

Response to He Pou a Rangi, the Climate Change Commission's 2021 Draft Advice

28 March 2021

The New Zealand Infrastructure Commission / Te Waihanga Act 2019 s. 11(b) states that “when identifying or advising on current and future infrastructure needs, or the priorities for infrastructure, the Commission must have regard to long-term trends that impact on, or are impacted by, infrastructure, including (but not limited to) – (iii) matters relating to the mitigation of the effects of climate change (including through reducing emissions of greenhouse gases) and adapting to the effects of climate change”.

Climate change mitigation and adaptation are therefore one of the focus areas of the 30-year Infrastructure Strategy Te Waihanga is currently developing, and we welcome the opportunity to share our thinking on the links between climate change mitigation, adaptation and infrastructure with the Climate Change Commission, He Pou a Rangi.

Te Waihanga acknowledge the science of climate change, and the impacts climate change will have on infrastructure¹, detailed most recently for Aotearoa in the first National Climate Change Risk Assessment². Even if globally, warming is limited to ~1.5°C, the impact on Aotearoa’s infrastructure from sea-level rise, increasing storm intensity, changing rainfall patterns, and increasing temperatures will be significant for both physical infrastructure assets and the services they provide. These impacts increase with warming, and for this reason, action on both climate change mitigation and adaptation are increasingly urgent.^{3,4,5,6}

In terms of the Principles He Pou a Rangi have used to guide the development of the advice, Te Waihanga wish to highlight the importance of Principle 1 for infrastructure. This Principle speaks to the importance of timely decision-making for transitioning long-lived infrastructure assets, which we see as critical. The need for policy direction is key to

¹ IPCC. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by R.K. Pachauri and L.A. Meyer. IPCC, Geneva, Switzerland, 2014.

² Ministry for the Environment. *National Climate Change Risk Assessment for New Zealand. Technical Report. Arotakenga Tūraru Mō Te Huringa Āhuarangi O Āotearoa. Pūrongo Whaihanga*, 2020.

³ IPCC. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by R.K. Pachauri and L.A. Meyer. IPCC, Geneva, Switzerland, 2014.

⁴ Reisinger, A., R.L. Kitching, F. Chiew, L. Hughes, P.C.D. Newton, S.S. Schuster, A. Tait, and P. Whetton. “Australasia.” In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White, 1371–1438. Cambridge University Press, 2014.

⁵ Bell, R., J. Lawrence, S. Allan, P. Blackett, and S. Stephens. “Coastal Hazards and Climate Change: Guidance for Local Government.” Vol. 39. New Zealand Government, November 2012. <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/coastal-hazards-guide-final.pdf>.

⁶ “Climate Change Scenarios for New Zealand,” February 28, 2007. <https://niwa.co.nz/our-science/climate/information-and-resources/clivar/scenarios>.

beginning to transition infrastructure assets, particularly if we are to leverage asset management cycles to deliver actions, which we see as being potentially an effective and efficient way to transition many existing assets.

Te Waihanga supports including carbon abatement and climate change adaptation in the investment- and decision-making processes in both the public and private sectors. However, it is important that He Pou a Rangi reflect the fact that Te Waihanga does not have a decision- or investment-making function, and does not have any directive or coercive powers. Therefore, in the absence of legislative change, we simply cannot give effect to recommended time-critical necessary action 6(e): “...Government require the Infrastructure Commission to include climate change as part of its decision- and investment-making framework, including embedded emissions and climate resilience”. Te Waihanga will continue to work with agencies across Government, including the Treasury, to support better decision-making. However, this recommendation must sit across multiple agencies, not solely with Te Waihanga.

He Pou a Rangi have made it clear that the scale of change required to meet the recommended targets is significant, but that it is a transition that can be made with current technology in a way that is equitable. Te Waihanga see that infrastructure has an important role to play in facilitating the transition, particularly transport, energy, waste, and social infrastructure. We agree with He Pou a Rangi that many of the actions required also have the potential to create co-benefits and positive equity outcomes, and these must be maximised.

