SCION™
FORESTS ■ PRODUCTS ■ INNOVATION

Statement of Corporate Intent 2023–2026

Appendix 3: Portfolio roadmaps to impact

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High-value biorefineries portfolio

Vision: Making high-value chemicals and materials in New Zealand from sustainably sourced trees and other biomass.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Targeting solutions that impact several industrial value chains resulting in: • Unlocking future investment for new infrastructure such as biorefineries. • $20 billion sustainable GDP growth driven through existing and new companies. • 2500 new regional and rural jobs.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
High-value chemicals obtained from the oil industry are unsustainable. New Zealand imports many high-value chemicals which affects our security of supply and represents a cost and access risk (opportunity cost to industry) and fewer imports reduce our carbon footprint.	Indigenous biomass-based biorefineries *Working with Māori to identify chemicals and products from indigenous biomasses to enhance the Māori economy. Supporting Māori landowners to advance their rights and interests in the taonga growing on their lands through science discovery and mission-led research.*	Te Ao Māori based options for Māori owned and operated high-value biorefineries with appropriate safeguards for IP and data protection.	A Māori biorefinery is investigated and established.	A Māori brand / value chain is established.	Māori are world leaders in New Zealand's indigenous biobased refineries adding $5 billion to New Zealand's economy.
The value of New Zealand's abundant biomass is not currently being fully realised or capitalised. There is an opportunity to build new high-tech high-value sectors based on the entire value-chain derived from biorefineries, including their construction. There is an opportunity for government strategy to provide clear incentives or direction to implement capital intensive research which is currently limiting industry response and investment into biorefineries. Māori have the opportunity to participate in an emerging sector under their own terms. Due to New Zealand's abundant biomass, the country has the opportunity to be a net exporter of a range of high-value chemicals and materials.	Pine and other exotic forestry-based biorefineries *Using New Zealand's existing and future commercial forestry as feedstock for biorefineries. Working with existing forestry and related companies to envision what forested trees and their value-chains could become.*	Implementation of biorefinery approaches to the deconstruction of wood. Engagement with the pulp & paper Industry with options to add further high-value products.	A short rotation forestry feedstock trial is established with industry. At lab scale a 'lignin first' biorefinery has been shown to be viable. 10% of forest residues are transported out of the forest for use in biorefineries.	One pulp & paper mill has upgraded to produce chemicals for high-value industries. A pilot plant scale 'lignin first' biorefinery has been tested at biopilot plant scale. 50% of forest residues are transported out of the forest for use in biorefineries.	Sufficient biomass is available to support a large scale biorefinery industry. At least two industrial 'lignin first' biorefineries have been constructed. 80% of forest residues are transported out of the forest for use in biorefineries.
	Alternative sustainable biomass-based biorefineries *Working with industries across the value chain to maximise value from current and future biomass sources. This area will work with a broad range of companies and partner research providers to explore and deploy leading-edge technologies.*	New technologies for the conversation of biomass into feedstock for high-value industries. Novel bio-derived bioactive compounds. New linkages with other research providers.	At least one biorefinery producing chemicals for the cosmeceutical industry.	At least one biorefinery producing chemicals for the nutraceutical industry.	At least one biorefinery producing either fine chemicals or pharmaceutical intermediates.
Cross cutting research outputs to 2030 and impacts	Science reported in the media and peer reviewed journals Benefits and opportunities of biorefineries communicated with iwi, industry and investors. Resource databases for high-value (bio) chemical production.		Develop an investment case for biorefineries based on Scion and other world leading technologies.	Identify biomasses and locations that meet environmental and economic criteria.	Generate $20 billion sustainable GDP growth; 2500 regional high-value jobs.

Bioproducts and packaging portfolio

Vision: Enabling onshore manufacturing of bioproducts and packaging from New Zealand's natural resources for global markets.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Targeting solutions that impact several industrial value chains resulting in: • $20 billion sustainable GDP growth driven through existing and new companies. • 2500 new regional and rural jobs. • Substituting fossil energy and materials with sustainable alternatives.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Education and change: Lack of consumer and value chain understanding hinders change and uptake necessary to support a circular bioeconomy. Iwi engagement: Low engagement with Māori makes it hard to interweave tikanga (knowledge and values) for Māori benefit. Product: Sustainable products currently not suitable for all use cases. Feedstock: Large geographic distribution, seasonality, low volume, cost and variability means it can be hard to secure a reliable biomass source. Economics: Market forces associated with oil-based or imported alternatives makes it challenging to develop a competitive local market. Manufacturing: Lack of onshore manufacturing (plastics and products) and recycling Infrastructure Legislation: Regulations for plastics and packaging are not currently incentivising the transition to sustainable packaging options. Waste: Need to reduce waste to landfill to reduce both methane emissions and mitigate environmental impact.	Bioplastics made in New Zealand *Enable onshore manufacture of bioplastics from bioresources and methane/CO_2.*	Expertise to enable onshore large-scale production of existing bioplastics. New technology for direct conversion of methane and CO_2 into bioplastics. Development of novel high-performance bioplastics from sustainable resources.	Commercial onshore production of compostable/recyclable bioplastics has begun. Sustainable value chain for manufacturing developed. Commercially relevant feedstocks and opportunities are identified and evaluated.	Commercial onshore prototyping of new higher performance bioplastics begins. Negative carbon footprint for bioplastic and polymer production. Scion recognised as a global leader for biomass utilisation through biotechnology.	High performance, high-value engineering grade bioplastic/ biopolymers in commercial production in New Zealand. Export of high value bioplastics/ biopolymers.
	Compostable, reusable and recyclable packaging *Enable the transition to sustainable packaging for New Zealand companies, and support export of New Zealand goods* *Digitisation of the packaging value/supply chain.*	Improved compostable packaging materials for domestic and export markets. New high-performance renewable and recyclable fibre-based packaging options. Expertise to support New Zealand's transition to compostable and recyclable packaging. New conductive carbon-based material. Printable green electronics. New biobased sensors/ electronics enabling authenticity/traceability.	75% of New Zealand products are packaged in recyclable (or with recycled content) or compostable packaging. Consumers are selecting products that are better, more affordable, and support the circular economy. Development of new prototype biobased packaging and electronics.	New Zealand has a circular economy for packaging. Recycling is feasible and the norm. Re-pulpable recycled fibre solutions with barrier properties are on the market. Commercial uptake and technology transfer of novel prototype packaging solutions.	Scion is regarded as leading advisor on circular bioeconomy. Commercial onshore production of biobased electronics.
	Distinct products from indigenous fibres *Māori-led design and manufacture of products using indigenous fibre.*	Foster the revitalisation of Māori traditions using biofibres. New products from Māori resources and traditional knowledge.	Establishment of a national Māori industry fibres association.	An indigenous fibre supply chain and value chain investment is complete. A premium cultural brand supporting the Māori economy and tikanga is established.	Industry built upon utilisation of indigenous fibres established.
	Sustainable composite products *Development of existing and new sustainable fibre, polymer and composite products manufactured in New Zealand.*	New biocomposites for uptake by New Zealand companies. Expertise to enable onshore large-scale manufacture of biocomposites. Optimised biomass for application - fibre forests, alternative fibres or renewable polymer feedstocks.	Commercial uptake of a new bioproduct for production (Ligate/ Woodforce). Multiple novel fibre-polymer composite prototype products.	On-shore manufacture of new biocomposites by upgrading or retrofitting existing New Zealand mills. Impact of new bioproducts exceeds $100 million pa to the New Zealand economy.	Displacement of petrochemical-derived composites with innovative fibre products that satisfy internal consumer demands and external emerging markets.

