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SCION
FORESTS ▪ PRODUCTS ▪ INNOVATION

24 November 2021

Emissions reduction plan consultation
Ministry for the Environment
Manatū Mō Te Taiao
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Climateconsultation2021@mfe.govt.nz

2021 Draft Advice for ERP Consultation

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Scion's key points are:

1. **Aotearoa New Zealand needs to significantly increase its effort to reduce emissions, and the Emission Reduction Plan needs to reflect that.**

    - New Zealand needs to work hard to reduce its gross greenhouse gas emissions and make significant changes to New Zealand's economy to help Aotearoa keep the world on a 1.5°C pathway.

2. **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. It makes sense to focus on domestic action first: if our net-zero targets rely on forestry offsets, we need to invest in New Zealand's future and generate those locally rather than buying them offshore.**

    - Forests must be a vital part of New Zealand's climate change response. In addition to sustained and ambitious efforts to reduce gross economy-wide emissions, meeting New Zealand's 2050 net-zero emissions targets will need the planting and use of significant new areas of forest – indigenous and exotic – and a significant increase in domestic use of carbon sequestered by forests in New Zealand.

    - While reducing gross emissions needs to be the priority, even with strong reductions in gross emissions, there is a critical and ongoing role for removing CO_2 from the atmosphere by forests.

    - Forests need to be managed in ways that lift New Zealand's wellbeing as we achieve a just transition to a prosperous and sustainable bioeconomy. That will require a spectrum of action, from maintaining the significant carbon stock stored in indigenous forests managed for non-carbon ecosystem services as part of the conservation estate, maximising the productivity of forests managed primarily for their role in sequestering carbon or as a source of timber, through to the very large areas of planted production forests that are not part of the Emissions Trading Scheme.

    - But considering forests and ecosystems just in terms of ecosystem services does not adequately reflect a Te Ao Māori perspective. Concepts around whakapapa and the interconnectedness of whenua, ngahere, and people are equally important.

- Scion has interests in supporting ambition right across that spectrum so that forests can be a foundation for a circular bioeconomy.

3. Scion's biobased research and innovation can support a just transition to a circular bioeconomy.

- Scion's research and innovation is supporting opportunities for:
    - Sequestering carbon; maximising forest carbon uptake by growing the right trees in the right place, for the purpose.
    - Storing carbon; particularly through greater use of timber in the built environment, but also in standing forests that are managed for their role as carbon sink.
    - Substituting carbon; by greater use of wood products, creating value-streams in bioenergy and advanced biobased products and polymers from a range of feedstocks, including waste, substitutes for products and materials currently derived from fossil carbon or with high embedded emissions.
    - Systems thinking; 'joining the dots' in all of those, particularly from a Te Ao Māori perspective that incorporates mauri, wairua, and tapu.
    - Social systems; incentivising and encouraging behaviour change and building the 'social licence' needed to enable the significant changes needed for a just transition to a low-carbon future.

4. The Government's Emissions Reduction Plan needs to support the transition to a circular bioeconomy with policies that:

- Encourage appropriate afforestation with the right trees, planted in the right places, and for the right purpose.

- Encourage trees and forests to be harvested appropriately, encourage effective management of new permanent forests in ways that support forest resilience, increase carbon mitigation benefits and recognise and encourage their provision of non-carbon ecosystem services.

- Encourage the use of wood and other biobased materials (e.g. horticulture residues, building and construction waste, recycling product streams) as feedstocks to empower the transition to a circular bioeconomy, increasing the use and production of:
    - Wood products (solid, engineered and modified)
    - High-value timber
    - Bioenergy (solid and liquid)
    - Bioproducts (biopolymers, bioplastics, niche high-value compounds)
    - Innovative products and materials that use material currently sent to landfill as waste.

- Encourage efforts to reduce gross emissions. Restrictions on afforestation may be counterproductive to that ambition by limiting flows of the feedstocks needed to substitute for fossil-carbon intensive materials and products across the economy.

- Recognise and encourage the use of forests and wood products as part of the global carbon cycle, managing them as flows rather than stocks of carbon.

- Support the creation of jobs in regional and rural New Zealand, supporting thriving communities and digitisation providing high-value jobs for the future workforce.

- We can see the need for a more systemic approach to this transition, supported by the establishment of a National Circular Bioeconomy Solutions Centre to support the development

of a national bioeconomy strategy. This could enable the mission-led science and innovation needed to help New Zealand shift to a circular bioeconomy.

- Scion has some natural strengths in this, and there are other organisations active in this space too. We are ready to contribute to collaborative conversations to help co-design this thinking.

5. **Realising the opportunity from the transition to a low-carbon future needs a significant up-tick in mission-focussed research and innovation.**

   - Scion already has technology that has potential to support the low carbon transition, but there are gaps in our ability to apply that knowledge 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.

6. **We have focussed our advice and inputs in response to particular questions where Scion has expertise and value-add.**

   - Some of the questions posed in the consultation document are best thought of as the starting point for a conversation and will take careful thought to address in a rigorous and evidence-based way.

   - Some of the questions around possible limits to afforestation, for instance, are difficult to answer in isolation without a more systemic consideration of other changes needed as New Zealand transitions to a low-carbon future.

   - Scion stands ready to provide additional input as the Emissions Reduction Plan continues to take shape.

Yours sincerely

Dr Julian Elder
Chief Executive

Meeting the net-zero challenge: Transition pathway:

1. Do you agree that the emissions reduction plan should be guided by a set of principles? If so, are the five principles set out above the correct ones? Please explain why or why not.

Yes, principles are useful to guide action. However, we can see some gaps.

One of the principles should more clearly respond to the scale of the climate change challenge and convey a real sense of urgency about New Zealand's response to that. It is included in the fifth principle, but that principle does not reflect the degree of urgency needed to keep emissions on a 1.5 °C pathway.

Another could more clearly focus on the need for intergenerational thinking and decision-making, ensuring that New Zealand moves with urgency and intention towards our carbon neutral and carbon negative future. An intergenerational approach could help build the capacity and capability of New Zealand's long-term marginalised groups (e.g. children, youth, Māori/Pasifika women, LGBQT+), taking a long-term intergenerational view to prioritising national planning and budgets and consider how the decisions we make take away from, or add to, future generations and natural capital assets.

Another principle might be to consider how New Zealand's domestic climate change response affects, and is affected by, actions in other countries. For instance, reduced ambition in New Zealand would negatively impact on our Pacific neighbours. Domestic policies in other countries might change the cost of our own net-zero target, for instance by making international offsets more expensive. And ambitious action by New Zealand, demonstrating that New Zealand can reduce emissions across our economy, will provide an example for others to follow.

