Te Uru Rākau New Zealand Forest Service

Te Kāwanatanga o Aotearoa
New Zealand Government

Te Ara Whakahou – Ahumahi Ngahere

Forestry and Wood Processing Industry Transformation Plan

November 2022

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Foreword from the Minister of Forestry

Tēnā koutou katoa,

As Minister of Forestry I am very proud to present the Forestry and Wood Processing Industry Transformation Plan (the plan).

The future of forestry is bright, so it's important now more than ever that we maximise our opportunities to play a key role in our bioeconomy, and deliver better outcomes for workers, whānau, and communities. The plan sets out the pathway for unlocking the potential of Aotearoa New Zealand's forestry and wood processing sector to grow our economy, build resilience, drive innovation, and respond to climate change.

This plan sets out actions to increase our onshore wood processing capacity and capability, maximising the value of our wood, and driving innovation through developing new industries, products, technologies, and markets – both domestic and international.

Aotearoa New Zealand currently exports over 60 percent of harvested wood as logs for other countries to process and add value. In contrast, the 15 percent exported as value-added wood products return over 40 percent of total export revenue. This highlights that one of the main transformations of the plan needs to be expanding our capability and capacity to process onshore more of the logs we harvest here. This will lift the quality of the timber passing through our ports, and boost our wood and wood products up the value chain.

Government is also investing in developing Aotearoa New Zealand's domestic woody biomass industry. Woody residues can power our transport, make plastics and pharmaceuticals, and replace high-emissions materials in our buildings. Almost anything made from fossil fuels today can be made from wood tomorrow.

Forestry and wood processing is operating in a challenging and dynamic environment. Time and time again, this sector has demonstrated the resilience, strength and expertise needed to meet these challenges. We can always do better, which is why my vision for the industry is for us to lead the world in the way we use our forests and their products.

Through building partnerships between government, Māori, businesses, organisations, and local communities we can keep moving from a commodity resource producer to a high-value, high-tech, low-emissions economy that better supports our people. Te Uru Rākau – New Zealand Forest Service will be there to support us each step of the way.

My vision is, "New Zealand is acknowledged as a global leader in the use of forests, and local communities are empowered through meaningful employment. The sector and our forests are resilient and diverse, and wood underpins our low emissions future."

While forestry and wood processing has been a foundation of Aotearoa New Zealand's economic, environmental and employment growth for generations, we need to keep doing things differently, lifting performance and our global and domestic brand, and being aspirational and innovative in the way we work.

Thank you to those who engaged in the public consultation on the draft plan. Your feedback has helped to create a plan that will make our sector and industries even stronger for the benefit of all New Zealanders.

Hon Stuart Nash
Minister of Forestry

Foreword from the Chair of the Industry Transformation Plan Advisory Group

Korōria nui ki te runga rawa ko ia te tīmatanga me te whakamutunga o ngā mea katoa. Rātou kua whetūrangitia mihia, tangihia, huri noa ki ngā mata korokoro, mata kuikui e hoea ana te waka nei, e hoe, e hoe, hoea rā! Te Ara Whakahou – Ahumahi Ngahere te whaingaroa e whārikingia kei mua i a tātou, he wero ki a tātou, kia mau, kia mau, kia ita!

He aha te mea nui o te ao? He tangata, he tangata, he tangata!

At the heart of this plan are the people of this country, as all of us that will be affected the most by the opportunities and risks that climate change presents.

The forestry and wood processing sector is the best positioned of all industries in Aotearoa New Zealand to take advantage of the opportunities that climate change presents, such as domestic production of higher value products, supporting regional communities, and creating high-paying sustainable employment. The forestry and wood processing sector is the sector that will underpin Aotearoa New Zealand's low-emissions economy.

We have the economic, environmental, social, and cultural credentials. We must act now! Building on our current platform and transforming our sector to be even better than it is now is both a challenge and a wonderful opportunity.

This Forestry and Wood Processing Industry Transformation Plan has been developed through a far-reaching and exhaustive process that has connected with an extensive group of people who have shared their ideas openly and willingly. We have welcomed everyone's input, including those representing te ao Māori, foresters, wood processors, wood marketers, environmentalists, government officials, industry consultants and union representatives. The diverse views have come together in a collaborative way to produce this plan.

The development of this plan has required a lot of goodwill from a lot of people. As we implement this plan, we will leverage the relationships that have developed.

A transformation of the scale and size that we are making will create a once in a generation opportunity that will benefit our people, our industry and indeed our country.

It will require all of us to continue to challenge and test our ideas, but more importantly to work together to take advantage of the transformational opportunities before us.

We already have great examples of world-class forests, world-class wood processing and world-class wood products. There is much more that we can do. The sector has a long track record of government and private investors working alongside each other. If the government didn't establish the first large-scale plantations in Aotearoa New Zealand, we would not be where we are today. We must build on this partnership into the future.

My thanks and gratitude to all who have contributed to this plan, and in particular to all members of the Advisory Group and all of the officials from Te Uru Rākau – New Zealand Forest Service.

Lees Seymour
Independent Chair

Forestry and Wood Processing Industry Transformation Plan Advisory Group

Executive summary

The Industry Transformation Plan (the plan) sets out a vision and actions that drive growth, create decent jobs, and underpin our low-carbon future, further building our world-leading forestry and wood processing sector. The plan will be updated over time in partnership with the sector as actions are delivered and as context changes.

The plan places people at the centre of the transformation to deliver greater collaboration and alignment across the supply chain, and a stronger partnership between government and Māori, leading to a world class forest-based bioeconomy.

Our forests are a vast resource that could produce significantly greater value for Aotearoa New Zealand

Forests are Aotearoa New Zealand's largest renewable resource and are vital in our move toward a more circular, zero-emissions economy. The materials, energy, and wood products that the sector produces are at the heart of the emerging bioeconomy.

The forestry and wood processing sector is a key contributor to the economy and society. In 2021, the sector contributed $6.7 billion in export earnings and employed between 35,000 and 40,000 people in wood production, processing, and wider support industries. The diagram on page 10 summarises the benefits the sector provides.

Over the last decade the number of logs harvested has doubled, while the capacity for processing wood domestically has stayed the same. This has led to a significant growth in the number of logs exported.

Our goal for Aotearoa New Zealand is to become a world leading producer and exporter of high-value wood-fibre products. To deliver wider outcomes like zero-emissions energy alternatives, higher paying jobs, Māori aspirations, and wider New Zealand buy-in the industry must process more wood fibre onshore and invest in the production of higher value wood products.

What we can make from wood, and the demand for wood products, is expanding

New technologies are changing what we can produce from wood fibre. Wood can be turned into engineered wood products to build tomorrow's high-rise buildings, replacing higher-emissions materials. Unlocking this potential requires us to process more wood fibre onshore.

Processing more wood onshore generates more woody residues. These residues can be used to produce liquid and solid biofuels and create advanced biochemicals and bioplastics.

There are strong export growth opportunities as many countries seek to meet their climate change commitments. Global demand for sustainable wood fibre is expected to quadruple by 2050 as countries seek to use wood and woody biomass to decarbonise their economies.

Nutraceuticals extracted from radiata pine bark by ENZO at Paeroa.

Industry transformation will require greater planning, coordination, and collaboration across government and the sector

This Forestry and Wood Processing Industry Transformation Plan is one of eight transformation plans being developed across government. These plans share a number of common actions that are mutually reinforcing and there is benefit from ensuring alignment across them.

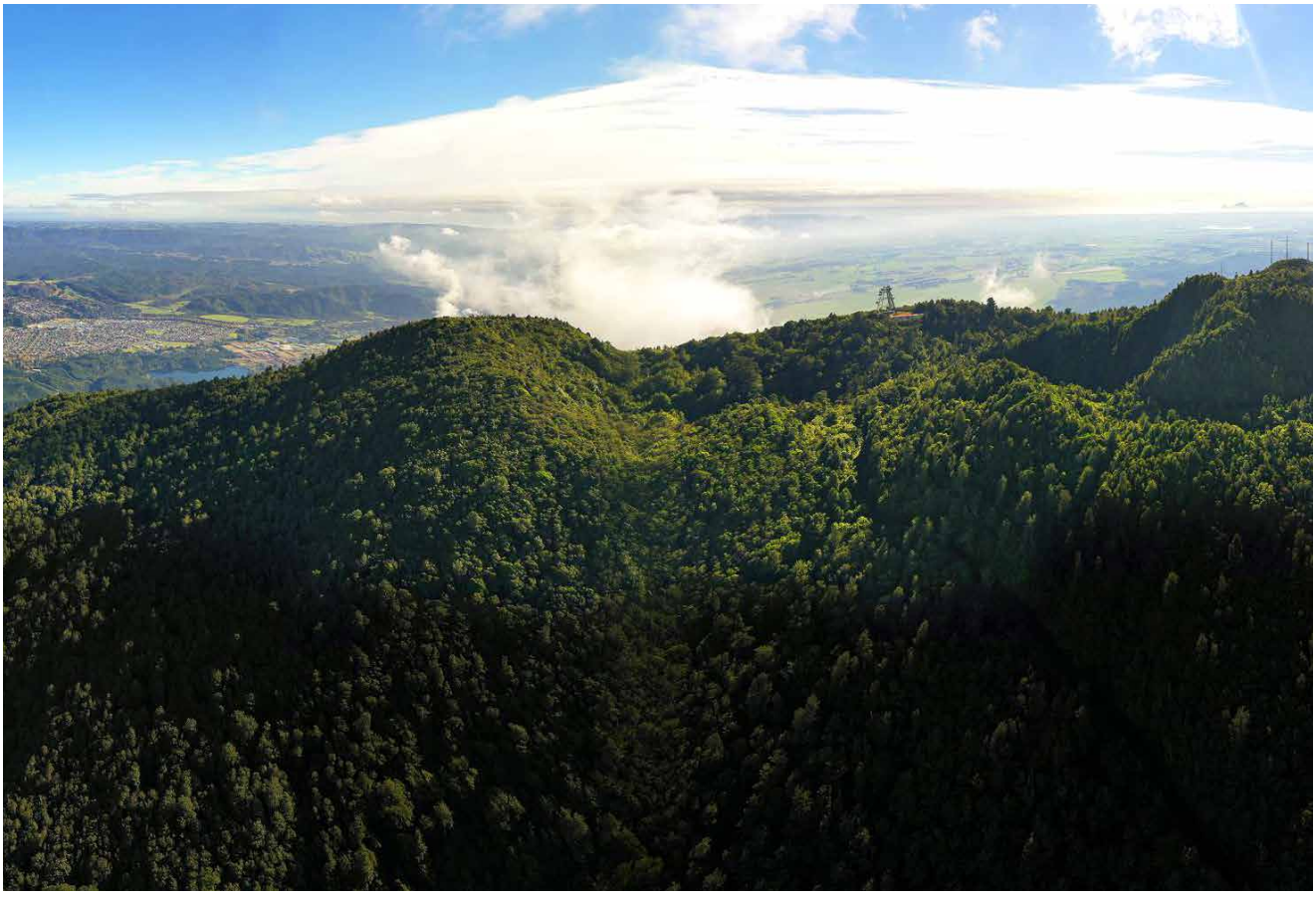
The key aim of this plan is for Aotearoa New Zealand to process more wood onshore and to use woody residues to grow the forest-based bioeconomy. The actions in the plan align closely with the goals in the Construction and Advanced Manufacturing transformation plans.

To rapidly transform this sector, it will require the government to take a leading role in some cases. Not all of the changes we are seeking are economic, such as the diversification of species which will provide longer term social and environmental benefits. Government can support the transformation through co-investment, using its procurement levers to create demand, reducing investment risk, demonstrating innovative projects, and supporting business cases.

Transformation will also require the sector to better work together and tell its story to the wider public. Strengthening the sector's social licence is a key enabler of future growth and policy stability.

The sector needs to raise awareness of the benefits it provides and ensure the benefits of growth are distributed and accessible to workers, communities, and Māori. Stronger community engagement and collaboration across the sector will play a key role in improving social licence.

Transformation will require government, Māori, the sector, and the workforce to work together and to form new partnerships across and beyond existing supply chains and we are working to establish a formal partnership. This partnership will support the implementation and the delivery of key actions going forward.



Vision and priority areas for action

Vision

New Zealand is acknowledged as a global leader in the use of forests, and local communities are empowered through meaningful employment. The sector and our forests are resilient and diverse, and wood underpins our low emissions future.

Key change

Process more logs and residues onshore to reduce our emissions and increase our production of value-added wood products.

Priority areas and key objectives

Create the foundations for a transformed sector

1. Create a strong and collaborative sector
2. Empower Māori to achieve their aspirations in the sector
3. Grow and attract the future workforce
4. Drive science and innovation across the sector
5. Provide sector insights to lift performance and innovation

Grow forests and supply wood for the future

6. Use technology and partnerships to add value
7. Diversify our forests to build sector resilience
8. Improve wood and residue supply for domestic processing and the bioeconomy

Modernise and expand wood processing

9. Attract investment to increase manufacturing of advanced wood-based products for building, biotech, and fuels
10. Support sector co-location, collaboration and sustainability

Develop sustainable markets for Aotearoa New Zealand's high-value wood products

11. Increase domestic demand for our wood products
12. Grow and diversify export markets

Social, environmental and economic benefits of forestry & wood processing

Emissions reduction

Forests absorb carbon, and wood products store carbon, potentially replacing higher emissions alternatives.

Sustainability

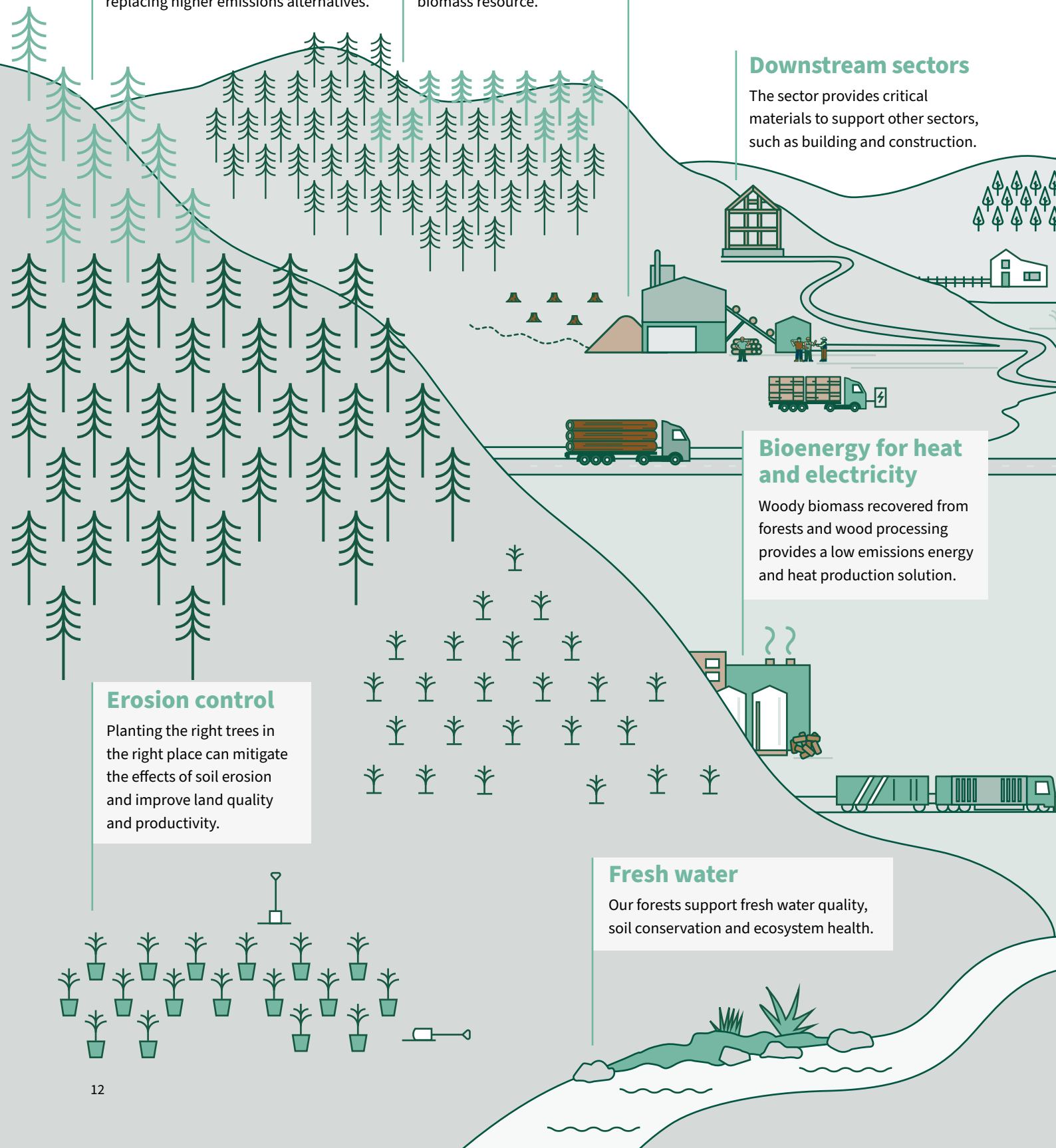
Forestry is New Zealand's largest renewable biomass resource.

Employment

The sector directly employs 40,000, and indirectly employs more.

Downstream sectors

The sector provides critical materials to support other sectors, such as building and construction.



Bioenergy for heat and electricity

Woody biomass recovered from forests and wood processing provides a low emissions energy and heat production solution.

Erosion control

Planting the right trees in the right place can mitigate the effects of soil erosion and improve land quality and productivity.

Fresh water

Our forests support fresh water quality, soil conservation and ecosystem health.

Current benefits

Emerging benefits

Supports regional communities

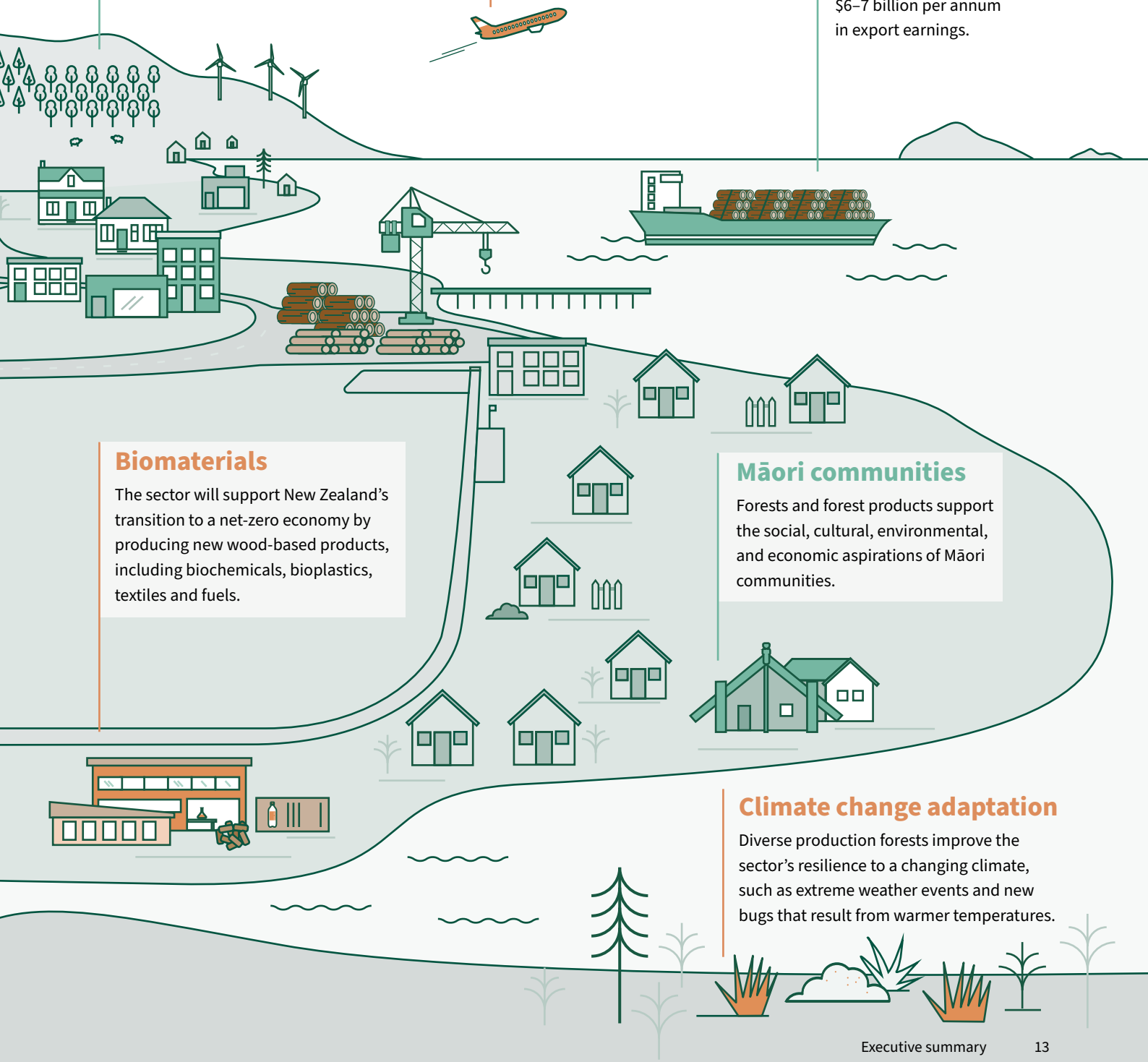
The sector supports regional New Zealand through jobs, places for leisure, and helps farmers diversity income by integrating trees into farms, which also improves soil protection and animal health.

Transport biofuels

Liquid biofuels provide a way to reduce emissions in sectors where electrification is unlikely to be viable, such as aviation and shipping.

Exports

The sector contributed $6–7 billion per annum in export earnings.



Biomaterials

The sector will support New Zealand's transition to a net-zero economy by producing new wood-based products, including biochemicals, bioplastics, textiles and fuels.

Māori communities

Forests and forest products support the social, cultural, environmental, and economic aspirations of Māori communities.

Climate change adaptation

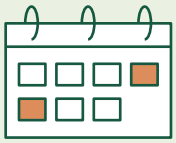
Diverse production forests improve the sector's resilience to a changing climate, such as extreme weather events and new bugs that result from warmer temperatures.

Consultation summary

The draft Forestry and Wood Processing Industry Transformation Plan was launched for consultation at the Canterbury and West Coast Forestry Awards on the 19 August 2022.

400+

people engaged in the public consultation process for the draft plan.



Consultation

In person

141

participants attending seven in-person workshops across the country

Including Northland, Rotorua, Tairāwhiti, Napier, Nelson, Christchurch, and Southland

Online

103

participants attending three online hui to discuss the themes in the draft plan

In-person wānanga

3

in-person wānanga – targeted consultation with Māori

Stakeholders

25

site visits and meetings with stakeholders

Submissions

Written

80

written submissions

Online

75

Short-form submissions through an online survey

Meetings

20

Discussions with the ITP Advisory Group

Short-form submissions

Of those who submitted short-form submissions:

50%

individuals (approximately)

50%

organisations (approximately)

Written submissions

Note – not all submissions were able to be categorised

5

Māori submissions

10

bioeconomy enterprises/ research entities

12

wood processing businesses

5

forest-owning businesses

17

industry associations/ organisations

13

government, NGOs, and other organisations

Overall, feedback was supportive of the goals, vision, and actions of the draft plan. Submitters noted how aspirational and transformative the proposed actions were. Comments from submitters acknowledged that the draft plan reflected a level of support by government that they felt had been largely absent for the past decade.

A detailed summary of feedback on the draft plan will be released on Te Uru Rākau – New Zealand Forest Service website by the end of 2022.

The following common themes emerged during the consultation process.

Bringing a te ao Māori lens to the plan

Feedback stressed that the value over volume proposition outlined in the draft plan should be expanded to consider the concept of value more broadly, widening the benefits of the plan to better reflect the principles of Te Tiriti O Waitangi.

More focus on how the proposed industry transformation will affect people

Some submitters wanted to see a greater focus on how people – particularly rural communities – will benefit from the objectives and goals of the plan.

Driving implementation

There was support for the proposed vision for sector transformation in the draft plan, with many expressing a desire for more detail and sense of urgency to deliver the actions. The sector expressed a strong aspiration to work in partnership with government, providing leadership to help drive the implementation of the plan.

The need for greater government support for transformation

The feedback consistently outlined how the sector sought government support for industry transformation. These levers include adjusting tax and financial settings, using scale to influence areas such as procurement of low emission products, and incentivising the diversification of species. The sector cautioned that any transformation should not focus too heavily on the export market at the expense of the domestic market.

Acknowledging the impact of wider system settings

Submitters suggested ways to address workforce challenges, the need for consistent policy settings over time and for more stable investment channels, an alignment of CRI science and innovation funding with the goals of the ITP to help support commercialisation of innovation, and more diverse international access for wood products.

Photo courtesy of David Evison,
University of Canterbury

This plan recognises Te Tiriti o Waitangi

This plan provides an opportunity for the Crown and Māori to continue upholding the duties of working in partnership.

This plan recognises the Crown obligations under Te Tiriti o Waitangi:

- the principles of partnership, participation and protection underpin the relationship between the government and Māori under Te Tiriti o Waitangi
- partnership involves the Crown working with iwi, hapū, whānau, and Māori communities to develop strategies for how Māori can have a greater role in the forestry and wood processing sector
- participation requires enabling Māori to have a voice at all levels across the sector
- protection involves the government working to safeguard, and create a space for Māori cultural concepts, values, and practices.

We partnered with Māori, industry, workers, and key stakeholders to develop this plan

The plan was developed with the Forestry and Wood Processing Industry Transformation Plan Advisory Group (Advisory Group) and Ngā Pou a Tāne (National Māori Forestry Association).

The Advisory Group is made up of leaders, union representatives, and Māori in the sector. This group has supported the development of the plan and its suite of actions. The full list of the members of the Advisory Group are provided in Appendix one.

Ngā Pou a Tāne represents Māori foresters, landowners, and trusts. This group provided guidance from a te ao Māori perspective on the vision and actions of the plan.

We also worked closely with a range of sector stakeholders including:

- the Forestry Ministerial Advisory Group
- the New Zealand Farm Foresters Association
- the New Zealand Forest Owners Association
- the Wood Processing and Manufacturing Association
- the Bioenergy Association
- the New Zealand Institute of Forestry
- Future Foresters
- New Zealand Timber Industry Federation
- Scion.

The case for transforming Aotearoa New Zealand's forestry and wood processing sector

This plan identifies opportunities for us to be more strategic and deliberate about how we use our valuable wood resources. Aotearoa New Zealand has a strong and high-performing forestry and wood processing sector – but we can get more value from our forest resources.

Transformation will require significant new investment and changes across the supply chain

Transforming the sector will require significant scaling and modernisation of our wood processing facilities and supporting infrastructure, and investment in workers and skills.

This will require sizeable new investment from industry, government, and overseas investors. Attracting this scale of capital will need improvements to the investment environment. This includes tax and other financial incentives, use of co-location to lower costs and create economies of scale, and innovation in the types of products we make and the markets we serve.

The workforce will underpin transformation. The sector will need to attract new talent, and to train and retain existing workers. Achieving this will require ensuring pay and conditions in the sector are competitive and attractive.

We need to find new and more diverse markets for our wood products and use government procurement levers to drive long-term demand for higher-value wood products to make investment more attractive.

Processing more wood fibre onshore will retain more jobs, lower carbon emissions, and will enable the sector to continue to breathe life into New Zealand's regional communities.

Aotearoa New Zealand is the world's largest exporter of softwood log, but growth in wood processing has been minimal

Our production forests are an abundant and versatile resource. We have around 1.7 million hectares of productive forests. Our forestry and wood processing sector is characterised by a high reliance on a single species of tree (radiata pine), a small number of export markets, and a relatively narrow range of products. In 2021, we exported approximately 23 million cubic meters of unprocessed logs – around 60 percent of our total harvested log volume, more than any other country.

Our overall wood processing capacity has remained roughly the same since 2000 and there has been little growth in the export of value-added wood products. While some modernisation has occurred in the sector, overall investment in the sector has declined, with the last investment in a new sawmill in 2005.

Technology allows us to process more logs and create higher value.

Historically it has been cost prohibitive to process the logs we typically export

Most sawmills in Aotearoa New Zealand use higher grades of log to produce appearance or structural timber. The logs we export tend to be lower-quality grades. Turning lower grade logs into high-value products domestically has traditionally been cost prohibitive, so most mills are not equipped to process these lower quality logs.

New technologies, particularly automation and optimisation, are making processing lower grades of logs more economically viable and provide opportunities to manufacture engineered wood products.

Engineered wood products, such as plywood, glulam or cross-laminated timber, are made by binding wood with adhesives to create wood products that look like wood but are designed to be stronger and more durable. These products can be used as substitutes for emissions-intensive materials.

Engineered wood products are often made using structural grade timber. Increasingly companies are finding innovative ways to use lower grade logs in engineered products, either as a blend or solely lower grade.

Sequal: An Aotearoa New Zealand sawmill processing lower-grade logs through a 'mass customisation' model with advanced technology

Sequal, based in Kawerau, is currently the only large sawmill in Aotearoa New Zealand to process solely lower-grade logs. Sequal employs a "mass customisation" business model that uses its own specialised software and a variable milling system to produce an unlimited range of sizes and specifications, meeting individual requirements of domestic and global customers. This contrasts with the traditional mass standardisation model where sawmills process higher-grade logs to produce a large volume of uniform product.