Distributed and circular manufacturing portfolio

Vision: Kick-starting a distributed, circular bioeconomy that brings economic, social and environmental benefit to our regions by using the resources of today and tomorrow.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Targeting solutions that impact several industrial value chains resulting in: • $20 billion sustainable GDP growth driven through existing and new companies. • 2500 new regional and rural jobs.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Lack of high-value, future-proof jobs in New Zealand's regions. Biomass resources (wood & non-wood) that drive a bioeconomy are geographically and seasonally spread-out and underutilised. Some biobased material options are not financially competitive with oil-based alternatives. There is a lack of Te Ao Māori in New Zealand's bioeconomy vision, and its systems and value definition. Variable definitions of a national-scale circular bioeconomy and uncertainty on how it aligns globally. New Zealand manufacturing needs to advance to a resilient, high tech, high value sector that enables New Zealand's circular bioeconomy. Lack of chemical industry, advanced biorefinery and bioproduct markets to support a New Zealand circular bioeconomy.	Distributed biomass conversion *We will develop technology that turns biomass waste into products at its origin to use resources that we have; displace non renewables and start a distributed bioeconomy in New Zealand.*	Regional-scale distributed mobile processing-decision tool developed. Modular plant converting lignocellulosic to biochemicals developed. Case studies of feasible distributed/mobile biomass conversion completed. Iwi/hapu-led holistic, distributed biomass conversion models developed.	Stakeholders are investigating implementation of regional, modular biomass-to-chemical refining options. Distributed manufacturing co-development begins with and implementation by Māori partners. Distributed manufacturing clusters start to drive regional, pan-sectoral bioeconomy implementation.	Modularised biomass conversion enables value from biomass in the regions. Increased New Zealand biomass resources are used for bioeconomy products with reduced carbon footprint. Increased demand for New Zealand-made bioproducts or refining/conversion technologies.	Bioeconomy integrated forest industry sector delivers high-value employment and increased wellbeing to regional communities.
	Eco-industrial regions *We will design our future primary industry land-use and distributed symbiosis 'value' chains to start the transition to a bioeconomy.*	Sustainability Indicator Framework for New Zealand symbiosis networks developed. Roadmap on New Zealand's path to a distributed, bioeconomy symbiosis network published. Regional-scale future land-use decision tool and symbiosis model developed. Business models and parameters for symbiosis networks and systems with Te Ao Māori at its heart developed and published.	New Zealand policy drives to circular bioeconomy implementation and uptake. Primary and secondary industries are integrating networked-symbiosis system in strategies. Te Ao Māori-led value chain and techno-economic models enable regional bioeconomy opportunities. Distributed manufacturing clusters start to drive regional, pan-sectoral bioeconomy implementation.	Networked eco-industrial symbiosis cluster operating – New Zealand biorefinery – increasing regional high-value employment. Embedding new technology modules increases New Zealand's wood processing and manufacturing sector's resilience and profit.	A distributed and networked New Zealand bioeconomy gives effect to Māori and Pākehā aspirations and ensures intergenerational wellbeing for all.
	Modular and circular manufacturing *We will bring more of New Zealand manufacturing into the forest-based, circular bioeconomy to make it an integral part of a regenerative future for New Zealand.*	Future regional, modular and distributed forestry manufacturing value chains defined. Case studies of modular biomaterial manufacturing systems completed. Small-scale, modular forestry product (re) processing technologies developed. Models for Māori-led modular and circular manufacturing framework developed. Modularised, dynamic, distributed manufacturing technology for New Zealand bioproducts implemented.	Increased domestic (and international) demand for bioeconomy technology and materials. Increased awareness and demand in New Zealand for modular and mobile, small-scale bioresource processing and recovery technology. Regional communities participate in Māori-led symbiosis initiatives. Increased circular bioeconomy and technology knowledge in New Zealand's primary industry and manufacturing sectors. Distributed manufacturing clusters start to drive regional, pan-sectoral bioeconomy implementation.	New Zealand companies produce and export New Zealand-designed and made modular technology and service solutions for the global bioeconomy. New Zealand manufacturing industry demonstrated improved efficiency and effectiveness using modular and distributed technology approaches.	New Zealand's manufacturing sector is positioned as a resilient, global technology and service leader for the New Zealand and global circular bioeconomy ensuring long-term sustainable GDP growth.

Distributed and circular manufacturing portfolio

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Cross-cutting impacts			Further investment/ support in small-scale, modular technology R&D unlocked.	Te Ao Māori led regional bioeconomy clusters drive and guide the New Zealand primary and manufacturing sectors. Regional thought and action leadership powers a primary industry and (bio) manufacturing sector evolution.	Increased sustainable GDP through new eco-industrial regions and symbiosis clusters that make better use of our current and future resources. Transform the forestry sector to high-tech, high-value products that replace petrochemical materials and deliver emissions reduction. A distributed and networked New Zealand bioeconomy gives effect to Māori and Pākehā aspirations and ensures intergenerational wellbeing for all.