A final principle might be to focus our action domestically, particularly when New Zealand will rely on offsets to achieve its net-zero target. This will help ensure that New Zealand's net-zero target has environmental integrity and helps make sure the co-benefits of carbon offsets (e.g. employment, support for the transition to a circular bioeconomy, biodiversity conservation, etc) accrue to New Zealand.

2. How can we enable further private sector action to reduce emissions and help achieve a productive, sustainable and inclusive economy? In particular, what key barriers could we remove to support decarbonisation?

Unless discussed separately the Māori sector is included in this answer as part of the private sector.

There are several ways private sector action to reduce emissions can be encouraged, including clear, equitable and ambitious government-led action. But in the context of New Zealand's current climate response, ambitious private-sector action can be supported by making sure that supply and demand components of the ETS are well aligned. For instance, ongoing allocations to emissions intensive trade-exposed sectors of the economy can delay the incentive for reducing gross emissions. Rules around the differential treatment of pre-1990 forestry can create disincentives for wise use of forests where those forests can carry a surrender liability on harvest. This can disproportionately impact Māori forest owners who may have had pre-1990 forests included in Treaty settlements.

It will be important to think specifically what is meant by "decarbonisation". Complete decarbonisation may not be possible in all sectors, particularly in sectors where biological emissions dominate (e.g. landfills, agriculture)

Support is often targeted to enable early adopters or first movers; without the right long-term investment conditions to support diffusion of frontier technologies adopted by early movers, low-carbon technologies and actions will not become mainstream. This can be helped by government support to de-risk early-stage investment through pilot-scale demonstrations of new technologies.

Based on Scion's own experience in working with stakeholders to co-design our research roadmaps, the private sector is eager to be involved, has great ideas, can commit resources, and offers strong leadership and direction to national strategy. In exchange however they expect clarity, ambition, and commitment to action. One way to do this is via a whole of government approach to climate change with an increased level of invitation to the private sector and Māori. This Emissions Reduction Plan consultation process is a good place to start.

A key barrier we see is a lack of focus on funding and support for mission-led science and research, co-designed with the private sector, including Māori. We have key stakeholders coming to us for evidence-based support for the transition, but our core funding does not enable us to meet that demand. We will be addressing this further as part of our contributions to the government's Te Ara Paerangi/Future Pathways review process, including how this affects Māori and small business.

3. In addition to the actions already committed to and the proposed actions in this document, what further measures could be used to help close the gap?

4. How can the emissions reduction plan promote nature-based solutions that are good for both climate and biodiversity?

Nature-based solutions can be promoted by prioritising, recognising and rewarding the non-carbon benefits that afforestation can deliver. For instance, riparian planting or regenerative approaches to soil management could be valued and rewarded in addition to being given credit for carbon uptake via the ETS.

Forest systems in Aotearoa New Zealand are a continuum, from indigenous forests managed for their conservation value at one end, and exotic plantations manged for production value at the other. Nature-based solutions will need to enable the range of forest systems in between, particularly where those are on Māori land where forests support intergenerational natural capital assets such as like land, waterways, and coastlines, as well as supporting a sustainable and prosperous future. Limiting the utility and economic value for intergenerational landowners will not support this aspiration, especially for Māori.

5. Are there any other views you wish to share in relation to the Transition Pathway?

The transition to a low-carbon bioeconomy could be supported by greater transparency about future supply of feedstocks needed for ***production of a wide range of low-carbon materials. For instance, there is little information about non-wood feedstocks such as high moisture content organic wastes (effluents, biosolids, fruit and vegetable rejects, food waste etc) that could be used as feedstocks for bioenergy.***

6. *Which actions to reduce emissions can also best improve our ability to adapt to the effects of climate change?*

Future climate change impacts are likely to affect international supply chains and markets, for forestry products as well as for other important goods and services. Climate-related disruptions to those carry additional risks to New Zealand's wellbeing. Our best emissions reduction responses will be those that build resilience and adaptability in New Zealand and maintain our clean, green sustainable global brand.

7. Which actions to reduce emissions could increase future risks and impacts of climate change, and therefore need to be avoided?

Actions that are considered on a stand-alone basis without full system considerations will increase systemic risks to New Zealand. Relying on international offsets, rather than supporting domestic emissions reductions and removals, could significantly increase the costs of New Zealand's net-zero target. Likewise importing alternative fuels without consideration of all emissions along the supply chain risk making New Zealand's target more expensive to meet.

Focusing only on single species planting for carbon uptake is also risky. Biosecurity threats, the risk of wildfire and drought stress will be significant if New Zealand's carbon sequestration is focussed on a single species. Long-term planning of forest change due to climate and risk is needed so that these can be mitigated by species or age-class diversification.

Meeting the net-zero challenge: Working with our Tiriti Partners

8. The Climate Change Commission has recommended that the Government and iwi/Māori partner on a series of national plans and strategies to decarbonise our economy. Which, if any, of the strategies listed are a particular priority for your whānau, hapū or iwi and why is this?

9. What actions should a Māori-led transition strategy prioritise? What impact do you think these actions will have for Māori generally or for our emission reduction targets? What impact will these actions have for you?

We would need more time to consider a response to this question and would be happy to be part of conversations to address these issues as the Emissions Reduction Plan takes shape.

10. What would help your whānau, community, Māori collective or business to participate in the development of the strategy?

11. What information would your Māori collective, community or business like to capture in an emissions profile? Could this information support emissions reductions at a whānau level?

12. Reflecting on the Commission's recommendation for a mechanism that would build strong Te Tiriti partnerships, what existing models of partnership are you aware of that have resulted in good outcomes for Māori? Why were they effective?

We would need more time to consider a response to this question, and would be happy to be part of conversations to address these issues as the Emissions Reduction Plan takes shape, including by reflection on our own evolving partnerships and experience of working with mana whenua and other iwi in a variety of partnership arrangements.

Meeting the net-zero challenge: Making an equitable transition

The Climate Change Commission recommends developing an Equitable Transitions Strategy that addresses the following objectives: partnership with iwi/Māori, proactive transition planning, strengthening the responsiveness of the education system, supporting workers in transition, and minimising unequal impacts in all new policies.

13. Do you agree with the objectives for an Equitable Transitions Strategy as set out by the Climate Change Commission? What additional objectives should be included?

14. What additional measures are needed to give effect to the objectives noted by the Climate Change Commission, and any other objectives that you think should be included in an Equitable Transitions Strategy?