Having developed a system to deliver timber made specifically to a customer's needs in a "just in time" model, Sequal reduces both costs and waste by minimising the need for reprocessing. Sequal's timber is used in a range of applications, including packaging, furniture, and remanufactured construction products. Demand for their products in some international markets is significantly higher than current capacity.

Sequal demonstrates that the 'mass customisation' model represents an opportunity for domestic wood processors to compete internationally. The combination of the business model and investment in advanced technology makes it possible to produce high-value timber products from lower-grade logs.

Transformation will require addressing some key challenges across the sector

While there are significant opportunities, achieving sector transformation will also require addressing some long-standing challenges in the sector. Based on feedback from the sector and wider research, the following key challenges were identified:

Key system settings challenges

- Social licence challenges – work is needed to improve public perceptions of forestry, in particular the sector's standing within rural communities. Forestry needs to be seen as more than growing pine trees to export logs.
- The industry is struggling to attract and retain skilled workers and there are limited career progression pathways and onsite training opportunities for workers.
- Māori ownership is concentrated in the forestry estate, often owning the land and not the trees, while remaining underrepresented at ownership and leadership levels further down the supply chain.
- Low levels of R&D investment relative to other sectors and commercialisation of new technology.

Key challenges in forestry

- Over-reliance on a single species – 90 percent of production forests in Aotearoa New Zealand are radiata pine, where other species can add value and resilience to our land use and the products we can make.
- Lost opportunity from uncaptured residues – residues from harvesting and processing logs are not always effectively used for their highest value use.
- The sector's high reliance on a small number of international commodity markets creates considerable volatility and uncertainty for workers and mills, and exposes the sector to risks of economic shocks and price volatility.

Key challenges in wood processing

- Static wood processing capacity and low levels of new investment.
- Minimal growth in the export of value-add wood products.
- Short-term log supply contracts are common in the sector and create considerable uncertainty for mills seeking to attract investment and expand production.
- Harvest volumes are forecast to decline by 15 percent by 2035, which will put considerable pressure on some local processors in regions where supply is most impacted.

We need to scale up the sector to meet growing demand for low-emissions products across the economy

Current global demand for wood fibre is around 2 billion cubic metres. This is projected to increase by 10 percent by 2030 and by 30–40 percent by 2050. The government's Emissions Reduction Plan highlights a pathway for decarbonisation of the economy, with wood fibre anticipated to play a significant role in transitioning away from fossil fuels.

The majority of our wood processors are working at, or near, full capacity. To scale up the sector, more planting is required, providing the trees for processing, and we need to grow the capacity and improve the productivity of wood processors. Without this, supply of Aotearoa New Zealand-made wood products could become a real constraint across the economy and slow our transition to a zero-carbon future.

There are opportunities to grow the supply of woody biomass, but we need to manage demand

Current sources of biomass are varied, but our biggest source is woody biomass, including residues from forests and sawmills. Most of the residues produced from wood processing are already used in the industry.

As demand grows, existing users of residues and lower grade logs, like pulp, paper and fibreboard manufacturers, or farms using shavings as animal bedding, may feel supply pressures. To meet future demands, government and industry need to work together to maximise all potential sources of woody biomass including its reuse.

Due to past planting patterns, there could be a shortage of woody biomass by the mid-2030s based on forecast demand unless action to source additional biomass is undertaken. Opportunities to grow the supply of woody biomass include:

- growing domestic wood processing, which would increase the production of residues
- greater recovery of harvest residues (slash) from our productive forests
- growing new types of forests to produce additional volume of woody biomass for bioproducts
- diverting low-value logs from export to other higher value domestic uses.

This plan includes an action to map woody biomass supply and demand to enable deliberate direction for the use of this resource, given the likely competing and growing demands.

We need to maximise the value and circularity of the products made from woody biomass to support its most strategic use. There are significant opportunities for the reuse of wood waste, but there are barriers to overcome such as current treatments of timber and how to manage the capture of the treatment chemical for reuse.

Regulatory stability and long-term log supply are crucial enablers of future growth

Regulatory stability and long-term log supply are crucial for attracting investors and giving existing wood processors the confidence to re-invest.

Aotearoa New Zealand's forecast drop in harvest and continued regulatory uncertainty for the planting of new production forests is having a dampening effect on new investment and infrastructure upgrades across the sector. Declining log supply will also start to become a significant constraint for existing business and regions, who may need to reduce output, or start importing logs.

We need to increase the supply of logs for domestic processing by planting more forests in strategic locations and ensuring local processors can compete with high international log prices. Processing more lower grade logs domestically will provide significant benefits. But we also need to increase the supply of structural and pruned logs, particularly to support the rise in domestic use of wood in construction.

A changing climate, fires, and diseases are some of the challenges to our forests' resilience.

Forestry and wood processing will be the heart of our future low-emissions economy

With the Government declaring a climate emergency, the forestry and wood processing sector is of growing strategic importance. Transitioning to a low-emissions and circular economy will require us to use the logs we harvest and their residues to create low-carbon products and fuels.

To drive our contribution to the global effort to limit warming to 1.5˚C, Aotearoa New Zealand has committed to reach net zero emissions for all greenhouse gases, other than biogenic methane, by 2050. "Net zero" means the same or more carbon dioxide is sequestered than is emitted.

Wood products store carbon dioxide and contribute to our climate change targets

Wood products made from Aotearoa New Zealand's logs delays emission of the carbon that was sequestered by the tree – in many cases by decades. In longer-lived wood products, the carbon is released slowly as the product decays, this "delayed emission" contributes to our climate change targets. In 2019, the carbon stored in wood products contributed around 9 million tonnes carbon dioxide equivalent (Mt CO_2-e).

To increase the benefit to our climate change goals through this "delayed emission" effect, we can process more logs onshore into longer-lived wood products and use them in our buildings or export them to be used in international economies.

Woody biomass can be turned into a range of high-value low-emissions products

Technological developments are expanding what we can make from wood fibre. Emerging products include:

- engineered wood products for construction and furniture
- biochemicals and biopharmaceuticals to replace plastics and other products relying on petrochemicals
- solid biofuels like wood pellets and energy chip can replace coal and gas for heating
- liquid transport biofuels that replace fossil-fuel derived diesel, petrol, aviation and marine fuels.

Woody biomass will be the core input into future biomanufacturing industries. Scaling up the production of low-emissions, high-value, wood-based products and fuels will enable other industries to decarbonise, such as transport, construction and industries reliant on coal.

Table 1 on the following page shows the emissions reduction potential from a variety of wood or wood-based products relative to comparator materials[1].

1 Te Uru Rākau – New Zealand Forest Service (2022). *Wood Fibre Futures Stage Two Report: Main Report*, Wellington.

Table 1: Emissions reduction potential of wood products relative to comparator

Product	Comparator	Emission reduction
Sawn timber	Steel	94%
Wood pellets	Hard coal	93%
Biocrude (Fast pyrolysis)	Light fuel oil	95%
Advanced liquid biofuels (Gasification Fischer-Tropsch)	Fossil diesel	83%

Wood products can reduce emissions in the construction sector

In 2021, the construction sector was responsible for around 15 percent of Aotearoa New Zealand's emissions, around half of which was embodied carbon – the carbon associated with the materials and construction processes of buildings. There are opportunities to use more innovative wood products to displace more emissions-intensive materials in multi-residential and commercial medium to high-rise buildings.

A study commissioned by Te Uru Rākau – New Zealand Forest Service shows that if we were to replace around half of our current concrete and steel building construction with timber construction, it could reduce our national embodied CO_2 emissions by 500,000 tonnes each year. This figure only includes embodied emissions and excludes operational emissions. The wood products used would also delay the emission of roughly a further 500,000 tonnes of the biogenic carbon stored in the wood [2].

For our wood processing industry to supply this volume of product, it would need to process an additional 1.3 million cubic metres of logs into high-value engineered wood products. This equates to approximately a ten percent increase in current domestic processing capacity.

NelsonPine® LVL / Nelson Airport: building a new airport from engineered timber

NelsonPine LVL is a structural engineered wood product manufactured by gluing together multiple layers of thin sheets of wood, bonded with an exterior structural strength adhesive. LVL provides a consistent, high-performance alternative to solid lumber and steel in structural uses.

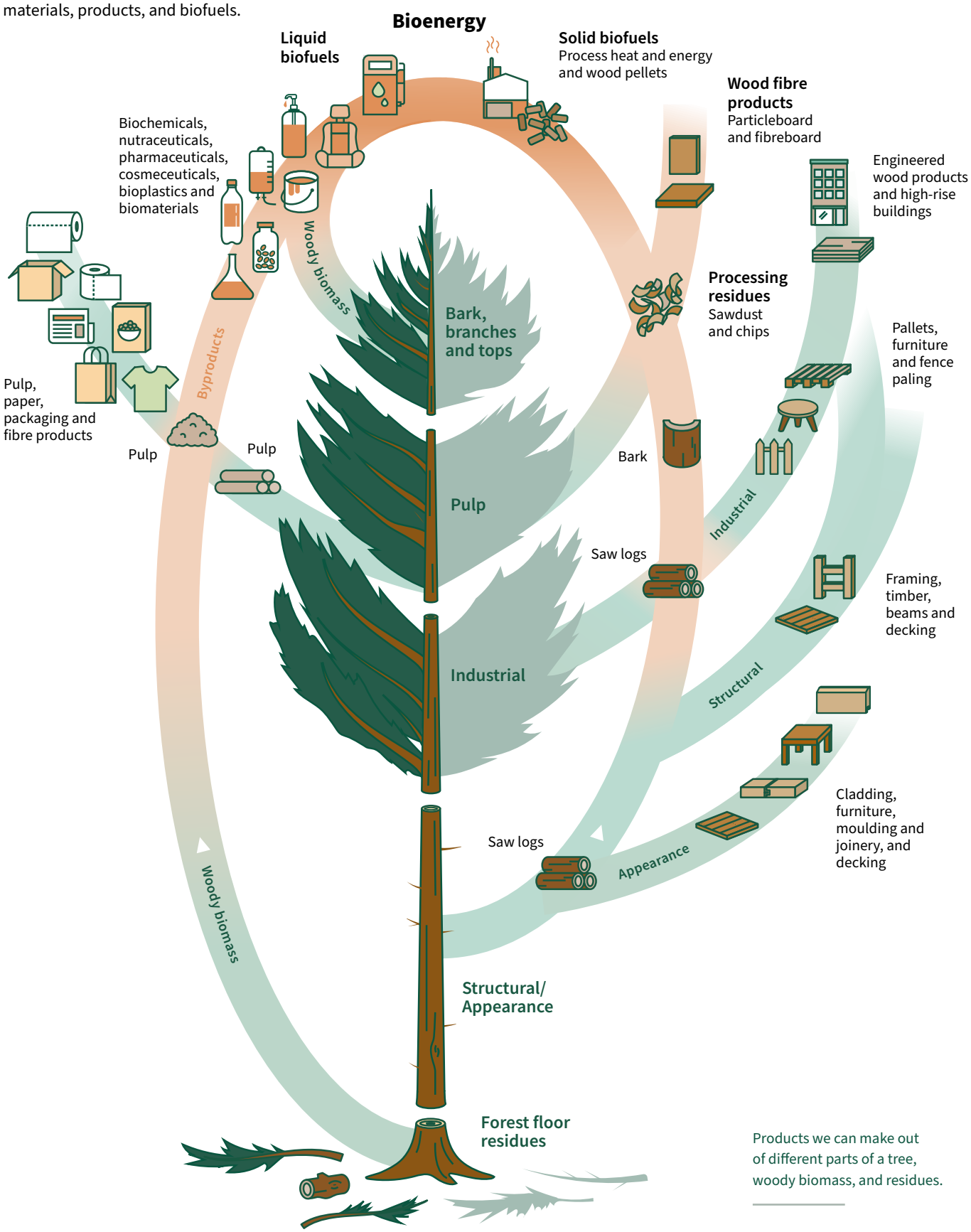
Although it looks similar to conventional plywood, which switches the orientation of its stacked veneers, LVL veneers are stacked in parallel. This allows for greater flexibility and stress-flexing without breaking, and produces structural-grade sheets of timber that allow the finished product to be consistent in appearance.

LVL is available in a variety of sizes and lengths and can be used across residential, commercial, industrial, formwork, and scaffolding applications. An example of Nelson Pine's product is at Nelson Airport in a large-scale project that ordinarily would be constructed using steel and concrete. LVL has allowed the terminal's building materials to be sourced sustainably using domestically grown radiata pine. It demonstrates how wood can be used in large-scale construction. Nelson Pine Industries – MDF and LVL processing plant.

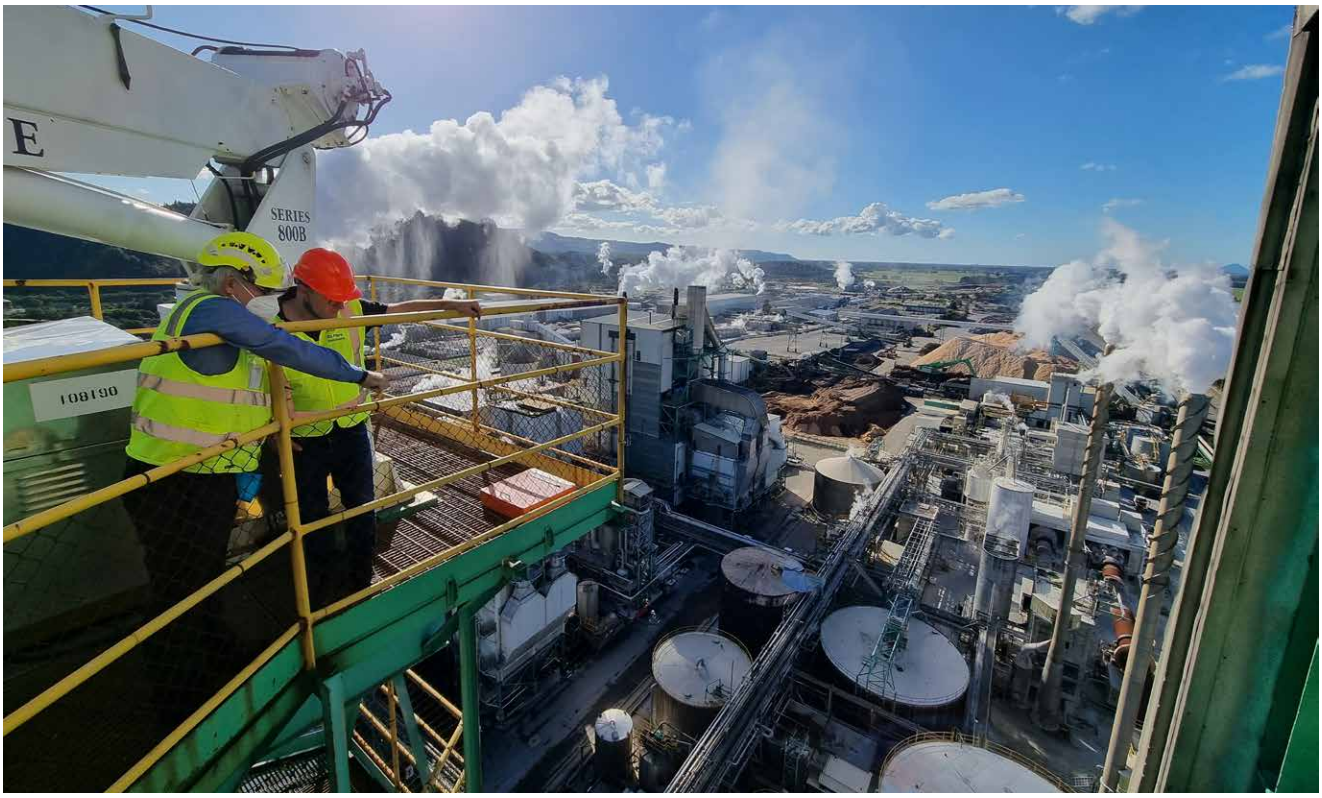
2 Andy Buchanan (2018). *Carbon Footprint of New Zealand Buildings*.

Products we can make out of a tree

Trees provide a sustainable and renewable source of wood fibre and residues to produce low-emissions materials, products, and biofuels.



Products we can make out of different parts of a tree, woody biomass, and residues.



Biofuels provide a pathway for transitioning away from fossil fuels

Biofuels provide the most immediate and available means to reduce emissions in some of our most hard-to-abate sectors, such as transport and process heat.

Aotearoa New Zealand uses around 2.8 million tonnes of coal every year. Wood pellets, which are made from wood residues and are readily available, can replace coal with minimal infrastructure upgrades. Solid biofuel is also available in a less processed form than pellets, by chipping or shredding woody biomass.

Biofuels offer a pathway to rapidly reduce our use of coal, replacing coal with wood fuel from renewable sources will lower emissions, and be equivalent to removing 15–20 percent of our annual car emissions of greenhouse gases.

Liquid biofuels will play a key role in reducing transport emissions

Transport contributes over 21 percent of gross domestic greenhouse gas (GHG) emissions and is Aotearoa New Zealand's fastest growing source of emissions.

There are few alternatives to address emissions from the existing conventional vehicle fleet. Based on the Ministry of Transport's projections, electric vehicles, and the future possibility of hydrogen will not transition transport fast enough to help meet our 2030 and 2050 emission targets.

Biofuels can immediately lower the carbon emissions of the conventional light vehicle fleet [3]. Vehicles running on fossil fuels that enter the fleet today will continue to emit high amounts of carbon for around another 20 years.

Biofuels offer a key advantage for the hard-to-abate sectors of transport and aviation. They are compatible with existing conventional vehicles and fuel infrastructure.

3 Biofuels are any fuel produced from biomass of plant or animal origin, such as, agricultural and forestry crops and residues, agricultural by-products, and organic waste. Internationally, the most common biofuels are bioethanol, which can be blended with petrol for use in cars, and conventional biodiesel.

Air New Zealand: moving toward sustainable aviation fuels

Air New Zealand considers their largest mitigation opportunity to be sustainable aviation fuel (SAF), as electricity and hydrogen are not suitable for long-haul flights.

Air New Zealand and the Ministry of Business, Innovation and Employment are working with Te Uru Rākau – New Zealand Forest Service to explore the feasibility of a commercial scale SAF production plant in Aotearoa New Zealand.

SAF can be produced from organic residues, including those from forestry. SAF is critical to aviation decarbonisation and can reduce aviation emissions by more than 80 percent compared to conventional jet fuel. However, there is a shortage – currently less than 1 percent of aviation fuel supplied in the world is SAF.

The domestic commercial production of SAF would help lower our emissions, reduce waste, and create jobs and economic opportunities in our regional communities.

Air New Zealand, Z Energy and Scion estimate that domestic SAF production could, by 2050, generate 1,800 new permanent direct jobs, over 5,000 additional indirect jobs and another 6,400 temporary infrastructure development jobs[4].

4 Ministry for Business, Innovation and Employment (2021) *Increasing the use of biofuels in transport: consultation paper on the Sustainable Biofuels Mandate*

Industry and research organisations are already doing world-leading research and innovation, which this plan seeks to build on

Scion, Forests' Growers Research, Canterbury University Forestry Department, and other research providers are already undertaking some world-leading research to improve the productivity and resilience of our forests and driving innovation in the use of wood products.

These organisations play a critical role in the forestry and wood processing sector. There are already a number of strong examples of successful industry-government corporation and co-investment to drive innovation in the sector. This includes:

- **Developing harvesting and logistics using automation and robotics.** This research programme is jointly lead and funded by the Forest Growers' Research and Ministry for Primary Industries' (MPI) Sustainable Food and Fibre Futures (SFF Futures) fund[5].
- **Investing in precision silviculture practices,** which is also jointly lead by the Forest Growers' Research and MPI[6].
- **Mid-rise wood construction:** Red Stag and MPI have partnered encourage the use of Aotearoa New Zealand-grown timber in the construction of mid-rise buildings using pre-fabrication[7].

Transformation will require strengthening the partnership between government, industry, Māori and unions

Industry transformation will require us to build on and scale up these partnerships. The ITP will be delivered in partnership with government, Māori, industry, and workers.

Māori will be key partners as we seek to transform the sector, Māori landowners are well positioned to contribute to and lead change, investment, and innovation in forestry and wood processing, owning approximately 30 percent of the land under New Zealand's plantation forests.

5 Forest Growers Research - Automation & Robotics PGP Programme. https://fgr.nz/programmes/harvesting-and-logistics/automation-robotics/. Accessed 8 November 2022.

6 MPI – SFF Futures projects: forestry – Precision silviculture. https://www.mpi.govt.nz/funding-rural-support/sustainable-food-fibre-futures/current-sff-futures-projects/sff-futures-projects-forestry/. Accessed 8 November 2022.

7 MPI – Mid-Rise Wood Construction. https://www.mpi.govt.nz/funding-rural-support/primary-growth-partnerships-pgps/current-pgp-programmes/mid-rise-wood-construction/. Accessed 8 November 2022.

Successful transformation will require greater alignment and coordination across government and a more cohesive industry

The forestry and wood processing sector is impacted by a number of different regulatory, policy and investment settings across government. Government is progressing several different strategies and work programmes that will impact the sector and its success. These include:

- the Emissions Reduction Plan
- government's overall Energy Strategy
- Fit for a Better World – The Primary Industries Roadmap
- any future changes to the New Zealand Emissions Trading Scheme
- The Bioeconomy Strategy and the Sustainable Biofuels Obligations
- government's Just Transition work programme
- other industry transformation plans, particularly Advanced Manufacturing and Construction
- wider work undertaken by the Reserve Bank on improving Māori access to capital.

Successful industry transformation will require ensuring these settings and government agencies are well aligned and coordinated and seek to maximise the potential of the forestry and wood processing sector.

There are also significant potential benefits from greater alignment and cohesion within the forestry and wood processing sector itself and increasing sector funding for industry-good activities. Relative to other sectors in Aotearoa New Zealand, the sector has low levels of spending on research and development and industry-good activities and often struggles to speak with a single voice on critical issues.

Strengthening social licence is a key enabler of future growth

The benefits of the sector need to be more widely communicated and understood. Sector partners need to work together to tell the sector's low-emissions story, both domestically and globally. Forestry needs to be seen as more than growing pine trees to export logs, rather as a key part of a community where domestic manufacturing facilities support regional economies and employment.

The social licence concerns are partly driven by the recent increase in afforestation that is seen as competing for land, such as the sheep and beef sector. These concerns often relate to the perceived wider economic and social impact of afforestation, particularly the impact on local jobs.

Strengthening social licence and ensuring the benefits of growth are both understood and widely distributed will support greater regulatory certainty, and improve the investment environment.

The benefits of sector growth need to be shared widely, particularly with rural communities, Māori and workers. As the sector grows, new opportunities will develop for a range of stakeholders. For example, the opportunities for farm forestry will increase as the bioeconomy develops and new markets emerge. Integrating trees into farms can diversify farm revenue streams and improve environmental resilience.

A strong forestry and wood processing sector can support thriving rural communities, providing direct employment and land use diversification opportunities for farmers.

Our vision and goals for transformation

Goals for industry transformation

We have set five aspirational goals to measure the progress of this plan. Each goal focuses on a key change that this plan seeks to bring about over time.

Transforming the forestry and wood processing sector requires changes across the sector and its supply chain. Some of the goals are mutually reinforcing – for example, growing export revenue and reducing emissions both depend on processing more wood fibre onshore.

The goals also interact in other ways. Our wood supply is finite but can grow or decline over time. This means that at any point in time growing domestic demand for wood products will have an impact on the amount of wood products we can export and vice versa.

1 Carbon emissions reduce by 6.9 million tonnes by 2030, and by 54 million tonnes by 2050[8]

Current state

New Zealand produced 81 million tonnes of CO_2 equivalent (year ending March 2021).

Between now and 2030 New Zealand is expected to emit 653 million tonnes of CO_2 equivalent.

Between now and 2050 New Zealand is expected to produce 1.68 billion tonnes of CO_2 equivalent.

Description of goal

This goal aims for the sector to reduce our emissions by providing low-carbon bio-alternatives as substitutes for about 2.8 million tonnes of coal per year, and 3.8 billion litres of diesel.

Achieving this goal would require the sector by 2050 to:

- provide the construction industry with 14 million m^3 of innovative wood products that can be used in new buildings
- use 16.4 million tonnes of wood fuel to replace 9.2 million tonnes of coal
- produce alternative fuels for transport by using 49.3 million m^3 of woody biomass to replace 8.9 billion litres of fossil fuels with biofuels, including sustainable aviation fuel and drop-in renewable diesel.

Note: these totals are cumulative and relate to gross emissions.

2 Wood processing increases by 3.5 million m^3 (25%) by 2030

Current state

14.2 million m^3 of logs were processed in 2021.

Description of goal

This goal seeks to significantly scale up our domestic wood processing of underused lower grade logs and reduce the number of unprocessed logs we export.

Achieving this goal would require:

- establishing new mills that process lower-grade logs
- increasing the capacity of Aotearoa New Zealand's existing primary processors by 25 percent. This means we would roughly need an additional three to four modern large-scale sawmills or a scaling up of existing mills.

8 2050 figures are used to reflect the exponential nature of carbon emissions reduction.

3 Export earnings from value-added wood products grow by $600 million[9] by 2040

Current state

Export earnings from value-added wood products were NZ$2.5 billion in 2021, of which $1.3 billion was sawn timber and panels.

Description of goal

We want Aotearoa New Zealand to be a world-leading exporter of high-value products made from wood. Strong export growth will support national and regional economic development.

To achieve this, we need to scale up domestic wood processing, produce high-value wood products and find markets for these products.

4 Use of wood products in mid-rise or commercial construction increases by 25% by 2030

Current state

1.4 million m^3 of wood products were used in construction in 2021.

Description of goal

This goal aims to reduce the emissions of Aotearoa New Zealand's construction industry by replacing emissions-intensive building products with engineered wood products.

To achieve this goal, we would use up to additional 400,000 m^3 of low emissions wood products by 2030. This replacement would use mostly cross laminated timber, glue laminated beams and laminated veneer lumber (LVL).

The types of buildings that would be made with more wood products[10] include:

Houses: light timber framing or mass timber ground floors.

Apartments: light timber framing or mass timber framing.

Office, education and commercial buildings: cross-laminated timber floors and exterior walls and mass timber framing methods, such as glue laminated beams (glulam) or LVL.

Farm buildings, factories, or storage buildings: encouraging the use of LVL portal frames and LVL purlins.

5 Planting of alternative species (non-radiata) increases to 20% of all planting by 2030

Current state

Estimated at 10 percent alternative species in 2022.

Description of goal

This goal aims to increase the resilience and productivity of our forests.

Planting alternative species is key to improving the sector's resilience to climate change, and to biological and economic risks. It would also increase the wider environmental benefits gained from forestry, such as improved biodiversity, and expand the range of products we can manufacture from high-value timber and wood fibre.

To achieve this goal, we would need to work with the sector to understand and overcome the barriers to diversifying our productive forests. This diversification will be challenging, seeing as existing infrastructure and supply chains are tailored to radiata pine.

9 Figure is in real terms, which means it is inflation adjusted.

10 While there is some opportunity to increase the use of timber foundations and mass timber floors in standalone houses, the biggest gain is likely to be in mid-rise multi-residential and non-residential buildings.

Goals for transformation in the forestry & wood processing sector

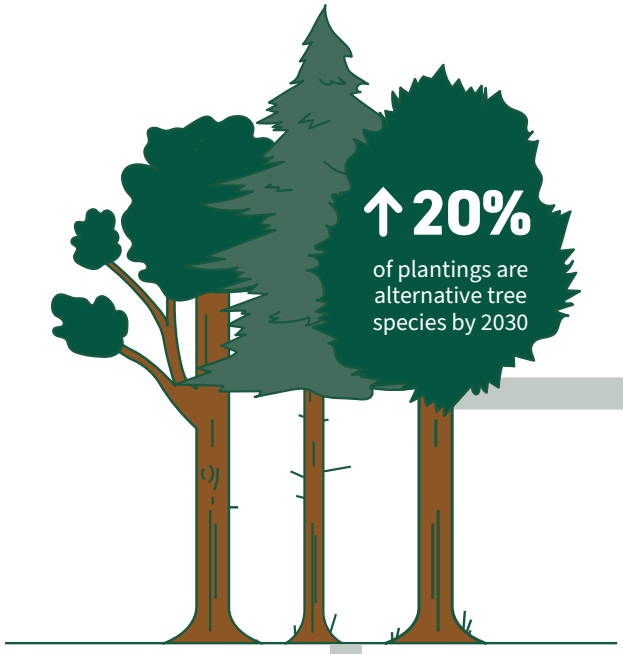
The goals in this plan are interconnected and linked to our vision for New Zealand to be acknowledged as a global leader in the use of forests, and local communities are empowered through meaningful employment. The sector and our forests are resilient and diverse, and wood underpins our low emissions future.