Integrated bioenergy portfolio

Vision: Positioning bioenergy as part of the transition away from fossil fuels.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Targeting solutions that impact several industrial value chains resulting in: • Substituting fossil energy and materials with sustainable alternatives. • 10 million tonne reduction in CO2 equivalents.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Over 91% of New Zealand's CO_2 emissions are from energy use (transport and heat) which needs to be reduced to achieve net zero emissions by 2050. The value of petroleum imports were $11.2 billion in 2018 which represents an economic opportunity. Reliance on energy from geopolitically unstable sources is a risk to our security of supply. Our export products have high carbon footprints. The regulatory framework for bioenergy in New Zealand is evolving rapidly so compliance requirements are unclear. Rapidly changing requirements in sectors and international bodies are driving change in bioenergy legislation. We need to ensure there is enough biomass feedstocks to support bioenergy production in the longer term. We need to ensure a 'just' transition in regional New Zealand economies to future energy production and markets.	Transport biofuels *Responding to emerging New Zealand legislation and international commitments on climate change by replacing fossil fuels.*	New technology for marine biofuel production developed. Identified the socio-economic benefits of bioenergy. Pathways to implementation identified.	Full feasibility study and feedstock plan is developed for sustainable aviation fuel plant in New Zealand. Investment case for marine biofuels is developed.	Commercial scale sustainable aviation fuel plant is operational. Marine biofuel plant piloted in New Zealand by venture, and business case defined.	Commercial scale (100 million litres pa) marine biofuel plant is operational. GHG emissions from transport sector are reduced, making a significant contribution to Paris commitment.
	Process heat bioenergy *Responding to emerging New Zealand legislation to replace coal and natural gas with bioenergy options.*	New high energy density, waterproof coal replacement from wood. New technology for distributed production of biohydrogen from wastes (with CO_2 capture and utilisation).	Industry scale trial of coal replacement solid fuel demonstrated. Ecogas facility in Reporoa is fully operational.	Drop-in solid biofuels production in New Zealand is underway and up to 20% of existing coal burners have switched to bioenergy. Biohydrogen substitution of natural gas in gas pipelines has started.	No coal, significantly less gas being burnt in New Zealand for process heat. GHG emissions from process heat sector reduced, making significant contribution to Paris commitment.
	Support new bioenergy focused value chains *Is there enough biomass? Now and into the future, and ensuring we use biomass in the "best" way.*	State of the art modelling tools, e.g. energy systems. Feedstock plans for new bioenergy production plants, including aviation and marine biofuel production in New Zealand. Advanced precision planting/ nutrition/ processing.	A short rotation forestry feedstock trial established with industry. Wood energy heat plant demonstration at Scion is operational. New biofuel bioenergy policy, legislation has passed and standards enable licence to operate in New Zealand.	Energy dedicated production forests established by forest owners. One Māori bioenergy company established and operating. Commercialisation of new technologies for liquid and solid biofuels started.	Sufficient biomass available to support large-scale bioenergy industry.
Cross-cutting research outputs to 2030 and impacts		Best use of biomass for bioenergy established. Established relationships (incl. Māori) embedded in project outputs. White papers, reports, manuscripts, and communication articles.	New biofuel/ bioenergy policy, legislation and standards enables licence to operate in New Zealand.	One Māori bioenergy company established and operating. Commercialisation of new technologies for liquid and solid biofuels started.	Carbon footprint of New Zealand export goods reduced to level acceptable in markets. Energy independence and security position improved through the use of New Zealand energy resources. Regional economies are improved with new jobs, feedstock production, and conversion plants. Integrated bioenergy makes a significant contribution to the New Zealand circular bioeconomy.

Trees to high-volume wood products portfolio

Vision: Supporting the exotic forest sector in New Zealand to deliver highly productive and sustainable forests that produce quality high-volume wood products.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: By 2030: Via the forest, manufacturing and construction industries we aim to: • Increase GDP by $10 billion through low emission, forest diversity, timber products and sustainable and healthy communities. • Reduce CO_2 emissions by 1 million tonnes from the adoption of circular principles.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
The forestry industry is dependent on a limited number of exotic species, markets and products with no clear contingency plan or tools to cope with a disruption to the value chain either through productivity or market disturbances.	De-risking the forestry sector Managing value chain system risk *We will de-risk current, future and alternative value chains through the implementation of risk mitigation and diversification practices.*	Developed, evaluated and assessed at least two viable contingency species for current *Pinus radiata* cultivars. Developed biosecurity surveillance and diagnostic tools and grow knowledge to allow industry to prevent and manage new pest and disease incursions. Identified new export opportunities and economic models to address loss of primary market access.	Contingency species are adopted as a viable option to diversify the forestry estate. Industry implementation of integrated biosecurity, pest and disease management models. Prototypes of advanced tools and techniques used to control disease and manage biosecurity are developed.	Realisation of new commodity value chain opportunities. Confidence to re-plant *Pinus radiata* for log and feedstock supply.	Trees can be planted in the right setting with confidence that they have the best chance of surviving and remaining productive and profitable. Diversified value chains are embedded within the forestry industry. Preparedness, ability and capacity to manage all types of biosecurity threats are in place.
Current risks and future threats are increasing with climate change impacting on certainty of our ability to meet supply of high-volume logs.	Protecting the future forestry sector Climate adaptive forest management *We will increase resilience to biotic and abiotic stress in trees, forests and landscapes while maintaining productivity.*	Developed predictive and adaptive management models and frameworks that account for climate change risk to support decision-making. Developed new climate adaptive biotechnologies and genetic technologies to protect pine.	Prototypes of advanced tools and techniques used to control disease and manage biosecurity are developed.	Radiata pine growth is maintained across production clines. A shorter rotation of *Pinus radiata* is realised. Critical forest management decisions are supported by fit-for-purpose tools. Resilient forest management is normalised within the industry and identified as best practice.	By 2050, improved diversity, resilience and productivity of plantation forestry in New Zealand delivers a $5 billion pa increase in GDP through greater forest diversity and timber products. Trees can be planted in the right setting with confidence that they have the best chance of surviving and remaining productive and profitable. Forests are managed in an integrated way and at an appropriate landscape scale.
The negative perceptions of radiata pine forestry are compromising the sector's ability to contribute and benefit from ecosystem services, integrated land use, climate change mitigation and the circular bioeconomy.	Transforming the forestry sector Sustainable forest management *We will evaluate emerging environmentally sustainable and socially responsible forest management models against their ability to meet public, government and investor scrutiny.*	Develop forestry design frameworks to minimise environmental impacts. Develop economic and social ecosystem services benefit look-up tables. Develop a rubric for guidance and assessment to build public engagement and social licence.	A Māori Forestry Strategy and Implementation Plan is enacted. Forests are managed to minimise environmental impacts and maximise site productivity. Forests are designed for ecological impacts and managed for optimised production and profit.	Māori are increasingly at the value-end of the supply chain leading to increased contribution to the Māori economy. Planted forests are valued for their ecosystem services.	Non-commercial benefits of forestry ecosystem services are realised. Public have embraced radiata pine forestry to address climate change challenges. Forests are managed in an integrated way and at an appropriate landscape scale. Trees can be planted in the right setting with confidence that they have the best chance of surviving and remaining productive and profitable.