The Commission suggests that the Equitable Transitions Strategy should be co-designed alongside iwi/Māori, local government, regional economic development agencies, businesses, workers, unions, the disability community and community groups.

15. What models and approaches should be used in developing an Equitable Transitions Strategy to ensure that it incorporates and effectively responds to the perspectives and priorities of different groups?

Scion has successfully used co-design approaches to work with our stakeholders to help shape the research programmes needed to meet strategic priorities and deliver impact for Aotearoa. We would be happy to share our experiences with that.

16. How can Government further support households (particularly low-income households) to reduce their emissions footprint?

17. How can Government further support workers at threat of displacement to develop new skills and find good jobs with minimal disruption?

18. What additional resources, tools and information are needed to support community transition planning?

19. How could the uptake of low-emissions business models and production methods be best encouraged?

Low-emissions business models and production methods can be encouraged by working with business to co-design approaches and demonstrating clearly that they work, deliver meaningful emissions reductions, and support business profitability. Approaches should be evidence based and delivered in ways that ensure New Zealand businesses transitioning to new (and better) production systems remain competitive as they transition to low-emissions systems.

Scion can help with this. We have globally innovative technology to support the transition to a circular bioeconomy, including by transforming a range of bio-feedstocks into the new compounds and materials needed to pivot to a fossil-carbon-free bioeconomy. Our technology can help supercharge this innovation including in bioenergy (solid and liquid biofuels), bioplastics and biopolymers, niche high-value compounds/extracts (including nutraceuticals, ingredients), and waste/co-product re-purposing. We know these work in the laboratory but New Zealand needs to invest in the infrastructure needed to demonstrate their viability at commercial scale. Scion also has the knowledge to support the sustainable supply of forest-based biomass resources that will be required to implement the transition.

20. Is there anything else you wish to share in relation to making an equitable transition?

Aligning systems and tools: Government accountability and coordination

21. In addition to the Climate Change Commission monitoring and reporting on progress, what other measures are needed to ensure government is held accountable?

22. How can new ways of working together, like mission-oriented innovation, help meet our ambitious goals for a fair and inclusive society and a productive, sustainable and climate-resilient economy?

Mission-focussed innovation is critical to meeting and exceeding New Zealand's goals for climate change. Scion will be engaging closely in the Government's Te Ara Paerangi/Future Pathways process aiming at supporting mission-led innovation, particularly where that supports the transition to a low-carbon circular bioeconomy.

New Zealand will need a balance between innovation and science. Research can push the frontiers and demonstrate what is possible. We cannot rely only on international science – New Zealand systems and approaches are different, particularly as we include Mātauranga Māori and a Te Tiriti-led approach to a sustainable and low-carbon future.

To meet these goals the missions need longer-term predictable funding, with support towards greater partnership and participation. Missions should cover both stretch to push the boundaries of knowledge, as well as a focus on applying that new knowledge to drive impact.

23. Is there anything else you wish to share in relation to government accountability and coordination?

Aligning systems and tools: Funding and financing

24. What are the main barriers or gaps that affect the flow of private capital into low-emissions investment in Aotearoa?

New Zealand has a relatively small manufacturing base, which reinforces the need for scale up infrastructure (pilot facilities) that many countries' governments have established. This step is needed to ensure that new technologies and processes can progress from the laboratory and to an investable stage. It is the role of CRIs to help get across what is referred to as the valley of death in innovation. The key infrastructure missing in this country is the government-supported scale up infrastructure to achieve this. New Zealand has adopted a similar approach to add value to volume in the food space through the Food Innovation Network. We now need to take the lessons learned from that approach and apply them to help de-risk the investments in new technologies needed to reduce emissions and shift New Zealand to a low-carbon circular bioeconomy.

25. What constraints have Māori and Māori collectives experienced in accessing finance for climate change response activities?

26. What else should the Government prioritise in directing public and private finance into low-emissions investment and activity?

27. Is there anything else you wish to share in relation to funding and financing?

The transition to a circular bioeconomy has potential to add $30 billion to New Zealand's GDP in the next decade. Realising this potential needs a mission-focussed approach. Scion can see value in establishing a National Circular Bioeconomy Solutions Centre to support the development of a national bioeconomy strategy. This could enable the mission-led science and innovation needed to drive the investment to shift to a circular bioeconomy.

Scion has some natural strengths in this, but there are other organisations active in this space too. We'd be happy to lead some collaborative conversations to help co-design this thinking. It would align and support work already underway in the forestry and advanced manufacturing industry transformation plans.

We can see this could be kick-started with an allocation out of the landfill levy. That would be a great 'fit', as many of the solutions we are talking about are circular in nature – they include recycling, design for re-use, and development of materials that biodegrade into environmentally friendly materials if they're not sent to landfill. The Government's thinking around a new waste strategy proposal, and its thinking around expanding the scope of the levy, is strongly pointing in this direction. But we can already see scope to get this work underway. We would like to work with officials to progress these ideas

Aligning systems and tools: Emissions pricing

28. Do you have sufficient information on future emissions price paths to inform your investment decisions?

29. What emissions price are you factoring into your investment decisions?

30. Do you agree the treatment of forestry in the NZ ETS should not result in a delay, or reduction of effort, in reducing gross emissions in other sectors of the economy?

Treatment of forestry in the ETS should not delay or reduce effort in reducing gross emissions. But meeting New Zealand's net emissions targets will need a significant increase in removals of atmospheric CO_2. Establishing new forests that can rapidly capture carbon is the only way we can do this – and this will need to be done quickly at the same time as other sectors transition to much lower emissions. So, while our emissions reduction policies need to encourage significant reductions in emissions, they should also encourage high ambition in removals. The ETS is one way of doing this, but other mechanisms to encourage afforestation (e.g. recognition for non-carbon ecosystem services to incentivise planting of indigenous forest) will also need to be quickly developed.

31. What are your views on the options presented above to constrain forestry inside the NZ ETS? What does the Government need to consider when assessing options? What unintended consequences do we need to consider to ensure we do not unnecessarily restrict forest planting?

The options presented in the consultation document will require careful analysis, particularly to make sure that any constraints on the role that afforestation can play in the ETS do not adversely constrain the contribution that afforestation – including of forests that are not part of the ETS – makes to New Zealand's overall emissions reductions. We need to significantly increase the amount of CO_2 removed from the atmosphere – and quickly – and ETS changes should support that.

