs account for 50% of export receipts. This proportion has been increasing. The other half of exports are processed in New Zealand, primarily as sawn timber but also including manufactured products. The forest and wood products category is the economy's third largest export earner. Production of logs and lumber is attractive to a category of investors.

Impacts on commercial forests of global warming and climate change

The inevitability of global warming and climate change is now well accepted, to the extent that 'Climate Change Emergencies' are being declared globally and in New Zealand. Science suggests that the effects of these major changes on commercial forests will be both biological and physical:

- (a) Increasing risk of incursion of new pests and pathogens due to a warmer environment.
- (b) The risk that current species – especially *Pinus radiata* – will thrive less well in future conditions that have more extremes of drought and rainfall and have average warming of at least 1.5 degrees C and, much more plausibly, 2 degrees C and higher.
- (c) The certainty that cyclones of 'Bola intensity' will occur and become more frequent.

Both Government and commercial foresters appear to have been reluctant to acknowledge these effects, to assess their impact on commercial forestry, and to prepare and implement plans that address them. This glaring deficiency should be rectified immediately.

Towards sustainable forest management and standards

Commercial forest owners and managers will increasingly adopt sustainable management practices simply to improve profitability. These practices will require that environmental and social considerations rank alongside economic outcomes in all management decisions and assessments of investment in forests. The commercial forest sector has to address three major issues as it takes this way forward:

- (a) Clear-felling of large tracts of land is of particular concern to the public. One reason for this is the dramatic visual impact and loss of aesthetic value. Aesthetics are an important determinant of public approval of commercial forestry. Day to day visual impacts of forests play a major role in determining public trust in the sector. Large scale clear-felling risks this trust. Another reason for concern, is that contiguous clear-felling causes abrupt changes to the ecosystems of large tracts of land. This concern is intensifying as the public becomes more aware of the principles of ecosystem degradation.
- (b) The instability of harvest slash on steep land, causing severe down-stream damage and ecosystem degradation, is another public issue.
- (c) A third public concern is the need to share roads with logging trucks.

Both Government and commercial foresters appear to have been reluctant to acknowledge these effects, to assess their impact on commercial forestry, and to prepare plans for managing adaptation to them. This glaring deficiency should be rectified immediately by strengthening implementation of practices that have already been documented. For instance, Independent certification practices – undertaken by internationally accredited organisations such as the Forest Stewardship Council (FSC) established in 1993 and the Programme for the Endorsement of Forest Certification (PEFC) in 2016 – serve to ameliorate public concern about the sector. Both agencies endorse standards for forest products – by assessing the entire production chain – forest growing, management and harvesting processes – including aesthetics. Thus product certification corroborates the Social Licence for forest operations.

Further, the forestry sector adopted in 2018 the *National Environmental Standards for Plantation Forests* (NES) which is linked to the Resource Management Act. Compliance with NES standards enables foresters to circumvent many mundane and repetitive consent procedures, reducing their costs. The New Zealand Forest Owners Association's excellent *Environmental Code of Practice for Plantation Forestry* highlights best practices to minimizing forests negative impacts. It recommends that at the time of forest establishment (including post-harvest replanting), forest managers should consider the biodiversity impacts, the rotation-long landscape values of the trees being planted, and risk of the trees 'escaping' as wildings.

Wood residues as bio-fuel

At present, most harvest slash lies unused. For some time, advocates have proposed that this material be used as a source of energy, via a number of alternative processes, as an alternative to burning fossil fuels. The argument has been that burning fossil fuels releases new carbon to the atmosphere, whereas burning slash is simply part of the carbon cycle and circulates carbon that has been in the atmosphere before. This is a sound reason, but the practical costs of collecting and using slash have deterred progress. However, as the relative costs of fossil fuels rise in the future, this use of slash will eventually become viable.

In addition to use of harvesting slash, wood fibre supplies for future bio-fuels could also arise from whole trees for which this is the best use, and also from new forests of species that are selected and grown for this purpose.

Wood processing and marketing

The annual harvest of exotic plantations produces about 29 million cubic metres of logs from nearly 50,000 hectares of harvested land. Presently there are fifty processing plants nationwide, ranging from sawmills and pulp mills to cross laminated timber and chip board mills. Half the harvested product is shipped overseas as logs, despite prices for processed forest products being on average six times greater than those for logs on a per cubic metre basis.