Trees to high-volume wood products portfolio

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Much of our exotic forestry is *Pinus radiata* however its inherent characteristics and current management limits the ability to meet the demands of the wood processing sector which requires greater volume, wood quality and log uniformity.	Improving resilience in the forestry sector Managing resilient forests for productivity and wood performance in the face of climate change *We will adapt radiata pine production systems to improve wood performance and productivity to reduce uncertainty in log, fibre, and feedstock supply.*	Develop *Pinus radiata* silviculture methodologies for improved site productivity. Develop new *Pinus radiata* cultivars bred for resilience, and performance.	Forests are designed and managed for optimised production and profit. There is improved wood performance and yields across all sites. Large-scale planting of improved *Pinus radiata* cultivars is underway.	Investment to increase onshore timber processing capacity. Consistent supply of high-grade high-volume *Pinus radiata* logs. More onshore processing from supply of high-quality *Pinus radiata* logs.	New Zealand has a diverse and productive forest estate. More wood, fewer trees. Trees can be planted in the right setting with confidence that they have the best chance of surviving and remaining productive and profitable.

Trees to high-value wood products portfolio

Vision: Unlocking the value of wood products from diverse exotic forests to deliver a low-carbon built environment.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Via the forest, manufacturing and construction industries we aim to: • **Increase GDP by $10 billion through low emission, forest diversity, timber products and sustainable and healthy communities.** • **Reduce CO_2 emissions by 1 million tonnes from the adoption of circular principles.** • **Have two New Zealand communities adopt circular living concepts.**		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Exotic alternative species are not yet planted at scale and are not clustered in viable wood processing catchments. The value of alternative forests and landscape management, regenerating wood while delivering wider benefits, is unknown and unrecognised. Potential of Māori-owned forests to sustain long-term Māori housing supply is not yet realised. The value of circular manufacturing and low-carbon manufacturing is not captured.	Shaping future forestry, processing and built environments *Shaping our future diverse exotic forests, manufacturing and built environments to maximise the holistic values they can provide to us, and to the next generations.*	Regenerative-productive forest landscapes and processing models are defined supporting productive forests' transition to mixed species, continuous cover, selective harvesting and integrated land-use. Innovative wood processing, manufacturing and construction approaches are investigated to transition the wood products and building sectors towards circular, high-efficiency and low-impact manufacturing. Forests-to-Papakāinga systems and supply chain approaches are co-developed supporting Māori living in healthy homes built by Māori from trees grown and processed on Māori land. Circular built environment and communities' models, systems-thinking and roadmap are defined. Supporting regenerative planning and local developments.	An increase in alternative species forest areas and catchments and a diversification of forest models. Government and industry invest in ongoing R&D on alternative species, forestry and processing. Regenerative benefits of productive forests are measured and accounted by industry. Industry and Scion establish a long-term sector database infrastructure. Local councils are implementing circular, regenerative urban/ community principles.	Farmers implement productive agroforestry models on their land. Forest growers, landowners and wood processors capture new value streams from regenerative forestry and alternative species. A circular bioeconomy model is successfully applied to Māori housing. Māori are increasingly living in healthy homes grown from and located on Māori land providing intergenerational health and housing security. Wood manufacturers and construction stakeholders implement circular manufacturing processes.	A New Zealand forestry model for new productive forests has transitioned to mixed species, selective harvesting and integrated land use. Wood manufacturers and construction deliver full circularity. Products are fit for markets. Large-scale developers implement circular regenerative principles on building and/ or neighbourhood developments.

Trees to high-value wood products portfolio

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Alternative tree species, innovative wood products and technologies are struggling to gain market share (and investment) while high-value wood is imported to fulfil internal market demand. Design and construction sector stakeholders, consumers and regulators are not confident in the quality and performance of high-value wood products. The benefits of transition to a wood-based circular and regenerative built environment and communities are little known.	Quality, performance and innovations *Delivering prosperity to our sector and communities by ensuring that our diverse exotic trees, their wood products and systems are of high quality and deliver performance and low impact over their life cycle.* *Ensuring ongoing innovation pathways and adaption of Māori technical ingenuity and practice.*	Durability pathways are developing integrating specialty species natural durability, tree genetic enhancements, wood thermo-chemical modifications together with building physics design and construction principles. Wood and wood products are modified, engineered and processed to deliver fit for in-use performance supporting new market opportunities for high-value exotic species, timber, wood processing, products and construction systems. Novel high-tech wood products for new and speciality applications are developed and prototyped. Fundamental wood science knowledge is enhanced. Scion's strategic infrastructure of scientific knowledge, data and physical facilities are maintained and upgraded for the benefit of Scion and New Zealand.	Genetic and breeding stakeholders deploy trials of diverse tree species. Wood processing and manufacturing industry partners are commercialising new high-value wood products and innovations. Local council building authorities accept alternative solutions based on building physics and timber design guidelines. Building Code and ASNZ Standards include a variety of performing products and species.	Regulation enables industry implementation of wood-performance-based genomic selection methods and market deployment. Wood processing and manufacturing industry process high-value products from alternative species at increasing scale and capacity. Large housing developers transition to wood-based construction medium density housing.	The forest and wood product sectors are fulfilling the increasing internal demand for specialist timber through a variety of products and species. Export markets increase demand for New Zealand brand high-value wood products and innovations. Wood is the market's material of choice for low-carbon and healthy buildings.