The ETS is not the only policy tool that can help meet New Zealand's emissions reduction targets, and there may be other mechanisms (e.g. recognising and valuing other ecosystem services such as biodiversity conservation or water quality improvement, or recognising other

wellbeing values) that could also encourage wise use of forests to quickly increase the amount of CO_2 removed. Policy around the ETS settings needs to evolve to not only support CO_2 capture, but also to encourage behaviour and activities that deliver benefit to New Zealand in addition to offsets, for example in the use of biomass to reduce emissions at source.

The Government will need to consider policies that encourage the sustainable harvest and use of forests so that carbon captured by forests is used appropriately (e.g. stored in timber construction, or as a feedstock to substitute for fossil-carbon in bioenergy or biomaterals).

32. Are there any other views you wish to share in relation to emissions pricing?

Aligning systems and tools: Planning

33. In addition to resource management reform, what changes should we prioritise to ensure our planning system enables emissions reductions across sectors? This could include partnerships, emissions impact quantification for planning decisions, improving data and evidence, expectations for crown entities, enabling local government to make decisions to reduce emissions.

34. What more do we need to do to promote urban intensification, support low-emissions land uses and concentrate intensification around public transport and walkable neighbourhoods?

35. Are there any other views you wish to share in relation to planning?

Aligning systems and tools: Research, science and innovation

36. What are the big challenges, particularly around technology, that a mission-based approach could help solve?

Transitioning New Zealand's economy from a linear economy to a circular low-carbon bioeconomy is an enormous challenge, which needs a long-term mission-focussed approach. Scion will be engaging closely in the Government's Te Ara Paerangi/Future Pathways process which is aimed at supporting mission-led innovation, particularly where that supports the transition to a low-carbon circular bioeconomy.

Based on our discussions with some of our key partners we can see opportunities for some early wins. One of those wins is scale-up infrastructure to demonstrate that low-carbon innovations that work at lab-scale can work at commercially viable scales needed to deliver impact. Our stakeholders are telling us they see this gap too, and our innovation partners tell us they struggle to de-risk the gap from innovation to commercial-scale application.

New Zealand has great ideas that work in the laboratory, in innovation streams that will help reduce emissions in solid and liquid biofuels, in new bioplastics and biopolymers, including the use of materials currently sent to landfill. A bold step would be government investment in commercial demonstration of a biomass to liquid fuels technology.

We see a significant gap in New Zealand's innovation infrastructure, which can be filled with an expanded biopilot 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. Scion has been

promoting this for some time and can see opportunity to build on the expertise located in Rotorua. A biopilot network is less about generating new knowledge, and more about re-risking investment in new bioeconomy innovations. As such, it needs a dedicated investment outside the scope of Scion's core science-focussed funding.

In addition, a bioeconomy governance framework that enables such an innovation infrastructure is required so that innovations can cross the chasm and connect or integrate into a circular system. The governance framework must provide for enhanced social connectivity alongside an implementation plan that provides for adaptive transition. Without such a framework, technology development is unlikely to become mainstreamed.

37. How can the research, science and innovation system better support sectors such as energy, waste or hard-to-abate industries?

The New Zealand science and innovation system needs to work closely with industry to better understand the challenges to supporting greater ambition in hard-to-abate sectors, and work collaboratively to find solutions to those challenges. Working on the sectors identified in the ERP in isolation is not the way to approach this because solutions for one (e.g. encouraging uptake of biofuels in light passenger vehicles) can undermine solutions in others (e.g. encouraging solid bioenergy in high-temperature industrial use). Solutions and processes developed as part of the Government's Te Ara Paerangi/Future Pathways will be essential to supporting an ambitious transition to a low-carbon bioeconomy, and Scion will be engaging actively in that process to help deliver solutions to support ambitious emissions reductions across the economy. Scion has been working in this space for more than a decade, but with the growing urgency around emissions reduction and the transition to a circular bioeconomy New Zealand needs a much stronger mission-focussed approach, supported by the sustainable long-term funding needed to drive innovation to impact.

38. What opportunities are there in areas where Aotearoa has a unique global advantage in low-emissions abatement?

New Zealand already has a head start with an electricity system dominated by renewable electricity. We can build on that by decarbonising other parts of our energy system, with more focus on other areas; biomass for coal and natural gas in process heat, and biomass to liquid fuels. Forest biomass will need to be a significant part of that, but we also need to use materials from other parts of the bioeconomy (e.g. landfill gas capture, other biomass to energy) or work on the establishment of short-rotation energy crops to help fuel this transition.

New Zealand has a significant biomass resource that is currently sold to international partners who add value to that resource in their own economies. It is worth asking whether that is the best use of that resource, and instead whether New Zealand can focus on adding value to that here, including by substitution of fossil fuel derived energy and materials. New Zealand has world-leading research and knowledge in new materials and expertise in adapting overseas technologies to our context.

39. How can Aotearoa grow frontier firms to have an impact on the global green economy? Are there additional requirements needed to ensure the growth of Māori frontier firms? How can we best support and learn from Mātauranga Māori in the science and innovation systems, to lower emissions?

These are challenging questions and need careful thought to unpack them. They seem awkwardly grouped, as growing frontier firms "to have an impact on the global green economy" seems unrelated to asking how we can "best support and learn from Mātauranga Māori". How are these things connected? To learn from Mātauranga Māori there needs to be relationships

of trust where Māori are willing to share that mātauranga and are confident that their mātauranga will be respected.

40. What are the opportunities for innovation that could generate the greatest reduction in emissions? What emissions reduction could we expect from these innovations, and how could we quantify it?

41. Are there any other views you wish to share in relation to research, science and innovation?

It will be important to make sure that any changes resulting from the Government's Te Ara Paerangi/Future Pathways reforms support an ambitious climate change response. It is also critically important that we do not wait for the Future Pathways project to unfold. The initiatives Scion has suggested throughout this submission – establishment of a national biopilot infrastructure, and a mission-focussed transition to a circular bioeconomy – should be progressed ahead of Te Ara Paerangi and can be bought into that process as it gets closer to shaping a future science system.

Aligning systems and tools: Behaviour change – empowering action

42. What information, tools or forums would encourage you to take greater action on climate change?

43. What messages and/or sources of information would you trust to inform you on the need and benefits of reducing your individual and/or your businesses emissions?

44. Are there other views you wish to share in relation to behaviour change?

Meeting New Zealand's emissions reduction targets will require disruptive change to our economy. As well as contributing to efforts to keep the rise in mean global temperature to well below 2 °C above pre-industrial levels, and preferably limit the increase to 1.5 °C, the Emissions Reduction Plan is a significant opportunity to help build a sustainable and prosperous future for New Zealand. Realising that potential will need significant behaviour change.

