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Ministry for the Environment
Via online submission

Re: New Zealand's Second Emissions Reduction Plan

Tēnā koe,

As the Government's consultation document sets out, current policies and plans see New Zealand broadly on track to meet the emissions budget for 2026-30 necessary to keep on a pathway to meet its 2050 net-zero targets.

However, we see some particular – and growing – risks from the policy pathway set out in the ERP2 consultation, and strongly encourage a policy pathway that enables significantly greater ambition in the third and subsequent budget periods. As the Climate Change Commission has noted, achieving the second budget is facing increasing headwinds from: a growing share of transport and energy emissions as economic growth picks up; low hydro generation requiring higher than expected generation from coal and gas; and from ongoing delays in technology and policy to support on-farm emissions reduction from the agricultural sector.

While a focus on achieving net emissions at least cost will reduce near-term costs to the economy carbon pricing, it makes longer-term action increasingly more challenging. ERP2 needs to signal a much clearer focus on reducing gross emissions.

Forestry and the forest-based bioeconomy are fundamental to New Zealand's low-carbon economy. As well as being the only current economically viable option for increasing removals of CO_2 from the air, forests – exotic as well as indigenous – are a source of sustainable biomass to store carbon in meaningful timeframes and at scale, and to actively support the decarbonisation of other parts of the economy including a range of energy demands and product substitution. Forests offer significant other benefits including improving soil and water quality, reducing erosion, and supporting greater biodiversity, particularly compared to pasture.

While opportunity for significant additional decarbonisation in the second budget period is relatively small with current policies, ERP2 needs to set a trajectory for greater ambition in subsequent budget periods.

Achieving New Zealand's net zero targets will need a stronger focus on reducing gross emissions, particularly in energy and transport, and from land-use changes in the primary sector. While ERP2 suggests NZ is broadly on track to meet short-term budgets, emissions planning needs to set a clear direction for greater and more urgent progress in meeting subsequent budgets. The second budget is within reach, but the interim projections set out in the ERP2 consultation document show that with current policies New Zealand may miss the third emissions budget by around 17 Mt CO_2-e[1].

Scion is working on innovations that can help close this gap, grow New Zealand's regional economy, and help the forest-based bioeconomy contribute to the government's objective of doubling the value of New Zealand's exports by:

- Doubling the contribution of future forests to reported emissions removals (CO_2 and methane) including by forest soil;

[1] Table 2.2 of the consultation document sets out interim projection of net emissions for the third budget period is 257 ± 29 Mt CO_2-e, compared to an emissions budget for the period of 240 Mt CO_2-e.

- Replacing 50% of steel and concrete in buildings with advanced timber engineering, reducing emissions by 5 Mt CO_2-e over the budget period;
- Reducing emissions from process heat by 0.4 Mt CO_2-e by using biomass to replace coal and gas, with greater emissions reductions possible subsequently depending on technology and policy support. This would have the dual benefit of further reducing effect of gas supply in our energy sector;
- Replacing New Zealand's annual demand for fossil-based polyethylene with bio-based polyethylene, which could reduce emissions by 2.8 Mt CO_2-e over the budget period (0.56 Mt CO_2-e per year);
- Using experience from establishing production forestry to significantly reduce the cost of indigenous afforestation at scale. The New Zealand forestry sector has decreased costs of establishment – including post-planting survival and production – for *Pinus radiata* by close to 70%. With effort and investment, similar cost reductions could be possible for indigenous afforestation at commercial scale.
- Developing short-rotation forests, managed for energy, have potential to provide around 40 PJ of primary energy. If that energy was derived from coal, it would equate to around 3.8 Mt CO_2-e of avoided gross emissions.

With that in mind, rather than addressing individual questions from the consultation document, we make the following comments that are more directly aligned that the work Scion can do to help meet New Zealand's net-zero 2050 target with greater focus on reducing domestic emissions, and to help grow New Zealand's low-carbon economy.

1. ERP2 should set a clear pathway to encourage use of forest and other biomass to help decarbonise other parts of the economy,

ERP2 needs to fully enable the economic opportunity from the transition to our low-carbon future. As seen elsewhere in the world, forestry and biomaterials are vital to that shared global goal, we want to make sure that ERP2 is focused on significantly increasing the amount of carbon our forests are taking out of the atmosphere. But more importantly, we need that carbon to be significantly contributing to reducing our gross emissions, leaving fossil carbon in the ground by decarbonizing hard-to-abate emissions in energy, transport, and the biomaterials needed to grow our economy.

Opportunities for bioenergy from forest biomass are significant. This could be from existing residues either in-forest, or through processing logs for timber. Not all residues are available for the bioeconomy. Some forest residues are important for forest and soil health but some, totalling several million tonnes can be utilised. Likewise processing residues already provide a significant energy source for timber and pulp/paper production, demonstrating that further contributions to reducing emissions from coal and gas can be achieved.