Trees to high-value wood products

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
The holistic value of an integrated New Zealand forestry-wood products value system is largely unknown. This limits the opportunity to capture higher value for the sector. The wider regulatory system needs to enforce quality control and best-practice towards goals and incentivising value-added products and solutions.	Removing barriers and enabling higher values through partnerships *Mapping the holistic value flows across the forest-wood community value system, identifying interdependencies and opportunities to deliver higher-value through circular regenerative approaches.* *Partnering for change, to remove barriers and create the right context – industrial, market, regulatory, educational, economic and socio-cultural – for transitioning to a wood-based, low-carbon, circular and regenerative future.*	Forest-wood-community circular values-system are mapped linking the forests, the products and the people. Forest-wood-community circular values-system interdependencies and socio-economic and environmental values flows are defined and modelled. New sector partnerships for change are developed, supporting cross-industries initiative to enable higher-values across the forest-wood-community-value system. New policy and decision making are supported by robust science outcomes and data at all stages, supporting transitions to circular biobased forestry, wood processing, timber construction and low-carbon built environments. Te Tiriti & Te Ao Māori pathway approaches are co-developed or adopted specific to supporting new opportunities for Māori to develop healthy and sustainable homes from trees grown, owned and processed by Māori on whenua Māori. Co-creation, participatory action, and co-innovation are developed or adopted to enable education, awareness and community engagement towards transition to the wood-based circular bioeconomy.	Regenerative forest and products labelling inform consumers choice. Industry adapts plans and procedures based on holistic value stream modelling. A NZ Timber Design Centre supports sector, regulators and end-users providing knowledge and education. The industry sector accounts for temporary carbon storage in construction wood products.	Policy makers adapt plans and procedures based on holistic value stream modelling. Local and central government provide regulation and incentivise wood construction. The forestry, wood processing and timber design and construction associations are confederated.	The value of diverse exotic forests and wood products is harnessed by the sector stakeholders and celebrated and preferred by our society. New Zealand is recognised as an international leader/ hub for carbon-positive wood architecture, built environment.

Distinct value indigenous wood products portfolio

Vision: Amplifying innovative indigenous value chains to deliver distinct value wood products for the wellbeing of Tāne and his children.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Via the forest, manufacturing and construction industries we aim to: • Increase GDP by $10 billion through low emission, forest diversity, timber products and sustainable and healthy communities. • Reduce CO_2 emissions by 1 million tonnes from the adoption of circular principles.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Historic over-exploitation and conservation lobbying of our indigenous wood forests has fuelled anti-harvest sentiment, low social licence, and is limiting freedom to operate. The tools of policy, regulation and incentives have been roadblocks for Māori and private landowners. The risk management and sustainability of these forests are not prioritised. The Treaty of Waitangi promised undisturbed possession of the forests to the chiefs of the time, but they were annexed by legislation and regulations – UNDRIP, Wai262, recommendations support indigenous licence as critical to wood trading, genetic improvement and breeding. Indigenous forests represent 0.05% of New Zealand's national annual forestry harvest. R&D spend on indigenous wood products is less than 1%. The price per cubic metre is more than pine and local diversity mitigates risk – we need to rethink. The quantity and quality of indigenous wood resource on Māori and private land is not well understood, and we lack improved (resilient, productive) indigenous stocks.	Scalable indigenous forest-to-wood product paradigms from a Māori perspective are established. *Values-based modelling to create the building blocks for integrated indigenous value chains at scale.* *Productive, harvestable and distinct indigenous forests - regenerative place-based and whole value chains that reflect Māori aspirations and approaches.*	National resource stocktake informs several scaled provenance forests with digital fingerprints. Modelling a system for multi-management regimes (with and without other land uses) and enabling bio-origin tree breeding capabilities. Establishment and growth models for planting and deploying indigenous species. Two optimised indigenous wood value chains operating at a regional or national scale. Demonstrating the theory on multi-use ngahere farms.	People are investing in new indigenous forest afforestation and transitions and are welcoming new business to regions. Māori and private landowners have pathways and tools to transition to indigenous (or mixed) forestry models. Landowners are propagating seedlings sharing seed systems knowledge. Trees are being planted at scale on underutilised land. Greater understanding and evidence for planting indigenous species for resilience and productive purposes.	People embrace trees as living enablers, and we are exceeding New Zealand's planting goals. We see diversified forests and landscapes. We operate in diversified sectors and benefit flows back into these forests and landscapes. Value chains from indigenous forests and ngahere Māori and productive indigenous forests are leading the sector and fortifying the multiple values and purposes of indigenous forests. Indigenous permanent production systems are highly valued.	>15% of production forestry stocks are fast-growing indigenous species. Existing and new indigenous wood forest systems are futureproofed with the latest technology, methods and new tools. Other productive sectors have been integrated and are being driven by values and system flows. A national indigenous forestry strategy prioritises intergenerational forestry outcomes for New Zealand. New Zealanders are experiencing multiple direct and indirect benefits and values from indigenous value chains at local, regional and national levels.
	Provide research and evidence for an environment that enables productive indigenous forestry and demonstrates a transformative future for holistic and intergenerational wellbeing. *Develop a framework for productive indigenous forestry and forest-to-wood product to appropriately value and support a different intergenerational model of wellbeing in a forest-based circular bioeconomy.*	A theoretical economics and distributions framework for long-term stocks and flows. Papers providing research and evidence to inform policy discussions to better enable sustainable and regenerative approaches in productive indigenous forestry.	Cross-collaboration and support for an intergenerational economics theory embedding Māori systems perspectives through the production, finance, investment and property sectors. Collective buy-in by key actors to build and reinforce a productive indigenous forestry sector, led by Māori.	A policy and legal environment is in place that enables productive indigenous forestry at scale, while ensuring forest-stocks are replenished in a regenerative and virtuous cycle. Productive indigenous forestry is an accepted part of the forestry sector and part of a positive reinforcing holistic (and economic) cycle. People are motivated and attracted to work in the productive indigenous forestry sector. Forestry-based circular bioeconomy provides greater self-sufficiency at small and farm scales in communities and regions.	Resilient communities are based on holistic wellbeing and values within a forest-based circular bioeconomy, with greater levels of social cohesion, community-building and reciprocity. Māori values lead (and are part of) an integrated system and inform the forest-based circular bioeconomy and how it is implemented in New Zealand and globally. The world is working within planetary boundaries as global intergenerational priorities expand.