Aligning systems and tools: Moving Aotearoa to a circular economy

45. Recognising our strengths, challenges, and opportunities, what do you think our circular economy could look like in 2030, 2040, and 2050, and what do we need to do to get there?

This is a challenging question to answer succinctly, but achieving our net-zero emissions reduction goals requires a significant shift away from our current "take, make, waste" linear economy to a circular economy. In our current economy natural resources are turned into products that are ultimately destined to become waste because of the way they have been designed and made. Instead, a circular economy is driven by design and accelerated by digital innovation that aims to eliminate waste, use bio-materials to replace materials and energy derived from fossil carbon, keep materials in use and regenerate natural systems. Achieving this will need a stronger evidence base and understanding of the amount of carbon that can be

recycled in a circular bioeconomy versus the amount of carbon that can be stored in forests and wood products.

46. How would you define the bioeconomy and what should be in scope of a bioeconomy agenda? What opportunities do you see in the bioeconomy for Aotearoa?

A bioeconomy has three elements:

- Sustainable renewable resource use and a reduction in waste and pollutants; coupled with
- A transition away from fossil-carbon dependence; to achieve
- Economic and social growth and employment.

A circular bioeconomy for Aotearoa New Zealand is not simply about enhancing biological resource use because a large proportion of New Zealand's GDP is already generated from biological resources. Rather, it needs to include:

- a strong whole-of-government implementation plan that encompasses a Te Ao Māori worldview;
- enabling niche industries to better integrate into mainstream industries;
- better cross-sectoral integration; along with intra-regional supply chains for bio-processing of waste streams for higher revenue;
- a focus on our key New Zealand strengths in biomass production innovations in the primary sector, leveraging a clean, green global image;
- innovating business models and sharing options that allow for more integrated and relational solutions with respect to shared use of resources, processing equipment, and land use, in contrast to purely transactional arrangements

47. What should a circular economy strategy for Aotearoa include?

Integration across waste streams/ industry sectors is critical within the ERP/strategy. Emphasis on increasing circularity within farm systems (for instance), or circularity within a single industry sector, will not be enough.

Do you agree the bioeconomy should be included within a circular economy strategy?

Yes

48. What are your views of the potential proposals we have outlined? What work could we progress or start immediately on a circular economy and/or bioeconomy before drawing up a comprehensive strategy?

We believe that we need to establish a National Circular Bioeconomy Centre, with Scion at its centre, to deliver on a mission and to coordinate across the R&D activities needed. We could start developing investable solutions (scaled up from our current lab -scale solutions) immediately. This will be linked to a capability pipeline running through the university system. Together CRIs and universities can deliver what is needed to launch the bioeconomy and deliver a new workforce trained for this new future.

49. What do you see as the main barriers to taking a circular approach, or expanding the bioeconomy in Aotearoa?

The main barrier to expanding a circular bioeconomy in Aotearoa New Zealand is a lack of an integrated, systemic, approach to supporting the transition. The lack of a national bioeconomy strategy or governance framework is a significant impediment to shifting finance and investment needed to support the transition to a prosperous and sustainable low-carbon future.

50. The Commission notes the need for cross-sector regulations and investments that would help us move to a more circular economy. Which regulations and investments should we prioritise (and why)?

51. Are there any other views you wish to share in relation to a circular economy and/or bioeconomy?

The questions raised in this consultation document are the starting point of a discussion to co-design policies to support the transition to a circular bioeconomy. Scion welcomes the opportunity to discuss these ideas further. The circular bioeconomy offers a unique opportunity to New Zealand but taking advantage of that needs investment in innovation and de-risking to accelerate up-take of mission-led impact.

Transitioning key sectors: Transport

52. Do you support the target to reduce VKT by cars and light vehicles by 20 per cent by 2035 through providing better travel options, particularly in our largest cities, and associated actions?

53. Do you support the target to make 30 per cent of the light vehicle fleet zero-emissions vehicles by 2035, and the associated actions?

54. Do you support the target to reduce emissions from freight transport by 25 per cent by 2035, and the associated actions?

55. Do you support the target to reduce the emissions intensity of transport fuel by 15 per cent by 2035, and the associated actions?

56. The Climate Change Commission has recommended setting a time limit on light vehicles with internal combustion engines entering, being manufactured, or assembled in Aotearoa as early as 2030. Do you support this change, and if so, when and how do you think it should take effect?

57. Are there any other views you wish to share in relation to transport?

Policies and strategies to reduce transport emissions should include biofuel as part of a low-carbon transition. Some parts of the transport sector are difficult to electrify (e.g. heavy off-road machinery in agriculture, forestry, mining and construction) as they have large energy demands and are often operating in places that have no electricity infrastructure. Liquid biofuels would seem to be a valid option for this market.

Transitioning key sectors: Energy and industry

Energy strategy

58. In your view, what are the key priorities, challenges and opportunities that an energy strategy must address to enable a successful and equitable transition of the energy system?

59. What areas require clear signalling to set a pathway for transition?

Setting targets for the energy system

60. What level of ambition would you like to see Government adopt, as we consider the Commission's proposal for a renewable energy target?

A very ambitious renewable energy target is both necessary and achievable, and can support economic growth, as long as it includes the opportunity presented by afforestation.

Phasing out fossil gas while maintaining consumer wellbeing and security of supply

61. What are your views on the outcomes, scope, measures to manage distributional impacts, timeframes and approach that should be considered to develop a plan for managing the phase out of fossil gas?

Phase out of gas is inevitable unless new large fields are found and developed. Maximising use of the existing infrastructure would suggest a focus on production and use of gas from wastes via anaerobic digestion, and increased use of landfill gas.

Decarbonising the industry sector

62. How can work underway to decarbonise the industrial sector be brought together, and how would this make it easier to meet emissions budgets and ensure an equitable transition?

63. Are there any issues, challenges and opportunities for decarbonising the industrial sector that the Government should consider, that are not covered by existing work or the Commission's recommendations?

Addressing current data gaps on New Zealand's energy use and associated emissions through an Energy and Emissions Reporting scheme

64. In your view, should the definition of a large energy user for the purposes of the proposed Energy and Emissions Reporting scheme include commercial and transport companies that meet a specified threshold?

65. We have identified a proposed threshold of 1 kt CO2e for large stationary energy users including commercial entities. In your view, is this proposed threshold reasonable and aligned with the Government's intention to meet emissions budgets and ensure an equitable transition?