Te Waihanga also wish to highlight the importance of non-built mechanisms to deliver the changes we need across infrastructure systems. This could be through pricing mechanisms, demand management, or standards and codes to better use the infrastructure assets we have now, and to speed up the behaviour change we wish to see.

It is critical that whole-of-life carbon emissions (including both embodied emissions and emissions generated through the use of infrastructure) be considered at the infrastructure asset level. For this reason, it is important that embodied emissions, and a consumption-based measurement approach, are further considered by He Pou a Rangi with a view to creating embodied emissions targets at the asset level in due course. We also see that there is the potential for perverse outcomes if it is increasingly cost-effective to import high-carbon construction materials, and therefore submit that high-carbon construction materials critical to infrastructure development and maintenance, such as steel, cement and aluminium, are included in He Pou a Rangi’s ongoing work on carbon emissions leakage and border carbon adjustments.

We would welcome the opportunity to discuss any aspect of our response with He Pou a Rangi in the coming months as the advice is finalised.

Consultation Question 1: Do you support the principles we have used to guide our analysis? Is there anything we should change, and why?

Te Waihangā generally supports the Principles that have been used to guide He Pou a Rangi's advice and submit particular observations on Principles 1, 2, 3, 4 and 5 as they pertain to infrastructure.

The details of *Principle 1: Align with the 2050 targets* are particularly important in the infrastructure content. This Principle acknowledges the lag-time associated in transitioning long-lived infrastructure. Actions taken in the next 5-years will be critical for both planned and existing assets. If decisions are not taken in a timely manner within this budget period, then 2050 targets will become harder to reach, and may not fully leverage the contribution infrastructure has the potential to make to the transition to a low-carbon economy.

With regards to *Principle 2: Focus on decarbonising the economy*, Te Waihangā supports a hierarchy of absolute emissions reduction, followed by domestic removals, particularly where there are co-benefits for people and the environment. However, we do see that there may be the case to include offshore mitigation as a third tier of this hierarchy, particularly where this creates benefits for Pacific island nations.

There may be risks to sustaining the domestic production of carbon-intensive construction materials if there are not appropriate border adjustments. Losing onshore manufacturing capability would have negative consequences for supply chain resilience, our workforce and the economy, as well as not having the desired impact of reducing net carbon globally. We support the view that: "*Aotearoa should focus on decarbonising its industries rather than reducing production in a way that could increase emissions offshore*".

We agree with aspects of *Principle 3: Create options*. We agree that climate change policy and outcomes remain highly uncertain and, whenever possible, decisions taken now should open up a wide range of future options and keep options open for as long as possible. Moving towards this is in alignment with the type of decision-making that will be needed to support climate change adaptation too. Tools such as Dynamic Adaptive Policy Pathways Planning and Robust Decision-Making^{7, 8} should be mainstreamed to support this outcome as part of decision-making process.

However, we disagree with the statement that "*...uncertainty is not a reason for delay...*". In infrastructure investment, uncertainty is a compelling reason for delay. Efforts should be made to reduce the uncertainty infrastructure providers face in order to reduce the investment risk. We encourage an alternative principle focussing on reducing uncertainty to avoid investment delay.

We support *Principle 4: Avoid unnecessary cost* but note that the value of extending asset life is often greater than just "avoiding unnecessary costs". Infrastructure typically contains high embodied carbon and energy. Replacing end-of-life assets with new creates considerable one-off emissions and costs in the demolition (disposal or recycling) and construction phases. Optimising asset replacement timing using Life Cycle Analysis allows objective decisions to be made comparing the operational and embodied carbon equivalent performance. As

⁷ Bell, R., J. Lawrence, S. Allan, P. Blackett, and S. Stephens. "Coastal Hazards and Climate Change: Guidance for Local Government." Vol. 39. New Zealand Government, November 2012. <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/coastal-hazards-guide-final.pdf>.

⁸ Kool, Rick, Judy Lawrence, Martin Drews, and Robert Bell. "Preparing for Sea-Level Rise through Adaptive Managed Retreat of a New Zealand Stormwater and Wastewater Network." *Infrastructures* 5, no. 11 (November 1, 2020): 92.

electricity and other forms of energy decarbonise, embodied emissions will continue to rise in relative importance.