Goals

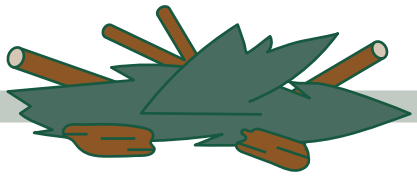
1 2 3 4 5

5 Planting of alternative species

Improve resilience, expand range of manufactured products, and enhance wider environmental benefits



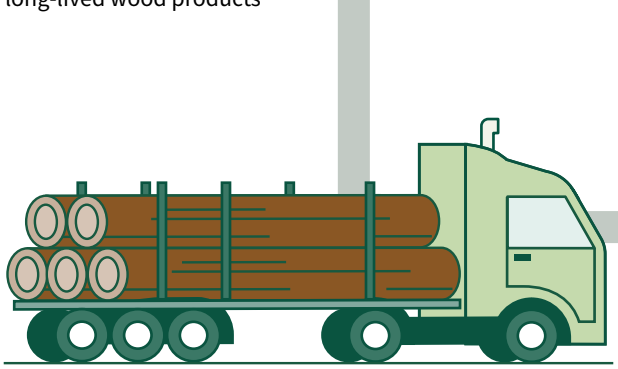
Increase woody biomass supply
Increased woody biomass recovered from forest floor and harvesting residues, bioenergy managed forests and pulp logs

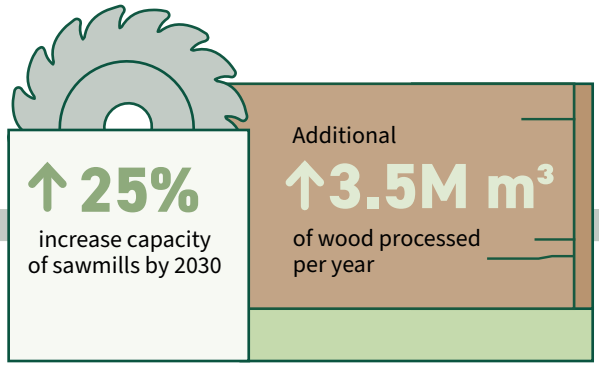


Carbon sequestration
Production forests sequester carbon and produce long-lived wood products

2 Domestic wood processing

Significant scaling up of capacity.





Keep more logs for processing in New Zealand
60% of our logs are currently exported. With industry transformation, more logs will be kept in New Zealand for onshore processing

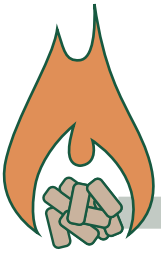
1 Carbon emissions reduce by

↓ 6.9M tonnes by 2030

↓ 54M tonnes by 2050

1 Decarbonisation of process heat

Replace coal with solid biofuels

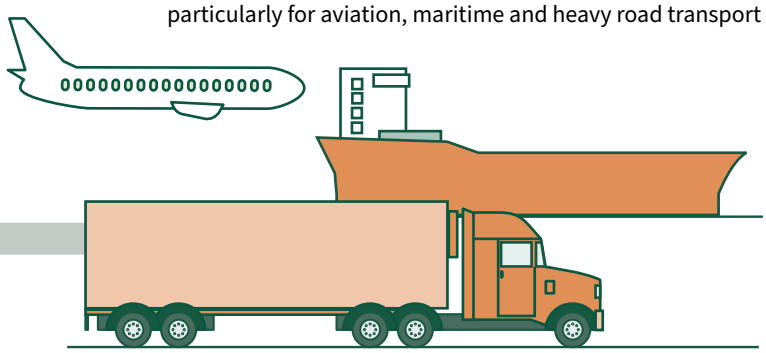


16.4M tonnes

of wood pellets replace 9.2M tonnes of coal by 2050

1 Decarbonising transport

8.9B litres of liquid fuels made from 49.3M m³ of woody biomass to support decarbonisation in the transport sector, particularly for aviation, maritime and heavy road transport



1 Woody biomass

Processing more wood will increase residues

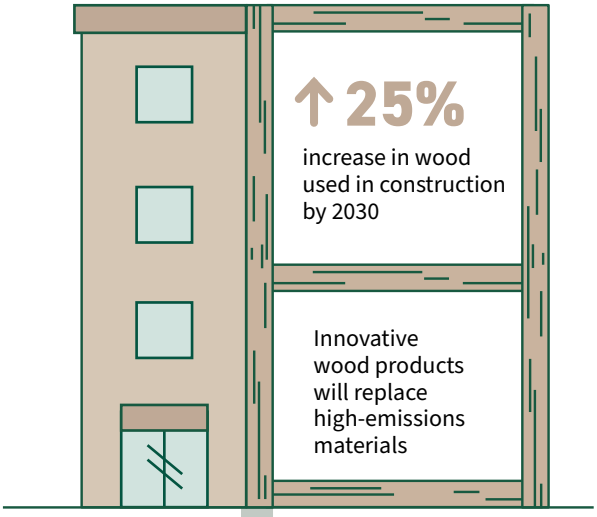
Additional

↑ 1.5M m³

of wood-processing residues per annum by 2040

4 Using wood products in construction

Replace emissions-intensive building products with engineered wood products such as Laminated Veneer Lumber (LVL)

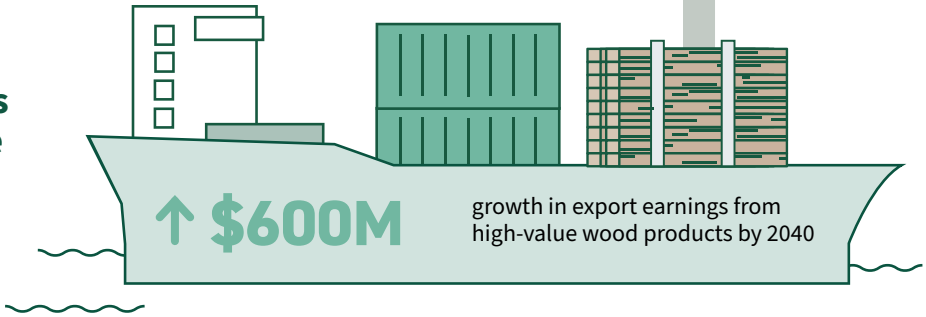


↑ 25%

increase in wood used in construction by 2030

Innovative wood products will replace high-emissions materials

3 Grow exports of high-value products



↑ $600M

growth in export earnings from high-value wood products by 2040

Feller buncher harvesting a tree.

An overview of the sector

In this section we set out the current state of the sector, including:

- our commercial forestry
- our wood processing
- the supply chain, from tree to wood product
- the demand for wood products
- our workforce.

Production forestry in Aotearoa New Zealand

Aotearoa New Zealand has 1.7 million hectares of commercial forests

We have around 9.9 million hectares of land (38 percent of the country) with forest cover in 2021, with around 1.7 million hectares planted for production purposes.

Our forestry industry is largely based around sustainably managed plantation forests. About 90 percent of our plantation forests are radiata pine. The remainder are Douglas fir (6 percent of plantation area), eucalypts, and other softwood and hardwood species.

Production forests are primarily on marginal quality land (Land Use Capability classification 6, 7, and 8). The land use capability (LUC) classification puts a classification onto different kinds of land according to its capacity to support long-term sustained production. The higher the number, the lower the quality of land, and therefore the lower the suitability of the land for other production purposes.

Forestry is a long-term investment for most landowners

Forestry is a long-term investment compared to other land uses. A typical radiata pine forest is harvested at 28 years of age. Before harvest, foresters make silviculture decisions that will impact the end volume or quality, including stocking rates, pruning, and thinning.

There are also about 25,000 hectares of natural native productive forests, with harvesting regulated under the Forest Act (1949). Native plantations can offer long term carbon sinks, support biodiversity, and act as high-value timbers. These trees are slower growing and tend to be managed on longer rotations (50 years or more).

Forests are an integral part of farms in Aotearoa New Zealand

Small growers, such as farmers, private owners and those in syndicate and partnership blocks, currently represent 30 percent of the plantation estate and more than half of this area is in holdings of less than 40 hectares. Due to high planting rates in the 1990s, these forests are expected to make up 40 percent of harvest volumes in the next decade.

The plan envisages that small growers, in particular the farm forestry community, will play an increasingly important role in the forestry supply chain. There is significant potential across the country for additional farm-level planting, which can be readily integrated into operations to sustain and help diversify farming properties and communities.

Farm forests offer unique habitats for plants and animals, reduce leaching of nutrients from soils, improve water quality, and limit erosion: all of which benefit on-farm performance.

While radiata pine is the mainstay, there has been strong interest from small growers in trialling and establishing a broader range of commercial species, including cypresses, eucalypts, redwood, blackwood, other exotic species, and managed indigenous forests.

Ownership of our forests

A small number of companies own a large proportion of our production forests – around 70 percent of productive forests by area are owned by 20 companies. Crown Forestry, which is government run, operates around 4 percent of the estate.

Small woodlot owners (forest owners with less than 1,000 hectares) provide roughly 20 percent of the commercial forest area. Small woodlot owners, such as farm foresters, are becoming increasingly important to our log supply.

Approximately 57 percent of our commercial forests are foreign-owned The *Overseas Investment Act* governs overseas investments in forestry.

Forests are significant to Māori

Pūrākau (traditional narratives) such as the creation story of Rangi and Papa tell of the spiritual nature of the world's creation process and are a special part of what links tangata whenua (People of the Land) intrinsically to the forests of Aotearoa New Zealand. This indigenous worldview of forestry goes beyond cultivating economic assets. It includes intergenerational responsibility for people, the environment, and amplifies the connection between Māori communities, and forestry and wood processing.

Māori foresters' aspirations include seeing diverse forests grown and processed, while considering their wider benefits such as recreation and mental and social wellbeing. Continuity of whakapapa (relationship) and kaitiakitanga (customary practice) through forestry opens up the opportunity to explore intangible and tangible cultural heritage such as kai (food), rongoā (medicine), whakairo (artistic expression), and rākau mauri (wellbeing through connection with forest and forest products).

Tāne Mahuta: this tree symbolises the God of the Forest Tāne Mahuta as standing tall, holding his father Ranginui, apart from his mother Papatūānuku, so that the world could be covered in light.

Ngahere and whenua ngahere (forest land) are significant taonga (inheritance) to Māori and represent an important part of contemporary Māori culture. They also play an important role in the Māori economy, providing a wide range of benefits to Māori communities, including jobs and opportunities for tourism and leisure.

Other concepts in te ao Māori (the Māori world) that influence sustainable forestry practices include the concept of Māori as kaitiaki (stewards) over land. The kaitiaki responsibilities over ngahere inform whānau, hapū and iwi aspirations for kaupapa-led forestry practices. This means Māori have a strong focus on long term sustainability, ecology and biodiversity, ensuring forestry provides wider benefits for all.

Māori in commercial forestry

Māori models of forestry are heavily influenced by of tikanga (doing things in the right way); ngā taonga tuku iho (the treasures, rights, interests and cultural responsibility passed down through generations); customary kaitiakitanga (guardianship over the environment); and kaupapa-led (values-based) forestry planning and design. This means Māori partnerships are likely to have a strong focus on long term sustainability and biodiversity, and ensuring forestry provides wider benefits to Māori communities, as well as benefiting all New Zealanders.

With significant interests in Aotearoa New Zealand's commercial forestry sector, Māori trusts and incorporations own $4.3 billion of assets in forestry and have ownership of more than 30 percent of land under plantation forestry as well as large areas of indigenous forest. Around 8,300 Māori work across the forestry and wood processing sector, making up 22 percent of the workforce.

Large-scale planting of exotic production forests on Māori-owned land began in the 1960s. Many of these new forests were under Crown Forestry licences, with the Crown often paying rent below market rate, and a percentage of stumpage fees[11].

Crown Forestry has gradually phased out forestry leases in favour of direct ownership or joint ventures with Māori. Around 355,000 hectares of former Crown land has been transitioned to iwi ownership, or to joint venture[12] agreements.

11 Forestry contractors pay "stumpage fees", an amount of money per tree that they are entitled to fell.

12 Joint ventures are forest investments between two parties, where typically one party provides the land and the other provides the means to establish and manage the forest.

Significant areas of land have also been returned to iwi as part of their settlement process. While a positive step, much of this land was already leased, meaning the economic potential of the land often goes to private companies or the Crown (at least for a period). The land can be lower quality, 'land locked' (a piece of land to which there is no reasonable access), underutilised, or far from urban centres. Options for this type of land are narrow, but is suitable for forestry.

Kaingaroa Forest (the second largest plantation forest in the southern hemisphere) is a prime example where the land is owned by the Central North Island (CNI) Iwi Collective, but the trees and the forestry lease are still largely held by a private company.

The New Zealand Emissions Trading Scheme plays a key role in the sector

The New Zealand Emissions Trading Scheme (NZ ETS) plays a key role in the forestry and wood processing sector. The NZ ETS was set up in 2008 to reduce emissions in line with Aotearoa New Zealand's climate change targets by setting a price on carbon (NZUs).

Foresters with forests planted after 1989 who enter the NZ ETS are awarded NZUs for the carbon absorbed by their forests. To incentivise owners of forests planted before 1990 to remain in forest cover, the NZ ETS treats land conversion as an emission for which these owners must pay, and the cost of this is governed by the carbon price.

There are 350,000 hectares of forest land now registered in the NZ ETS and over 2,000 participants, with demand continuing to grow. Some landowners, however, have chosen not to enter their forests into the NZ ETS. Around 2.7 million hectares of eligible post-1989 forest land is not registered in the ETS.

Strong carbon prices in the NZ ETS are proving an effective driver of afforestation, particularly exotic forests. Maximising the benefits of this afforestation requires supporting the right mix, level, and location of planting to provide wood, while maintaining the incentive for gross emissions reductions.

Lake Taupō Forest Trust: Crown and Iwi working together to support Māori ownership

In 1969, the Crown and the Lake Taupō Forest Trust signed a 70-year forestry lease over 30,000 hectares on the whenua of Ngāti Tūwharetoa.

Under the original lease, the Crown planted around 24,000 hectares of forest with planting completed in the mid-1980s. The Crown commenced harvesting in 1996, with the harvested areas replanted each year to create a second rotation crop.

The Crown has taken active steps to return forest ownership back to the Trust.

In 2000, the Crown and the Trust agreed to vary the terms of the lease from a two-rotation arrangement to a single-rotation lease with the Trust acquiring ownership of the second-rotation crop. The Crown progressively returned leased land to the Trust as the first rotation crop was harvested.

In 2021, the Trust marked a significant milestone: the harvest of the second rotation crop that were trees 100 percent owned by the Lake Taupō Forest Trust. The Trust is now the 21st largest forest owner in Aotearoa New Zealand, with its forest providing continuing employment and income for Ngāti Tūwharetoa. At the ceremony, Te Waa Logging – a family crew owned and operated by beneficial owners of Lake Taupō Forest Trust – felled five trees to mark the start of the Trust's harvest.

Our production forests

10.1M hectares
of forests in New Zealand, covering 38% of the land

8M hectares
of native forest

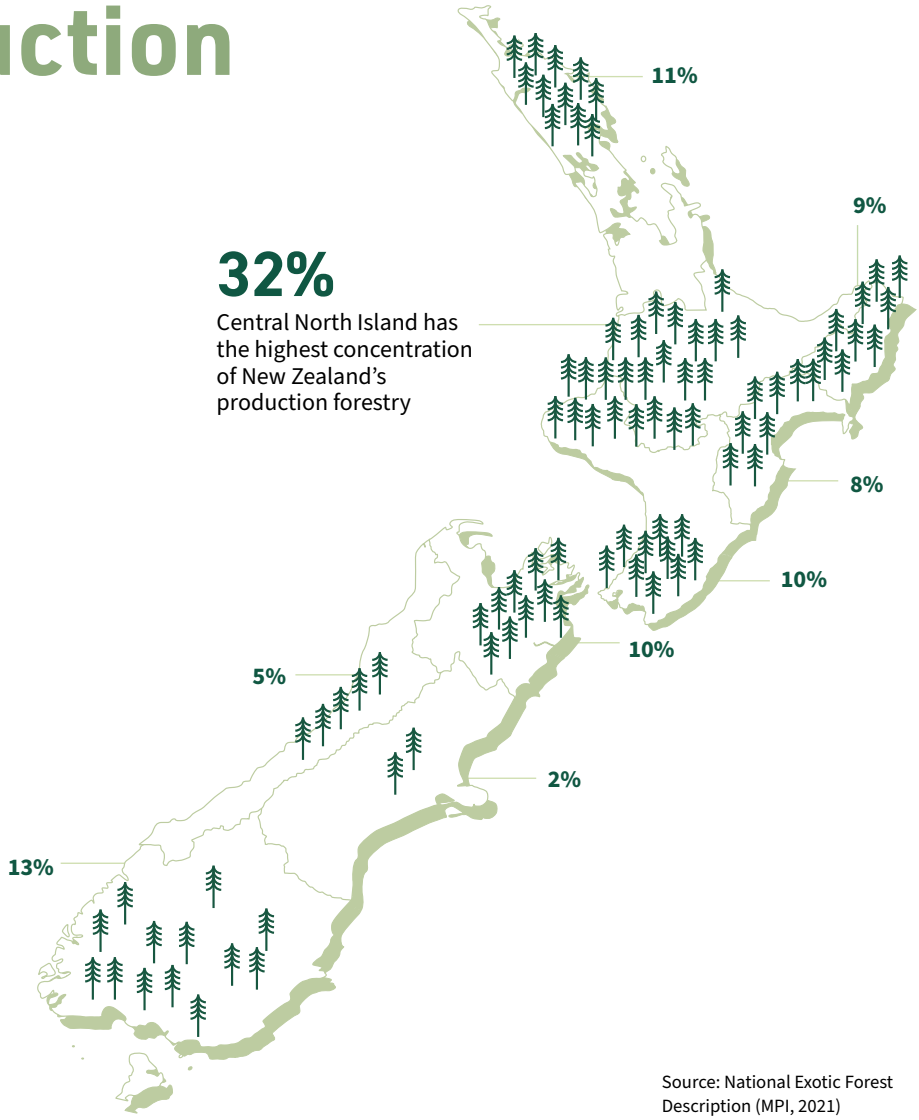
1.739M

hectares of planted production forest
This excludes non-production native and exotic forests that are part of parks, reserves, etc

0.4M hectares
of reserves, areas near bodies of water and infrastructure

32%

Central North Island has the highest concentration of New Zealand's production forestry



Source: National Exotic Forest Description (MPI, 2021)

Tree species in production forests in Aotearoa New Zealand

90%

Radiata pine

Other species include: Douglas fir, eucalyptus, cypresses, redwoods, other exotic softwoods, and native tree species like tōtara

Radiata pine (90%)
1,571,575 hectares

Douglas Fir (5.5%)
97,584 hectares

Other hardwoods (2.1%)
36,816 hectares

Other softwoods (1.9%)
33,997 hectares

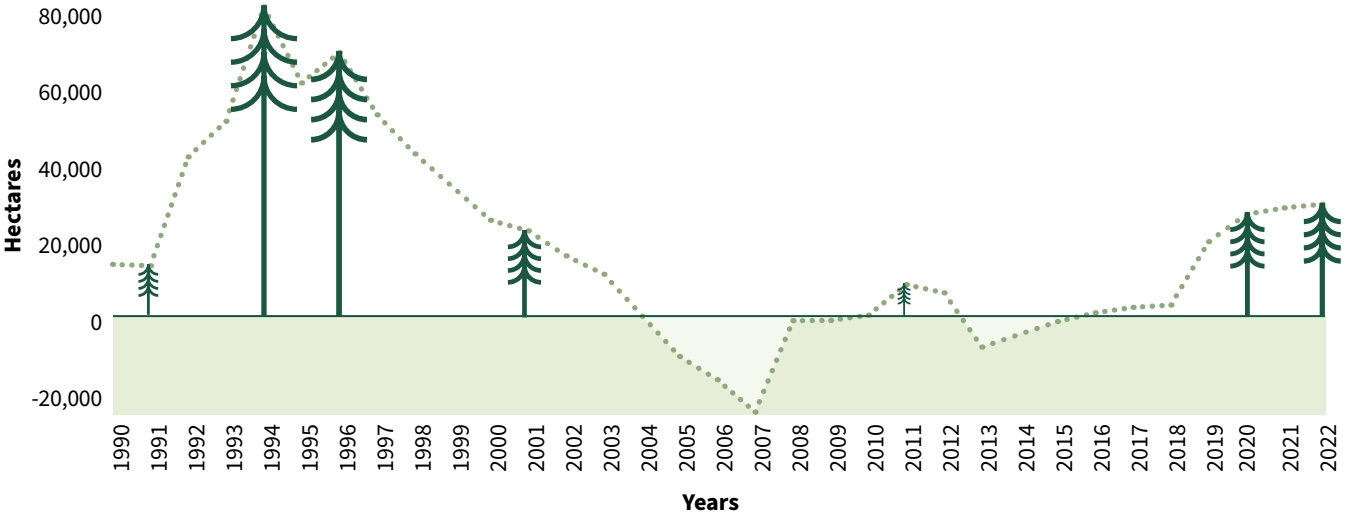
Source: National Exotic Forest Description (MPI, 2021)

Afforestation

The rate of planting new forests (afforestation) was the highest in the 1990s, driven by high log prices, with 80,000 hectares of new forest planted in 1994.

Since then, there has been steady decrease in the afforestation rate until the last three years, when the carbon and log market have created another increase in the afforestation rate.

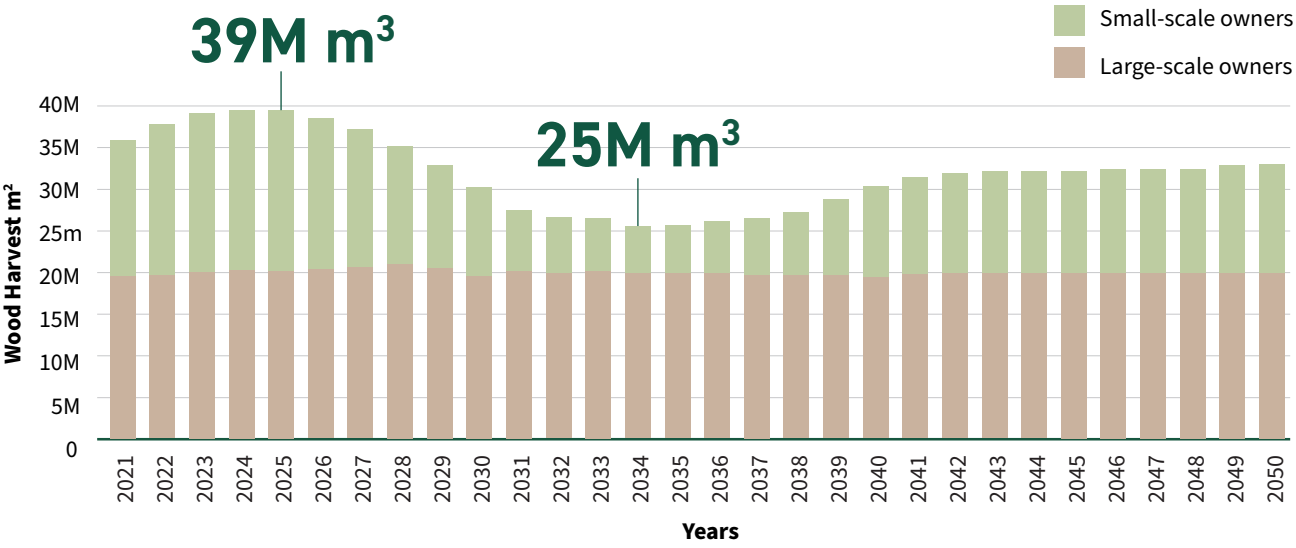
Source: National Exotic Forest Description (MPI, 2021)



Our wood harvest is forecast to decline

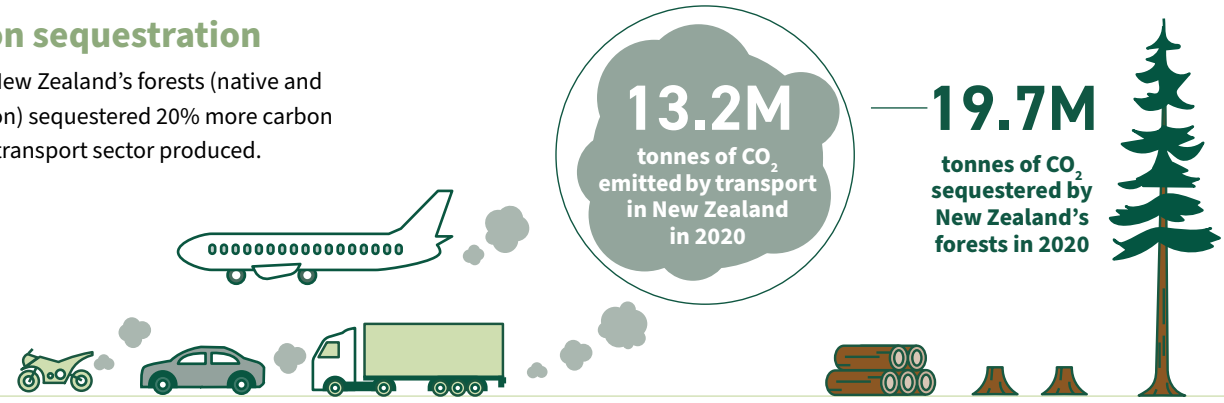
Harvesting is expected to peak at just under 40 million m^3 in 2025 and fall to about 25 million m^3 by 2034 due to the declining afforestation rates throughout the early 2000's.

Source: Wood Availability Forecasts (MPI, 2021)



Carbon sequestration

In 2020, New Zealand's forests (native and production) sequestered 20% more carbon than the transport sector produced.



Wood processing in Aotearoa New Zealand

Aotearoa New Zealand has around 90 sawmills in operation today

Sawmills are the first step in processing logs into products. Around 90 sawmills operate across the country, varying in type and size. In the year ending September 2019, Aotearoa New Zealand produced 4.4 million cubic metres of sawn timber.

There are currently four pulp mills. Pulp mills turn wood fibre, such as wood chip, into pulp, paper, paperboard, and other cellulose-based products. A range of other processing companies make posts, packaging, plywood, MDF, and wood pallets using sawmill products and logs.

All domestic wood processing is privately owned, with a mix of foreign and locally owned mills.

A small number of companies produce the bulk of sawn timber in large mills. Small sawmills continue to play a key role in supplying timber and employment in smaller rural communities.

Most wood processors are in the central North Island

Most of our wood processors are in the central North Island. Otago and Southland have the second highest number of mills in the country with mostly smaller sawmills.

Forests, sawmills, and secondary processors are typically located close to each other to increase efficiency, reduce costs (for things like transport and infrastructure), and share heat and energy.

Sawmills produce a range of products and residues

Different parts of a tree (known as "log grades") are used for different purposes and have different value. Wood quality and value diminishes the further up the tree you go, as this is the youngest part of the tree. The way a forest is planted and managed while it is growing influences the range of log grades the trees will produce.

Sawmills produce their primary product (like structural sawn timber), and residue products.

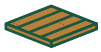
Residues, such as sawdust, bark, or wood chip, are produced during sawmilling processes. Logs processed domestically result in 40 to 50 percent of the volume of the log being converted into residues. These residues may be consumed by the mill for energy, or on-sold to secondary processors.

Residues from sawmilling are used in a range of products, historically in the pulp, paper and packaging sector or for medium density fibreboard (MDF).

Residues are increasingly valuable, with demand growing as companies seek low emissions alternatives. For example, some diary companies are using wood pellets, hog or chip fuel to replace coal in heating and industrial processes.[13] A wide range of other high-value products are coming to market.

Sawn timber is either sold straight to market, or to secondary processors. Secondary processors process the outputs of the mill into higher value products, such as those shown in the table below.

Table 2: Examples of secondary wood products

 Engineered wood products	 Industrial products	 Panels	 Paper products	 Construction timber	 Mouldings
Sawn timber can be remanufactured into a new, higher strength engineered form. e.g. cross-laminated timber (CLT).	Lower grade sawn timber can be used to make non-structural products, such as pallets.	Residues can be reconstituted into new forms, e.g. medium-density fibreboard (MDF).	Residues can be turned into pulp and paper.	Sawn timber can be made into frames, trusses and treated outdoor timbers.	Sawn timber can be planed and routed to create dressed and shaped products such as weatherboards and architraves.

13 Wood fuel is generally chip, hog or densified into pellets or briquettes. Hog fuel is created by shredding or grinding forest residues. The characteristic of each type of fuel will determine that fuel's suitability for specific designs of combustion boiler. Wood is processed by suppliers to meet the specified requirements of a customer's combustion plant. Wood pellets or briquettes are ideal for co-firing with coal or replacing coal in an existing boiler.