Distinct value indigenous wood products portfolio

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
	Multiple values are provided from and embedded in new and existing indigenous wood products. *Establish and facilitate an independent distinct value in-market product incubator to grow community, domestic and export markets for a range of indigenous wood products for construction and non-construction wood purposes, including for distinct Māori value (e.g. cultural purposes).*	Distinct and high value demonstrated and embedded as a premium on indigenous wood products (bio-origins and credentials). New knowledge and science generated about the characteristics of indigenous species and their potential applications (spec catalogue). Resilient distinct value markets and value chains characterised.	Pathway and roadmap to innovate indigenous species to distinct and high-value wood products and technologies. Highly praised appearance and exterior wood applications are being used in the built environment.	Futures lab concept established for innovating and de-risking indigenous wood product applications and markets. An intergenerational wood products movement is driving a sense of pride through communities. Architectural and design awards are being won in distinct value categories. Consumers feel a high sense of contribution to New Zealand through indigenous wood products. Tohunga Whakairo are driving values and information about wood products. Values-based industries are defining the way of the future.	Futures lab has successfully established a process and market to discover and pathway innovative indigenous wood products and technologies to successful application or to markets. A consumer's life is enhanced, and society is improving because of wood values. All New Zealanders appreciate the multiple values that indigenous forests and wood products provide. Led by multi-use ngahere products, forestry champions the meaning behind distinct value New Zealand indigenous forestry and wood products.
Cross cutting research outputs and impacts	Delivery of collaborative research across impact areas, providing transformative leadership to create a sustainable future for all New Zealanders and Māori.	Good practice guidance developed from Scion research to practically guide and inform landowner decision-making. Published papers, reports, manuscripts, and articles to demonstrate thought leadership in indigenous forestry and transformative approaches to test system-level change towards a circular bioeconomy.	Scion research informs decisions and investment in productive indigenous forestry and pathways to a low-carbon forest-based circular bioeconomy Communities, landowners and industry trust Scion's expert and referent position in the forestry sector.	Values-based industries are defining the way of the future.	Scion's thought leadership is making a positive collective impact on New Zealanders and Māori wellbeing within a low-carbon forest-based circular bioeconomy. Led by multi-use ngahere products, forestry champions the meaning behind distinct value New Zealand indigenous forestry and wood products.

New value digital forest and wood sector portfolio

Vision: Transforming our forest and wood product ecosystem in New Zealand through digitisation and automation enabling new players, platforms and jobs.

Critical Issues	Programmes	Research Outputs to 2030	**Contributes to: Via the forest, manufacturing and construction industries we aim to:** • **Increase GDP by $10 billion through low emission, forest diversity, timber products and sustainable and healthy communities.** • **Reduce CO_2 emissions by 1 million tonnes from the adoption of circular principles.**		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Current and future markets are uncertain as demand and supply fluctuates and inventory flows are hard to visualise in a disconnected productive forest and wood processing system.	Supply chain connectivity *We will enable a smart connected supply chain for the forestry and wood products sector by enabling visibility of wood flows to market, predictive modelling and traceability.*	Developed an advanced forestry inventory model at national scale. Developed a model of the current supply chain. Developed predictive models for new supply/ value chains.	Regional wood flow variation and side stream potential is realised. A connected view of information flow in the New Zealand forestry supply chain allows industry to identify automation opportunities.	A dynamic wood flow model at national scale allows full visibility of the forest inventory for government. Data traceability through forestry supply chain drives automation and protection for industry.	Measurement, monitoring and evaluation of productive forest at scale drives sustainable practice. New entrants into the forestry and biobased products sector have a baseline to assess supply chain and market. A national view of forest inventory unlocks planning and modelling at scale and offers greater protection for our natural capital.
Simulation and modelling of change agents such as climate change, biotic, abiotic and economic risks as it contributes to productivity is not easily accessible or available.	Intelligent forestry systems *We will bring together data and intelligent analysis to visualise New Zealand's national productive estate and simulate change under current and future conditions using deep learning delivering digital forest experiences through mixed realities.*	Developed national scale, spatial, change simulation model under different conditions. Developed 3D models using synthetic data generation and 3D generative techniques. Developed decision support models at individual tree level and next generation productivity models.	Foresters have the ability to predict and forecast productivity and risk at scale spatially. Forestry has an agreed data collaboration approach to drive sector innovation.	A national scale risk modelling platform for forest growers drives decision support. Real time data from national scale sensor informs new real time risk and productivity models.	A national 'digital twin' of productive estate to simulate growth, assess risk and productivity. A public/private national scale productive forest risk, inventory and health decision support platform.
Precision forestry and manufacturing methods and interoperability are well underway but have not been operationalised as knowledge has yet to be scaled up and scaled out.	Precision forestry at scale *Using advanced tissue culture methods, matching best genotypes to the site environment through phenotyping and managing lifecycle through precision management we will transform the way forestry industry selects, plants, manages trees.*	Developed an advanced single tree phenotyping platform. Developed precision embryo selection protocol using machine learning/adapted fluidics systems. Advanced single tree characterisation methods. End-to-end precision tree management model including wood quality post-harvest.	Data sharing across industry partners drives greater collective knowledge. Technology has enhanced selection of best genetics to aid growth.	Individual tree characterisation methods transferred to industry enable precision management, inventory and estate valuation services. Cultural identity of Māori forests are fortified through cultural phenotyping. This drives right tree, right place, right purpose on Māori land.	An automated health assessment platform delivers more precise forest inventories alongside improved silviculture using individual tree methods.
The scale and remote nature of forestry breeds greater health and safety risks which leads to labour and skills shortages and a need for new ways of working through digitisation and automation.	Future-proofing forestry *Digital-led forestry and wood processing transformation to support the existing workforce and attract new people into highly skilled, safer jobs, that lift productivity, job satisfaction and environmental outcomes.*	Innovating towards future silviculture and harvesting systems. Digital nursery demonstration scale at Scion. Modelling risks and benefits of mechanised/ automated technologies. Informed technology policy/regulation.	Three automated log sort yards in operation drive efficiency. Experiential education upskill supports existing workforce and attracts new people into jobs.	Forestry futures lab showcase jobs, tech, skills for forestry and wood processing.	75% of forestry silviculture and harvesting now mechanised or automated for enhanced productivity. Greater precision, mechanisation/ automation increases forest carbon value by $1.35 billion and net present value of timber by $479 million.