We see *Principle 5* as important to Aotearoa's success in the transition. Ensuring all members of our society have access to low-carbon alternatives, and that those alternatives fit their needs, will ensure all New Zealanders can play their part in the transition. He Pou a Rangi have noted the issues around alternative engine vehicle affordability, and the types of vehicles many iwi / Māori prefer, as examples of ensuring accessibility and fit-for-purpose, and we support these principles continuing to be applied to the actions that will result from He Pou a Rangi's advice. We support intergenerational and cultural equity being considered among the desirable co-benefits of transition actions. We also support considering these principles in terms of the impact our actions have offshore. Exporting our issues by importing finished products, and leaving the carbon, environmental and social impacts in overseas communities must also be avoided.

Consultation Question 5: Cross-party support for emissions budget. Do you support enabling recommendation 1? Is there anything we should change, and why?

We support this recommendation. Cross-party support is likely to reduce the risk and uncertainty faced by infrastructure providers.

Consultation Question 7: Genuine, active and enduring partnership with iwi/Māori. Do you support enabling recommendation 3? Is there anything we should change, and why?

Te Waihanga acknowledges the dual nature of potential partnerships with iwi / Māori – to both draw on Mātauranga Māori to help develop and implement climate change mitigation solutions, as well as leverage actions to support Māori wellbeing and enhanced relationships within whānau and communities, and with the whenua (land) or taiao (environment).

However, at this stage this recommendation lacks specificity as to how the enabling actions recommended will give effect to the values outlined. The recommendation simply states that “*We recommend that...central and local government take action...*”.

As the Governments' lead advisor on infrastructure, it is difficult to assess the potential implications or opportunities of this recommendation for infrastructure providers.

Consultation Question 8: Central and local government working in partnership. Do you support enabling recommendation 4? Is there anything we should change, and why?

Te Waihanga agrees that central and local government need to work in partnership (along with iwi/ Māori and the wider community) to develop and implement the initiatives needed to meet the reduction targets.

We do have concerns that the significance of the legislative reform underway (including resource management and three waters reform) may mean local governments do not have the right incentives, or resources, to engage in the way needed to form these partnerships. Some local government entities may be concerned about their future viability as a result of the proposed reforms.

We recommend incentives are reviewed, along with the capability and capacity of local government, to support implementation of this recommendation. The Government should also be mindful of any future proposals to reform local government, and if that arises, ensure climate change mitigation and adaptation are a core outcome of that reform.

Consultation Question 10: Locking in net zero. Do you support our approach to focus on decarbonising sources of long-lived gas emissions where possible? Is there anything we should change?

Te Waihangā understands the rationale of reducing the production of long-lived gasses as much as practicable to ensure there is a reduction in gross emissions, and that the effort associated with emissions reductions isn't shifted out to the next generation.

Beginning to transition now is important when considering the long-lived nature of infrastructure, and infrastructure has a critical enabling role in the transition, including:

- **Decarbonising design and construction** though the adoption of low-carbon construction methodologies and materials, overall dematerialisation through design, and the reduction of waste through design and construction methodologies. These opportunities exist for all infrastructure types in initial design and construction, and well as during maintenance.
- New **renewable energy infrastructure** will support the decarbonisation of the grid and the electrification required to transition away from fossil fuels used in heating, cooling and industrial processes.
- New **distribution infrastructure** will be required to support the use of alternative fuels and engines in transport.
- New **transport infrastructure** will be required to support low-carbon mode shifts for freight and passenger movement.
- New **waste (or circular economy) infrastructure** to support the reuse of materials as well as increased rates of recycling.

Consultation Question 11: Do you support our approach to focus on growing new native forests to create a long-lived source of carbon removals? Is there anything we should change, and why?

Te Waihangā acknowledges that there are limits to the amount of land that Aotearoa will wish to afforest as a response to removing carbon from the atmosphere. Carbon needs to be removed in the long-term to have the right impact in terms of limiting warming. However, Te Waihangā note there will be some aspects of the infrastructure value chain where significant reductions are not feasible in the near term, such as steel and cement production. While there may be interventions that Government can make to support innovation and technology adoption, the need for offsetting will remain in the near-term until low-carbon technologies become available.