Key comments can be made about this situation:

- (a) Exported logs enter commodity markets where there is no opportunity to differentiate products. Most of the attributes of Radiata logs are well understood and clearly ranked among softwood species. Thus, exporters are typically takers of a price that reflects the value of the attributes of the product relative to alternatives.
- (b) Forest-owner investors apparently accept the return/risk profile of this tree-growing and log supply chain that adds little value.
- (c) Sawn timber markets, both in New Zealand and in the international markets targeted by New Zealand exporters, are also essentially commodity markets in which New Zealand processors are price takers, with actual prices reflecting the perceived quality of Radiata pine timber relative to other species. Adherence to quality standards and the reputation of the supplier are the only potential sources of slight competitive advantage.
- (d) The difficult competitive dynamics and cost/price structures in these sawn timber export markets probably deter New Zealand exporters from investing in growth that would process a higher proportion of New Zealand logs. However, it is noted that little market research is undertaken to explore opportunities for extension of product ranges.

Thus, from a marketing perspective, the commercial forest sector is in a commodity trap that yields relatively low returns. These (log) returns are apparently satisfactory to current owners and investors who have objectives that are compatible with this level of financial performance. This means that the entire sector tends to be held back by the low expectations of these investors. Investment in growth of sawn timber capacity is insufficiently attractive to gain much traction. These low-value approaches to commercial forestry can be readily scaled up if investors have the appetite to support it, but this is not apparent at present.

In principle, the best opportunities for transition out of the 'business as usual' commodity trap could be through technologically advanced engineered structural products in which the attributes of Radiata pine are fully utilised and where sound marketing can establish differential advantages in markets. Because the processes for products such as structural wall panels and laminated beams have substantial economies of scale, competitive cost positions require markets larger than those available in New Zealand. In other words, any innovative venture of this kind would benefit greatly from being an exporter from the outset.

Innovative structural wood businesses already exist in New Zealand and could become the leaders of the major development proposed here. This could be the first initiative towards building a diverse, technologically endowed, environmentally responsible and internationally competitive domestic forest processing sector. For three or four decades, logs from exotic plantations will offer the best scope for processing. Beyond that, more wood from recently-planted indigenous logs may be harvested. The supply of logs to green-field processors must be assured. The planting spike of the early 1990s will become harvestable over the decade 2020 to 2030. With careful planning, this harvest peak will serve as a supply base for the commissioning of new processing.

As domestic processing expands, so too will wood residues. These will become the raw material for complementary and novel products including biochemicals, bioplastics, and biocomposites.

New demand for structural wood products that will arise from climate change

A highly plausible global scenario for one of the effects of medium-term climate change is that, on a global basis, millions of households will be displaced by increasingly severe coastal storm surges and flooded rivers. Thousands of communities will require construction of housing in safer locations. In parallel, the costs of concrete and steel structural materials will increase markedly due to levies that bring to account the external costs of GHG emissions incurred in their manufacturing processes. These adjustments will change cost structures substantially in favour of engineered structural wood, relative to steel and concrete. These products are also attractive due to their sequestration of carbon dioxide, greater resilience and better insulation. Hence, a view that global demand for structural wood products such as CLT and LVL will soar can be accepted with considerable confidence.

Promotion of New Zealand wood products

The current programme for generic promotion of New Zealand wood is disadvantaged because most of the products are positioned in their markets as commodities that have little scope for differentiation.

It is proposed that this programme be reoriented to target primarily the highly differentiable advanced structural products that are substitutes for steel and concrete, and coordinated with these developments. It would emphasise wood's significant advantages – its seismic resilience, low embedded energy and carbon sequestration. The New Zealand building industry has well developed 'design and build' expertise for multi-storey engineered timber structures. It is currently focused on building prefabricated houses to meet a critical domestic shortage. A logical extension of off-site house manufacturing is to expand into world markets. Opportunities to 'house the world in New Zealand wood' could involve the design and erection of prefabricated homes for many cultures globally.

The programme would include a section demonstrating that this wood is suitable for a multitude of other uses, such as sheathing, lining, finishing and furnishings.