Wood processing

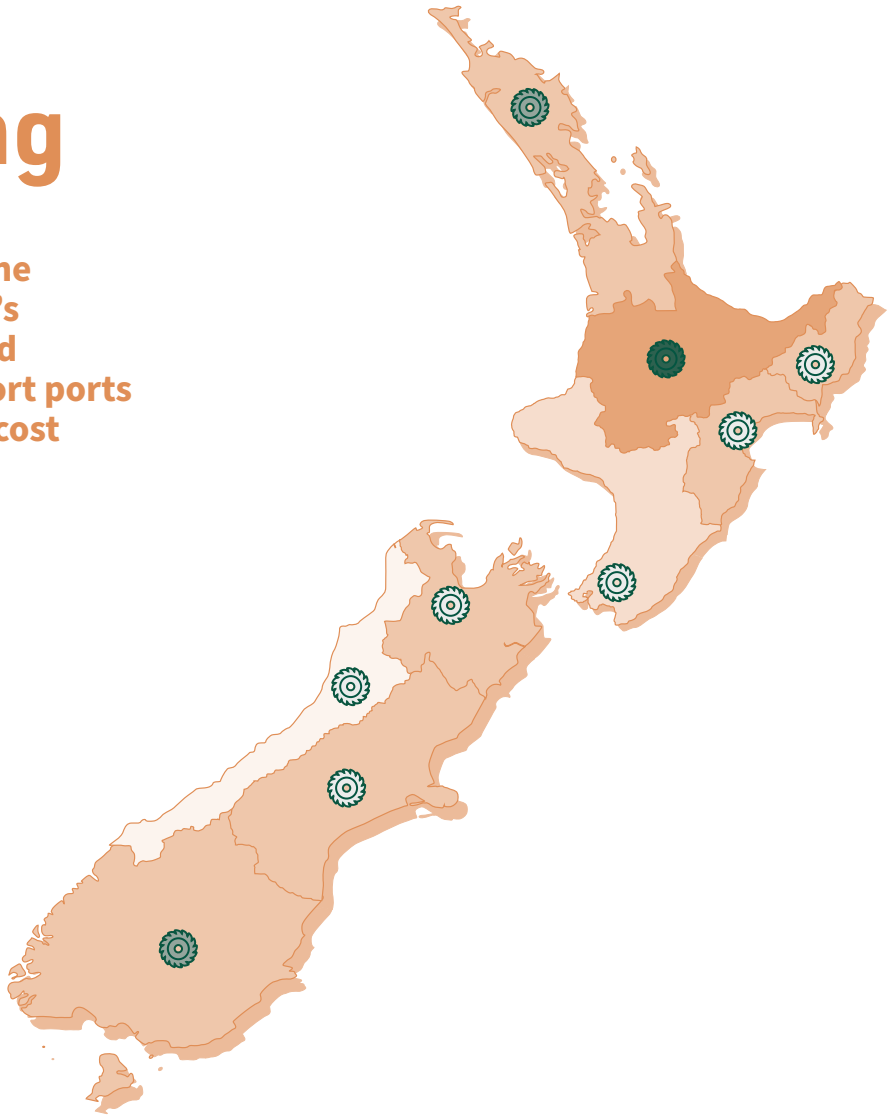
Distribution of radiata pine in Aotearoa New Zealand's production forestry, wood processing capacity, export ports and relative log delivery cost

Percentage of the total radiata pine estate

- 1–3%
- 8–12%
- 4–6%
- 35%

Wood processing capacity
Volume of wood (m^3) able to be locally processed

- **Low** <1M m^3
- **Medium** 1–2M m^3
- **High** >2M m^3



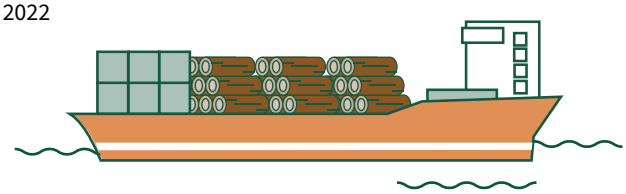
Source: Wood Fibre Futures, Stage 1 report, 2019

Log production

36M m^3

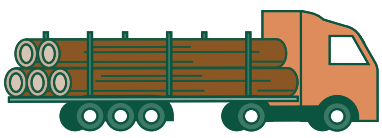
produced in New Zealand for the year ended March 2022

22M m^3



exported (predominantly lower grade)

14M m^3



processed onshore

90%

of logs are radiata pine and include different log grades (for example saw, peeler, pulp and industrial logs)

Source: Stats NZ; MPI (2022)

Wood products' output

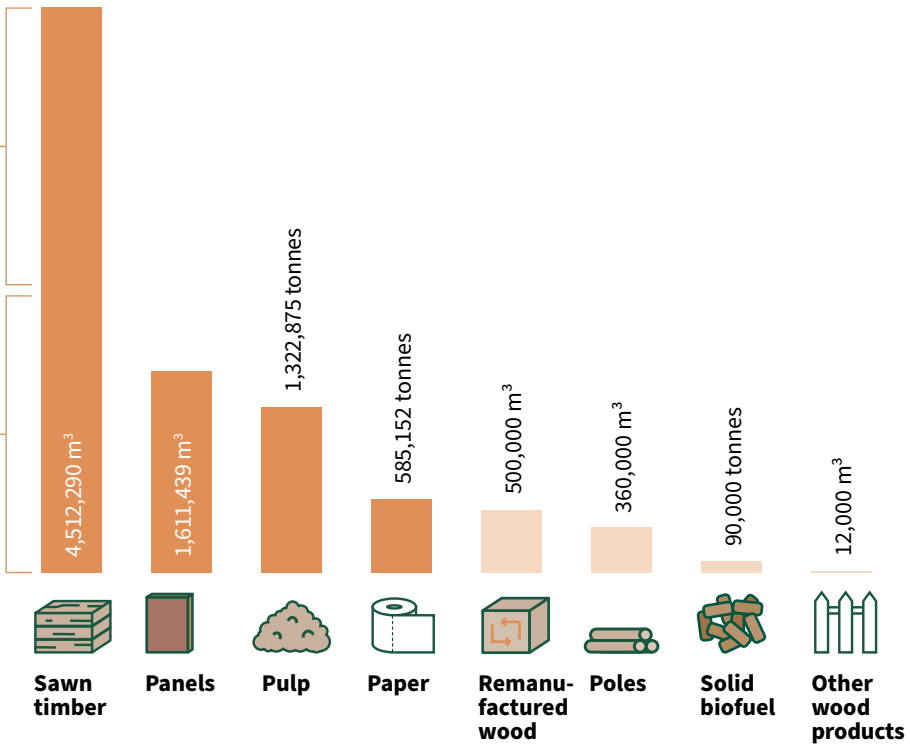
Aotearoa New Zealand produces over 8M m^3 of processed wood products

6

large sawmills produce over half of Aotearoa New Zealand's sawn timber

80+

smaller-sized sawmills produce the other half (50%) of sawn timber

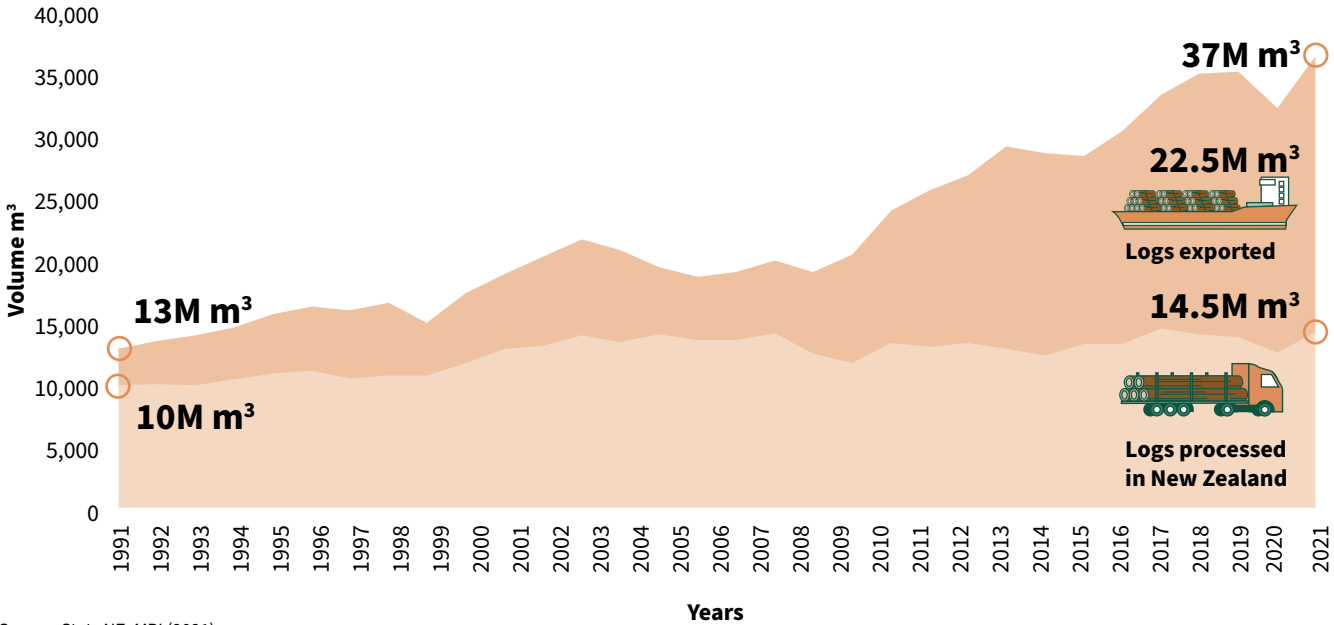


- Gross production – some of these products are used as an intermediate to produce other products
- Estimates based upon known manufacturing capacity rather than actual production

Source: MPI (2021)

Logs exported vs. processed onshore over time

Since 2000, forest harvest volume has roughly doubled from 15–20 million m^3 to over 36 million m^3, but processing capacity has remained roughly constant between 12–14.5 million m^3.



Source: Stats NZ; MPI (2021)

Forestry and wood processing supply chain

The forestry and wood processing sector is a complex system and value chain. The chain includes planting and harvesting forests, processing logs into various products, and further processing these products, or the residues from processing, into refined products.

Key components of the supply chain

The main components of the sector are the following:

- **Breeding and nurseries:** this is where the best genetics are developed, and seedlings are grown.
- **Forest management:** this involves the planting, silviculture, and harvesting of productive forests. Most productive forests in Aotearoa New Zealand are made up of exotic trees. Logs harvested are either directly exported or processed domestically.
- **Primary processing:** this is the first stage of processing in the supply chain where raw logs are processed. It includes sawmilling and remanufacturing of timber to value-added products such as glulam and mouldings. Primary processing creates products that are sold directly to market or products sold to secondary processors.
- **Secondary processing:** this involves processing or refining the products or residues from primary processing. This includes panel production, pulping, the manufacturing of paper, cardboard, paperboard, and exterior/interior building products.
- **The emerging bioeconomy:** processing creates residues, such as sawdust, bark and woodchips. Residues can be processed into solid biofuel which can be used:
  - to produce heat and electricity
  - feedstock to produce bio-based products such as char, gaseous and liquid biofuels, biochemicals and pharmaceuticals
  - for a wide range of other applications such as clothing and food products.

The figure on the next page provides an overview of the forestry and wood processing supply chain and highlights some of the bioeconomy opportunities.

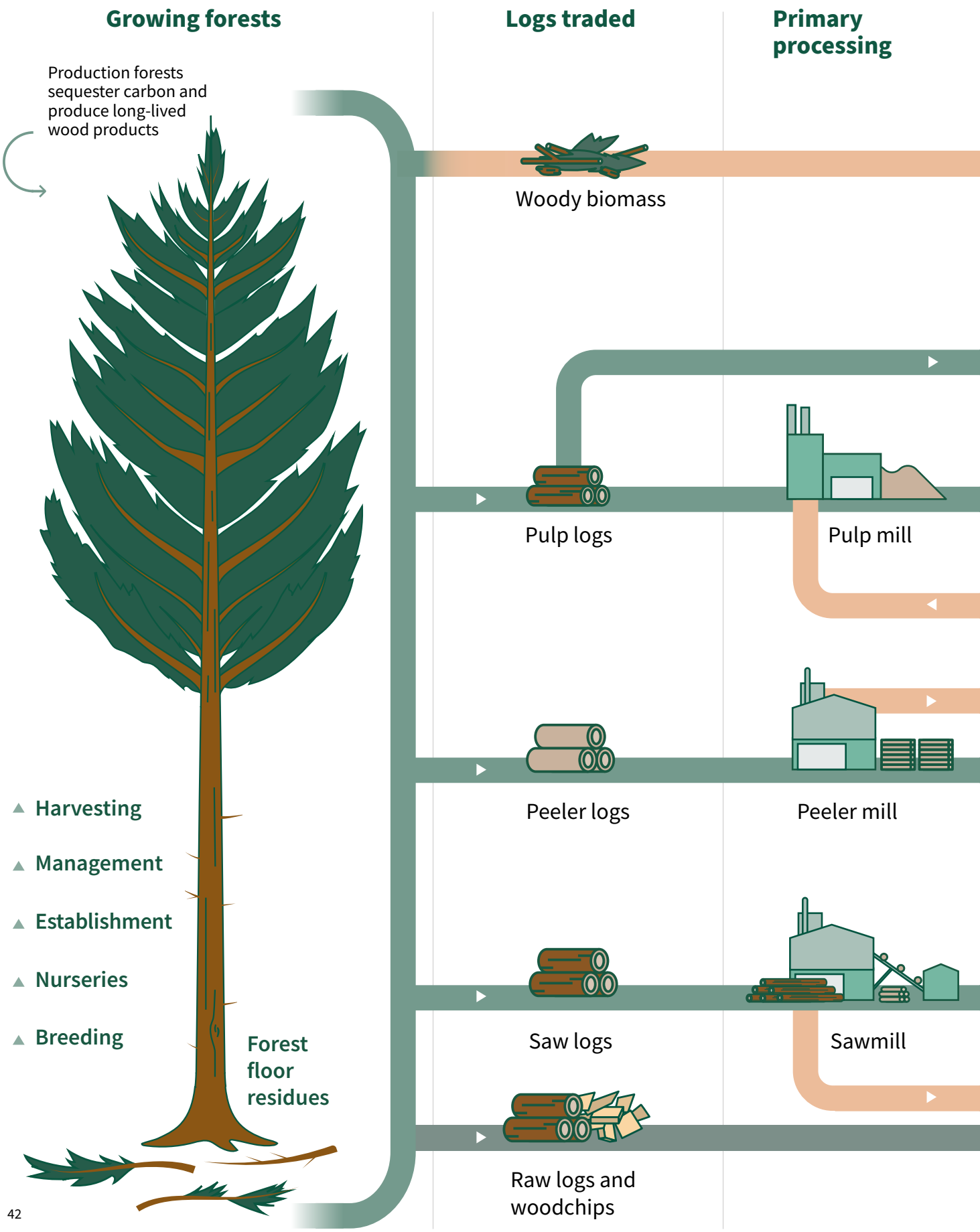
Transport and logistics are a key part of the supply chain

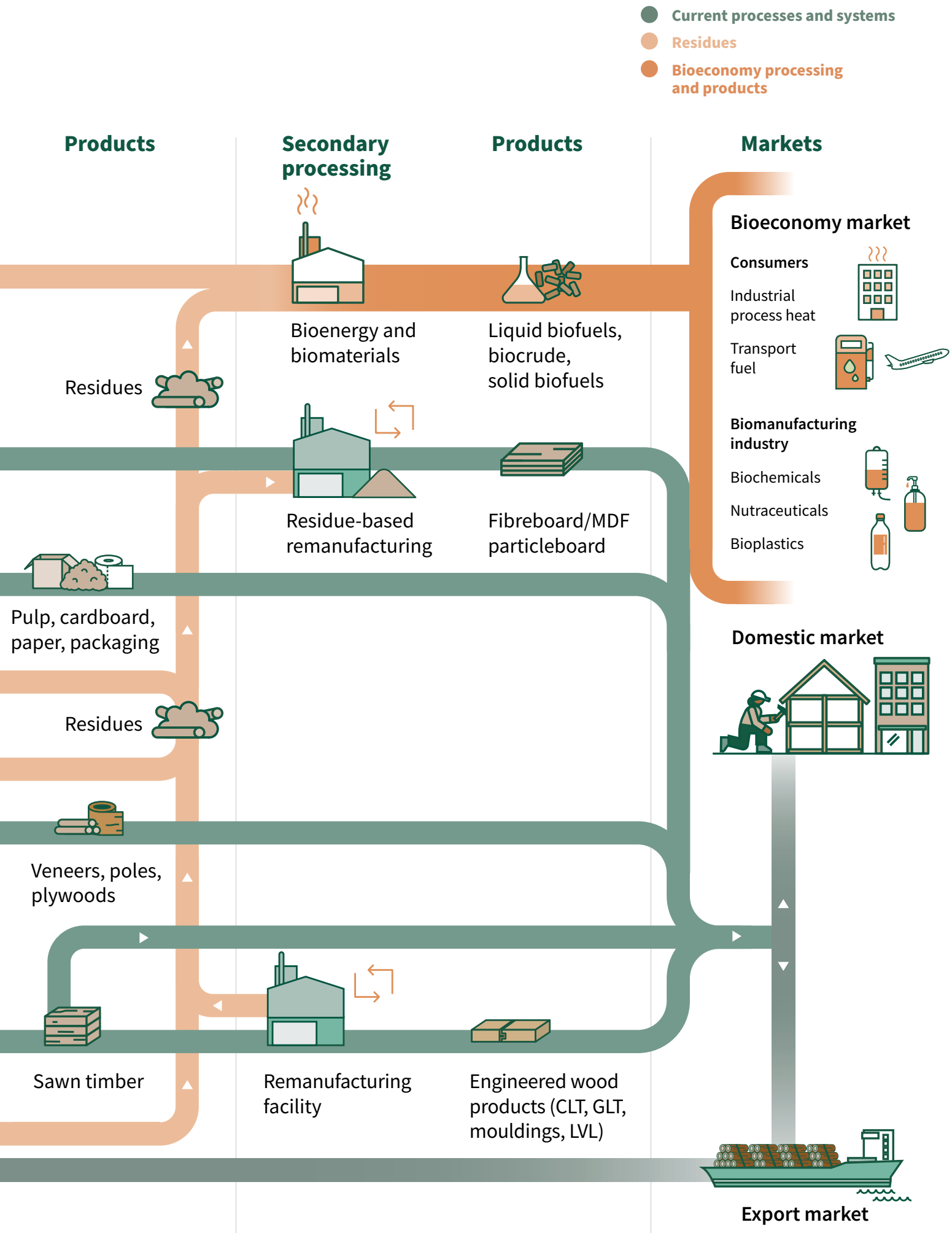
The transport and freight infrastructure system is a key enabler of the forestry and wood processing sector. This transport sector stores and transports logs, products, and residues from forest, to processor, to end market.

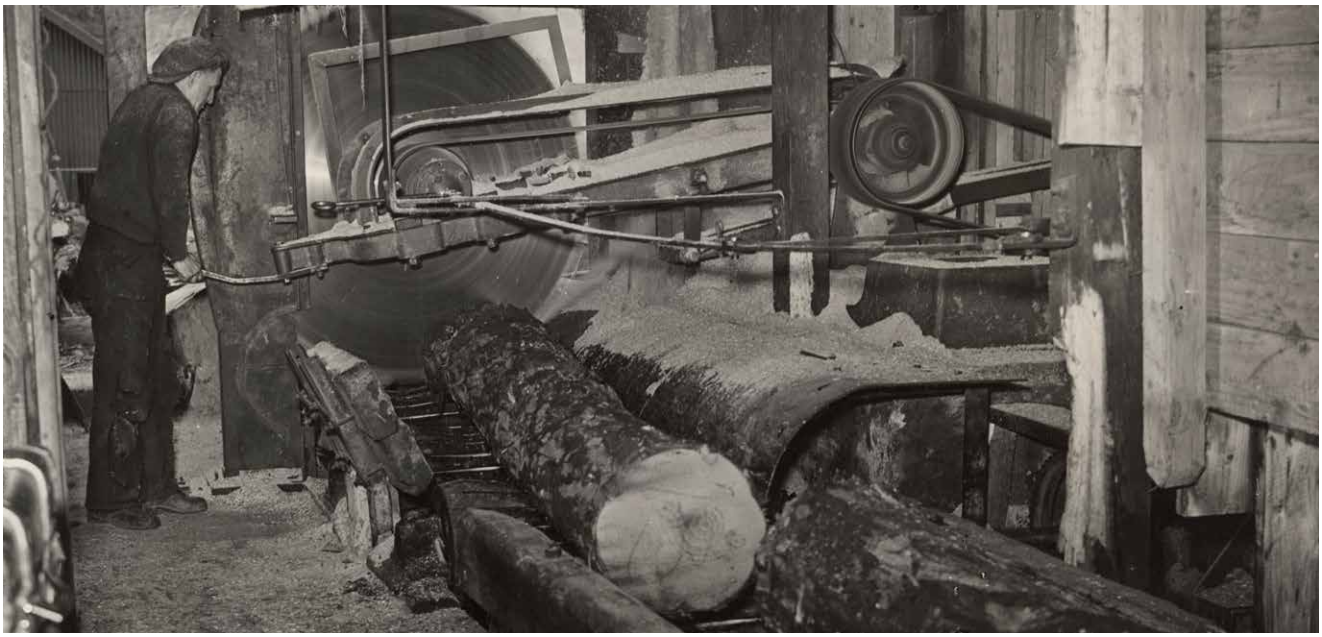
Transport is an important factor in business decisions and competitiveness due to Aotearoa New Zealand's rugged and often remote forest plantations, and our geographical location as an island nation. An efficient system that supports the supply chain in a timely, cost-effective manner is an important part of developing the competitiveness of businesses within the industry.

Forestry and wood processing system

The value chain of the sector is a complex system – from growing forests to processing logs and manufacturing a wide range of value-add wood products. Residues are used for the production of bioenergy and biomaterials that underpin the emerging bioeconomy.




Current processes and systems
Residues
Bioeconomy processing and products
Products
Secondary processing
Products
Markets
Bioeconomy market
Consumers
Industrial process heat
Transport fuel
Biomanufacturing industry
Biochemicals
Nutraceuticals
Bioplastics
Bioenergy and biomaterials
Liquid biofuels, biocrude, solid biofuels
Residues
Residue-based remanufacturing
Fibreboard/MDF particleboard
Pulp, cardboard, paper, packaging
Residues
Domestic market
Veneers, poles, plywoods
Sawn timber
Remanufacturing facility
Engineered wood products (CLT, GLT, mouldings, LVL)
Export market



Waipā Mill in the 1940s.

The history of the forestry and wood processing sector in Aotearoa New Zealand

Historically, government played a key role in establishing and growing the forestry and wood processing sector

For more than 800 years the life-creating and sustaining-qualities of Aotearoa New Zealand's forests have been recorded in the whakapapa (oral histories) and pūrākau of tangata whenua. There is evidence of wood technologies being used across the country dating back to the 1300s, including being used in fortifications, kainga and waka construction, pou whenua (carvings), food flavouring, fragrances, dyes, tools, utensils, and more.

Māori landowners still prize the mauri (vital essence and quality of trees/wood) of whenua ngahere (forest lands) as taonga (treasures) of cultural, ecological and economic significance. This special relationship with forest has continued unbroken as a symbol of tino rangatiratanga (economic sovereignty and determination). It endures as a distinct and vibrant thread woven by Māori across generations that is deeply imbued in New Zealand's forestry and wood processing history.

After European settlers began arriving in Aotearoa New Zealand in the 1800s, native timber processing quickly grew as an industry. Trade in products including ship masts and kauri gum made profitable exports. Large areas of forests were cleared for farming and agriculture.

By 1897, due to the slow growth of native species, the government began an experimental tree planting programme in the Rotorua district and Kaingaroa Plains to learn which exotic species would survive in Aotearoa New Zealand conditions.

This was the beginning of Aotearoa New Zealand's productive forests industry. The key historical developments in the sector are summarised below. The history shows the critical role played by government in catalysing innovation and partnering with the sector to drive growth, innovation, and wider benefits to Aotearoa New Zealand.

- **1890s – New Zealand's first plantings of experimental tree species:** Early plantings of exotic tree species for plantation purposes began on Ngāti Whakaue and Tuhourangi tribal land just outside of Whakarewarewa in Rotorua. This was shortly followed by the establishment of a 20-hectare forest nursery established on the same land. Today this site is occupied by Scion.
- **1910s – Government-led species trials:** The Royal Commission on Forestry concluded that native species would not regenerate quickly enough to meet future needs and recommended Aotearoa New Zealand plant extensive exotic forests. Several tree species were further trialled, and radiata pine was a recommended species.

An aerial view of Kinleath Mill in 1959.

- **1920s – State Forest Service established:** The State Forest Service ran an extensive planting programme during the Great Depression, which supported employment and made the Crown the largest owner of exotic forests in Aotearoa New Zealand.
- **1930s – The Forest Service pioneered technology for processing exotic timber:** The Forest Service pioneered the technology necessary for large-scale sawmilling of exotic timber.[14] The Crown built sawmills at Waipa and Rotorua as demonstration projects, which eventually led to private investment in new and larger mills.
- **1950s – Establishment of pulp and paper mills at Kawerau and Kinleith:** In 1952, to support the establishment of the Kawerau mill, the government granted the mil operator the right to purchase up to 28 million cubic feet of timber per annum from the state-owned Kaingaroa Forest and financed the necessary infrastructure, such as the construction of port facilities at Mt Maunganui.
- **1960s – Sector growth:** The establishment of the mills in Kawerau and Kinleith and other locations initiated a period of rapid growth in the sector and had a dramatic social and economic impact on regional Aotearoa New Zealand. The Kinleith mill employed more than 3,300 people at its peak.
- **1980s – Functional split and protection of most Crown-owned conservation estate:** The New Zealand Forest Service was dissolved in 1987 and the State forest estate was divided between the Department of Conservation (to manage protected native forests) and the New Zealand Forestry Corporation (to manage plantation forests). Although logging of native forest continued on the West Coast until 1999, this split legislatively removed most of Aotearoa New Zealand's remaining native forests from the forestry sector.
- **1980s – 90s – Privatisation of state-run forests and wider economic reform:** The New Zealand Forest Service controlled most of the productive forest estate from 1919 to 1987, where it controlled roughly 50 percent of commercial productive forestry. In the 1990s these forests were sold to the private sector alongside wider economic reforms.

  These economic reforms had intergenerational effects on forestry communities across New Zealand. Māori forestry communities – like Murupara, Minginui, Kaingaroa, Waitahanui, Mangakino, and Ohakune – saw many people leave, due to the economic decline of their towns, to find employment in the forestry processing centres of Rotorua, Kawerau, and Tokoroa.
- **2000s – Significant Treaty Settlements in the Central North Island:** In 2008 the Central North Island Forests Land Collective Settlement took place between the Crown and eight iwi across the land under 176,000 hectares of the Kaingaroa forest, the second largest plantation forest in the Southern Hemisphere.

14 McClintock, Wayne; Taylor Nick (1983) *Pines, pulp and people: a case study of New Zealand forestry towns.*

Demand for wood products

Many key sectors in Aotearoa New Zealand rely on wood products to operate

Demand for wood products comes from many parts of our economy. These include wooden pallets for logistics and freight operations, and fencing posts and poles in agriculture.

The construction industry is a major consumer of wood products

Timber remains the material of choice for housing construction in Aotearoa New Zealand due to the versatility and properties that make it easy to use, our familiarity with building with timber, and its low emissions in production. Around 90 percent of standalone residential buildings are constructed using light timber structural framing.

Approximately 2.7 million cubic metres of sawn timber was used for building activity[15] in 2019 across the country. The construction boom has driven an increase in housing permits issued and demand for sawn timber. Future demand is highly uncertain and depends on a range of factors including building costs, immigration, and demand.

Aotearoa New Zealand has seen significant growth in the export of unprocessed logs to a small number of countries

Each year the export of logs and wood products adds $6 billon to $7 billion[16] to the economy in export revenue. The sector has experienced significant export growth over the last decade. Since 2000, the export of raw logs has quadrupled.

Over this time, the harvesting of Aotearoa New Zealand forests doubled, but our domestic wood processing capacity remained the same. Export of these excess logs was the only option available to some foresters. As our mills tend to only process the high-grade parts of the log, the export market was critical for selling all parts of our logs.

Our export growth has been concentrated in a small number of markets, particularly the Chinese market where our logs are often used for concrete boxing.

Aotearoa New Zealand also exports value-added wood products

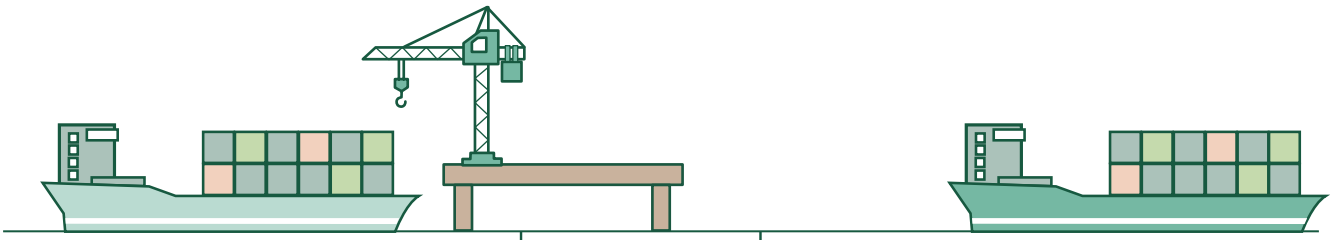
The export of value-added wood products has not seen the same level of growth – it has remained relatively constant. Value-added wood products have, however, provided strong export earnings for our economy, especially when considered by volume. Currently, value-added wood products make up just 15 percent of our forestry export volumes but generate over 40 percent of our forestry export revenue.

Some of our largest wood processors supply value-added wood products to international markets. Many of our largest sawmills produce “clearwood” – appearance-grade sawn timber from pruned logs that is used as weatherboards, internal wooden mouldings, and furniture. This wood is free of knots, so is sought after and generates a premium for these exporters. The United States is a strong market for these products.

15 BRANZ (2021) *Estimates of wood demand in building construction 2021-2030*.

16 MPI(2022) *Situation and Outlook for the Primary Industries.*

Products and markets



Value of imported wood products

New Zealand imports some wood products to support a range of specialty needs and industries. We have an opportunity to produce some of these goods in New Zealand.