66. In your view, what is an appropriate threshold for other large energy users such as transport companies?

67. Are there other issues, challenges or opportunities arising from including commercial and transport companies in the definition of large energy users for the purposes of the proposed Energy and Emissions Reporting scheme that the Government should consider? Supporting evidence on fleet size and characteristics is welcomed.

Supporting development and use of low-emissions fuels

68. What level of support could or should Government provide for development of low-emissions fuels, including bioenergy and hydrogen resources, to support decarbonisation of industrial heat, electricity and transport?

Development of low-emissions fuels will require a sustained and systematic investment in innovation and infrastructure to decarbonise transport, electricity, and industrial heat. Scion has expertise in key aspects of this and stands ready to help in the low-carbon bioenergy transition. The bioenergy opportunity for New Zealand is substantial and needs to be given greater priority.

69. Are there any other views you wish to share in relation to energy?

Meeting New Zealand's emissions reduction targets may require some prioritisation of effort in bioenergy. It might make sense (for instance) to prioritise bioenergy to hard-to-abate sectors such as aviation, where liquid biofuels are the only viable option for decarbonising within the lifetime of the current transport fleet.

Transitioning key sectors: Building and construction

70. The Commission recommended the Government improve the energy efficiency of buildings by introducing mandatory participation in energy performance programmes for existing commercial and public buildings. What are your views on this?

Energy performance programmes could be applied to both existing and new buildings, including through energy certification schemes that would enable buildings' energy performance to be assessed and rated. This recommendation is aligned with existing international regulations and initiatives targeting operational emission reductions from the building sector (e.g. European Community and the U.K).

It is recommended to consider the gradual extension of this strategy to the new and retrofit housing sector.

71. What could the Government do to help the building and construction sector reduce emissions from other sectors, such as energy, industry, transport and waste?

The Government can help develop and promote best practice in design and construction using structural engineered wood products (e.g. cross laminated timber, laminated veneer lumber, glue laminated timber). This can help:

- Lower emissions from materials manufacturing compared to alternative materials (carbon substitution effect).
- Reduce transport emissions due to lower weight of timber and efficient transport of prefabricated elements compared to alternative materials.
- Increase efficient use of materials efficiency and reduce waste during manufacturing and construction through prefabrication and modular construction.
- Reduce waste through material recovery, recycling, reuse or energy substitution at the building end of life through Design for Manufacturing, Assembly & Disassembly approaches. However, it is noted that current New Zealand requirements for timber treatment and preservation (e.g. CCA pesticide and anti-fungal treatment) are limiting circular end-of-life opportunities.
- The current standards system in New Zealand can be used as a barrier to the adoption of new technology and solutions and needs to be bought more into line with other countries to allow evidence-based standards to be set.

This is in addition to the many other social, environmental and economic benefits provided by using locally grown and manufactured timber in construction.

72. The Building for Climate Change programme proposes capping the total emissions from buildings. The caps are anticipated to reduce demand for fossil fuels over time, while allowing flexibility and time for the possibility of low-emissions alternatives. Subsequently, the Commission recommended the Government set a date to end the expansion of fossil gas pipeline infrastructure (recommendation 20.8a). What are your views on setting a date to end new fossil gas connections in all buildings (for example, by 2025) and for eliminating fossil gas in all buildings (for example, by 2050)? How could Government best support people, communities and businesses to reduce demand for fossil fuels in buildings?

A fossil-gas phase out requires close coordination with a range of sectors, and needs to take account of the readiness of gas-alternative energy options. For instance, the electricity sector

will need to be able to sustain the increase capacity demand generated by this proposition in addition to other potential electricity demand increments e.g. population increase, additional industrial demand, electric transport growth. It may also be possible to substitute some of the fossil-gas with gas produced from alternative sources (e.g. from landfill gas, or from other biological feedstocks). Any phase out will need to be clearly communicated to allow the sector to adjust.

73. The Government is developing options for reducing fossil fuel use in industry, as outlined in the Energy and industry section. What are your views on the best way to address the use of fossil fuels (for example, coal, fossil gas and LPG) in boilers used for space and water heating in commercial buildings?

- Solid or liquid biofuels system (e.g. biomass boilers, cogeneration and trigeneration systems)
- Heat pump systems using renewable energy sources e.g.
    - Local PV solar integration or other renewables (local hydroelectric or wind generation)
    - Certified renewable-electric energy from grid
    - Geothermal systems (Low-enthalpy geothermic systems, either shallow or surface)
- Solar hot-water integration

74. Do you believe that the Government's policies and proposed actions to reduce building-related emissions will adversely affect any particular people or groups? If so, what actions or policies could help reduce any adverse impacts?

Any policy that has potential to increase costs in the built environment has potential to adversely affect particular groups, and transitions need to be managed with this in mind. Just looking at the building sector, the Government should consider interventions to facilitate a rapid transition and uptake of best practices, with quality control and assurance pathways. Learning from previous international experiences, deploying stringent performance requirements supported by incentivisation schemes is an effective way to enable rapid market and industry transformation, supporting end-users' decision making and enabling affordability through faster reach of economy of scale.

It is also important to consider the increase in bureaucracy and workloads for specific categories (e.g. building consenting authorities, design & construction workforce) that will require support through upskilling and professional accreditation programmes. Initiatives such as the proposed Timber Design Centre are important to help the supply chain become more efficient in these areas (e.g. to help streamline consideration of resource and building consents, training of workforce etc.)

75. How could the Government ensure the needs and aspirations of Māori and iwi are effectively recognised, understood and considered within the Building for Climate Change programme?

76. Do you support the proposed behaviour change activity focusing on two key groups: consumers and industry (including building product producers and building sector tradespeople)? What should the Government take into account when seeking to raise awareness of low-emissions buildings in these groups?

Yes, however within industry (stakeholders) it is important to include also:

- Building designers

- Quantity surveyors
- Real estate agents
- Building consenting officials.

Regulatory changes are a rapid way to raise awareness and influence industry change. Public campaign and incentivisation schemes support awareness and uptake by the general public.

77. Are there any key areas in the building and construction sector where you think that a contestable fund could help drive low-emissions innovation and encourage, or amplify, emissions reduction opportunities? Examples could include building design, product innovation, building methodologies or other?