On a wider basis, another part of the programme could become the initial 'port of call' for anyone seeking reliable information about timber. This should provide for enquiries from all professions across the construction chain - architects, designers, builders and fixers, to owners, scholars and writers. Aspects of the existing building regulations – particularly those parts specifying the use of wood – are deficient. These 'timber use' regulations need upgrading promptly. The building regulations around wood should be adjusted to simply and clearly to describe and decree how timber should be properly used.

In the decade from 2000 to 2010, the net loss of forest cover worldwide was 52 million hectares. As the global population inexorably grows, the demand for wood fibre will expand apace. Not only as a direct response to more people, but also as new uses are found for wood because it is a utilitarian raw material with an increasingly valuable negative carbon footprint. New Zealand is one of few countries with both the forest expertise and forest environment needed to meet this demand, in comparatively quick order.

Policy 1.1

Commercial forest *production* is developed primarily through:

- (a) Ensuring that tree species selection, and plans for the silviculture and harvesting that applies to existing forests, align as much as possible with future insight into the requirements of processors and markets.
- (b) Rectifying with great urgency the current deficiencies in assessing biological and physical risks to forests caused by global warming and climate change, then prepare and implement plans for managing the adaptation that is needed.
- (c) Devising and adopting plantation harvesting schemes that reduce sharply the scale of ecosystem changes and the impacts on aesthetic visual effects.
- (d) Keeping the concept of using harvest slash and selected categories of whole trees as bio-fuel under continual review, and implement it as soon as shifting cost structures make it viable.

Policy 1.2

Processing of the output from commercial forests is considered worthwhile and developed primarily through:

- (a) Building a scenario for growth in demand for engineered structural wood products caused by climate change.
- (b) Based on this scenario, developing and implementing strategy, structure, and operations for an international business that manufactures in New Zealand using New Zealand wood.
- (c) Subject to this business proceeding, developing and implementing a complementary business that focusses on biochemicals, bioplastics, and biocomposites derived from wood.
- (d) Refocusing and energising the current wood promotion programme to:
 - Promote New Zealand wood to be part of (b) and (c).
 - Provide up-to-date generic and technical information about products derived from wood grown in New Zealand, using inspiring and innovative methods to encourage the use of wood and forest products in construction, finishing and furnishings – targeting consumers, builders, designers and architects.
 - Extend building codes to cover high rise structures using engineered wood to permit applications of their unique attributes of being safe and healthy.

Policy Section 2:

Establishing and sustaining forests that sequester carbon, with or without other purposes

All forests, both indigenous and exotic, sequester carbon dioxide. New Zealand's *Climate Change Accord* was developed in 2007 and recognises both exotic and indigenous forests as carbon sinks. Each sector is responsible for its own GHG emissions. Mature indigenous forests are approximately carbon neutral – they sequester carbon dioxide at about the same rate as its release from the decaying wood of trees that have fallen.

Forests are destined to play a central role in reducing New Zealand's net carbon emissions by way of the perpetual sequestration of atmospheric carbon by trees. Virtually from the day of planting, young trees commence sequestering and storing carbon. This will prove to be of immense significance for New Zealand's Climate Change commitments under the 2016 Paris Agreement. By

expanding its forests NZ can de-risk the unknown but potentially large fiscal and balance of payments impacts which will otherwise be triggered through importing carbon credits. At the current ETS price for carbon dioxide, the carbon stored within indigenous forests alone is worth \$23.5 billion.

The objectives of the forthcoming Zero Carbon legislation, and existing obligations under the Paris Accord both rely on the forest sector making robust commitments to ambitious and enduring carbon sequestration. Unfortunately, policies for rewarding forest owners for carbon sequestration through ETS pricing have historically vacillated, which has created uncertainty and mistrust. A comprehensive, secure and robust policy is now urgently required. It is acknowledged that the operation of the ETS in relation to forestry is under review.

Policy 2:

Government establishes, in collaboration with the forest sector, a stable and enduring programme involving simple procedures and an ETS pricing regime for the *perpetual* sequestration of carbon that

(a) *Either* reflects accurately the value of withdrawing carbon dioxide from the atmosphere, *or* establishes pricing that will motivate the rates of afforestation that are required by Zero Carbon and the Paris Accord, *whichever is the greater*, and

(b) Applies equally to all types of forests, including:

- **Dedicated sequestration forests that use the best species for this purpose**
- **Forests established primarily for commercial fibre production**
- **Plantations established to mitigate erosion and flooding, and to manage water catchments**
- **Forests established to enhance biodiversity**
- **Forests established to provide opportunities for recreation and tourism.**

Policy Section 3:

Sustaining and expanding forests that conserve, protect and regenerate biodiversity and ecosystems

New Zealand has forest ecosystem biodiversity that is globally unique. This alone serves as a strong motivation for indigenous forest conservation and preservation. Over four-fifths of New Zealand's forested area consists indigenous species. Despite their exploitation during 800 years of human settlement, they still cover one third of the country's land area.