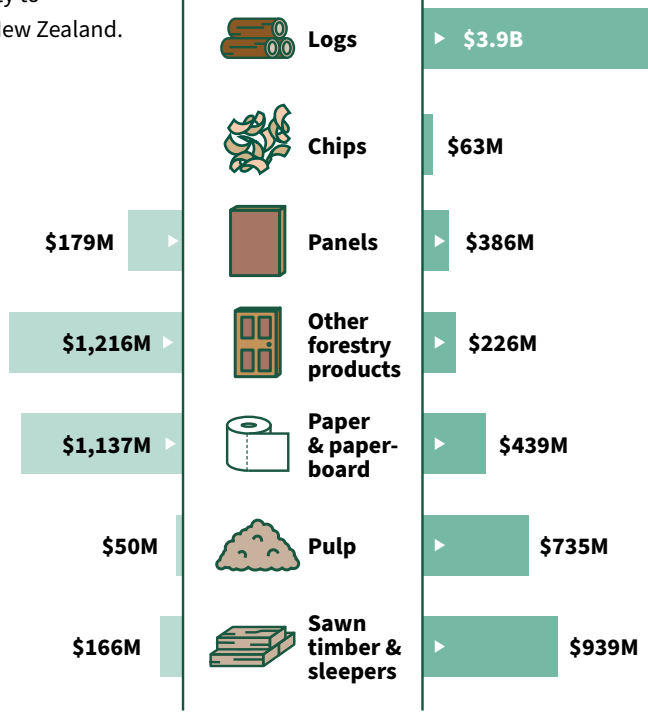
$2.7B

Manufactured wood products

Most of New Zealand's imported wood products are manufactured for use in the home.

Value of exported wood products

Forestry and wood processing is New Zealand's 4th largest export earner.



$3.9B

Logs

New Zealand currently exports over 60% of harvested wood as unprocessed logs (22M m^3).

$2.8B

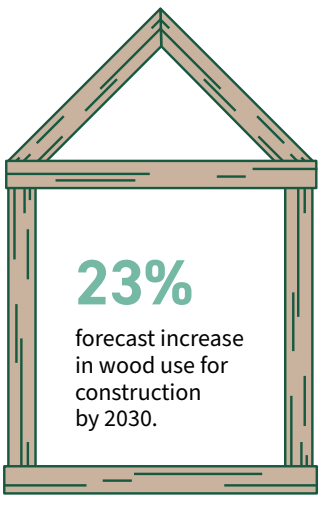
Wood products

Value-added wood products provide significant export earnings for New Zealand.

Source: Stats NZ; MPI (2022)

Use of wood in New Zealand's construction sector

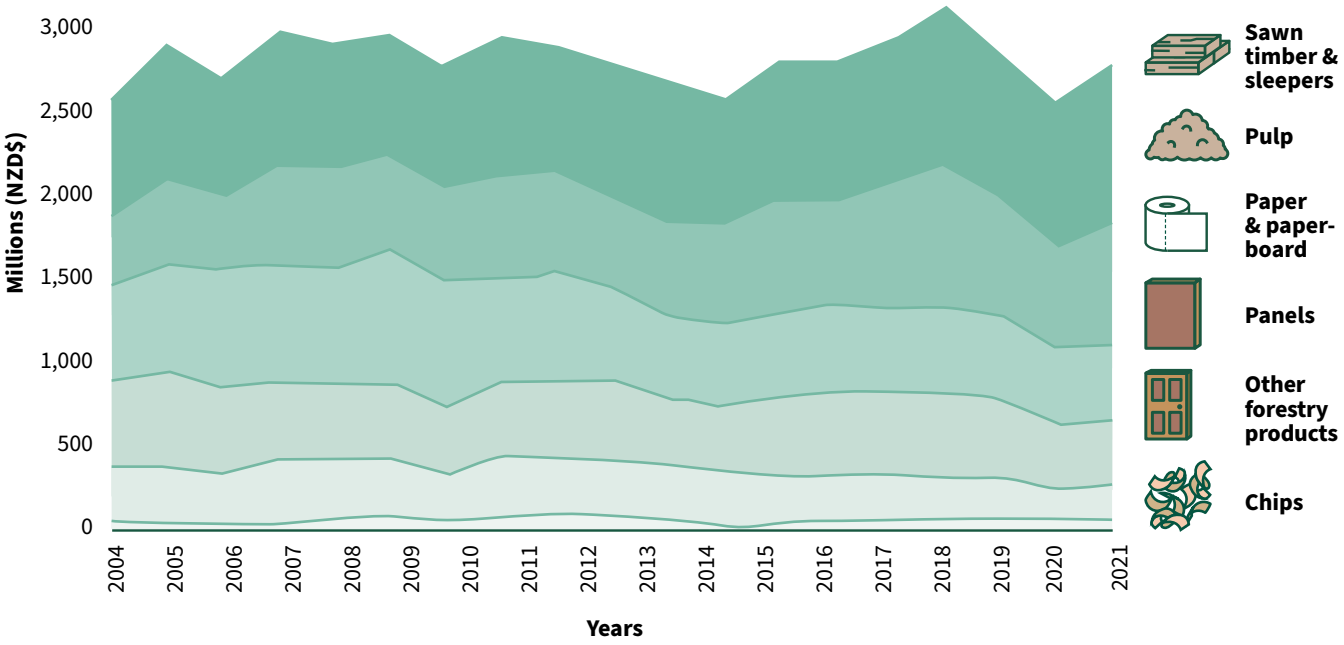
Wood is increasingly used as construction material, replacing high-emissions materials (e.g. multi-storey buildings, mainframes, and roof structures).



Value of New Zealand's wood product exports (2004–2021)

The export of value-added wood products has remained relatively constant.

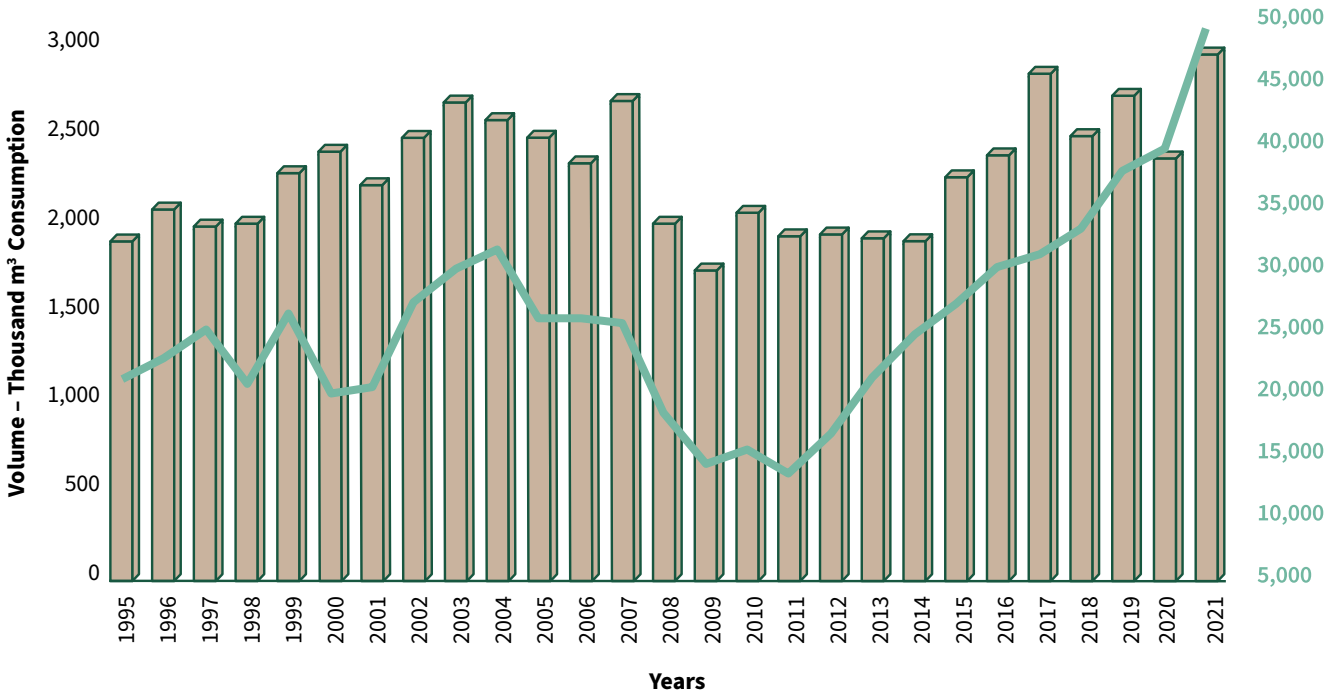
While value-added wood products make up just 15% of our forestry export volumes, they generate over 40% of New Zealand's forestry export revenue.



Source: Stats NZ; MPI (2022)

New sawn timber demand and housing permits issued (1995–2021)

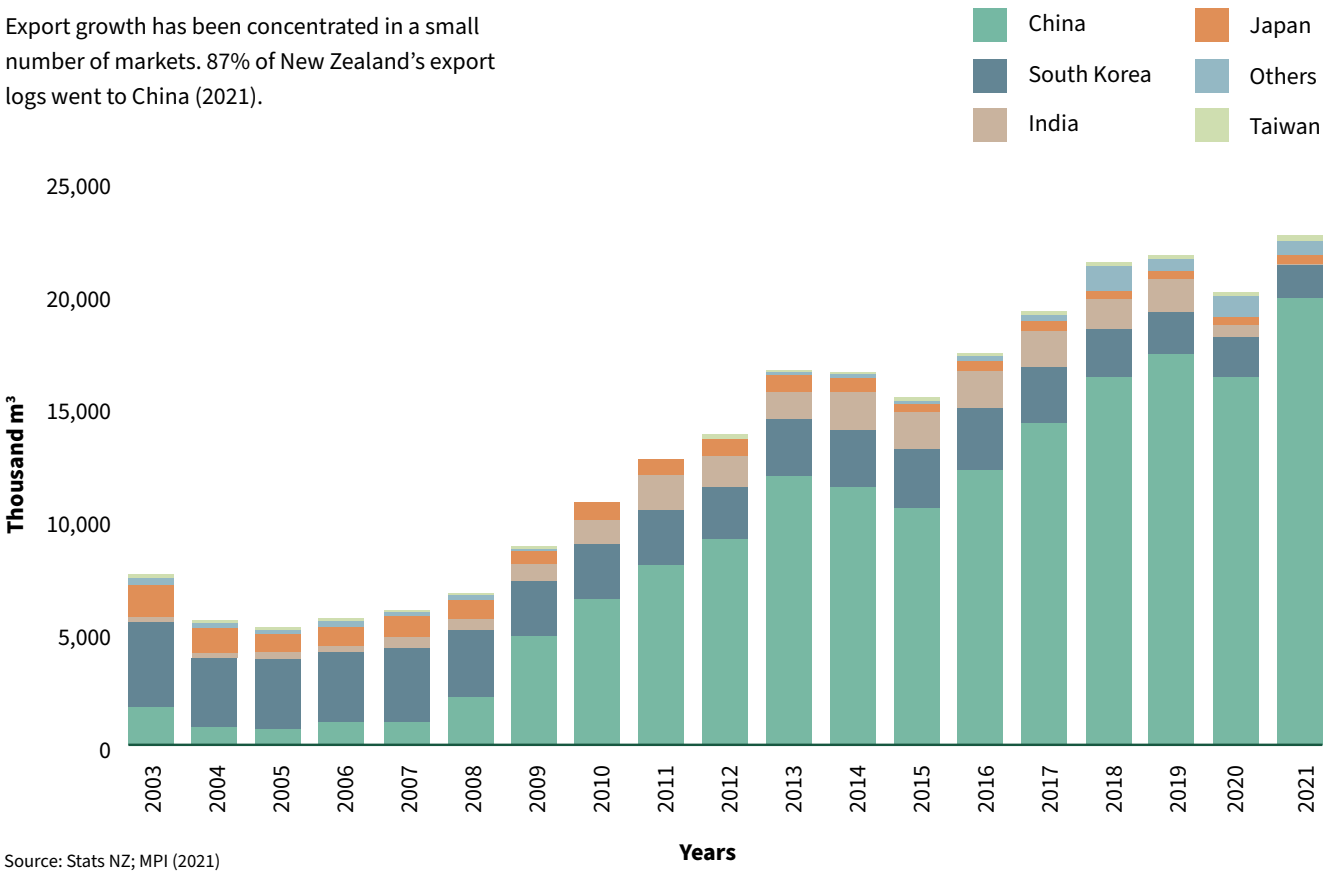
The construction industry is driving domestic demand for sawn timber as housing permits issued increased from 2012.



Source: Stats NZ; MPI (2021)

New Zealand log exports by destination

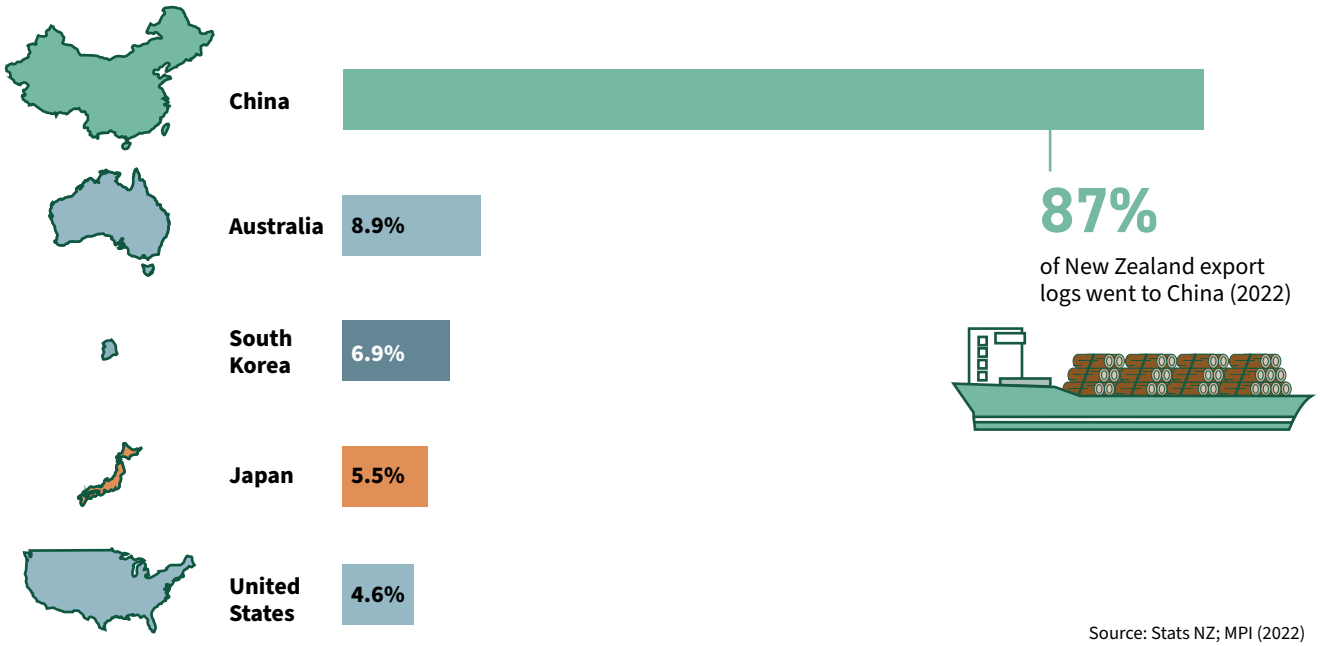
Export growth has been concentrated in a small number of markets. 87% of New Zealand's export logs went to China (2021).



Source: Stats NZ; MPI (2021)

Top five export markets by volume

81% of New Zealand's exports market is made up of five countries.



Source: Stats NZ; MPI (2022)

Health and safety and working conditions have improved in recent years.

Workforce

Today the sector employs approximately 40,835 people and is a key employer in regional areas. It also supports employment in several associated industries.

Diversity is a challenge for the sector

The forestry and wood processing sector is male dominated (82 percent) compared to the whole of country labour force, which has a more equitable split, with 48 percent female and 52 percent male.

However recent trends are positive and indicate a growing number of women joining the sector.

The diversity challenges faced by the forestry and wood processing sector are more pronounced when comparing differing levels of employment. Māori workers are overrepresented in lower wage roles, whereas at leadership level most positions are occupied by Pākehā men, with women, Māori and other ethnicities underrepresented.

Reform of Vocational Education

The Reform of Vocational Education (RoVE) is underway and aims to create a unified and sustainable vocational education system that delivers the skills that learners, employers, and communities need to thrive. The reform aims to deliver more support to learners while they are training and vocational education that is more relevant to work.

On-the-job learning is becoming increasingly important to both employers and learners. The need to take a leave of absence, to leave a job to undertake additional study, or to move away and leave family, are key barriers to further learning. In addition, many employees are less willing to travel to study and would prefer options to complete training while in work.

Making training more accessible allows workers to gain qualifications that are widely recognised, and will lead to greater retention and clear career pathways.

We need to boost recruitment and retention of skilled workers

Like many sectors in Aotearoa New Zealand, this sector faces substantial challenges when recruiting and retaining a suitably skilled and qualified workforce.

Attraction challenges are driven by a range of factors including rural depopulation and perceptions of work in the sector as unsafe and physically demanding. There is a lack of education around the opportunities and types of jobs in the forestry and wood processing sector that make it harder to attract younger workers and address the aging workforce.

The Forestry and Wood Processing Workforce Action Plan (2020-24) provides a framework to bring these steps together. This action plan was developed collaboratively by the forestry and wood processing sector, government agencies, and First Union. The plan is a living document. It provides the flexibility to respond to the emerging workforce needs and support the plan's implementation plan.

Health and safety will continue to be a strong focus of the sector

Health and safety is an area of constant focus for the sector. Long working hours and the physical nature of the work generate fatigue. Advances in safety and handling equipment in sawmilling has improved safety outcomes. Increased mechanisation in harvesting has made significant inroads into reducing forestry related workplace injuries.

The Forestry Industry Safety Council (FISC) is a tri-partite industry-led body representing one voice in workplace health and safety. Improvements in workplace conditions for workers have been achieved in recent years, driven by FISC's goal of zero fatalities.

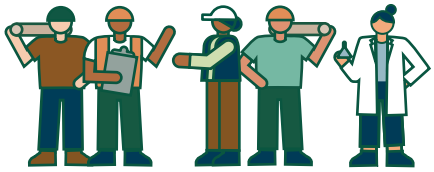
MPI is partnering with FISC to support Safetree certification, a safety and wellbeing standard ensuring all forestry contractors are working to the same industry safety specifications. MPI is also supporting FISC with the rollout of a practical leadership programme, which aims to improve work, health, and safety outcomes for crews through improved communication and leadership.

People working in the sector

The sector has increased the number of jobs between 2012 and 2019, providing employment to over 40 thousand people.

Total people working in the sector

40,835

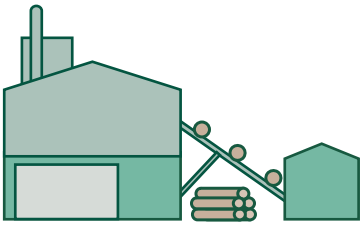


↑ 6.8% increase (2012–19)

People working in wood processing/ commercialisation

79%

32,260 people

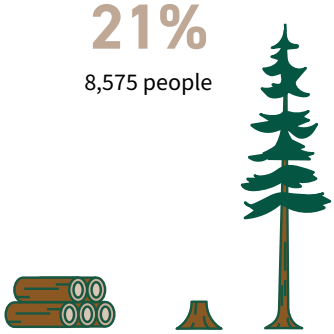


↑ 2.4% increase (2012–19)

People working in forestry

21%

8,575 people



↑ 8.1% increase (2012–19)

Only direct employment is included here. The sector provides further indirect jobs not included in these numbers.

Gender

The sector is male dominated (82%), but more women are joining the sector (e.g. in 2016, 23% of new entrants to the sector were female). Women working in the sector are more highly qualified and tend to occupy more science-related positions.

82%
Male

18%
Female

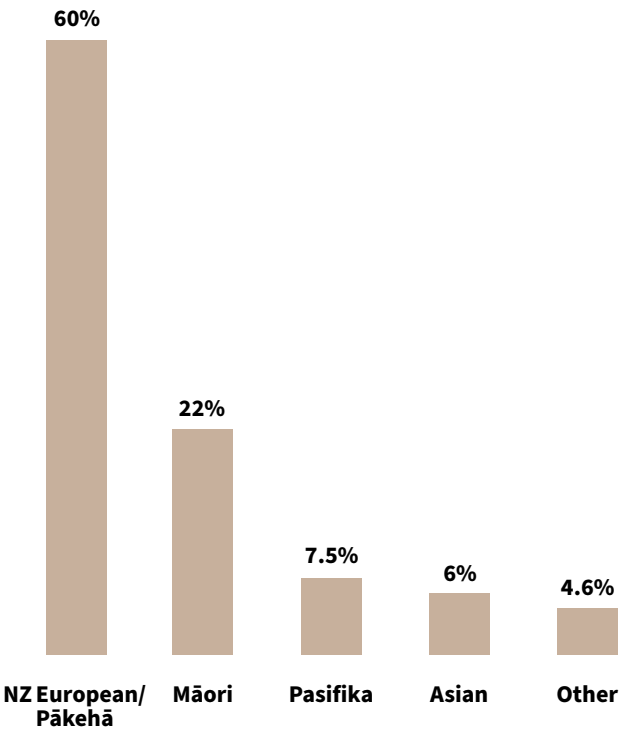
Median age

Employees	Self employed
41 years old	54 years old

The sector has an aging workforce, with a higher median age of 41, compared to the range of median ages (30–37) across other primary industries.

Ethnicity

Diversity remains a challenge in the sector, particularly at leadership level, where most positions are occupied by NZ European/ Pākehā men.



Action plan for transformation

This plan is based around four priority areas to support the transformation of the whole sector. For each focus area there are key objectives we want to achieve. The first section spans across the supply chain while the following sections focus on different parts of the supply chain.

The diagram overleaf summarises the priority areas and key objectives. The actions are explained under each objective throughout this section of the document, and we summarise them in a table at the end of this section.

Create the foundations for a transformed sector

1 Create a resilient and collaborative sector

2 Empower Māori to achieve their aspirations in the sector

3 Grow and attract the future workforce

4 Drive science and innovation across the sector

5 Provide sector insights to lift performance and innovation

Grow forests and supply wood for the future

6 Use technology and partnerships to add value

7 Diversify our forests to build sector resilience

8 Improve wood and residue supply for domestic processing and the bioeconomy

Modernise and expand wood processing

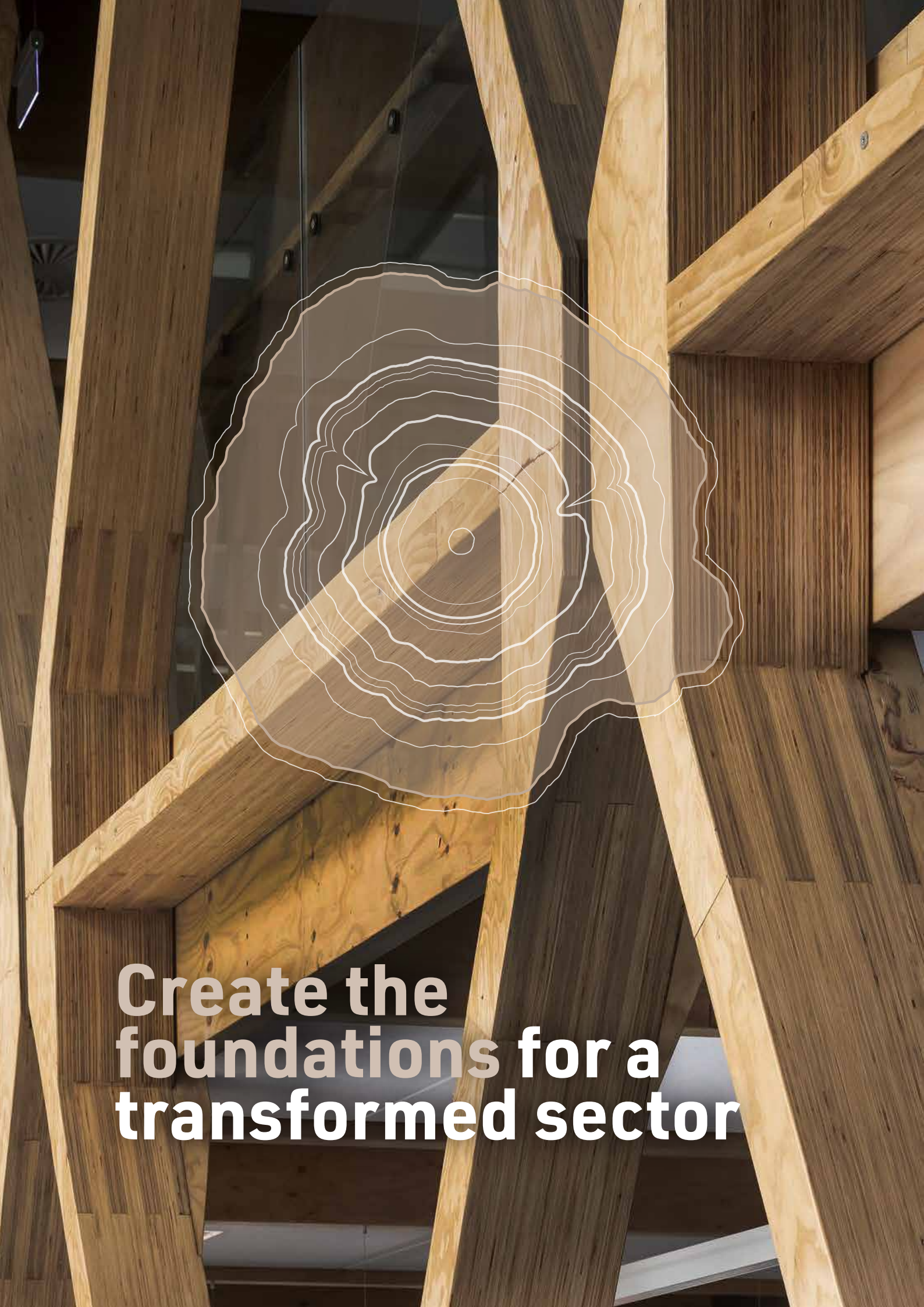
9 Attract investment to increase manufacturing of advanced wood-based products for building, biotech, and fuels

10 Support sector co-location, collaboration and sustainability

Develop sustainable markets for Aotearoa New Zealand's high-value wood products

11 Increase domestic demand for our wood products

12 Grow and diversify export markets



Create the foundations for a transformed sector

We need to get the system settings right to create a thriving sector that benefits all New Zealanders. This includes strengthening collaboration across the sector, enhancing Māori representation and participation in decision-making across the value chain, training that enables a skilled workforce, decent jobs, and well-supported innovation across the sector.

This priority area sets out a range of actions to ensure we get the system settings for the forestry and wood processing sector right to catalyse future growth and innovation.

Objectives

Create a resilient and collaborative sector

Industry transformation will require a resilient, collaborative, and cohesive sector

Fostering greater collaboration and alignment across the forestry and wood processing supply chain, and a stronger partnership between industry, government and Māori, is an essential for industry transformation. Many of the actions in this plan rely on greater collaboration and cohesion.

The sector recognises there is a missed opportunity where there are common interests, by not speaking with “one voice” about and investing more in industry-good activities, such as co-investment in research and development and improving the sector’s social licence.

There are benefits from wider sector collaboration

Government will support the sector to organise and undertake industry-good activities, such as enabling industry to develop new funding arrangements.

The benefits of greater collaboration across the supply chain include sector resilience through an improved ability to:

- partner effectively with government, Māori, and other sectors on industry-good activities, such as research and development
- drive planning and preparedness for future skills and management requirements
- forecast and prepare for shifting trends, new market opportunities, and collaboration opportunities
- organise and fund market-side initiatives, such as the development of product standards
- understand and address changing societal expectations, such as best practice environmental management standards
- support public education and the promotion of wood fibre, such as the use of wood in construction.

A cohesive sector presents a unique opportunity to support the implementation of this plan. Drawing on the experience of the Forest Growers Levy Trust, it is important to recognise that it will take time to build consensus on the path forward and gain commitment of industry bodies, government, and Māori.

Improving social licence

Improving public perceptions of the forestry and wood processing sector is a critical part of supporting the sector's growth. Recent improvements in areas such as health and safety have helped improve the sector's social licence, but the sector recognises it needs to do more.

Some of the concerns today include land use change, plant-and-leave carbon forests, foreign ownership of plantations, negative environmental impacts of pine trees, pest and wilding issues, fire risks, sediment or slash runoff, and landscape degradation from harvesting[17]. The industry also faces challenges in attracting and retaining a skilled workforce.

Work is needed to help people understand the benefits of forestry and wood processing, how the sector works, and the value of its products. At the same time, industry can invest through industry-good initiatives to lift the overall performance, safety, and attractiveness of the sector for all New Zealanders – whether that be the workforce, consumers of wood, or communities. By working more collaboratively, the sector can ensure that growth benefits wider communities and the environments they live and work in.

Investment and policy settings need to be well coordinated across government, and industry needs to take advantage of existing support

Government provides a range of investment and advisory support across the economy, however there is a need for government agencies to be better coordinated and aligned to ensure that benefits are realised for the sector and the wider public.

As part of the implementation of this plan, Te Uru Rākau – New Zealand Forest Service will play a role in improving coordination across government agencies, working with the sector to raise awareness of the support available, and to connect the people in the sector with the appropriate agencies.