Support for increasing emissions reduction opportunities in the built environment needs to focus on opportunities to drive innovation and increase uptake of low-emissions technology. Contestable funding could be one way to do this, but another might be to consider ways to increase application of technology and innovation by the sector. Technologies, standards and certifications schemes already exist and are adopted in New Zealand on a voluntary basis. Support to encourage broader uptake of these could be a significant scale-up opportunity, perhaps supported by investments in innovation to increase the use of sustainably sourced low-carbon materials (e.g. wood and wood products). Certified Passive Houses have proven internationally to deliver very low carbon emission performance (embodied and operational) over their life cycle. When local production of renewable energy is integrated with “bio-based Certified Passive Houses” the emission profile of building can be from very-low and even negative over the life cycle.

Government and its agencies can show leadership through their procurement. An example would be having Kainga Ora establish some larger longer-term supply contracts that support the development of these new supply chains. This would help in de-risk private-sector investment in new manufacturing and construction capability.

78. The Ministry of Business, Innovation and Employment (MBIE) is considering a range of initiatives and incentives to reduce construction waste and increase reuse, repurposing and recycling of materials. Are there any options not specified in this document that you believe should be considered?

Design and construction using structural engineered wood products (e.g. Cross Laminated Timber, Laminated Veneer Lumber, Glue Laminated Timber), enables the adoption of modular prefabrication, Design for Manufacturing, Assembly & Disassembly approaches that enable materials efficiency, waste minimisation during manufacturing and construction, and opportunity for material recovery at the building end of life.

Government should also consider a revised approach to standards that is more agile and better allows for innovation to come to market faster.

79. What should the Government take into account in exploring how to encourage low-emissions buildings and retrofits (including reducing embodied emissions), such as through financial and other incentives?

- In addition to measures that encourage uptake of distributed energy technology (e.g. increased use of installed solar energy), the Government should take into account that incentivisation schemes towards high-performance building design and retrofitting need to be supported by an evidence-based assessment of building performance, ideally via third-party schemes and/or design & construction standards.

80. What should the Government take into account in seeking to coordinate and support workforce transformation, to ensure the sector has the right workforce at the right time?

- Education of next generation workforce through professional development programmes and academic curricula is necessary.
- Upskilling current workforce through continuous education and knowledge certification through professional qualifications/registration is necessary.
- Existing workforce is likely to be reluctant to uptake training and upskilling unless there is a clear requirement (e.g. mandatory skill accreditation) or benefit (e.g. market demand growth or mandatory building requirements).

81. Our future vision for Aotearoa includes a place where all New Zealanders have a warm, dry, safe and durable home to live in. How can we ensure that all New Zealanders benefit from improved thermal performance standards for our buildings?

- Mandating requirement for high building energy performance at a national level will ensure that the design & construction market will not consider higher energy efficiency building performance (associated with warmer drier healthier homes) as a luxury items within a high-end market niche. Rising the 'minimum requirement' bar to high-energy performance (e.g. Passive House Standard) at a national level will ensure economy of scale, with market cost readjustment thanks to more competition between a larger pool of performing materials, technologies and design providers.
- Proposed changes to the national building standards to vary construction and building performance standards by region might have the perverse outcome of creating barriers to greater uptake of innovative, modular off-site construction methods.
- In relation to ensuring delivery of performance and healthiness through design standard, it is stressed that the international Passive House Standard is currently the most robust, scientifically proven, design and construction standard internationally. The benefits of the PH Standard are intertwined with the requirements for third party verified quality control during the design and construction phase mandated by the PH Certification process. There is a rapidly increasing number of PH designers, certifiers, builders, product manufacturers and PH certified buildings (residential and commercial) in New Zealand.

82. Are there any other views you wish to share on the role of the building and construction sector in the first emissions reduction plan?

Transitioning key sectors: Agriculture

83. How could the Government better support and target farm advisory and extension services to support farmers and growers to reduce their emissions?

a. How could the Government support the specific needs of Māori-collective land owners?

84. What could the Government do to encourage uptake of on-farm mitigation practices, ahead of implementing a pricing mechanism for agricultural emissions?

85. What research and development on mitigations should Government and the sector be supporting?

86. How could the Government help industry and Māori agribusinesses show their environmental credentials for low-emissions food and fibre products to international customers?

87. How could the Government help reduce barriers to changing land use to lower emissions farming systems and products? What tools and information would be most useful to support decision-making on land use?

88. Are there any other views you wish to share in relation to agriculture?

Transitioning key sectors: Waste

89. The Commission's recommended emissions reduction target for the waste sector significantly increased in its final advice. Do you support the target to reduce waste biogenic methane emissions by 40 per cent by 2035?

90. Do you support more funding for education and behaviour change initiatives to help households, communities and businesses reduce their organic waste (for example, food, cardboard, timber)?

91. What other policies would support households, communities and businesses to manage the impacts of higher waste disposal costs?

92. Would you support a proposal to ban the disposal of food, green and paper waste at landfills for all households and businesses by 1 January 2030, if there were alternative ways to recycle this waste instead?

Yes, although we note that not all paper waste can be recycled (e.g. contaminated and coated papers). The only viable end-of-life use for this material might instead be waste-to-energy. To support alternatives of recycling and for the development of new alternative materials a component of the Waste Minimisation Levy should be allocated directly to the work that we propose that a new National Circular Bioeconomy Centre would carry out in these areas.

93. Would you support a proposal to ban all organic materials going to landfills that are unsuitable for capturing methane gas?

94. Do you support a potential requirement to install landfill gas (LFG) capture systems at landfill sites that are suitable?

95. Would you support a more standardised approach to collection systems for households and businesses, which prioritises separating recyclables such as fibre (paper and cardboard) and food and garden waste?

96. Do you think transfer stations should be required to separate and recycle materials, rather than sending them to landfill?

97. Do you think the proposals outlined in this document should also extend to farm dumps?

98. Do you have any alternative ideas on how we can manage emissions from farm dumps, and waste production on farms?

99. What other options could significantly reduce landfill waste emissions across Aotearoa?

Scion will also be providing input into the Government's consultation on proposals for a new waste strategy.

It is likely that waste-to-energy systems will be needed as part of efforts to significantly reduce landfill waste emissions. This would allow for better management of non-recyclable waste, and in a scenario where materials are derived from biological materials as part of a bioeconomy, the CO_2 released from waste incineration would not increase CO_2 emissions. Development of new materials with lower net life-time emissions will be an important part of this work.

Transitioning key sectors: F-gases

100. Do you think it would be possible to phase down the bulk import of hydrofluorocarbons (HFCs) more quickly than under the existing Kigali Amendment timetable, or not?

101. One proposal is to extend the import phase down to finished products containing high-global warming potential HFCs. What impact would this have on you or your business?

102. What are your views on restricting the import or sale of finished products that contain high-global warming potential HFCs, where alternatives are available?