There are also native forest remnants. There are presently no controls preventing the clearance of them. Any protection is left to their private owners, although the QEII National Trust and Nga Whenua Rahui covenants together support the protection of 320,000 hectares. Proposed modifications to the Resource Management Act (RMA) may direct regional councils to limit remnant clear-felling, as one step towards preserving this source of indigenous biodiversity.

The Department of Conservation (DoC) is responsible for national strategies for the preservation of biodiversity. As it applies to indigenous forests, its Biodiversity Strategy (covering years 2000 – 2020) is intended to prevent extinctions of native species, and DoC has stated that its replacement will be stronger. The 'Threatened Environment Classification' list documents and maps imperilled species, and DoC coordinates monitoring of them across various governmental agencies.

None of the programmes referred to above acknowledge, nor deal with the effects of global warming and climate change on retention of biodiversity. Major work is needed urgently to rectify this deficiency. It is plausible to expect that the ecosystems of which indigenous forests are a part will adapt to global warming and will be affected by the physical effects of climate change. The need for adaptation will speed up over time. Some species will thrive while others will weaken and may succumb. It is inevitable that biodiversity will change naturally due to these natural processes of adaptation. This implies that efforts to preserve biodiversity must be based on robust and practical understandings of the dynamics of biodiversity that are being introduced by global warming and climate change. There is little point in attempting to preserve species that cannot survive in the ecosystems of the future. The limited resources that are available should be applied to the aspects of biodiversity that have the best prospects.

Policy 3:

- (a) Continue effective programmes aimed at preserving biodiversity, but revise them to acknowledge that inevitable future rapid adaptation to global warming and the physical effects of climate change will dynamically shift the ecological basis of biodiversity.**
- (b) Develop and continually update the most likely scenarios of the future adaptive dynamics of the ecologies that include indigenous forests, and apply these scenarios to the strategies implemented in (a).**

Policy Section 4:

Establishing and sustaining forests that mitigate risks of erosion and flooding.

Increasing risk

By global standards, New Zealand already has high rates of soil erosion and land sliding. This is due primarily to:

- (a) Steep topographies due to geological uplifts and volcanic activity.
- (b) Prevalence of high intensity rainstorms.
- (c) Clearing of original forest to establish grassland that has lower capacity to mitigate erosion.

Every year, New Zealand loses considerable volumes of soil. This reduces soil productivity and damages waterways by lowering water quality, degrading aquatic ecosystems, and weakens capacity for flood management by leaving sediment in the river channels of lowland catchments.

On this basis alone, mitigation of erosion and flooding merits a core place in New Zealand forest policy. In fact, the priority is actually much higher than this because the expected effects of global warming and climate change increase substantially the levels of risk. These greater risks will arise from more severe rainstorms impacting on steep land, larger downstream floods, and coastal inundation from coastal storm surges. These effects are not in the distant future. Science has demonstrated that they have already begun – at relatively mild levels – and will intensify continuously until well after global atmospheric GHG levels are reduced.

Current risk assessments of erosion on particular land types, and of flooding in each catchment are based on historical data. These assessments are now obsolete because global warming and climate change will cause rain storm and storm surge events that are outside the range of historical records. There is a clear and urgent need to re-assess risks for all land types, regions and current land use.

Mitigation of risk – core principles

It is generally accepted that restoration of forest cover to deforested, erosion-susceptible land will:

- (a) Mitigate soil erosion and sediment discharges. Forests reduce mass-movement soil erosion that causes damage to lowland farms, other property and infrastructure.
- (b) Assist with management of water catchments by impeding the flow of run-off into streams and rivers, thereby delaying floods and lowering the levels of them.
- (c) Impede the flooding of previously-drained wetlands in coastal areas and river margins by returning them to approximately their original state, including planting wetland tree species.