Transformation will require ensuring the sector is aware of and takes advantage of these investment and advisory opportunities, which include the following:

17 Payne, Tim (2021). *Forestry mythbusting – myths, misperceptions, impacts and solutions. New Zealand Journal of Forestry.*

There are a range of services across government that support businesses in the sector

Support available	Agency responsible
Crown research institute that specialises in research, science and technology development for the forestry, wood product, wood-derived materials, and other biomaterial sectors	Scion
Investment support for businesses, particularly major process heat energy users, to decarbonise, through the Government Investment in Decarbonising Industry (GIDI) fund	Energy Efficiency and Conservation Authority (EECA)
Support for businesses looking to start or scale up export opportunities and grow international markets	New Zealand Trade and Enterprise (NZTE)
Support for companies undertaking research and development, both early stage and longer term	Callaghan Innovation
Investment support for projects or commercial ventures which will reduce emissions	New Zealand Green Investment Finance
Support for businesses that are high energy users' to create a pathway to emissions reduction through the Energy Transition Accelerator (ETA) programme	Energy Efficiency and Conservation Authority (EECA)
Support for small and medium businesses to grow by enabling access to finance, through the Business Growth Fund	Business.govt.nz (Ministry of Business, Innovation and Employment (MBIE))
Support for Māori businesses to grow and Māori land to prosper, through multiple programmes including the Māori Agribusiness programmes, Whenua Māori Fund, Te Pūnaha Hihiko: Vision Mātauranga Capability Fund, Connect Scheme and more	Te Uru Rākau – New Zealand Forest Service, Ministry for Primary Industries (MPI) Te Ao Māori team at Scion Te Puni Kōkiri Ministry of Business, Innovation and Employment (MBIE)
Funding support for transformative programmes in the primary sectors which create more value; develop capability and new practices; and deliver sustainable economic, social, cultural and environmental benefits; through the Sustainable Food and Fibre Futures fund	MPI

Actions	Outcomes
1.1 Industry will collaborate to invest in "industry good" Industry, with support from government, will: • explore how it can best drive collaboration and cohesion in the sector, including through different cross-sector organisational structures • explore sustainable funding arrangements, such as a levy increase or subscription model, to support industry good activity.	Industry-good activities are well resourced and reflect the needs of stakeholders. Industry is able to sustainably co-invest with government and businesses to support positive industry transformation at all stages of the forestry and wood processing supply chain.
1.2 Support the industry to maintain and build social licence Continue to support industry to maintain and build their social licence through industry-led marketing and information.	Industry tells a consistent story of a sector that is lifting performance, safety, and innovation. The sector is seeing the benefits of their investment, with people feeling more positive towards productive forestry and farmers are capitalising on the benefits of multi land use. New Zealanders understand the significance of forestry and wood products in a low-emissions world. Skilled people are attracted to and retained in the industry.
1.3 Improve cross-government collaboration and policy alignment Government will improve how it works with the sector through better coordination across agencies and improving awareness and uptake of existing government initiatives and funding support.	Government agencies are well connected and coordinated, making it easier for the sector to access information, advice, and funding support. The sector is aware of all funding and other support available across government and knows how to access this.

2 Empower Māori to achieve their aspirations in the sector

Industry transformation will support better outcomes for Māori

Many Māori communities are strongly connected with the forestry and wood processing sector. Industry transformation seeks to achieve better social, environmental, economic, and cultural outcomes (reflecting te ao Māori) for Māori and all New Zealanders.

Māori aspirations in the sector

Māori aspirations in the sector vary by iwi and hapū, from large-scale business opportunities to smaller enterprises. Māori businesses often:

- consider the social, cultural and environmental opportunities with equal standing alongside economic considerations
- align work more closely with nature through a holistic approach to forest management
- focus on long-term or intergenerational timeframes, including the opportunities the whenua or ngahere might provide for future generations.

Implementation of the plan will be flexible to enable different business approaches and models. One example of potential business opportunities is the Tōtara Industry Pilot (on the next page).

Understanding the key challenges Māori face

The challenges Māori face to fully realising the benefits and opportunities in the sector include:

- owning the land underneath plantation forests, but not the trees themselves
- making up a large portion of the processing workforce but being underrepresented in ownership or leadership positions
- a reduced ability to raise capital against Māori land
- limited ownership of the supply chain beyond forestry, such as in wood processing, secondary processing, or in export businesses.

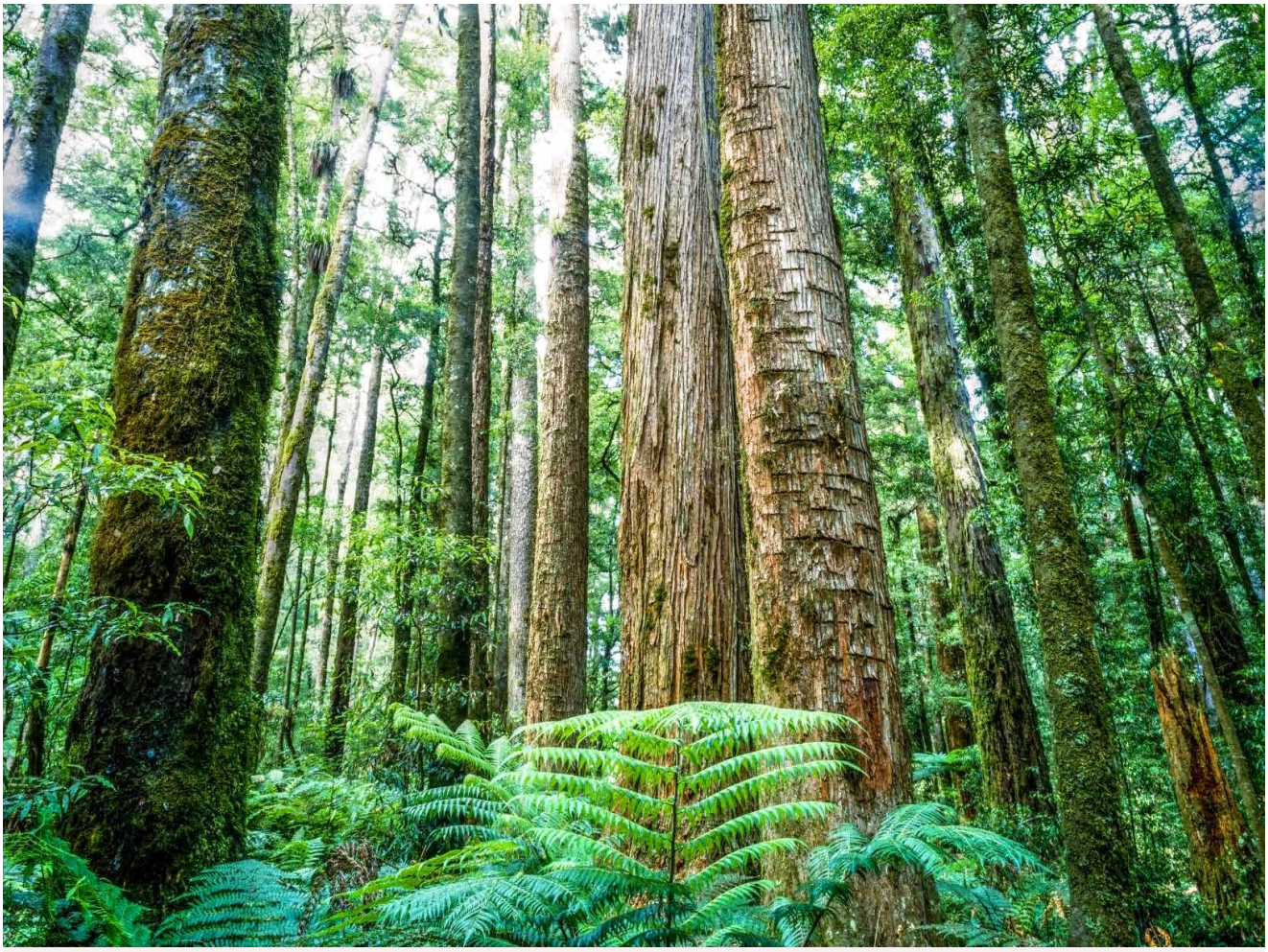
Some of these challenges occur through Māori land returned by the Crown under a Treaty Settlement. Much of this land is collectively owned or has existing long-term leases, meaning the economic potential of the land often goes to private companies or the Crown. These circumstances create challenges as this land cannot be used as collateral against loans, and banks are not well equipped to provide financial advice to Māori entities seeking loans.

Improving Māori access to capital

Māori would benefit from greater access to capital to fulfil their aspirations for expanding and creating businesses.

The Reserve Bank of New Zealand is working to increase Māori access to capital by focusing on Māori-owned land and businesses, and their aspirations for them. They are working with Māori businesses such as Post-Settlement Governance Entities (PSGEs), trusts, Māori governance entities, and landowners.

Separately, the New Zealand Trade and Enterprise Māori Investment Team supports Māori companies, PSGEs, and land trusts in securing capital. This can come in the form of helping secure debt funding, connection to private capital, or facilitating collaboration with other Māori entities with capital to invest.



The Tōtara Industry Pilot: exploring continuous canopy management

The Tōtara Industry Pilot was a two-year study to explore the opportunities that continuous canopy management of regenerating stands of tōtara could bring for landowners and the industry. The partners of this project include: Taitokerau Māori Forests Inc, Scion, Te Uru Rākau – New Zealand Forest Service, Tāne's Tree Trust and Northland Inc, MBIE, and the Northland Regional Council.

The partners believe that native forestry can bring together all the advantages of conservation, timber production, and environmental, socio-economic and cultural enrichment. The goal is to showcase a regional industry based on sustainably managed tōtara as part of a holistic ecosystem, to regain its historic high value, and to shift landowners' views on tōtara as beneficial for the environment and a commercially viable forestry endeavour.

A successful tōtara industry will see sustainable production from a continuous canopy forest regime and encourage the planting of new areas, increasing the area of native forest on private land.

The Tōtara Industry Pilot initiative aligns with the values of kaitiakitanga by:

- creating appropriate land-use options with regenerating totara
- increasing the well-being and benefiting local communities
- ensuring that local narratives are part of the value provided
- strengthening mātauranga Māori alongside the application of science
- building resilience for the future
- providing a better future for our mokopuna.

Actions	Outcomes
2.1 Empower Māori to be forestry decision-makers Support greater Māori participation and representation in the forestry and wood processing sector at decision-making levels. This includes: • funding the establishment of Ngā Pou a Tāne (the National Māori Forestry Association) to participate in the transformation of forestry and wood processing • supporting the development of a National Māori Forestry Strategy • exploring options to develop Māori leaders in the sector.	Māori views and interests are represented across the value chains in the sector through early and continued open engagement. Māori and the Crown work in partnership. Ngā Pou a Tāne is supported to develop a delivery model. A National Māori Forestry Strategy is developed.
2.2 Support growth of Māori ownership across the value chains • Develop options to enable Māori to access finance/capital to develop their forestry assets. This may include liaising with financial entities to support access to debt funding and private capital, and facilitating collaboration with other Māori entities that may not be as capital constrained. • Explore options to increase Māori ownership in the forestry and wood processing sector, as well as participate in the new bioeconomy.	More Māori have access to finance/capital to develop their forestry assets. Māori businesses, landowners, and communities can expand the Māori forestry economy and fully develop their land and businesses to grow their economic opportunities. This extends across all parts of forestry value chains, creating jobs for Māori, and improving the wellbeing of their communities.

3 Grow and attract the future workforce

A well-trained workforce and enough workers is critical to the successful transformation of our sector. This means decent, safe, and fulfilling work, access to culturally appropriate training, and support through transitions in forestry. While the government has invested significantly in reducing barriers to education and improving skills, more needs to be done.

Improving working conditions and pay will attract and grow a highly skilled workforce

To attract a wider range of workers from more diverse backgrounds, the sector needs to improve pay and working conditions. This includes providing competitive wages, continuing to improve health and safety, and offering career pathways and benefits, such as ongoing education and flexible working arrangements.

Innovative and culturally appropriate types of training will be key to developing a more productive and highly skilled workforce, as technological changes require different skills.

We need to strengthen leadership training and development opportunities across the sector, including for Māori. We're starting to see an increase in the number of Māori leaders in the sector, but more work is needed.

Te Uru Rākau – New Zealand Forest Service is seeking to increase opportunities for a diverse workforce by offering Ngā Karahipi Uru Rākau scholarships. These scholarships aim to increase the number and diversity of people studying forestry at a tertiary level and encourage Māori and those who identify as female to apply.

Forestry Workforce Transition plan

The Forestry Workforce Transition plan (WTP) is nearing completion. The WTP will build upon opportunities identified in the Forestry and Wood Processing Workforce Action plan and the Forestry and Wood Processing Industry Transformation plan. The Workforce Transition plan is primarily concerned with people and making sure the sector has enough people to deliver, grow and thrive.

The Workforce Transition plan will respond to emerging needs to build an appropriately skilled and sustainable workforce. Global trends in technology, sustainable development and movement towards a bioeconomy are driving a need for new job opportunities in expanding areas of work which are supplementary to more traditional roles.

Effort across the sector is underway to address attraction and retention of new employees, better working conditions, and providing improved training that can mitigate short- and medium-term gaps. This will likely benefit Māori workers, who tend to face disproportionate safety, health, and wellbeing risks, and are less likely to receive training. We have an opportunity to incorporate by-Māori for-Māori, and on-the-job training and solutions into New Zealand's training regimes.

Government, industry, and Māori will work together to:

- close the disparity between low-, mid- and high-income earners in the sector
- increase female participation
- improve outcomes for the nearly 70 percent of Māori in the workforce that tend to be working at the low-skilled, lower-income, and higher-risk end of the sector.

Education and training are key to supporting Māori aspirations in the sector

More work needs to be done to identify and develop opportunities to upskill Māori across the sector and to grow the number of Māori in leadership positions. We need to ensure Māori workers have access to on-the-job training and tertiary education opportunities.

Sawmill worker at Red Stag

Actions	Outcomes
3.1 **Conduct a skills forecast** The government will complete a forecast of skills needed in the food and fibre sectors, including scenarios for forestry and wood processing.	Visibility of current and future skills needs and gaps for the forestry and wood processing industry and the bioeconomy to inform further actions from the government and industry
3.2 **Partner with the sector to support the successful implementation of the Workforce Transition plan** The Workforce Transition Plan will respond to new workforce challenges driven by the ITP. This includes: • growing a future workforce to meet demand • leveraging new technologies • supported by education resources and improved business and employment practices • identifying actions to boost talent recruitment and retention.	Workers have the opportunity to upskill and benefit from improved business and employment practices. Businesses will benefit from a more stable, ready, and educated workforce.
3.3 **Develop tertiary pathways for innovative wood engineering and architecture** This includes dedicated postgraduate qualifications in wood engineering and biochemical engineering.	Increased supply of skilled domestic workers to participate in and grow opportunities for timber engineering, and advanced wood and bio-manufacturing.
3.4 **Develop a Future Forestry Leader qualification** Develop a higher level (Level 5) qualification that uses online and on-the-job training to develop people for positions in leadership or management in the forestry sector.	Employees progress to higher levels of training and are better prepared to take on leadership and management roles.

4 Drive science and innovation across the sector

Ensuring our science system works for people is key to transformation. Developing our science system to innovate and better enable commercialisation of research will be critical. This work must also ensure protections for Māori intellectual property, for the benefit of Māori and New Zealanders.

Science and innovation can drive productivity and growth in the sector

This plan aims to increase innovation across the forest and wood processing value chain – from science, research and development, commercialisation, through to marketing and after-sales support. This includes supporting the development and adoption of new technologies, processes, and engineered wood solutions.

The forestry sector has below-average investment (compared to other sectors) in R&D despite the huge potential for it to drive productivity and growth and the emergence of new wood-based technologies globally. There are a range of options to drive innovation in the sector, some include:

- providing support and financial incentives to entrepreneurs and businesses that are exploring new innovations or undertaking research and development
- improving access to larger innovation facilities to provide scaling-up opportunities
- better alignment of science funding to ITP objectives, and an imperative to develop commercialisation activity
- using the workforce actions to support development of the skills and leadership capability needed to drive innovation
- increasing technology transfer and absorption by increasing international visits and cross-sector collaboration with leading companies or jurisdictions
- improving the understanding of the opportunities that a circular bioeconomy and bio-innovation can provide to investors across the country to facilitate commercialisation.

Using genetics to improve our forests

Tree breeding and genetic development programmes are fundamental to improving productivity and developing the sector's long-term sustainability and resilience. The genetic development of native species is also subject to government's ongoing response to the Waitangi Tribunal claim (Wai 262) relating to the rights, interests, ownership, and use of Māori knowledge, cultural expressions, and the customary relationship with indigenous species of flora and fauna and products made from them.

Sustained investment in genetic research and development will be vital, along with measures to ensure that all growers have fair access to the best genetic stock. However, decisions around using nursery stock should not cut across local genetic diversity.

The Radiata Pine Breeding Company plays a key role in the sector. The company runs a critical breeding programme that improves the genetic traits of radiata pine for its shareholding companies. Supporting forest grower access to the latest genetic research and future market development will be vital to innovation and resilience.

We need to improve access to science and innovation facilities across the sector

Many smaller less established firms struggle to access science and innovation services available to them[18]. Work is needed to better foster connections between firms and science and innovation partners.

Work is also needed to help bridge the gap between technology at the lab scale and the pre-commercial demonstration scale, which is needed to de-risk investment. This is a significant issue for Aotearoa New Zealand firms.

Work to develop the industry-good collaboration as outlined in action 1.1 will likely support science and innovation in the sector. Strong industry collaboration can improve information sharing and enable the setting and funding of shared science and research priorities.

Aotearoa New Zealand has strong R&D capabilities but there are significant gaps in scaling up to the commercial opportunities. Without intervention, these gaps will widen.

Worker making high-value bioproducts.

18 Moore, David; Bulatovic, Vladimir; MacIntyre, Peter; Woock, Kelvin; Woon, Lockie; Barton, Ben (2021) *Analysis of Access to Innovation Facilities.*

Actions	Outcomes
4.1 Support innovation and commercialisation Support parties doing research and innovation and the sector to improve uptake of domestic and international research and innovation. This will also support international innovation partnerships and the commercialisation journey. Work with Scion and KiwiNet to explore options for encouraging greater commercialisation of their research, including spinoffs from Scion.	Forestry and wood processing firms are leading the world in adopting new technology and are taking their innovations out to the world.
4.2 Boost access to innovation facilities Emerging and growing enterprises have access to appropriate scale-up facilities to enable the sector to achieve economies of scale.	The ability to access appropriate scale-up and de-risking facilities for advanced manufacturing significantly increases.
4.3 Improve breeding and genetics of forestry species Explore options to improve breeding and genetics to enhance resilience and productivity, whilst honouring **Te Tiriti o Waitangi.** This includes identifying opportunities to increase access, boost research and advance development, and mitigate wilding risk.	Foresters have better access and are able to use the best genetic stock when planting. Māori are empowered to use mātauranga to ensure New Zealand is growing the best native stock possible. Māori knowledge, cultural expressions, and indigenous species of flora and fauna and products made from them benefit all Māori and New Zealanders.

5 Provide sector insights to lift performance and innovation

Through Te Uru Rākau – the New Zealand Forest Service, the government has invested in creating new insights and advisory services that will be a key supporting mechanism of this plan.

The advisory services will be based at the community level but will have the breadth and expertise of national teams to offer a service to the sector that is bespoke to their situation and requirements. The insights services will work with the sector to offer a regional and national view to support sector requirements.

The service will:

- work alongside existing forest advisers to complement the services they already provide
- extend the tools and resources needed to support future generations of foresters
- build the data to enable informed investment decisions
- enable projections of future demand by volume, species, and regional differences
- support for the introduction of new technologies.

The services will encourage more people to become forestry participants through better accessibility to trusted advice and information. Using data, the services will help provide information to enable the sector to match supply to demand, particularly to support innovation in the growing bioeconomy.

The services are developing products and services to allow Māori landowners and forest participants to engage and realise value, increase sector resilience, and ensure that forestry advice and information is accessible to all.

Improving the information available to foresters and processors

The insights and advisory services will work with the sector to improve the data available to allow informed decision making. This includes greater visibility of the location, species and age class of trees available to the market.

Better information is needed to allow greater analysis of the impact of changing infrastructure, logistics, environmental, and market factors. Better information will strengthen planning at the national and regional levels. The insights and advisory services will seek to analyse current and future data to inform all participants in the sector of the factors that will allow better planning for future growth of the sector.

Additionally, the services will coordinate and commission research such as determining the sequestration rates of different tree species and establishing the economic viability of alternative species.

Building a deeper understanding of markets and demand to inform investment decisions

When making investment decisions, developing products, or forming an approach to market development, businesses and relevant government organisations need to:

- understand current and emerging demand trends
- be able to test market appetite for new products
- understand price trends and other variables to assess investment economic viability.

As industry and government work in a more strategic manner to invest in wood processing (see Priority Area 3) and collaborate to grow domestic and international markets (see Priority Area 4), there is a need to grow more sophisticated and open market insights to support decision making. This could be a role for Te Uru Rākau – New Zealand Forest Service, supported by partnering government agencies.

Helping inform transport planning on the needs of the forestry and wood processing sector

Freight and infrastructure capability, particularly at the regional level, will play an important role in a transformed industry. New Zealand has some of the highest transport costs in the world when getting logs to sawmills, which impacts the competitiveness of these sawmills. A cost-effective transport system will be critical to transporting woody biomass and enabling the growth of bioeconomy businesses. The competitiveness of our exporters is most directly influenced by the logistical costs of supply end-users, particularly given our distance from most export markets.

Advancing our understanding of the transport system across the country and its regions will play an important role when recommending where improvements could enable increased value-added processing.

Actions	Outcomes
5.1 Enhance MPI's forestry-based advisory services Provide better insights and advisory services to support afforestation and ensure that the right forests are in the right place for the right purpose. This will include: • supporting current and potential forest growers by providing advice across the full cycle of establishing, managing and harvesting forests • developing national and regional plans to increase understanding of demand and supply, the forest estate, regional infrastructure, and the processing capacity needed for growing productive forestry and domestic manufacturing • developing insights and advice on regional transport capability, supply chain improvements, and associated infrastructure requirements, to enable Te Uru Rākau – New Zealand Forest Service to represent the sector's interests across government transport-related work and investment • providing advice on diversifying forestry regimes, including alternative species • helping forest owners make informed decisions about planting and management based on the long-term impacts of climate change.	Landowners, foresters, iwi/Māori, local government, and organisations that wish to introduce trees into their landscape have good access to generic and specialist advisory services. The insights and advisory services help people understand what trees to plant, where to plant them, how to remediate erosion issues and, for farmers, how to make the most of riparian planting and on farm forestry. This service will also enable greater certainty for wood processors by connecting foresters and sawmills.
5.2 Build better insights into log and biomass availability Improve data collection, information and insights on current and future forecasted supply and availability of logs and woody biomass, and demand by wood processors and bioeconomy businesses.	The sector is able to access greater information about current and future supply of logs and woody biomass feedstocks – enabling better harvest management decisions and better information for wood processors and bioeconomy ventures on future supply.
5.3 Expand market intelligence Create a centralised market intelligence capability within government to inform the supply chain by the end of 2023.	Wood processers have access to market and investment intelligence, enabling more considered export and investment decisions.

Grow forests and supply wood for the future

This priority area contains actions to add value, increase resilience, and unlock the bioeconomy with the forestry sector. This includes the trees we plant and how the trees are managed and harvested.

Delivering on these actions will ensure that we can meet the growing demand for better economic, social, and environmental outcomes from our forests.

Objectives

6 Use technology and partnerships to add value

Forest growing in Aotearoa New Zealand has been mostly focused on volume. New technologies are creating opportunities to add value, improve safety, enable greater coordination, and attract people with more diverse backgrounds and skillsets to the industry.

The sector has already taken significant strides toward implementing technology in silviculture with the seven-year programme led by Forest Growers Research Limited. The first step of this programme is focused on reducing seedling costs to the forest owner by improving the efficiency of nurseries.

Supporting coordination and aggregation of small woodlots

Small forest owners are crucial suppliers of logs and biomass in Aotearoa New Zealand. However, many have not met their potential to benefit the whole value chain due to the limitations of their small scale.

Supporting these forest owners with tools to work together will benefit foresters and wood processors as both gain greater certainty of price and supply. Some of the key opportunities include reducing legal barriers to aggregating multiple blocks, working together to plan harvest flows, share machinery, achieve economies of scale, and exercise greater bargaining power.

Increasing the uptake of new technology in forest management

This plan contains actions to increase the uptake and adoption of new technologies to add value. The forestry process is becoming more automated and mechanised across the world. Domestic innovation along with strong international connections with leading jurisdictions will be crucial to ensuring we adopt world-leading technology. Some current industry programme examples include the following:

- new mechanical tools and machines can help improve safety and productivity in nurseries, planting, pruning, thinning and harvesting, and deliver higher quality logs
- drones are creating advances in data and automation for nurseries, forest inventory, and even harvesting. In the future, such tools could allow activities like selective tree cuts in steep, remote areas without endangering people
- new heads on excavators can help prevent stem breakage, reduce wood wastage, debark trees on site, and chip wood for biomass. This can lead to more opportunities for small scale forestry operations.

Technology can assist with the problem of declining volumes of pruned logs

Value-adding silviculture like pruning has declined over recent years due to older technology, market forces, and labour shortages. Wood processors are concerned about the impact this decline will have on the amount of high-value timber that will be available over the next decade. New mechanical and automated technology can offer a possible solution by lowering the costs of these value-adding processes and reducing reliance on labour.

Distributed manufacturing

New technology is making it possible to create mini manufacturing facilities that use a range of biomaterial, including forestry slash, to make wood-products, bio fuels and chemicals. These mini factories will enable the transition away from fossil fuels, while supporting economic, environmental and social benefits for our regions. For more information, visit:

scionresearch.com/distributed-manufacturing

A networked biomass processing sector distributed across New Zealand is well positioned to take advantage of regional opportunities. Some examples of potential biomass processing opportunities are shown on the map.

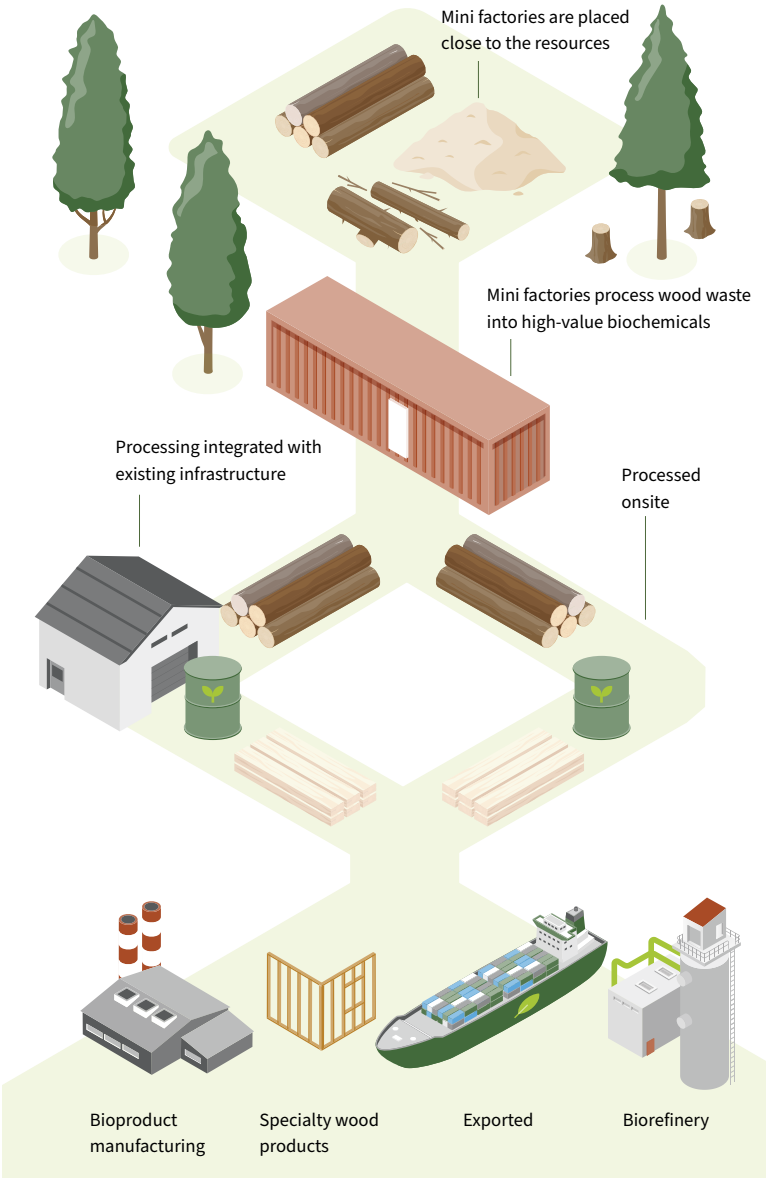
Right process

Scion is leading the development of a technique called 'Distributed manufacturing' which involves placing small processing units on or near forestry harvest sites.

These shipping container-sized 'mini factories' are flexible and can be used to process forest residues. They can perform scalable processes such as biochemical conversion, pyrolysis, reactive extrusion and pulping. The choice of process depends on feedstock inputs and the product being made.

Mini factories are tailored to process biomass such as forest residues into high-value wood-based products, biochemicals, or their intermediates (which is better for transporting elsewhere).

Chemical intermediates can be further processed at a biorefinery to create biofuels, unique local wood products and materials such as bioplastics for consumer goods.



Right region

These mini factories would be distributed across New Zealand and positioned to take advantage of regional feedstocks. For example, forestry residues within planted forests, or shelterbelt trimmings and crop stubble in regions with a concentration of horticulture and cropping.

New Zealand has a rugged landscape and often remote forest plantations. Currently, within these forests, residues are clumped at landing sites and skid sites. Lowering the extraction and transport costs of harvesting residues will be key to increasing their use.