Establishing indigenous forests portfolio

Vision: Enabling New Zealanders to recloak the whenua by helping to establish indigenous forests so that these forests will be resilient and thrive, bringing health, wealth and wellbeing to communities, ecosystems and the environment.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Via permanent standing forests we aim to achieve: • 100% increase in afforestation of highly erodible red zone land. • Converting 30% of underutilised Māori land to standing forest plantations. • 80% increase in forested area managed to enhance soil and water resources, biodiversity, landscape resilience. Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Propagation methods for indigenous tree species are needed that are cheaper, more reliable and sustainable. These methods must consider Treaty obligations. We need to plant at scale to establish a large area of healthy and resilient indigenous plants to meet government goals. Guidelines, tools and methods are required to grow and site indigenous forests now and for future generations. Multi-species multi-age forests have a whole new complexity where we need new adaptive and active ways to support all future uses and climate outcomes. Under-storey or pre-canopy value chains are limited, and their potential is under-realised. Māori rights and interests have not been adequately enabled and the potential is yet to be realised.	Indigenous plant production at scale *Māori-led and kaupapa research.* *Co-developed seed orchard, screening and breeding methodologies for indigenous trees.* *Seed, plants and nurseries at scale.* *Facilitating nurseries at all scales – large, medium and small.* *Case studies, tools, methods, workshops, capacity and capability building.*	Healthy, cost-effective and sustainable plant production methods at scale improved and developed. Co-developed seed orchard and breeding methodologies for indigenous trees. Māori nursery protocols, frameworks and tikanga enabled.	Propagation protocols and plant quality metrics for indigenous forest plants are adopted. Māori-nursery collective is established. Solutions mitigating the limitation of seed supply are developed. Strategic partnerships are established between Scion and Te Uru Rākau, Māori, Whenua Oho, DOC, Manaaki Whenua, NZPPI, Tānes Tree Trust and Pāmu.	A productive, financially viable and thriving indigenous forest nursery industry is established. Māori-led indigenous forest initiative is launched. Co-developed active forest breeding programmes with sovereignty solutions are implemented.	Indigenous nurseries are producing high-quality forest plants in a way that is more sustainable and circular. Large-scale propagation of indigenous forest plants results in the Government's goal of planting 300,000 ha by 2035 being on track.
	Smart establishment of indigenous forests *Best practice establishment of indigenous forests- now and under climate change.* *Māori-led and kaupapa research.* *Mapping biogeographical zones with climate change towards sensible ecosourcing.* *Case studies, tools, workshops, capacity and capability building.*	Create site species matching tools for indigenous species with and without climate change. New forest establishment and management regimes developed for different sites, scales and purposes. Frameworks are developed for informed ecosourcing.	Demonstration forests are planted on Māori, Pāmu and other land. Māori-led forest methodologies and frameworks for propagation are enabled. Indigenous forest plantings are successful, and more land is being planted.	Siting of new indigenous forests across different eco-zones with and without climate change is being actively adopted by landowners.	Co-developed appropriate active forest management systems are being implemented by forest industry and landowners. A national seed ecosourcing system is established.
	Establishment of complex indigenous forests. *Testing and piloting new types of complex planted forest.* *Active and adaptive forest management.* *Complex forest modelling.* *Inter-cropping value chains and taonga species.*	Active and adaptive forest stewardship championed as a living method of ecosystem management. Inter-cropping and kaupapa-led under-storey taonga species identified for multiple uses and described.	New permanent forest systems have been designed and demonstration forests are planned for establishment. Strategic partnerships established between Scion and Māori, DOC, Pāmu and Te Uru Rākau.	New designed permanent forest systems have been designed and demonstration forests are being established. Communities are using example plots as blueprints for planning their own forest establishment.	New Zealanders are embracing the benefits of planted indigenous forests, and more forests are planted to create wildlife corridors, to protect water and to improve human health and wellbeing. Highly erodible and vulnerable land is protected from further degradation through new forests established using regimes from this programme. The prevention of economic loss from erosion is quantified and recognised, Resilient rural communities with attractive career opportunities.

Restoration, protection and mauri o Te Waonui a Tāne portfolio

Vision: Ko te whakahaumanu, ko te whakamaru, ko te mauri ora o te waonui me te ao tūroa: Restoration and protection of indigenous forests for intergenerational prosperity and perpetuity.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Via permanent standing forests we aim to achieve: • 80% increase in forested area managed to enhance soil and water resources, biodiversity, landscape resilience. • 100% increase in the use of forests for human health and wellbeing. • 100% increase in the value of Māori standing forests with maximum carbon net returns defined by landowner values.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
Single factor focused solutions do not address the complexity and holistic nature of the biophysical systems and biocultural relationships with Te Waonui a Tāne. Associated research, science and innovation is often led by dominant worldviews and does not access the opportunities of indigenous knowledge systems.	Ecological wellbeing *Kia Ora te Waonui*	Together with Māori partners, develop a set of projects that value Te Ao Māori worldview, enriching Aotearoa ngahere knowledge depth and data through methods largely unexplored by science. Māori-centred approaches that enable capacity, capability and leadership in ngahere ecosystem science, innovation, priorities and initiatives.	Kaitiakitanga approaches to environmental science. Enabling Māori- led and co-developed research projects resulting in increased ngahere knowledge, culturally appropriate responses and improved ngahere health.	Contributed traditional ecological knowledge has resulted in meaningful data and implementation strategies, practices and protocols resulting in resilient ngahere biodiversity and ecosystems.	An ecosystem approach to ngahere health and biodiversity. Te Ao Māori ecosystem concepts are understood as complementary and have developed opportunities for increased environmental and human wellbeing outcomes, locally, nationally and internationally.
New Zealand's unique indigenous forest ecosystems are under ongoing increasing stress from multiple factors (abiotic/biotic threats, e.g., climate, pests, insects, pathogens, land use, human impacts). An absence of a Te Tiriti approach has resulted in missed opportunities for new and novel solutions to improving forest ngahere health.	Protect indigenous forests *Whakamaru Ngahere*	Methods, protocols and tools to effectively quantify and prioritise existing and new pests and pathogens that pose a threat to our ngahere. Predicting extreme fire; integrated fire experiments; preparedness for wildfire; safeguarding indigenous ngahere; smart firefighting tools. Socio-ecological research to better inform local and national organisations and agencies strategies and policies. Climate change and bio-protection research, framework, strategies and approaches for local, regional and national inclusion. Tools and technologies to support New Zealand to make informed climate and biosecurity (aggregated) risk decisions.	Reduced likelihood of new pest establishment through increased knowledge, tools, and network collaborations. Activating innovative and meaningful participatory approaches to connect with Māori and community through ngahere research that delivers impact. Flammability knowledge and dataset baselines with multi-factor risk modelling for New Zealand landscapes and conditions.	Reduced impact of established pests through partnerships and delivery of advice, actions and tools for community, tangata whenua, local and central government. Database of contributing risk factors (climate, wildfire, pests, pathogens, weeds) enabling agencies to build (past), present and future combined risk, climate and carbon scenarios.	Strategic collaborative approaches, new technologies, partnerships to protect against the impacts of abiotic and biotic threats to indigenous ngahere and forests not intended for harvest purposes. World leading predictive extreme wildfire and atmospheric knowledge and new mitigation options. Tangata whenua, community and industry research co-development through trusted relationships for improved end user implementation. Government, tangata whenua and private landowners can make informed decisions with aggregated risk modelling. Carbon stores protected.