However new forest types, particularly short rotation forests managed for energy, have potential to provide around 40 PJ of primary energy. If that energy was derived from coal, it would equate to around 3.8 Mt of CO_2-e gross emissions avoided. Our modelling shows that short rotation forestry as a feedstock for bioenergy has the potential to replace 6% of New Zealand's annual fossil fuel demand from less than 1% of the land area. This work shows that short rotation forestry should be established on lower value land (LUC 5-7) in locations where transport distances to processing locations can be minimised, and where land is suitable for intensive management. We are already working with the Ministry for Primary Industries (MPI) on developing designs for forest bioenergy trials. These trials will involve rigorous testing of growth rates, optimal density, and tree health for different species, including *Pinus radiata* and eucalyptus varieties.

In the built environment, replacing 50% of concrete and steel with timber would reduce emissions from new buildings by 1 Mt CO_2-e each year. Approximately half of this would come from carbon embodied

in the timber, with the remainder from reduced emissions from steel and concrete production. There are significant emissions reduction opportunities from building use. The New Zealand Green Building Council estimates policies to improve the energy efficiency of our buildings can reduce New Zealand's emissions by 6.1 Mt CO_2-e between 2026 and 2030, accumulating to 93 Mt CO_2-e by 2050).

ERP2 could support significant opportunity to reduce CO2-e emissions associated with materials and product use. For example, replacing New Zealand's annual demand for fossil-based polyethylene with bio-based polyethylene would reduce emissions by 0.56 Mt CO_2-e per year (2.8 Mt CO_2-e over the budget period). These bioplastics are made by fermentation from a range of feedstocks which can include sugars, gasification of biomass, geothermal gasses. Similar reductions from other bioplastic substitutions are possible.

ERP2 outcomes could usefully support and draw from proposed changes to regulations around gene technology in New Zealand, which could help optimise productive and efficient use of purpose grown biomass. We are working with international collaborators to develop 'trees designed for deconstruction', with biomass that is significantly quicker and requires less energy to process. For instance, one of the key obstacles to extracting sugars from biomass is a complex polymer called lignin. Lignin is a major component of plant cell walls and gives plants their structural integrity. It is the most difficult part of the plant to break down. It is possible to introduce weak bonds, or "zips," into the lignin polymer, to make biomass much easier and cheaper to break apart for use in bioenergy and advanced biomaterials. Trees modified to produce zip lignin could be a key component to drive decarbonisation and grow demand for forest-based biomaterials for New Zealand.

Using forest and other biomass to decarbonise the economy will require significant new investment in wood processing

We strongly support the focus boosting wood processing, and we welcome the commitment to give wood processors longer-term market certainty to invest in production and innovation as boosting domestic production will also result in additional residues to be used in the decarbonisation of our economy as well as a locking more carbon away in long life wood products.

The Wood Processing Growth Fund can be an important part of that, supporting a shift to greater production of the higher-value timber products needed to displace high-carbon alternatives – steel and concrete – from the built environment.

Scion is actively collaborating with key partners in the wood processing sector to optimise use of high-value timber and wood products in New Zealand. We are also working with partners in the construction sector to leverage expertise in timber and hybrid building design to promote sustainable architecture and urban development, ensuring that wood-based materials significantly contribute to sustainable, resource-efficient homes that seamlessly integrate with the built environment.

Forests and sustainable biomass are New Zealand's superpower to decarbonise a growing economy

While New Zealand is on track to meeting its second emissions budget, it will need significantly greater effort focussed on net emissions reduction at home to reduce the cost of meeting the first and subsequent Nationally Determined Contributions (NDCs) under the Paris Agreement. The second emission reduction plan needs to reflect and encourage that ambition.

Forests are at the heart of New Zealand's climate change response. Carbon uptake by forests is the only viable and cost-effective technology New Zealand has to remove CO¬2 from the atmosphere and achieve our net-zero 2050 target. Strategic use of New Zealand's sustainable biomass – our climate change superpower – is essential for New Zealand's growing a prosperous, resilient, and sustainable low-carbon economy. We strongly encourage a greater focus in the second emissions reduction plan on growing more forest, and on using this and other sustainable biomass to decarbonise other parts of the economy.

There is acute need for greater investment in the research and innovation needed to support this, and to set the trajectory of greater ambition in subsequent budget periods. As New Zealand's leading institute for forestry, industrial biotechnology and advanced manufacturing, Scion already has some of the technology needed to support the low carbon transition. This knowledge and expertise built up over the last 75 years within Scion by the New Zealand government needs to be contracted to provide the expert support needed it best enable our pathway to meet our climate commitments. We believe that there are opportunities in front of us that would grow the economy at the same time.