Establishing new large central biorefinery infrastructure needs large capital investment. Mini factories in a distributed network are cheaper to set up. As they are smaller, they can be added alongside existing infrastructure, making it easy to introduce to sites. These new manufacturing facilities support regional economies and employment and importantly will support better use of slash for example.

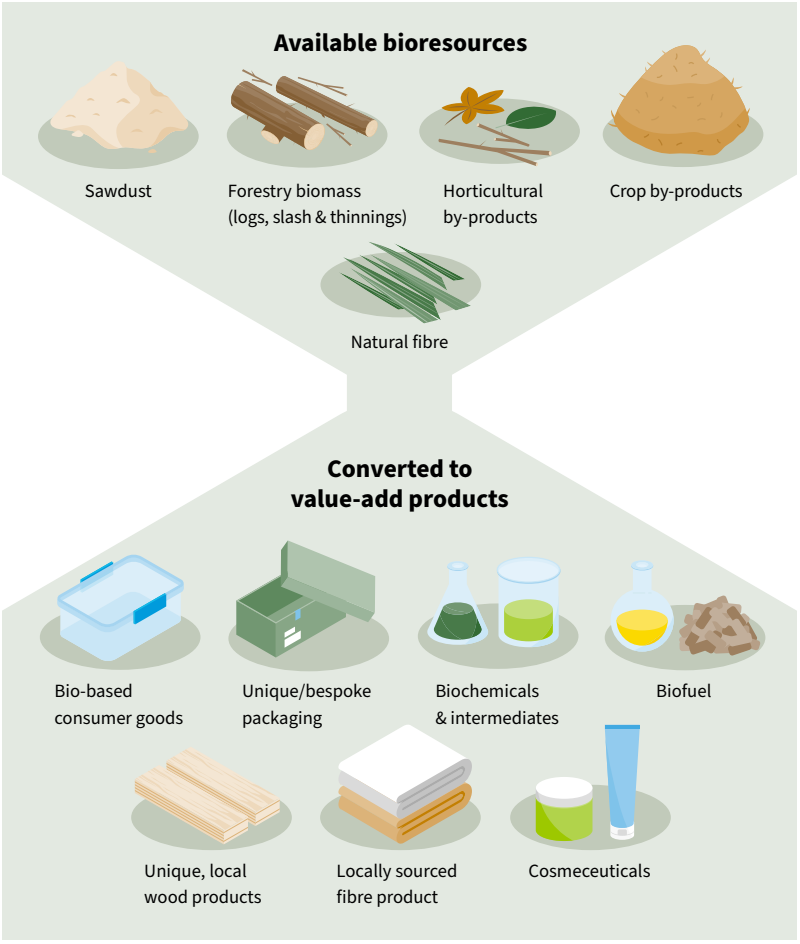
Right product

Unique products can be created from biomaterials by combining advanced technology, product design and branding, in the right place.

The opportunity to create next generation bioproducts such as novel wood products, bioplastics, nutraceuticals or pharmaceuticals from forests is significant and will help New Zealand transition to a low emission economy.

The range of products could be in the hundreds of thousands. Better still, technology is being developed to do this at the source, such as on a forest harvest site. Biochemicals synthesised from trees is just the start of realising forestry residues as a valuable resource.

Distributed manufacturing plants will be part of a connected industrial ecosystem ensuring that residues and waste are utilised at their highest value. The aim is to move New Zealand away from the petroleum-based raw material import model towards a circular forest-based bioeconomy.



Use of drones in forestry management.

Actions

Outcomes

6.1 Enable forest aggregation opportunities

Work with small woodlot foresters to stimulate aggregation through:

- supporting the development of aggregation pilots and business cases
- reducing policy barriers such as tax settings
- improving the purchasing environment for multiple small blocks.

Small scale forestry performance increases and attracts investment.

Log supply is more predictable due to aggregation initiatives.

6.2 Facilitate industry uptake of technology

Work with industry to build on their current progress to promote the uptake of technology in:

- health and safety
- small-scale forestry to benefit farm foresters
- biomass forestry
- data collection and management
- drones/UAVs
- automation.

New technology adds value to logs and biomass.

Forestry at all scales attracts a diverse set of skills and backgrounds for employment, is safe and efficient, and maximises the wider environmental benefits of forestry.

7 Diversify our forests to build sector resilience

The productive forestry sector focuses mostly on clear-fell forestry systems and radiata pine forestry, which makes up 90 percent of the commercial estate. Our heavy reliance on radiata pine and a single management regime limits the products and benefits forests can offer. It also exposes the sector to climate change and market risks.

Diversifying our forest systems will help us adapt to climate change

Climate change is causing more extreme weather events, such as extended droughts, more frequent high-magnitude fires, increased windstorms, and wider biological damage to our forests.

Very high and extreme fire risk days are predicted to increase, with the length of the average fire season increasing by about 70 percent by 2040[19]. The Intergovernmental Panel for Climate Change said in its recent report[20] that the productivity of radiata pine in Aotearoa New Zealand due to higher carbon dioxide is projected to increase by 19 percent by 2040, but greater damage to trees by wind and pathogens is expected.

Mountain pine and spruce bark beetle outbreaks have caused major losses in North America and Europe, and necessitated governments to support adaptation including replanting different species and improved stand management techniques.

Diversification will bring new opportunities, products, and markets

Diversifying our forest species and forest management practices offers significant opportunities for growth and building the sector's resilience.

New opportunities will come from using new species and management regimes. These include developing high-value carbon-neutral products beyond traditional radiata pine products.

Modern breeds of cypresses and eucalypts are disease resistant and offer incredible visual and natural durability properties for high-value wood products and nutraceuticals. They do not need to be treated with chromated copper arsenate (CCA) or other preservative chemicals to be durable.

Eucalypts and other hardwoods can be used for bioproducts and can be grown on rotations of 2–16 years depending on the species. These "biomass forests" can produce 20 times the amount of energy per year compared to the residues from a conventional forest and are valuable for use in high-value bioplastics and packaging.

Planting these different species will require changes across the supply chain, such as lowering seedling costs, genetic research, and developing new processing infrastructure, products and markets.

Government can use its forestry portfolio to evaluate, demonstrate and advance new opportunities in forestry. This may include diversifying tree species and assessing the viability of different management regimes.

Farm foresters growing pine and eucalypt species adjacent to their paddock.

19 Watt, Michael S; Kirschbaum,Miko U F; Moore, John R; Pearce, H Grant; Bulman, Lindsay S; Brockerhoff, Eckehard G; Melia, Nathanael (4 August 2018) Assessment of multiple climate change effects on plantation forests. *Forestry: An International Journal of Forest Research.* New Zealand

20 Lawrence, Judy. (1 October 2021) Chapter 11. *Sixth Assessment Report Intergovernmental Panel on Climate Change, Working Group II, 2022.* Australasia.

There are viable alternatives to clear-felling

Continuous canopy forestry is an alternative to clear felling rotational forestry. Only individual trees or small groups are harvested, and it can promote the management of mixed species and ages in a stand. Countries around the world implement this form of forestry to produce higher value timber and reduce the footprint of harvesting.

Certain native and exotic species such as tōtara and redwoods are conducive to continuous canopy harvesting models. These models can help enhance wider environmental and community benefits, such as recreation and carbon sequestration.

Continuous canopy forestry allows a forest to be continually productive and carbon-positive. This method can generate regular employment and maintain other standing forest benefits, such as recreation, biodiversity, erosion control, and flood mitigation. Opportunities exist for encouraging greater use of this type of harvesting practice across the country. Exotic forests can be managed using continuous canopy forestry to transition to a native or a mixed forest depending on the site's objectives.

Forests offer a wide range of non-timber opportunities

As forests grow, there are emerging opportunities to support the development and commercialisation of parallel revenue streams for forests owners and realise greater economic, social and cultural value for regional communities and Māori. Examples of these opportunities include tourism and recreation (such as mountain biking and hunting) and a range of non-wood forest products, such as kai, mushrooms, kōura (New Zealand freshwater crayfish), essential oils, and ginseng.

Horowai Forest – Kerikeri, Northland: continuous canopy forestry for high-value wood products

Horowai forest is a 200-hectare family-owned enterprise near Kerikeri. It consists of four types of plantation forestry of equal size (50 hectares each): radiata pine, stringybark eucalypts, cypress, and an indigenous reversion conservation area.

The forest is being managed under a continuous cover regime and is set up to produce sawn specialty timber and high-value products. As radiata pine trees mature, they will be felled and progressively replaced with high-value exotic species. Cypress and stringybark eucalypts are forecast to produce greater returns than radiata pine and are better suited for continuous cover harvesting.

The key challenges for Horowai Forest include manual harvesting, limited efficiency of small-scale sawmilling technology, and competing with low-cost wood products from overseas where there is a risk of illegal and unsustainable harvest.

The advantages are that the operation:

- is vertically integrated (from growing the forest to milling the wood and producing wood products)
- will offer sustainable year-round employment in perpetuity (unlike clear-felling)
- has sufficient scale to generate niche markets.

Actions	Outcomes
7.1 Enable a strategic approach to diversification Develop a Productive Forest Diversification Programme, including: • developing a strategic programme to help diversify productive forests to guide future policy, research, investment, education, promotion, and biosecurity contingency plans • ensuring new forest systems are prepared for climate change adaptation and mitigation.	Our forests are more resilient and produce better returns for growers, while processors can offer a wider range of products for different uses. The supply chain has plans in place to substitute radiata pine should the need arise.
7.2 Promote continuous canopy forestry • raise awareness of benefits of continuous canopy forestry with public, Māori, foresters, and investors • provide business cases for continuous canopy forestry • support continuous canopy forestry trials.	The environmental, social, and economic benefits of continuous canopy forests are realised. Forest managers take a more adaptive approach to forestry, using continuous canopy regimes where it is most appropriate for the objectives of the site.
7.3 Launch a native afforestation programme Government to drive native afforestation at scale to develop long-term carbon sinks and improve biodiversity, by: • using available technology to increase propagation and reduce cost of native seedlings • providing research on native forestry • providing a long-term strategic approach to large-scale native afforestation.	Improved nursery technology to help lower prices, and improve supply and survival rates of native trees, and have spill-over benefits to the rest of the industry. Research provides more certainty into native forestry and includes mātauranga Māori. A strategic approach ensures native afforestation occurs with a clear sense of direction for everyone.
7.4 Develop the business case for the Crown to invest in the diversification of productive forests Understand the potential for the government to invest in diversifying our productive forests using different species and management regimes – where this involves native species co-developing a strategic intent and implementation pathway with Māori.	The Crown strategically maximises wider benefits from forestry to support communities and combat climate change.

8 Improve wood and residue supply for domestic processing and the bioeconomy

The demand for wood and woody biomass is forecast to grow quickly over the next decade as businesses increasingly look to adopt sustainable alternatives to non-renewable products both here in Aotearoa New Zealand and globally.

Supply uncertainty is an issue affecting investment today and requires input from government (local and national) and industry to create solutions and increase confidence for businesses and investors to grow wood processing and the bioeconomy.

Recovering harvest and processing residues to increase volumes available for processing

Approximately 3.5 million tonnes of harvest residues remain in production forests each year. Of this, Scion estimates that approximately 1.6 million tonnes could be recovered from landing sites, which could be used to produce 11 million GJ per annum. This is enough to decarbonise the entire dairy sector.

The recovery of biomass from forests needs to occur sustainably so that it doesn't create risks to nutrient recycling in the forests. For example, some residues need to be left on the forest floor to return valuable nutrients for the next generation of trees. More work is needed to determine best practice for harvesting residue recovery.

Wood processors also produce significant volumes of residues. While many use their own residues as fuel, in many instances, excess residues are purchased by secondary processors to produce new high-value products. As demand for biofuels and bioproducts increases, demand for residues from wood processing will also increase. Developing regional and national understanding of where residues are available, and where they increase as primary processing capacity increases, will enable investment decisions and efficient distribution for the right purposes.

Lowering the extraction and transport costs of recovering and distributing residues will be key to increasing the use of forestry and processing residues. A range of options are being considered. For example, Scion is exploring the concept of "distributed manufacturing", which involves placing processing units closer to the forestry resource.

Slash left behind at a forestry landing site.

Biomass forests provide an opportunity to drive decarbonisation

Meeting growing demand for woody biomass will also involve planting new types of forests, such as "biomass forests". This forestry optimises fast-growth, energy content, or other high-value tree properties, which enable new decarbonised products in the bioeconomy.

There are a range of suitable species for these types of forests, including eucalypts, willows, and pines. But further research is needed to understand the forest systems best suited for biofuels and high-value bioproducts.

There may also be opportunities to optimise how we process, transport, store and utilise biomass to ensure the highest energy returns. Further research and improved practices could potentially lift our efficiency and sustainability.

Effective markets require information on log and biomass pricing and availability

Log and woody biomass buyers, sellers, and investors will benefit from better access to up-to-date supply and pricing information. Current information available is not updated frequently enough and lacks the detail required for good planning and decision making. Public forecasts such as the Wood Availability Forecast reports provide quality information on standing forest stocks, but they could provide more current detail on predicted harvest volumes, grades and pricing. There is no information for prospective investors on uncommitted volumes or grades, likely discouraging investment.

Market transparency and sharing of real time information on prices and available volumes are critical for enabling better long-term contracting. Such information supports aggregation and will help the market to function more effectively.

GreenChem: Using willows to create high-value bioproducts while treating sewage

GreenChem is a biotech start-up near Palmerston North that is developing new technologies to produce high-value biomaterials made from different hardwoods planted on sewage treatment sites. Some of GreenChem's innovative products include bioplastics used for luxury car seats.

To secure a feedstock to make these products, they use certain self-coppicing willows which withdraw toxic minerals from sewage sites. These trees are harvested every 2-3 years. Self-coppicing is the process of cutting trees down so they can naturally regenerate instead of manually planting new trees. There is potential to extend the range of species used for this and similar processes.

GreenChem's work will draw on a relatively small catchment area. There will be potential to collaborate with farmers, who are interested in diversifying their production for areas as small as 5 to 10 hectares.

Supporting industry to move toward long-term supply agreements

Market prices and the supply of logs for processing are volatile. The size of the export market means prices there tend to dictate domestic prices. Currently many supply contracts are short-term (quarterly), which inhibits long-term investment due to the uncertainty this creates. Forest owners, and in particular owners of small lots, may perceive an advantage in short term contracts as a way to sell during periods of strong prices in the export market.

More predictable long-term supply of logs is important to support investment in wood processing. While some price variability is inevitable, long-term contracts, price smoothening, and other financial instruments can provide greater certainty about log supply and price. There is opportunity for owners of small woodlots to coordinate and develop supply agreements with domestic processors providing good returns for forest owners alongside greater surety of supply for wood processing investors.

Enhancing circularity in the value chain and improving construction materials recycling can sustainably improve wood and biomass availability

Implementing the principles of a circular economy will be important in Aotearoa New Zealand's ability to meet climate change goals. For the sector, this means determining how we maximise the value and length of time of wood in the value chain.

For example, many international jurisdictions encourage or incentivise industry to follow the principles of "cascading". Cascading refers to creating a hierarchy of use for wood, where the highest value products are targeted first and maintained in the economy for as long as possible through reuse or recycling, before being repurposed for energy or another "end of life" product. Cascading:

- maintains sustainability of the resource
- maximises emissions benefits by delaying carbon release from wood for as long as possible
- prevents undesirable land-use change outcomes
- minimises market distortions.

Adopting principles like these and implementing other initiatives to collect and repurpose waste wood from buildings or elsewhere would enable wood fibre to remain in use for as long as possible and increase supply available for processing into new high-value products. Paper, cardboard and wood waste accounted for 22.6 percent of all waste to municipal landfills in 2018.

Actions	Outcomes
8.1 Research and develop optimal biomass regimes Research and develop biomass regimes to decarbonise and stimulate biomass supply. Research will include: • slash recovery • alternative management and species • biomass lifecycle analysis • biomass supply chain standards.	The sector recovers biomass residues from forestry operations using the best environmental practices in the world. Research provides more certainty to prospective biomass suppliers.
8.2 Map biomass supply and demand Government to conduct a nationwide mapping exercise of woody biomass supply and demand by region and support better matching between suppliers and users.	Information is available on the sources and volumes of available woody biomass, which enables government and industry to undertake strategic planning for the use of this resource.
8.3 Increase woody biomass supply The government will plant 10,000 hectares of forest, including alternative species. Forests will be managed for biomass to meet growing demand.	Strategic investment by the government de-risks biomass forestry by providing key learnings to the industry and generating scale.
8.4 Improve market transparency Develop tools to ensure log and biomass trading is more transparent to better inform buyers, sellers and investors. For example, region-specific log price indices, long-term forecasts of uncommitted wood availability, and trade conditions. It will also include research to better understand the potential impact of declining harvest volumes in the sector.	Growers, processors, and end-users have access to timely, good-quality information to support better decision making.
8.5 Support industry to develop improved market trading arrangements Government will form a collaborative working group with industry to develop solutions to improve trading arrangements. • solutions will be developed and implemented step by step • pace of change will be determined with industry to ensure acceptability and effectiveness.	Trading arrangements help the sector manage volatility in log and biomass markets. Processors will have more reliable supply, and predictability of prices. Growers will have improved opportunities to sell their logs and biomass. Business and investment decisions are better informed and more strategic.

Actions

Outcomes

8.6 Enhance sustainability of the value chain

Explore options to enhance sustainability and circularity of the value chain, which could include progressing:

- opportunities to give effect to the cascading principle
- investment in sorting and processing infrastructure for construction and demolition waste
- regulations for construction and demolition waste materials, for example through work on the national waste strategy, so that these products can be repurposed for new uses like structural materials or within the bioeconomy
- development of standards or regulation for manufacturing, treatment and construction approaches to ensure wood is more readily available for reuse after its initial function
- research into processes and applications that enable end of lifecycle wood products to be used in new applications.

Wood is maintained in the economy for as long as possible through reuse, recycling and remanufacturing, particularly products used in the construction industry.

Biofuels or bioproducts are produced in a way that manages the supply needs of the industry and Aotearoa New Zealand's decarbonisation targets, while minimising impacts on the environment and land use.

Used wood from building and construction is recovered and recycled to produce biofuels and other bioproducts to support the bioeconomy, instead of going to the landfill.

Modernise and expand wood processing

Since 2000, the number of logs we harvest has doubled. Despite this significant increase, domestic sawmilling capacity has remained largely unchanged, while the export of raw logs has quadrupled to around 60 percent of our harvested logs.

This priority area contains a range of actions to grow and modernise wood processing in Aotearoa New Zealand, so we can get more value from our logs and produce more residues to fuel our bioeconomy.

Objectives

9 Attract investment to increase manufacturing of advanced wood-based products for building, biotech, and fuels

Industry situated around regional centres brings decent jobs and economic prosperity, enabling our people to thrive in their community.

Significant investment is needed to modernise the wood processing sector

Expanding and modernising the wood processing sector will require significant new capital investment. New investment is required to:

- upgrade processing technology and adopt advanced manufacturing technologies at scale
- increase research and development, innovation in processing and new products
- lift the performance of our secondary processors such as pulp and paper
- cultivate new bioeconomy ventures.

Small- and medium-sized mills across the country make an important contribution to regional New Zealand communities. These mills, alongside large mills, will also benefit from additional investment to ensure they remain competitive and can take advantage of emerging opportunities.

We need to address the key factors that inhibit investment

Research indicates that the following key factors inhibit investment in the sector and constrain our international competitiveness:

- costs, risks, and delays associated with establishing new wood processing infrastructure and achieving competitive scale (for example resource consents, the higher capital costs associated with automation)
- long-term uncertainty and short-term volatility of the price and supply of logs and biomass (addressed in Section 8)
- high operational and input costs, and supply chain inefficiencies (particularly for transport and energy)[21]
- structurally higher capital costs relative to other developed countries[22]
- challenges in accessing capital from lenders due to the risk weightings

21 While logs are the primary input, the sector utilises a range of other inputs such as fibre (including recycled paper in some cases), labour, electricity, and gas.

22 OECD (2022) Financing SMEs and Entrepreneurs 2022: An OECD Scoreboard, OECD Publishing, Paris, https://doi.org/10.1787/e9073a0f-en

- other countries having tax settings and financial incentives that are more favourable to wood processing investment than in Aotearoa New Zealand
- difficulties in ensuring certainty of markets, both domestically and internationally (explored in Priority Area 4).

Growing domestic wood processing will require addressing these barriers to investment.

Key opportunities to improve the investment environment

Aotearoa New Zealand is one of many countries seeking to attract investment in forestry and wood processing. We have a strong legislative system and low corruption and are regularly ranked high in terms of ease of doing business.

However, to support the long-term development of the sector, our underlying settings (tax arrangements, planning, and regulatory processes) and the supporting supply chains need to be reliable, predictable, and internationally competitive.

Some key opportunities for improving the investment environment include:

- improving tax and financial settings to ensure Aotearoa New Zealand's wood processing investment environment is internationally competitive
- competitive access to finance and capital markets and increased private sector investment
- releasing information on wood availability and the costs and requirements to establish key processing plants domestically
- using co-location to achieve economies of scale
- ensuring that planning and consenting processes are expedient, effective and provide certainty for investors
- recognising the potential challenges of using some Māori land to raise capital when designing access and supporting utilisation of capital and finance.

Exploring options to recognise the value of delayed emissions from carbon stored in wood

Wood products store carbon, which delays emission of carbon dioxide from a harvested forest, potentially for significant periods of time. This "delayed emission" is accounted for within Aotearoa New Zealand's greenhouse gas inventory and contributes towards our first Nationally Determined Contribution (voluntary emissions targets) under the Paris Agreement's international climate change goals.

Logs processed domestically tend to be turned into longer-lived wood products than those processed offshore. These longer-lived wood products store carbon for longer.

There are opportunities to recognise this carbon benefit to:

- incentivise greater domestic production of long-lived wood products, and, as a result
- increase the delayed carbon emission benefit from wood products.

There are different options for recognising the delayed emission benefit from harvested wood products, including a type of fund, an NZ ETS scheme, or voluntary carbon markets[23].

Through Budget 2022's Climate Emergency Response Fund, government is currently establishing a funding provision to stimulate and accelerate investment in the production of long-lived harvested wood products in Aotearoa New Zealand (see action 9.1). By de-risking some of the cost associated with investment in wood processing and producing more long-lived wood products onshore, we can avoid a future carbon liability that it may otherwise choose to offset by buying international carbon credits.

Further investigation of the other options to recognise the delayed emissions benefit from harvested wood products is required to enable government and industry to make an informed decision about this opportunity. Investigation will include looking into the design considerations, benefits, costs and wider implications of implementing various options.

The ITP Advisory Group strongly supported changes to the NZ ETS to enable NZUs to be awarded to wood processors to recognise the carbon stored in wood products.

23 Evaluation of the climate benefits of the use of harvested wood products in the construction sector and assessment of remuneration schemes, Publications Office of the EU, 2021.

Emissions pricing plays an important role in incentivising production

The government is considering how the emissions pricing of production in our economy can support our climate change targets.

One risk of emissions pricing is “emissions leakage”, where firms either:

- shift their production to countries with weaker climate policies to avoid or reduce the emissions price they face
- lose market share to imports from countries with no or weak emissions pricing.

The risk of emissions leakage is currently managed through the allocation of NZUs in the NZ ETS (a process called industrial allocation). NZUs are allocated to firms undertaking eligible industrial activities that are considered at risk of emissions leakage.

This is relevant to the forestry and wood processing sector as some steel and concrete imports, which compete with wood products, are in some cases not subject to emissions pricing. Additionally, locally made steel and concrete products receive industrial allocation which provides these emissions-intensive products with an advantage over less emissions-intensive domestic-made wood products that are ineligible for allocations.

In the Emissions Reduction Plan (ERP), the government is exploring alternative options to its industrial allocation policy to address the risk of emissions leakage over the long term. A range of options are being considered, including a carbon border adjustment mechanism. The cement sector (as a relatively high emissions intensive, trade exposed sector) will be a case-study for this work. It is not yet clear what the outcome of this work will be, but there may be long-term opportunities to consider the relevance of these mechanisms to New Zealand’s wood processors.

Technology enabling processing more logs and creating higher value.

Actions

Outcomes

9.1 Government will establish funding options to reduce the risks associated with wood processing investment

The government will establish funding options to reduce some of the risks from investing in wood processing. This will include considering and implementing the most appropriate options, such as:

- establishing funding provisions to increase access to capital for wood processors looking to invest in new capacity or lifting productivity of existing capacity
- supporting the commissioning of pre-investment analysis and insights, for example collaborating on the development of feasibility studies and business cases. Developing greater insights capability is also explored in Priority Area 1
- directly co-investing in domestic wood processing.

This funding was secured through Budget 2022 to increase investment in the production of long-lived wood products.

Wood processing businesses have support from government in accessing resource and costs associated with developing investment cases and capital, reducing the risks for an investor.

This will accelerate investment in new primary wood processing capacity, producing more value-added wood products domestically, and boosting residue supplies to fuel the bioeconomy.

9.2 Government will improve the investment environment associated with wood processing

The government will consider and implement the appropriate mix of settings, incentives and guidance, with the aim of reducing the cost and risk of new wood processing investment and improving the competitiveness of existing businesses. These mechanisms will be designed in a manner consistent with Aotearoa New Zealand's international trade obligations.

This includes:

- continuing to explore the introduction of tax measures, like accelerated depreciation
- working with industry and the finance sector to reduce lending risk weightings
- working with local government to determine how costs and delays associated with consenting applications for wood processing investment can be addressed as part of the RMA reform and its ongoing enactment.

Wood processing and bioeconomy businesses have an internationally competitive investment environment and greater access to domestic and international investment capital.

This will spur industry investment in advanced wood processing and bio-product plants and technologies.

9.3	**Investigate options to recognise the "delayed emissions" from harvested wood products** Government will work with the sector to investigate and shortlist regulatory and non-regulatory options for establishing a scheme to recognise the carbon stored in wood products. This would include commissioning research to assess the feasibility, benefits, costs, risks and distributional impacts of the shortlisted options.	Government and the sector work together to identify the best options for recognising the delayed emissions from wood products. Government and industry have an evidence base to inform future decision making and investment in government or industry schemes.
9.4	**Investigate long-term options to address emissions leakage** Government will look at the long-term direction of how we manage the risk of emissions leakage in New Zealand in a manner that aligns with New Zealand's climate and trade goals.	Aotearoa New Zealand develops an understanding of the most appropriate mechanism to mitigate emissions leakage, to enable policy decisions that align with international climate ambition and our trade goals.

10 Support sector co-location, collaboration and sustainability

There are strong interdependencies between wood processing and "connected" industrial processing, such as the use of sawmill residues as a fuel. Encouraging greater co-location of facilities to create wood processing hubs will capture benefits from improved efficiency and productivity to maximise competitiveness and stimulate opportunities for innovation.

Collaboration at scale

Co-location can be taken further by encouraging the development of "cluster" initiatives to enable competing firms to collaborate and achieve greater scale and productivity in a common area of specialisation. Advanced clusters share knowledge and social networks, physical infrastructure, and develop strong brands that are more effective and scaled than any of the individual firms alone. They often involve whole value chains – so in the case of wood products, clusters could include plant nurseries, forestry contractors, wood processing, chemical/solvent production, logistics, architects and builders, education institutions, and economic development agencies.

Clusters can also be achieved on a more geographically dispersed scale – firms can build digital clusters to create the same outcomes as those firms that are physically co-located.

Overseas examples have shown that government has a key role in supporting co-location and collaboration. This can include co-funding feasibility studies, fast-tracking consenting processes and providing co-funding for initiatives that foster collaboration. All of our major forestry regions have potential to benefit from a clustering approach to capitalise on their individual strengths and local resource.

Key benefits of co-location and collaboration

Co-location and collaboration between firms as clusters are features of many overseas operations. We have opportunities to grow the number of "hubs" and support collaborative networks.

Strategic co-location and clustering offers productivity and decarbonisation opportunities for wood processors by:

- optimising the flow of residues and chemicals between different types of processing (e.g. from sawmill residues to pulp, paper, and biofuel production)
- creating long-term contracts to buy/sell a product or volume of output
- enabling businesses to share a sustainable energy source
- attracting, retaining, and sharing new investment and talent specific to wood processing
- minimising transport costs for the supply of forestry resources used as inputs.

Wider sector collaboration can also reduce operational costs through economies of scale, shared infrastructure and services and improved contracting of logs and woody biomass. An example of this is a group of wood processors working with neighbouring forest owners to plan and coordinate harvest schedules to reduce operational costs, reduce waste and increase returns.

Industrial Symbiosis Kawerau: the original forestry and wood processing cluster[24]

Industrial Symbiosis Kawerau is based on a collaboration formed in the 1950s between wood and fibre processing, geothermal energy producers, industrial engineering, service businesses, Māori business groups, the Kawerau District Council and central government agencies and science institutions.

In 2021 Industrial Symbiosis Kawerau was incorporated as a society. The society's objective is to raise the prosperity and resilience of the local community through initiatives that retain a skilled workforce in Kawerau and ensure improved social outcomes.

Kawerau is a well-established wood processing centre and home to the world's largest application of geothermal energy for direct industrial use. Its potential application for the production of hydrogen will also be economically significant for the area and the sustainability of associated industry. Kawerau is strategically located with established road and rail transport infrastructure as well as plans for an inland container terminal, all of which directly link to the Port of Tauranga.

The geographic proximity of Kawerau's businesses enables the exchange of materials, energy, water, by-products, services, knowledge, intellectual property, social capital, and networks. These exchanges reduce resource costs, increase revenues, and create new business opportunities.