Traditionally, tree planting in New Zealand for soil and water conservation has been of four basic types:

- (a) Blanket reforestation of farmland with commercial plantation species such as radiata pine, Douglas fir, cypresses or eucalypts. This planting has dual objectives: soil and water conservation, and commercial forestry.
- (b) Location-specific planting of exotic poplar and willow species on farm and in riparian environments, solely for soil and water conservation objectives, although these plantings may meet other objectives such as shade and shelter for livestock welfare.
- (c) Location-specific plantings of native forest species on farm and riparian environments. This type of planting typically has multiple objectives that include aesthetics, biodiversity, carbon mitigation, and soil and water conservation.
- (d) Forests permanently established in riparian zones to reduce run-off discharge of pollutants into watercourses. These strip forests are of two types: those that capture or control silt and chemicals (nitrogen and phosphorous) from the run-off of nearby farmland, and those that manage the movement of slash and silt from clear felling commercial forest.

Commercial short-rotation forests versus no-harvest or permanent forest options

Blanket reforestation with commercial forest species has been widely used to combat soil erosion and landslides in New Zealand. Approximately a quarter of New Zealand's plantation forest estate is established on highly erosion-susceptible lands, and many of these forests were deliberately sited on such lands with the aim of gaining the dual benefits of commercial timber production and soil conservation.

A major drawback of blanket reforestation with commercial plantations is that these short-rotation forests are usually harvested in less than 30 years. Upon harvesting, the mitigating effect of the forest on soil erosion and landslides is lost, and risks are increased temporarily after harvesting. Typically six years are needed to recover the risk mitigation effect through replanting. Thus, it is likely that short-rotation commercial forests fail meet the criterion of 'the right species in the right place for the right purpose' on erosion-susceptible land.

Alternative afforesting systems are required to meet soil and water conservation objectives on highly erosion-susceptible land. Three possible alternative systems are suggested:

- (a) **Blanket short-rotation commercial forest with regulation and best management practices.** In some cases, harvesting of commercial plantations can be carried out while still meeting soil and water conservation objectives. This requires a constant commitment to management of soil erosion and landslide risks from harvesting and earthworks activities. The National Environmental Standard-Plantation Forestry (NES-PF) regulates this – and may require a Discretionary Resource Consent under

the RMA. Risk management focus on the six-year 'window of vulnerability' is imperative.

- (b) Location-specific forestry on farmland.** Soil and water conservation objectives may be met using location-specific plantings of native or exotic species. These types of tree plantings will continue to be a mainstay of soil and water conservation programmes on New Zealand farms. However, because it is relatively expensive, this approach will become less effective as the scale and severity of erosion increases.
- (c) Permanent forest.** On most highly erosion-susceptible land, blanket permanent reforestation is the only effective option. The land is planted in permanent native or exotic forest, with or without provision for careful selection-harvesting of individual trees or small areas. In some cases, forests can be established by simply closing land from grazing to allow indigenous forest to re-establish by reversion. This option incorporates a single one-off revenue stream from carbon sequestration.

Adoption of forestry by landowners

There is some recognition of the need for reforestation from pastoral farming landowners. New Zealand Federated Farmers (representing agricultural land users) have acknowledged the benefits of tree planting on steep land. It lists the benefits as stopping soil erosion, offsetting emissions, reducing sedimentation, capturing pollutants (nitrogen and phosphorous) and supporting biodiversity. The pastoral farming community is aware that it must seek better uses for marginal land.

Widespread commercial plantation establishment on pasture is generally not favoured by the farming sector, since this is seen as likely to displace farmers and ultimately farming communities. However, there has been widespread adoption of location-specific plantings of exotic poplars and willows and indigenous tree species for soil and water conservation; and a variety of exotic and indigenous tree species for shelter. These are acceptable to farmers because they complement and enhance existing farming operations, but do not supplant them.

An alternative view is that within existing farms, blanket reforestation of marginal pastoral land would have no significant impact on overall farming profits, since the land that is reforested is costly to manage and has low pasture productivity. Furthermore, reforestation would improve the landowner's carbon emission profile during the lengthy period of growth in forest biomass.

Programmes that mitigate risk

Use of trees to improve land productivity, reduce erosion and improve water quality has already been adopted in principle as part of the One Billion Trees Programme, which provides funding for landowners to plant approved new forests. However, that programme relies on the initiative of land owners to apply for grants. Land that is at high risk will be ignored by the programme if its owners choose not to apply for a grant.