For these reasons we support the conclusion that there should be a better balance between new native and production forestry than current market settings are resulting in.

We do see there is the need for balance, as production forestry can provide low-carbon construction materials and the feedstock for the bioeconomy proposed as part of the draft advice.

Consultation Question 14: Do you support the package of recommendations and actions for the transport sector? Is there anything we should change and why?

It is clear that alternative engine vehicles and fuels have a role to play in the decarbonisation of the transport sector, alongside increased levels of active and mass transport, and mode-shift to reduce the carbon impacts of our domestic freight network.

We agree that transitioning to electric vehicles for private transport and small-medium commercial vehicles leverages Aotearoa's existing infrastructure, and globally available low-carbon technology. Barriers to uptake of these vehicles in Aotearoa includes cost and availability. For this reason we agree with the sentiment in He Pou a Rangī's advice that Government intervention will be required to help ensure that the right vehicles are imported

into Aotearoa, at an affordable, equitable, price.

The energy sector has already noted that with increased electrification will come a tipping point for investment in new energy infrastructure (including generation, distribution and changing infrastructure).^{9,10} As discussed in our response to Consultation Question 15, this technology exists, but creating demand certainty is key to stimulating the required investment in new renewable energy infrastructure. At present there are demand and supply variables making the business case for investment uncertain which may require further consideration by government.

While we acknowledge the potential in alternative engines and fuels, we also wish to highlight the importance of getting the right balance between electric vehicle uptake and other short-term solutions, including the creation of new active transport infrastructure at a faster rate than currently committed to in long-term plans. We would also encourage thinking about the potential to incentivise the uptake of electric bikes (in a similar way to electric vehicles) to expand the number of trips and passenger kilometres undertaken by active modes, and using active transport infrastructure to maximum effect.

We also question if the right balance has been struck between short-term actions to decarbonise our transport system, and longer-term actions, which could transform our transport systems and urban environments, and deliver a range of additional co-benefits, as well as deliver low-carbon transport.

While the delivery of additional mass transport and alternative freight infrastructure might occur over the longer-term, the decisions to create this type of infrastructure must begin within this period of He Pou a Rangi's advice, given the lag-time between decision-making and the delivery of infrastructure. Renewal programmes may be the best time for assets to be upgraded to include carriageways for active or mass transport, to incorporate charging infrastructure, or to procure low-carbon rolling stock. Leveraging the asset management cycle to deliver these additional transport elements may be the most efficient way to transition, but this will also be a source of lag. Providing direction for these actions must be confirmed, and costed, as soon as possible.

Like He Pou a Rangi, Te Waihangā also acknowledge the interdependence between transport options and urban form. Higher density urban environments, or hub-and spoke urban form, have the potential to minimise private vehicle use, and create the scale for mass transport to operate in a way that delivers levels of connectivity and convenience that are the same as or better than private transport. Again, we acknowledge that changing existing urban form takes time, but there should not be barriers to densification in existing urban areas, when clear market failures do not exist. We also propose that all new developments of significant size should have transport infrastructure, and indeed all utilities, integrated into alternative assessments and preliminary designs. This could help ensure we are planning for our future homes, businesses, and communities to be in the best locations possible, with access to low-carbon transport, and that the capacity of other infrastructure networks (such as water or electricity) don't become limiting factors.

This may require a more systematic identification of lead infrastructure – the infrastructure that supports further development. This is important where lead infrastructure has the characteristic of being long-lived, hard to retrofit, and results in higher rates of development

⁹ Prepared for Orion, Unison, and Powerco by Concept Consulting Group Limited. "Driving Change' – Issues and Options to Maximise the Opportunities from Large-Scale Electric Vehicle Uptake in New Zealand," March 7, 2018.

¹⁰ Vector. "EV Network Integration: Green Paper," n.d.

(and therefore downstream infrastructure requirements) or higher land values. Again, this policy direction must be provided sooner rather than later to have the desired effect.