This approach improves the viability and competitive advantage of the businesses involved and supports smarter use of resources, residues, and by-products to eliminate waste. The approach supports new commercial opportunities, job creation, and better environmental outcomes, with opportunities to grow this collaborative model.

24 Industrial Symbiosis Kawerau (ISK) (2021). Submission on He Pou A Rangi Climate Change Commission 2021 Draft Advice for Consultation.

Actions

Outcomes

10.1 Manufacturing co-location facilitation programme

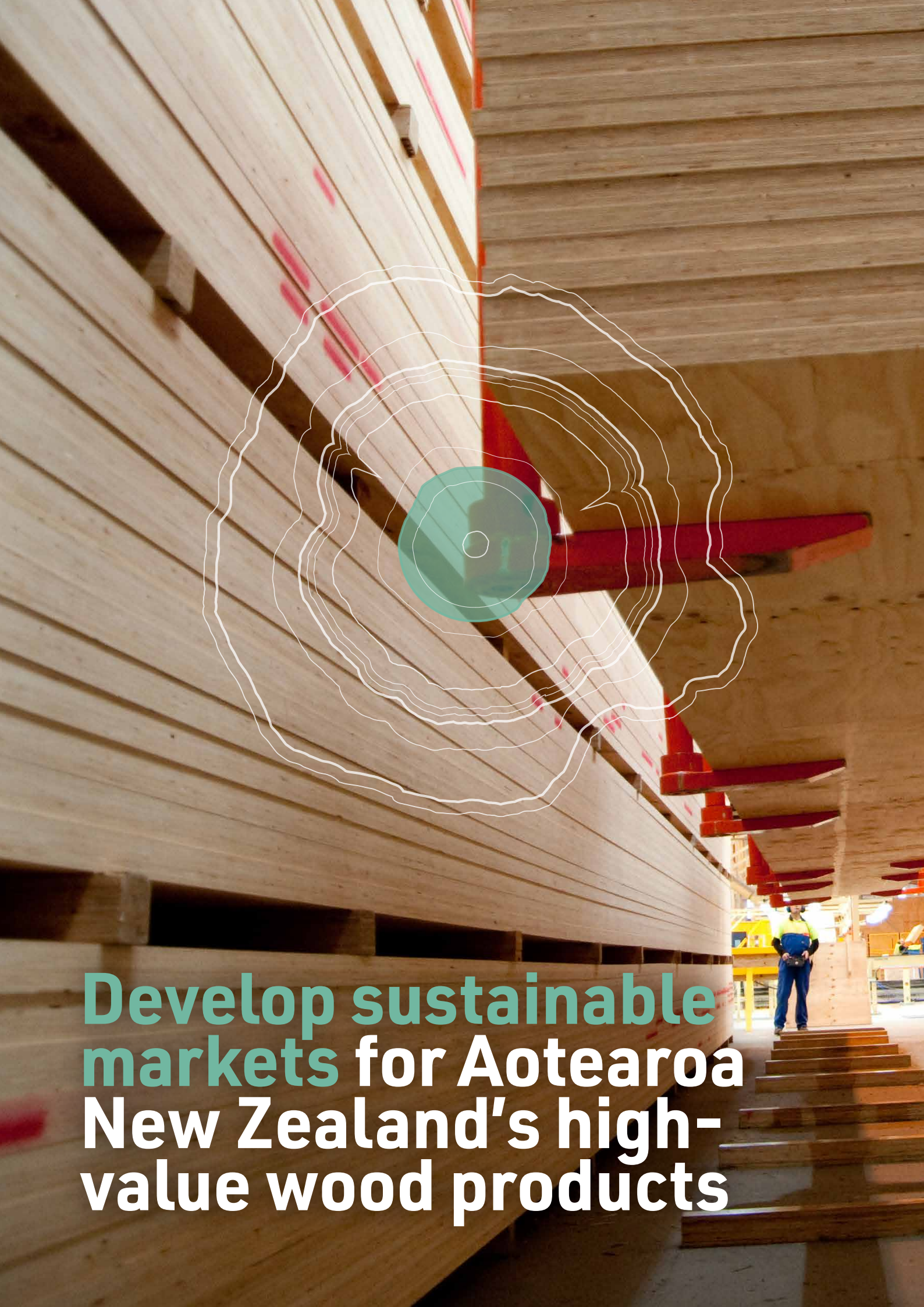
Government to support the development of advanced wood processing and bioeconomy clusters across the country.

This programme of support will:

- work with industry, education and research institutions, and local government to provide knowledge, strategic guidance, and facilitate collaborative regional development
- partner to provide co-investment and support to mitigate barriers to cluster development, for example, commissioning research and feasibility studies, consenting support, technical advice, developing a skilled workforce.

The sector and regions are supported by a strategic approach to developing wood processing and bioeconomy innovation ecosystems in regions. This support lifts innovation, productivity, and sustainability, and generates more employment.

Wood processing and bioeconomy businesses and regions have support to establish new clusters of co-located businesses or develop existing clusters. These clusters allow them to access benefits of symbiotic co-location and improved innovation ecosystems.



Develop sustainable markets for Aotearoa New Zealand's high-value wood products

Growing our onshore wood processing capacity and utilising more parts of our logs will require us to find new and diverse markets for our wood products, both domestically and internationally.

The over-exposure of our log exports to a single market creates risk. Recent drops in demand and price from China for Aotearoa New Zealand's logs has affected many in our domestic industry.

This priority area contains a range of actions to grow and diversity our export markets and lift our economic resilience. Expanding the range of products we produce and markets we sell into will:

- increase certainty for investors
- create a more resilient sector
- add more value to our exports
- support the decarbonisation of our economy.

Objectives

11 Increase domestic demand for our wood products

Increasing the use of wood in construction

The construction sector's emissions have increased by 66 percent in the past decade[25], and were responsible for around 15 percent of Aotearoa New Zealand's annual emission in 2021.

Wood will play a big role in the shift to a lower-emissions construction sector due to its ability to displace more carbon-intensive materials and store carbon over the life of a building. The Climate Change Commission recommended that timber could displace more emissions-intensive materials in construction and lower the embodied carbon of buildings. The actions in this plan aim to support this outcome.

The Government's Building for Climate Change Programme[26] seeks to increase the energy efficiency of buildings during operation and to lower embodied carbon emissions across the life of the building. The Building for Climate Change Programme will look at the materials used, construction processes, construction waste and end-of-life disposal. The actions in this plan will support design professionals and their clients to choose wood for their low-carbon buildings.

25 Construction Sector Accord (2021). Environmental challenges, opportunities and transitions for construction in Aotearoa New Zealand.

26 For more information about the Building for Climate Change programme, visit https://www.building.govt.nz/getting-started/building-for-climate-change/

Mid-Rise Wood Construction and Clearwater Quays Apartments – showing Aotearoa New Zealand the future of wooden buildings

The Mid-Rise Wood Construction partnership between the Ministry for Primary Industries and Red Stag aims to encourage the use of domestically produced engineered mass-timber materials and prefabrication as an alternative to other more emissions-intensive construction in mid-rise buildings.

The Clearwater Quays apartments in Christchurch have been constructed under this partnership and demonstrate how these engineered timber materials can be used in mid-rise buildings. The apartments, designed by Pacific Environments, combine cross-laminated timber (CLT), glulam and panelised timber framing to produce a cost-effective, resilient, sustainable and beautiful building.

The programme also seeks to share knowledge of mid-rise wood construction options across the design and construction sector and demonstrate the benefits of mass engineered timber. Ultimately, this would lead to more construction of timber buildings across the country.

Building using the mass timber option was faster and cheaper than the alternatives because the building was properly designed to use wood in the most efficient and low-waste ways.

Table 3: Clearwater Quays reference building – comparison of mass timber construction to other materials

Factors	Mass timber	Steel and concrete	Concrete only
Carbon Kg CO_2 equivalent	-82.6 thousand	+792.3 thousand	+831.6 thousand
Construction weeks	Baseline	+10	+10
Cost (including time cost)	$10.6 million	$11.1 million	$11.3 million

Source: Logic Group Quantity Surveyors

Lifting capability and ensuring building standards enable innovative wood product use

In 2019, 40 percent of new builds were multi-unit dwellings[27]. Significant scope exists for using more innovative wood products in multi-residential and commercial medium to high-rise buildings. Understanding and addressing technical barriers is critical for supporting greater uptake.

Supporting the construction sector to lift its capability is key for increasing wood-based construction. Design and construction professionals are less familiar with how to incorporate innovative wood products into building designs and their relative costs, benefits and risks. Stronger connections across the wood processing and construction value chains, and improved access to current, accurate information that is relevant for the Aotearoa New Zealand context, will help to lift capability. Hybrid building structures (constructed with timber and concrete and/or steel) can provide a stepping stone to introduce mass timber into a greater number of construction projects, while our capability and supply of mass timber increases.

Continuously improving our building and product standards and appraisals is key to ensuring the construction sector can use alternative timbers and innovative wood products. Continuous improvement is also critical for reducing the cost and risk of investing in alternative forests and innovative wood products, and encouraging greater demand for wood in construction. There needs to be a coordinated approach to addressing technical barriers to ensure that innovative wood products can be easily specified.

Improving the implementation of low-carbon procurement guidelines

As a significant procurer of construction projects, government needs to be a leader in low-carbon construction. The recently introduced low-carbon procurement requirements aim to lower the whole-of-life embodied emissions from government construction projects. This will increase the use of innovative wood products as a low-carbon alternative.

There are opportunities for the government and the sector to partner to ensure agencies are using cost-effective and innovative low-carbon wood products and building solutions in their projects.

Timber Design Centre: Growing and sharing knowledge of the use of innovative timbers

The Timber Design Centre was launched in March 2022 and is a service to promote and facilitate the use of timber in buildings. The establishment of the initiative was funded by Te Uru Rākau – New Zealand Forest Service. The Centre is being led by a consortium consisting of Scion (Crown Research Institute), the Wood Processors and Manufacturers Association, New Zealand Timber Design Society, and BRANZ.

The Centre will provide information on timber design guidance, research and development, and specialist technical advice to increase and speed up the use of timber in buildings. It will foster connections across the forestry, wood processing and construction sectors, and be an independent forum to develop local expertise, knowledge, techniques and skills in all aspects of using engineered timber in our buildings.

By overcoming barriers to using timber in design and construction, we can replace emissions intensive materials with wood. This replacement would lower carbon emissions, and support our drive to greater environmental sustainability.

Visit www.timberdesigncentre.co.nz for more information.

27 Construction Sector Accord (2021). Environmental challenges, opportunities and transitions for construction in Aotearoa New Zealand.

Actions	Outcomes
11.1 Support the Timber Design Centre Continue to provide establishment support to ensure that the Timber Design Centre addresses the barriers to greater use of timber in building projects – including lifting capability, providing access to quality information, connecting and coordinating across the value chain, and promoting timber as a low-carbon building solution.	Engineers, architects, designers, quantity surveyors, builders, and manufacturers specify and use more wood in building design and construction.
11.2 Accelerate low carbon procurement for government agencies and support implementation The Timber Design Centre will convene a reference group to identify how to help government agencies choose wood for their construction projects – for example by better connecting agencies with wood processors, improving access to information and advice, better utilising industry expertise in planning, design, and construction, and creating the full benefit proposition associated with agencies using timber as the building material of choice.	Government procurement processes favour materials with low emissions, enable collaboration, drive efficiencies across the construction value chain and support low carbon construction. Government procurement can support the advancement of research, development, demonstration, and commercialisation of innovative wood products and building methods.
11.3 Address technical barriers for innovative wood products, such as standards The Timber Design Centre will form a working group with industry representatives to identify regulation, standards, adopted industry practices and product appraisal barriers and identify critical opportunities to address these, to make it easier to specify and use innovative wood products in construction.	Engineers, designers, builders, and manufacturers can easily specify and use a wider range of wood products in building design and construction. This will reduce the costs and risks of designing and building with alternative timber and innovative wood products.

12 Grow and diversify export markets

Declining harvest volumes reinforce the need to diversify our export products and markets

Recent growth in our export earnings from forestry has been driven by the export of large volumes of unprocessed logs – around 60 percent of our total harvest.

Aotearoa New Zealand's log harvest volumes are forecast to fall by around 35 percent in the next 15 years[28].

Without any wider changes to our export markets and products, this decline in harvest volume will result in a decline in export earnings from forestry.

Log exports will continue to play a role in our sector for many years to come. But growing our export earnings over the next decade will depend on our ability to shift from exporting a high volume of unprocessed logs to a focus on value-added wood products across a range of markets.

Exporting processed wood products would lower overall emissions

On average, we export around 1.8 million tonnes of logs per month. This is the equivalent of approximately 45 log ships. These ships will consume around 2,800 tonnes of fuel on a round trip from Aotearoa New Zealand to China.

Approximately 50 percent of the weight of logs is water. So, every month, we export 900,000 tonnes of water encapsulated in logs and uses 126,000 tonnes of fuel to take it to market.

If those same logs were locally processed into sawn timber and medium density fibreboard, the final product would weigh half the weight of unprocessed logs and require only 21 ships to export. This would reduce fuel consumption by 67,200 tonnes per month.

Developing our understanding of key markets is critical to selling value-added products

Developing a stronger understanding of overseas markets and consumer preferences will be vital for targeted and successful product development, marketing, and campaigns. Greater cross-sector collaboration on gathering and sharing market insights will be key to supporting investment, market development and marketing programmes.

Growing international markets will require a stronger presence in key offshore markets. Given the projected shortfall of structural timber in Australia, this will be this be the initial focus.

Telling the story of the sector to the world can increase demand for our wood products

Our forestry and wood processing sector could benefit from a unified and proactive marketing approach on the international stage to build our competitiveness. Evidence shows that international competitors, such as Finland ("Wood from Finland") invest in telling the story of their industry and products to international markets[29].

Government and industry need to work together to support exporters to tell the sector's story and the advantages of sustainable wood products from Aotearoa New Zealand. Telling this story well has the potential to increase demand for our wood products and solutions and attract potential investors to Aotearoa New Zealand.

This story needs to align with the transformation focus of the sector and adapt over time as the sector evolves. As we scale up the processing of high-value wood products and our forests-based bioeconomy, the story of the sector will change.

28 The most likely scenario in the 2021–2050 Wood Availability Forecast shows the national harvest volumes rising to around 39 million cubic metres in 2025, before dropping to a low of 25 million cubic metres in 2034.

29 Indufor (2022). Precompetitive Approaches.

The Canadian wood products industry: a history of proactively developing international markets to grow and diversify wood product exports

Canada, one of the world's leading exporters of high-value wood products, invests significantly in growing its export markets. There is a history, dating back to the 1970s, of the Canadian federal and provincial governments cooperating with industry and working together to grow exports by carrying out proactive work in international markets.

Initial work was carried out in Japan to help advance housing quality – Canada was invited to help develop building codes and technologies, including introducing a building system that could utilise Canadian wood. To this day, over 3 million North American style lightwood frames have been built in Japan that would trace their ancestry to the initial market development programme.

Canada Wood Group (CWG) is the latest cross-industry organisation dedicated to leading the diversification and expansion of export market opportunities for Canadian wood product manufacturers in overseas markets. It also offers a brand that Canada's exporting firms can leverage.

CWG has a significant footprint, with offices in China, Japan, South Korea, and Europe. Activities include helping to remove regulatory barriers, delivering educational and promotional missions, trade fairs, market studies and demonstration projects. Carpenters are often included in these offices to provide technical mentoring to in-market building firms on how to build with wood.

On top of significant programmes in Japan and China, CWG has more recently carried out work in South Korea that has:

- reduced regulatory barriers for Canadian pressure-treated wood and Oriented Strand Board
- partnered with Chungnam National University to develop a wood wall workshop for architects and engineers
- created a "regulatory barriers initiative" to help support faster adoption of wood-framed construction
- organised a 12-day technical trade mission in Vancouver for 17 Korean construction professionals to learn about advanced wood building systems
- partnered with the Korean Wood Construction Association to launch an enhanced 5-star wood housing certification programme.

Results

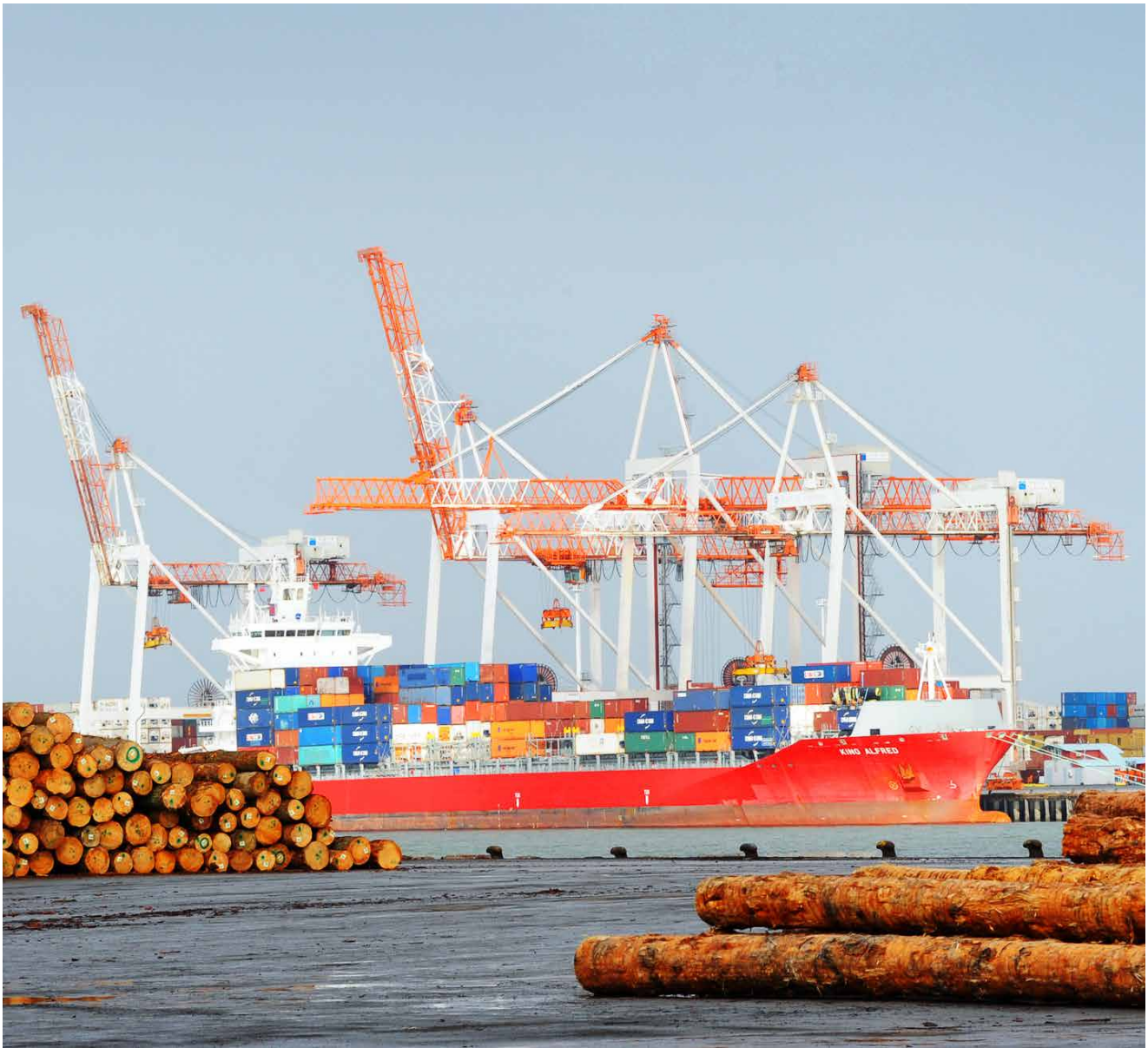
- 34 new clients or demonstration projects using Canadian wood
- 128,000 Korean houses built with Canadian framing timber
- 254 (5-star certified houses) built with Canadian framing timber
- 13 "Super E" (high-performance, energy-efficient) projects completed in Korea

Supporting access to global markets is essential to growing exports

Tariff and “non-tariff” barriers can impact exporter competitiveness. Tariffs put in place at the border by importers often mean it’s more expensive for a country to import value-added products, making imports less attractive.

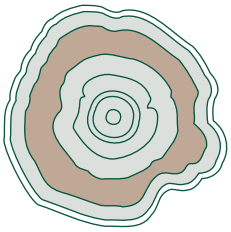
Non-tariff barriers such as regulatory or technical requirements in markets may restrict how our wood products are imported or used. For example, some countries may have building codes or product standards that mean the properties of Aotearoa New Zealand radiata pine are not permitted in buildings in that country.

We already carry out significant work on minimising trade and technical barriers, for example in developing free trade agreements to reduce tariffs, as well as developing joint standards and getting radiata pine accepted in building codes. However, there is a need to undertake further work to support the goals of industry transformation through the promotion of trade in a fair, transparent manner that is consistent with the WTO.



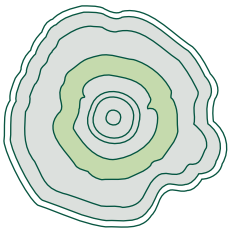
Actions	Outcomes
12.1 Create and sell our forestry and wood product story Government and the sector will co-develop an enduring marketing programme to deliver a sector-wide marketing story that showcases the value of Aotearoa New Zealand's sustainable forestry and wood on the global stage. This includes developing marketing resources for use by forestry and wood processing businesses. The story should evolve and continue to be promoted over time as the sector evolves and productivity lifts.	Overseas markets are more aware of the positive characteristics of Aotearoa New Zealand wood products. And exporters can leverage our brand to achieve higher prices. Increase in demand for our forest and wood product exports in a larger range of markets also increases our revenues and market resilience.
12.2 Establish offshore market presence Government and the sector will co-fund market development capability, including: • establishing staff focussed on key export markets to improve access and success for forestry products • working with international jurisdictions to minimise non-tariff barriers – such as local wood standards • building market demand and leading strategic initiatives that align with emerging trends • supporting the collection of market intelligence.	Targeted growth of export markets that exporters have access to with fewer barriers or challenges – leads to increased revenues and more market resilience. The sector benefits from enhanced understanding of overseas markets, log and product flow and international consumer preferences to support growth.
12.3 Improve the trading environment Te Uru Rākau – New Zealand Forest Service and the Ministry of Foreign Affairs and Trade (MFAT) will work to ensure trade policy and other international engagements support the goals of industry transformation as appropriate in a fair, transparent and WTO-consistent manner. This will include work to open up new markets and to seek to address non-tariff barriers.	The global trading environment is supportive of growth in value-added wood products.

Summary of ITP actions



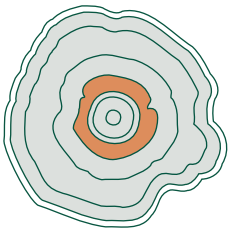
Priority area: Create the foundations for a transformed sector

1	**Create a resilient and collaborative sector**
1.1	Industry will collaborate to invest in “industry good”
1.2	Support the industry to maintain and build social licence
1.3	Improve cross-government collaboration and policy alignment
2	**Empower Māori to achieve their aspirations in the sector**
2.1	Empower Māori to be forestry decision-makers
2.2	Support growth of Māori ownership across the value chains
3	**Grow and attract the future workforce**
3.1	Conduct a skills forecast
3.2	Partner with the sector to support the successful implementation of the Workforce Transition plan
3.3	Develop tertiary pathways for innovative wood engineering and architecture
3.4	Develop a Future Forestry Leader qualification
4	**Drive science and innovation across the sector**
4.1	Support innovation and commercialisation
4.2	Boost access to innovation facilities
4.3	Improve breeding and genetics of forestry species
5	**Provide sector insights to lift performance and innovation**
5.1	Enhance MPI’s forestry-based advisory services
5.2	Build better insights into log and biomass availability
5.3	Expand market intelligence



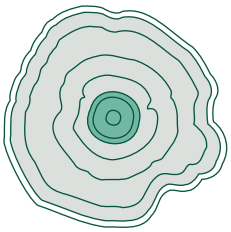
Priority area: Grow forests and supply wood for the future

6	**Use technology and partnerships to add value**
6.1	Enable forest aggregation opportunities
6.2	Facilitate industry uptake of technology
7	**Diversify our forests to build sector resilience**
7.1	Enable a strategic approach to diversification
7.2	Promote continuous canopy forestry
7.3	Launch a native afforestation programme
7.4	Develop the business case for the Crown for to invest in the diversification of productive forests
8	**Improve wood and residue supply for domestic processing and the bioeconomy**
8.1	Research and develop optimal biomass regimes
8.2	Map biomass supply and demand
8.3	Increase woody biomass supply
8.4	Improve market transparency
8.5	Support industry to develop improved market trading arrangements
8.6	Enhance the sustainability of the value chain



Priority area: Modernise and expand wood processing

9	**Attract investment to increase manufacturing of advanced wood-based products for building, biotech, and fuels**
9.1	Government will establish funding options to reduce the risks associated with wood processing investment
9.2	Government will improve the investment environment associated with wood processing
9.3	Investigate options to recognise the “delayed emissions” from harvested wood products
9.4	Investigate long-term options to address emissions leakage
10	**Support sector co-location, collaboration and sustainability**
10.1	Manufacturing co-location facilitation programme



Priority area: Develop sustainable markets for Aotearoa New Zealand's high-value wood products

11	**Increase domestic demand for our wood products**
11.1	Support the Timber Design Centre
11.2	Accelerate low-carbon procurement for government agencies and support implementation
11.3	Address technical barriers for innovative wood products, such as standards
12	**Grow and diversify export markets**
12.1	Create and sell our forestry and wood product story
12.2	Establish offshore in-market presence
12.3	Improve the trading environment

Appendix one

Forestry and Wood Processing Industry Transformation Plan Advisory Group Members

Bruce Habgood	Convenor of the Engineering, Infrastructure and Extractives Industry Council, E tū
Clayton Harris	Chief Executive – Carter Holt Harvey Wood Products New Zealand
Daniel Gudsell	Founding Director – Abodo Wood
David Turner	Executive Director – Sequal Lumber
Dean Satchell	Land Management Advisor – Northland Regional Council
Florian Graichen	General Manager – Forest to Biobased Products, Scion
Jon Ryder	Chief Executive Officer – Oji Fibre Solutions
Kent Chalmers	Market and Logistics Manager – City Forests
Louisa Jones	Assistant General Secretary – First Union
Marty Verry	Group Chief Executive – Red Stag Timber, Red Stag Forests, Red Stag Wood Solutions
Megan Struthers	Associate Director – Business Development, New Forests Asset Management Pty Limited
Robert Green	Managing Director – Australasia Timberland Operations at Manulife Investment Management
Te Kapunga Dewes	Te To (Chief Executive) – Whenua Oho
Tony Haworth	Investment Manager – Te Taurapa Tūhono New Zealand Trade & Enterprise
Vanessa Eparaima	Director of CNI Iwi Holdings Ltd, Chair of Te Wānanga o Aotearoa.

Glossary

Afforestation	The process of planting trees on land that does not already have forest on it.
Bioeconomy	The production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products and bioenergy.
Circular bioeconomy	The intersection of the bioeconomy and circular economy.
Circular economy	The economic space where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised.
Deforestation	The permanent removal of trees to make room for something besides forest.
Ecosystem services	Ecosystem services are categorised as "provisioning", such as food, timber and freshwater; "regulating', such as air quality, climate and pest regulation; "cultural" such as recreation and sense of belonging; and "supporting", such as soil quality and natural habitat resistance to weeds.
Forest system	Aotearoa New Zealand's trees and forests and all of those with an interest in them.
Forestry sector	Individuals, groups, organisations, and representative bodies involved in any economic activity that mostly depends on the production of goods and services from forests. Including, but not limited to, forest owners (private and commercial), investors, forest management companies and contractors, nurseries, processors, manufacturers, and exporters.
Kaitiaki	Guardian, steward, caregiver, trustee.
Kaitiakitanga	Guardianship, stewardship, trusteeship.
Kaupapa	Topic, policy, plan, purpose.
Kotahitanga	Unity, togetherness, solidarity, collective action.
Mātauranga Māori	Māori knowledge – the body of knowledge originating from Māori ancestors, including Māori worldview and perspectives, Māori creativity and cultural practices.
Manaakitanga	Hospitality, kindness, generosity, support – the process of showing respect, generosity and care for others.
Mauri	Lifeforce, life principle, vital essence, special nature, a material symbol of a life principle, source of emotions – the essential quality and vitality of a being or entity. Also used for a physical object, individual, ecosystem or social group in which this essence is located.
Ngahere	Forest, bush.

Sequestration	The process whereby trees remove CO_2 from the atmosphere and store it through photosynthesis.
Tangata whenua	Indigenous people of Aotearoa – people born of the whenua (land), i.e. the land where ancestors have lived or where their placenta was buried.
Taonga	Cultural treasure.
Te ao Māori	Māori worldview – the view of the world through Māori eyes.
Te Taiao	Nature, the natural world.
Tūrangawaewae	Domicile, standing, place where one has the right to stand – place where one has rights of residence and belonging through kinship and whakapapa (genealogy).
Wairuatanga	Spirituality. The concept of interconnectedness/integration.
Whakapapa	Genealogy, genealogical table, lineage, descent – reciting whakapapa was, and is still, an important skill. It reflects the importance of genealogies in Māori society in terms of leadership, land and fishing rights, kinship and status.
Whenua	Land, country, ground, nation.

Te Uru Rākau New Zealand Forest Service

Te Kāwanatanga o Aotearoa
New Zealand Government