103. What are your views on utilising lower global warming potential refrigerants in servicing existing equipment?

104. Do you have any thoughts on alternatives to HFC refrigerants Aotearoa should utilise (eg, hydrofluoroolefins or natural refrigerants)?

105. Can you suggest ways to reduce refrigerant emissions, in combination with other aspects of heating and cooling design, such as energy efficiency and building design?

Transitioning key sectors: Forestry

106. Do you think we should look to forestry to provide a buffer in case other sectors of the economy under-deliver reductions, or to increase the ambition of our future international commitments?

Yes. While reducing gross emissions in all sectors needs to be the priority, even with strong reductions in gross emissions there is a critical and ongoing role for removals of CO_2 from the atmosphere by forests. New Zealand needs more forests, and forests need to be managed in ways that lift New Zealand's wellbeing as we achieve a just transition to a prosperous and sustainable bioeconomy. A sustainably managed and sustained yield forest estate can in the long term provide both a carbon store of many millions of tonnes, as well as a flow of materials (timber, bioenergy and bio-material feedstock) needed to support a low-carbon circular bioeconomy.

107. What do you think the Government could do to support new employment and enable employment transitions in rural communities affected by land-use change into forestry?

A just transition to a circular economy needs a systematic understanding of the economic, social, and regulatory factors driving land use and employment changes in rural communities. We need a better understanding of the forestry systems that will be used to help deliver New Zealand's climate objectives.

108. What's needed to make it more economically viable to establish and maintain native forest through planting or regeneration on private land?

- Increased afforestation of indigenous forests can be encouraged by a range of measures, including
    - Adjustments to the rate at which native forests accrue emissions units in the ETS. While indigenous forests tend to sequester carbon more slowly than exotic forest tree species, the default values in the ETS look-up tables will under-allocate units to some indigenous forests in some situations. The converse is also true – in other circumstances the look-up tables will tend to over-estimate carbon uptake by indigenous forests, particularly on marginal land.
    - Amendments to policies (e.g. the Forest Act) to encourage appropriate use of indigenous forests in private ownership for economic use including for high-value timber production.
    - Considering adjustments in local land-use planning rules to encourage planting of indigenous forests by recognise the range of ecosystem services (e.g. biodiversity conservation, improvements to water quality, erosion control) that indigenous forests provide.
    - Measures to reduce the cost of establishing indigenous forests, e.g. through investment in innovative practices to increase the supply (and reduce the cost) of seedlings and cuttings in nurseries.
    - Investment to improve pest control to increase the success of forest planting, e.g. by reducing the impact of introduced herbivores on seedlings and young trees.
    - Investment in innovations to increase early growth and survivorship of planted seedlings.
    - Measures to value a wider range of the ecosystem services provided by indigenous forests.
- There are some significant challenges and opportunities around establishment of indigenous forests on private land. As well as the economic challenges, there are questions around the provenance and whakapapa of seedlings that are used to establish indigenous forests. It is not clear that our commercial nursery system is well placed to consider these questions, and at the scale needed for widespread indigenous

afforestation. This could become a significant barrier for afforestation with indigenous species on Māori land.

109. What kinds of forests and forestry systems, for example long-rotation alternative exotic species, continuous canopy harvest, exotic to native transition, should the Government encourage and why?

Meeting New Zealand's climate change targets will require investment in a range of forests and forestry systems, as well as innovations to increase the productivity and resilience of forest systems that are already being used. For instance:

- It is likely that meeting the full potential of a transition to wood-based bioenergy will require the establishment of new kinds of short-rotation, high-productive biomass crops to increase the volume of feedstock available in the short term.
- ETS settings can encourage the planting of new forests managed for their value as stocks of carbon. As these forests mature they transition from a net carbon sink to being broadly carbon neutral. We need to better understand what is needed to manage these forests in the long term so that they are providing a broader range of ecosystem and productive services (e.g. biodiversity conservation, water yield and quality, non-timber economic opportunity, human health and wellbeing).
- Increasing the diversity of planted forest species and the ways in which they are managed will help build resilience in New Zealand's forest sector.

a. Do you think limits are needed, for example, on different permanent exotic forest systems, and their location or management? Why or why not?

Meeting New Zealand's climate change targets clearly needs a significant increase in afforestation, as well as greater action to reduce gross emissions. Limits on afforestation may have the unintended consequence of limiting the ambition of New Zealand's climate response or making net reductions targets more difficult or expensive to achieve. Large scale establishment of exotic forests can help reduce net emissions. However, if they are not managed well New Zealand will miss opportunities to support the transition to a low-carbon bioeconomy. There are concerns over the concept of unmanaged exotic forests, and forests need to be managed to provide a full range of outcomes, not just sequestration.

b. What policies are needed to seize the opportunities associated with forestry while managing any negative impacts?

110. If we used more wood and wood residues from our forests to replace high-emitting products and energy sources, would you support more afforestation? Why or why not?

New Zealand's emissions reduction targets will require a significant increase in the amount of CO_2 removed from the atmosphere by forests, irrespective of whether the wood and wood-residues are used to replace high-emitting products and energy sources. New Zealand needs both a significant increase in afforestation and a significant increase in the use of wood and wood residues to replace products and materials with high life-time emissions.

111. What role do you think should be played by:

a. central and local governments in influencing the location and scale of afforestation through policies such as the resource management system, ETS and investment

b. the private sector in influencing the location and scale of afforestation?

Please provide reasons for your answer.

112. Pests are a risk to carbon sequestration and storage in new, regenerating and existing forest. How could the Government support pest control/management?

There is a range of ways that the Government could support better pest control in forests, including:

- Increased research into pest control methods (e.g. alternative animal control methods; better understanding of pest animal population dynamics at a landscape scale; understanding social preferences about animal hunting etc) to make pest control cost effective.
- Valuing non-carbon ecosystem services provided by forests (e.g. from biodiversity conservation, to encourage more active management of forest pests).
- More research into the carbon benefits from active pest control to enable the ETS to more accurately reward pest management (e.g. by adjusting look-up tables to account for pest management in indigenous forests).
- Better alignment among agencies and organisations with interests in improving the management of our indigenous forests.

113. From an iwi/Māori perspective, which issues and potential policies are a priority and why, and is anything critical missing?

114. Are there any other views you wish to share in relation to forestry?

National policies may be are required to limit any further deforestation of both natural or planted exotic forests. For instance, there are no national controls on deforestation of existing indigenous forest, and this is left to individual territorial authorities to control via the Resource Management Act.