This largely reactive approach to risk management does not ensure sound allocation of the Government funds. Planting plans need to be consistent with the principle of the 'right species in the right place for the right purpose'. We propose that the owner-application approach be replaced by directly-implemented plans for risk management. Planting plans would be based on a comprehensive assessment of future risk (including the intensifying impact of climate change) on all land categories and geographical areas that are currently in pastoral land use. These assessments establish priorities over land categories and regions, and specify the reforestation systems for each.

In those instances where risk is high, implementation is compulsory and based on fairly negotiated arrangements with land owners.

Policy 4:

Use carefully planned reforestation to mitigate and manage current risks of soil erosion and flooding and, additionally, the intensification of these risks that will emerge due to climate change. In particular:

- (a) Use global warming climate change models incorporated with risk assessment tools to make comprehensive assessments of land categories and regions that are at risk of erosion and flooding.
- (b) Use these assessments to establish nation-wide priorities for risk mitigation and management over land categories and regions.
- (c) Apply these priorities to prepare forest establishment plans for:
 - i. Retiring erosion-prone land from pastoral use and reforesting.
 - ii. Managing water catchments by establishing forests.
 - iii. Returning previously-drained wetlands in coastal areas and river margins to approximately their original state.
- (d) Implement these plans for mitigation and management, commencing with the highest priorities. These plans specify reforestation with optimum tree species and forest management systems. The plans include processes for negotiation of fair compensation to land owners for land taken out of economic production.

Policy Section 5:

Managing forests that provide sustained aesthetically attractive landscapes, and opportunities for recreation, tourism, and sociocultural wellbeing

New Zealand forests are important providers of visual and recreational amenities for tourism. Hence, they contribute significantly to this \$35b sector. Most forest-based tourism and recreation takes place within native forests and nearly half of the 3.5 million international visitors spend time in National Parks.

The recreational amenity of forests is yet another ecosystem service. Massey University research has tentatively calculated that public access to native and plantation forests has a recreational value of \$614m annually.

Grand woodlots evince feelings of wellbeing amongst humans. Upon visiting an old-growth grove of trees, such as Rotorua's Long Mile redwoods, many people report feelings of awe, peacefulness, security and happiness. In urban areas small forests are components of reserves and parkland, and thereby benefit the living environments of large numbers of people. We believe that in cities that become intensified, trees will come to be more valued and cherished in urban landscapes.

Maori have deep spiritual and ancestral links to forests. Planting indigenous trees embraces the values of matakura, and acknowledges Ngahere's subtle working that is part of Maoritanga.

Maori owned forests encompasses 300,000 hectares of indigenous forestry and iwi have in reserve an even greater area of unplanted land suitable for commercial plantations. Some land is being used to establish manuka which earns carbon credits, but has the principle purpose of honey production.

Maori plantation forestry will expand, sometimes adopting unconventional means and species in their approach. Examples are the partnerships with Scion that aims to develop plantations that have a variety of species including natives.

Indigenous forests in Maori ownership are of a scale sufficient to enable some selective harvesting of native species. Such harvesting should continue to be based upon Sustainable Management Plans. Some new indigenous plantations will, in a few decades, produce specialised timbers and pharmaceuticals.

Policy 5:

- (a) All types of forest are managed to contribute to aesthetically attractive landscapes.**
- (b) All types of forest are accessible for recreation and tourism wherever this is feasible in terms of other forest operations, safety standards, and biosecurity.**
- (c) Opportunities are increased for all New Zealanders, especially the urban population, to benefit from natural encounters with trees within suburban copses as well as rural forests.**
- (d) Maori spiritual and ancestral links to particular indigenous forests and particular species are recognised and respected.**
- (e) Maori interests are encouraged to invest in the forest sector.**

Policy Section 6:

Mitigating in all forests the future risks from predators, pests and pathogens

Present risks from predators, pests and pathogens originated with colonizers who were responsible for environmental modification through clearing indigenous forests, and also the impacts of animal and plant species that they imported. Species introductions were both intentional and inadvertent. Rats, dogs, game, estate and household animals accompanied various waves of immigrants; many eventually escaping to the wild. Other pests, such as wasps, were introduced when biosecurity did not have priority, such as during wartimes. Browsers and predators that ravage indigenous forest canopies are the most pervasive pests. The *Phytophthora* genus is proving to be the most troublesome of known plant pathogens.