In terms of decarbonising our existing transport networks, there should be increased focus on non-built solutions. In the case of existing roading networks, alongside transitioning to electric vehicles, non-built solutions could take the form of:

- Charging to reduce demand
- Lowering the cost of public transport at non-peak times
- Implementing real time parking
- Making better use of existing space to speed up public transport
- Density targets and supply requirements through zoning policy.

These mechanisms are only viable where options for mass or active transport exist, and must include analysis and actions to ensure that they do not exacerbate existing inequalities and disadvantage.

Consultation Question 15: Do you support the package of recommendations and actions for the heat, industry and power sectors? Is there anything we should change and why?

Both supply and demand need to be considered as a system to ensure that Aotearoa's energy system can transition to the pathway proposed.

The modelling undertaken by He Pou a Rangi appears to be consistent with what is widely accepted across the energy sector. In summary, electricity demand will increase due to electrification, including an uptake in electric vehicles, and that installed generation will increase, largely from wind resources, with some geothermal.

There is however an inherent assumption that the correct market settings are (or will be) in place for the sector to deliver this increase in generation at the desired time. As private entities, demand is the primary driver of investment, and while there is uncertainty as to when the predicted (and desired) increase in demand will be realised due to electrification, the market is unlikely to respond. The risk of over-investment may result in under-investment due to the lag-time in delivering new energy generation infrastructure. Therefore, there must be a focus on creating certainty in demand to stimulate the investment in new renewables generation that's needed for the pathway recommended to be realised. Given the lag, we also question if there should be rolling targets established (perhaps 5-yearly) for new wind generation establishment, which if not met, could be a trigger for further intervention.

To help de-risk the investment, the Crown could consider providing upfront capital for new renewables generation on the condition it is repaid by the generators as consumers 'connect' to the new renewable assets. This is a similar model to that developed for Crown Fibre Holdings under the Ultra-Fast Broadband programme.

The consenting environment is reported to be a barrier to new renewable generation, and at a high level, it should not be easier to consent new fossil fuel-based generation than it is to consent new renewable generation. Acknowledging the interdependencies that exist between generation infrastructure, other infrastructure types (including distribution and transport), and other land uses, it is important that an integrated, place-based approach is taken to consenting new generation assets. Resource Management reform has a role to play in this, as well as giving effect to the National Policy Statement for Renewable Electricity Generation. It may be that there is value in a further specific review to understand these barriers and inform any further regulatory changes.

Removing barriers to developing small- or community-scale generation should also be explored. While consideration must be given to how energy is used and/or stored, including if it enters the grid and the implications of this, distributed generation is a potentially effective way to meet demand in particular locations, and to create resilience. Again, a place-based approach is required.

The question of dry-year management is a critical one, and while the NZ Battery Project has an important role to play in helping determining the best way to manage this, we would also encourage other options for dry- and calm-year management to be explored in addition to pumped hydro.

The question as to how the electricity currently contracted to New Zealand's Aluminium Smelter at Tiwai Point will be used in the future, particularly whether it will be used in pumped hydro, enter the grid, or be used in another carbon intensive industry in Southland, is another factor creating investment uncertainty at present, which is likely to create binary investment decision-making in the sector.

As activities like aluminium and methanol production cease in Aotearoa, there is the potential to use some of these energy resources as a lever for economic growth to attract, or grow, high-productivity sectors. While this type of future economic use of energy isn't included in He Pou a Rangi's modelling, Te Waihanga see it as an area worthy of further exploration.

A pragmatic approach is needed for the continued strategic use of gas to support the management of peak demand. Additional work may be needed to determine how this gas will be delivered, as the current gas distribution network may not be viable with the decreasing volumes that will be demanded over time. Further, less onshore supply of gas may lead to increasing prices, which could mean that overall fossil fuel peaking could be considered more viable, which would be a perverse outcome.

Demand management has the potential to smooth seasonal and diurnal peak demand, which in turn, determines overall generation and distribution requirements, and can mean that more demand doesn't have to equal more supply. While reducing demand is desirable, and can create co-benefits, it is another factor that generators will be looking at when considering when to develop new capacity. Firming up implementation pathways for energy efficiency and demand management should therefore be actioned as part of creating demand certainty.