Designing forests - Mahi tahi whaihua portfolio

Vision: Designing forests to meet the needs and values of communities that restore and enhance New Zealand's natural capital, delivering sustainable and resilient ecosystem functions and equitable outcomes over generations.

Critical Issues	Programmes	Research Outputs to 2030	Contributes to: Via permanent standing forests we aim to achieve: • 100% increase in afforestation of highly erodible red zone land. • 8 million tonnes increase in sequestered above and below ground carbon storage in new forests. • 80% increase in forested area managed to enhance soil and water resources, biodiversity, landscape resilience. • 100% increase in the use of forests for human health and wellbeing.		
			Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
New Zealand's economic base, including the primary sector and tourism, is directly reliant on a healthy productive environment. Exploitation beyond what the natural resources can sustainably support undermines the systems that depend on it. Climate change biodiversity loss, soil and water quality, changes to pests, diseases, increased fire and other threats are interconnected yet typically addressed in isolation. Holistic response and systems-level change are needed. Carbon stored in forests, particularly forest soils is at risk of loss due to climate change. Any shift in forest carbon fundamentally alters system ecology and function, changing our soil and water quality, biodiversity and net productivity. The rural sector is often operating as fragmented, vulnerable, individual components, leading to unsatisfactory outcomes for communities, environments and the sectors themselves. Urban centres are critical zones where sea-level rise, heat waves, coastal pollution, waste and storm water discharge, most strongly impact people, infrastructure, and coastal margins.	Complex forests systems *Recognising multiple, rapid changes impacting forests, changing needs and expectations of forests and enabling solutions.*	Enabled decision making based on amalgam of information, spanning empirical data to cultural value-based systems. Natural capital valuation tool that can enable holistic planning and decision making when considering types and placement of trees and forests in New Zealand. Entirely new areas of ecological understanding of complex forest behaviour and function that is needed to protect forest multifunctionality and resilience in changing conditions (spanning pests, diseases to climate shifts).	Growth and ecosystem service data layers are established for a range of exotic and indigenous plants. These publicly available layers assist in informed planting decisions. Long-term trials are established to understand how the ecology of complex forest systems function in changing climate. These trials serve an outreach and demonstration purpose.	A natural capital framework is in place to enable equitable and long-term decision making on land use options. Complex forests are increasingly being established for their resilience to pests and climate change. These complex forests have bespoke portfolios of ecosystems functions. These forests avoid the perverse outcomes of planting for a single function, e.g. carbon storage.	Forest systems across New Zealand are regenerating natural capital across the physical, social, human, financial and cultural domains, providing a safe, prosperous, equitable future for all. Complexity of species and management enables New Zealand's forest systems to be resilient to abiotic and biotic threats while sustainably delivering a mixed portfolio of ecosystem functions and meeting the specific needs of each community.

Designing forests - Mahi tahi whaihua portfolio

Continued

Critical Issues	Programmes	Research Outputs to 2030	Impacts delivered with our partners		
			Short term (1-5 years)	Medium term (~ 10 years)	Long term (~ 20 years)
	Carbon secure forests *Simultaneously meet New Zealand's climate change obligations and protect, sequester and retain carbon.*	Carbon budgets and sequestration rate predictions for diverse range of tree species and forest types under varying climate scenarios. Capacity for holistic carbon accounting, capturing carbon's full value in supporting natural capital. Innovative designs of climate smart forest systems that protect forest carbon stocks for generations.	Quantify carbon budgets for exemplar production and native forests, including root, soil and subsoil components. This information informs and updates New Zealand's ETS and carbon accounting schemes. Release a new framework that reconceptualises carbon in terms of its role in delivering ecosystem functions and supporting natural capital.	Sensitivity of forest carbon balance to ecosystem change is mapped under different climate scenarios; Risks to ecosystem functions understood, quantified to enable mitigation planning. Novel methods for forest soil carbon stabilisation are established and forests are planted to store carbon in perpetuity.	New Zealand forests remain a carbon sink, enabling New Zealand to meet zero carbon ambitions.
	Resilient landscapes *Integration of trees into natural and managed landscapes for a diverse range of purposes.*	Design options operating across spatial scales that can integrate trees and forests into farm systems and landscapes for specific needs, e.g. water quality, soil stabilisation, or biodiversity. Tools and approaches available to protect iconic landscapes, sensitive catchments and other valuable whenua from degradation.	Key barriers to integration of trees onto farms and landscapes identified and communicated to all stakeholders. Strategies to overcome these barriers co-developed. New tools and knowledge deployed that are enabling purposeful integration of trees into natural and managed landscapes to meet range of purposes.	Complex forests are in place providing diversity of income and jobs, stabilising hill slopes, keeping topsoil in place, and protecting watersheds. Landscape values and functions are restored and preserved. Specific community needs for trees and forests are met, e.g. soil stabilisation on erodible land.	Landscapes and farms have been transitioned from vulnerable individual components into connected, complex and resilient systems.
	Urban forests *Trees as green infrastructure, enabling healthy and connected communities in urban environments.*	Informed community and council/regulatory decision making and policy for urban forestry to protect infrastructure, properties and communities from sea level change, storm events, winds and other adverse events. Enabled modelling of trees in urban environments for scenario projection, engagement and education allowing for placing of the right trees for the right purpose.	A National Urban Forestry Strategy is released highlighting risks and opportunities for trees in urban centres and providing guiding principles for design of urban forests around community needs. Education packages for schools and other learning centres are in place.	Increase in canopy cover in major urban centres results in enhanced community health and wellbeing, lower insurance claims for storm events, greater biodiversity outcomes and significantly improved water quality. Communities are digitally connected to their urban forest, engaging them in tree health, urban resilience and shared outcomes.	Design of trees into urban ecosystems provides a multitude of benefits to infrastructure and communities, particularly for climate change resilience, biosecurity and biodiversity, water quality and reducing inequality.