Public funding for pest control of the indigenous forest conservation estate is presently sufficient only for one eighth of the total area, which is a profoundly unsatisfactory situation. Commercial forests are cared for, at the expense of the owner. Usually to a level justified by financial outcomes.

Some exotic forest species are themselves spreading as weeds. Known as 'wildings', these escapees are altering landscapes and threatening natural vegetation, managed forests and pasture. Wilding conifers currently cover 1.8m hectares. Even though a case can be made to commercially utilise wildings, the Ministry of Primary Industries and DoC, along with a coalition of forest and farm industry agencies, administer an annual \$15m budget aimed at containing wildings by 2030.

Government and the forest sector work together to operate biosecurity readiness and response against new pest introductions. A Government Industry Agreement (GIA) sets out joint obligations for funding and decision-making.

New Zealand has accepted the challenge of working towards a pest free future. An initiative called *Predator Free NZ 2050* has gained following and support. Science-based technologies are to be

deployed and world-leading processes are under development. However, there is a large gap between this laudable intention and the technology and funding available to support it.

None of the programmes referred to above have been attuned to acknowledge and respond to the future effects of global warming and climate change on predators, pests and pathogens. It is anticipated that atmospheric warming will increase biosecurity risks because the New Zealand forest environment will become increasingly congenial to pathogens that were previously unable to thrive. Moreover, it is likely that predators and pests will be strengthened and that some tree species will become more susceptible to attack. However, the absence of robust risk analysis and management plans is a major deficiency that should be rectified promptly.

Another effect of climate change will be increased risk of fire due to more extreme droughts, especially in exotic plantations but now also in indigenous forests previously considered to have low fire risk.

Policy 6:

- (a) Undertake for all forests urgent and robust risk analyses regarding the effects of global warming and climate change on current and potential pathogens, predators, and pests, and the thrift of relevant tree species. Use this analysis as the basis for development and implementation of stable, enduring and properly funded risk mitigation programmes.**
- (b) Continually update these assessments of risks and consequential mitigation programmes.**
- (c) Ensure that the Predator Free NZ 2050 project has robust implementation plans that are sufficiently funded.**
- (d) Maintain the effectiveness of both the GIA collaboration between Government and commercial forest owners, and the wilding eradication programme.**
- (e) Adjust fire management plans for the increased risks from extreme droughts and wind events caused by climate change.**

It is emphasised that Policy 6 applies jointly to indigenous and exotic forests.

Policy Section 7:

Managing forests in ways that align with priorities of regional development through generating employment growth and other economic benefits.

The foregoing Policies 1 - 6 are likely to all have favourable impacts on employment growth and other economic benefits nationally and in particular regions. Implementation will take place in specified regions where the opportunities exist. In other instances, initiatives can be placed in alternative regions and choices can be made that align with Government policies and priorities for Regional Development.

These choices are for Government to make, subject to regional development objectives not being used to compromise the success of forest development.

Policy 7:

Government should coordinate forest policies with regional development initiatives.

Policy Section 8:

Building the social license for using land for forests and plantations

A 'Social Licence' to operate exists when a project or sector gains the approval of the effected local communities and the public in general. Forestry has gained public regard and a 'tentative' social licence in recent years principally because of carbon sequestration and the recreational opportunities that the sector provides. On the other hand, the visual and ecological impacts of large-scale clear-felling together with highly publicised occurrences of harvest slash fouling waterways and downstream land have generated negative public perspectives. Also it is likely that the public perception that the sector adds little value to the logs produced from large-scale land use would detract further from the social license.

Hence, the sector's social license needs strengthening with delicate cultivation of the public. Harvesting processes and techniques need modifying, to redress the negativity that arises from current practices. There is considerable scope for strengthening the social license through demonstrating the value of forests in carbon sequestration, management of water catchments and mitigation of erosion and flooding. When advanced structural wood products achieve commercial significance, further favourable public attention will be generated by the economic and employment outcomes and also from contributions to global humanitarian needs.