There are gaps in our ability to apply the knowledge we already have at real-world, commercial scale. We know what works in the lab, but there's a pressing need for investment in scale-up facilities to demonstrate that New Zealand's world leading bioeconomy innovations from across the primary sector are impact- and investment-ready. A government commitment to establish a new biopilot network would help fill that fundamental gap. This investment would see creation of an expanded network of open-access test bed and pre-commercial scale-up infrastructure with the ideas, technology, and equipment needed to transform bio-feedstocks into the new compounds and materials needed to pivot to a fossil carbon-free bioeconomy.

2. As well as having a clearer focus on gross emissions reduction, New Zealand needs to grow significantly more forest – indigenous as well as exotic – and will need to manage some of those forests differently, to help meet our net-zero targets.

Net-zero targets mean that the area of forest needed to achieve net-zero emissions depends on the level of gross emissions reduction achieved by the rest of the economy. Without greater reductions in gross emissions, New Zealand will plant more forest – and keep that in permanent or continuous-cover forest – in order to meet net zero targets.

The area of forest needed will depend on the species planted, and it is possible to achieve greater rates of carbon uptake in some places with species other than *Pinus radiata*. For instance, our modelling, based on real-world measurements of tree growth and carbon uptake, suggests carbon uptake and storage by long-term plantations of redwood could exceed that of radiata pine by up to 85% (5,203 vs. 2,808 tonnes CO_2/ha at age 100 years), making a significant contribution to net-zero targets after 2050.[2].

3. Increasing the area of indigenous forest established at scale and at pace will require significant investment in innovation to reduce the cost of forest establishment…

Current approaches to establish indigenous tree plantings show some of the same results that were experienced for plantation radiata pine in the 1970s, with relatively high post-planting mortality (around 50%) and high post-planting costs. However, a decade of research into nursery and establishment practices increased survival rates for radiata pine to ~95%, while significantly decreasing costs in the nursery and the forest[3]. More recent research has shown changes to nursery practice can enhance forest productivity for several years, increasing rates of growth and carbon capture [4]. This past research provides a blueprint to drive indigenous tree production and establishment to levels approaching radiata pine, in terms of costs and success rates, and at a much faster rate given past experience and the advent of new technology.

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[2] Watt, M. S., Kimberley, M. O., Steer, B. S., & Neumann, A. (2023). Financial comparison of afforestation using redwood and radiata pine under carbon regimes within New Zealand. *Trees, Forests and People*, *13*, 100422.

[3] Menzies,M. I.,Holden,D.G.,andKlomp,B.K.2001.Recent trends in nursery practice in New Zealand.New Forest, 22,317

[4] Smaill, S.J.; Walbert, K.; & Osorio, R. (2020) *Reduced fungicide use in the nursery improves post-planting productivity of* Pinus radiata *for at least six years*. Forest Ecology and Management, 475,118416,

Based on experience with production forestry species, investment in research and innovation to increase the success of planted indigenous afforestation could:

- Reduce the cost of planting stock through better nursery management by up to 70% at scale
- Increase post-planting survivorship though better management of soil microbes (e.g. mycorrhizal fungi)– estimated savings of up to 40% at scale
- Developing more robust planting stock with greater survival rates and initial growth, reducing the need for post-establishment care with estimated savings of up to 40% at scale

…***and in innovation to accelerate the transition of continuous cover forest from canopy dominated by exotic species to indigenous forest.***

A carbon budget to meet New Zealand's commitment to be net-zero by 2050 requires the amount of CO_2 removed from the atmosphere by forests each year to more than double within the next ten years.

Meeting that challenge will need new ways of thinking about forest management, particularly for forests established to be a long-term store of sequestered carbon. 'Plant and walk away' afforestation – of exotic as well as indigenous forests – is a sub-optimal forest management approach that risks under-achieving the potential of our forests to provide good outcomes across a range of social and environmental measures.

Not enough is known about how to optimise the transition of forests of fast-growing exotic species to indigenous forests that maximise ecosystem services like conservation of indigenous biodiversity, and soil and water quality; or about agroforestry options suitable for the 21st century.

New Zealand can become a thriving, climate-resilient, and low emissions society. Scion has a bold and ambitious vision for a productive and sustainable low-carbon future to Aotearoa New Zealand, with the science and innovation need to help lead the transition to a circular bioeconomy. Scion looks forward to being part of that journey and stands ready to provide additional input as the Emissions Reduction Plan continues to take shape.

It is time now to invest in solid science, technologies, options and tools to position New Zealand as a global leader by 2050,

Dr Julian Elder
Chief Executive