Policy 8:

Improve the public perception of the forest sector, and the social license for its uses of land in all possible ways, emphasising:

- (a) Active engagement with communities, schools, and forest neighbours.**
- (b) Urgent adoption of modified harvesting processes for commercial forests that remove public perspectives that current practices cause visual and ecological damage.**
- (c) Ongoing demonstration of the value of forests in sequestering carbon, managing water catchments and mitigation of erosion and flooding.**
- (d) When advanced structural wood products achieve commercial significance, generate further favourable public understanding of the economic and employment outcomes and of the contributions of these developments to global humanitarian needs. In this way, redress any public perception that large areas of land are used to produce logs to which little value is added.**

Policy Section 9:

Research, education and development of skills in forestry

Scientific research – physical, biological, environmental and social – is essential to the development of forestry and forests. The greatly broadened and re-focussed roles for forestry and forests proposed by policies in this document will require a major strategic review of the scope, priorities, and funding of research for forestry and forests.

The same point applies to education in forestry and to skills training for workers in forests and the value chains based on them.

Policy 9:

Adoption of the policies proposed in this document is accompanied by a major strategic widening of the scope, priorities, funding, and approaches to implementation of:

- (a) Forestry and forest research.**
- (b) Education in forestry and skills training for workers in forests and the value chains based on them.**
- (c) Expanding scientific research of forest production, management and processing; while also incorporating skills like sector public relations.**

Policy Section 10:

Forest sector leadership and governance

The establishment of Te Uru Rakau (Forestry NZ) in 2017 heartened the forest sector, as did the appointment of a Cabinet member as Minister of Forestry. Both moves overcame serious concerns noted during early phases of the work that led to this document.

It is probable that Te Uru Rakau will find that the policies proposed in this document contribute substantially to its own development of strategies for the forest sector. Te Uru Rakau is charged with leading the forest sector by ensuring that policy and strategies are current and pertinent and are co-ordinated across all affected Ministries.

Further, there is increasing need for all primary land-uses to improve and account for environmental performance, particularly in meeting biodiversity targets and in reducing net carbon emissions. This establishes a strong case for a Forestry Satellite Account under the Environmental Reporting Act (2015). Because New Zealand forests fulfil many hugely beneficial environmental and social roles that are not subject to market forces, the forest sector warrants such interpretative accounting. This will provide reliable measures of the potentially massive contribution of forests to the country's low-carbon economy that is essential.

There is scope too for an expansion of regional and local government forests for erosion control, management of the supply and quality of water resources and the mitigation of pollution from pastoral enterprises. Regional councils oversee the *National Policy on Freshwater Management* and as a consequence regulate waste discharges and are introducing limits on nitrogen, phosphate and silt emissions. Forests will play important roles to support these obligations.

Policy 10:

- (a) Te Uru Rakau ensures that forest-related legislation is relevant to the needs of the sector and all roles of forestry as described in this policy document**
- (b) Te Uru Rakau coordinates the work of all Ministries that impinge upon the implementation of aspects of forestry policies – including forests' economic development – as well as conservation, environment, climate change, regional development, and agriculture.**
- (c) Government establishes a Forestry Satellite Account within the national accounts to provide a comprehensive and reliable view of the value of the various benefits of forests to the nation.**

Appendix 1: Contributors to the Forest Policy Project Team

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..and many others..

Appendix 2: The Case for Expansion of New Zealand Forests – A Summary

The policies proposed in this document provide a strong case for overall expansion of the New Zealand forest estate. The core elements of this expansion are:

1. New non-commercial plantation and reversion forests to mitigate soil erosion on steep land currently used for pastoral farming.
2. New non-commercial forests as part of management plans for mitigation of rapid flooding in water catchments.
3. Re-establishment of wetland forests to mitigate flooding of land previously drained for pastoral farming.
4. New forests established to sequester carbon dioxide – with or without other commercial revenue expectations.
5. New forests established to enhance biodiversity and in accordance with cultural and social values, aesthetic outcomes, recreational opportunities, and specialised bio-product opportunities.
6. New forests which become justifiable under circumstances where the evaluation of alternative land uses becomes comprehensive and unbiased through proper assessment of the external costs due to waterway pollution and degradation of ecologies, external costs due to GHG emissions, and external benefits due to carbon sequestration.

Expansion of commercial forests will also eventually be motivated as growth of higher-value processing of logs absorbs the supply of commodity Radiata pine logs.

Tempering this expansionary outlook, the effects of global warming and climate change will go both ways – providing major market opportunities, but also increasing biological and physical risks to forests.