Energy performance in the built environment in Aotearoa is generally acknowledged as being behind comparable jurisdictions. There may be the potential to improve performance faster than proposed, with potentially lower cost overall than creating the equivalent supply. The New Zealand Government has the opportunity to leverage its social infrastructure assets to speed up elements of this transition, and normalise the installation and use of the technology and energy sources we need to transition to a low-carbon, energy efficient built environment. For example, in hospitals and schools, this could take the form of accelerating electrification programmes. Government power purchasing agreements which specify renewables could also be used to help create demand certainty, noting that with finite funding available there will be trade-offs that will need to be understood and agreed.

The asset maintenance and replacement cycle could be leveraged to transition to low-carbon industrial and space heating. However, as not all components of these systems get replaced at the same time, particularly in large/complex infrastructure assets, there will be significant costs for some asset owners. These costs may require additional intervention to overcome.

Non-built solutions are important to demand management e.g. smart chargers to manage and optimise electric vehicle charging demand. In this area there is the need for standards to ensure that the technology we transition to has the desired outcome. For example, an electric

vehicle charging standard could be used to ensure that the electric vehicle charging interfaces imported into Aotearoa are compatible with smart chargers to allow load shift, and for opportunities such as vehicle-to-grid to be realised.

Workforce capability and capacity will be important to developing new generation and improving energy efficiency in the built environment and could warrant a strategic response through programmes like Mana in Mahi.

Consultation Question 18: Do you support the package of recommendations and actions for the waste sector? Is there anything we should change and why?

As waste from the construction sector makes up a significant proportion (~29%¹¹) of the waste entering Aotearoa's landfills, there is the opportunity to leverage prefabrication and improve resource recovery techniques to reduce waste, and reuse or recover the waste that is unavoidable as part of demolition and construction.

Te Waihangā is working on a study into the security of supply of construction materials (including steel, concrete, bitumen, timber, aggregates and other resources). This will also cover the capacity for recycling these resources, which we can share with He Pou a Rangi in mid-2021.

While there is variable access to collection and processing infrastructure across Aotearoa, there are a range of ways waste reduction outcomes may be improved that may be less resource intensive, and more cost effective, than simply developing more processing / recycling capacity. Policy and legislation to reduce waste overall, and reduce the volume of materials that are either hard to recycle, or for which there is no market for the recycled products, could have a significant impact. It may also be possible to stimulate innovation so that domestic markets for recyclates are created or strengthened. This would support the investment case for additional infrastructure and incentivise recovery overall.

The role of transport should also be explored to make better use of existing resource recovery infrastructure, or to allow a smaller number of highly efficient new processing plants to be built which could service large areas of the country.

Te Waihangā support the development of a strategic approach to how organic waste is managed to divert this waste from landfill, including the development of the appropriate infrastructure to support this.

Te Waihangā also supports the capture and use of landfill gas at all landfills that will still be required to manage Aotearoa's waste into the future.

¹¹ Wilson et al., The New Zealand Waste Disposal Levy: Potential Impacts of Adjustments to the Current Levy Rate and Structure (Eunomia Research & Consulting, 2017), 15.

Consultation Question 19: Do you support the package of recommendations and actions to create a multisector strategy? Is there anything we should change?

There are many aspects covered in He Pou a Rangi's multisector strategy advice. While we generally support an integrated approach to climate change mitigation and adaptation, we particularly wish to comment on advice about infrastructure decision-making and the development of mechanisms to address carbon leakage with specific reference to construction materials:

- Recommended time-critical necessary action 6(e): "*...Government require the Infrastructure Commission to include climate change as part of its decision- and investment-making framework, including embedded emissions and climate resilience*"
- Necessary action 19(d): "*...in the first budget period the Government make progress on exploring alternative policy instruments that could address the risk of emissions leakage*"

Infrastructure decision-making

Te Waihanga supports incorporating whole-of-life carbon emissions (both embodied and operational) into the business case / decision-making process for all new infrastructure assets and major upgrades or renewals.

Natural hazards, including those that will be exacerbated by climate change, should also be integrated into decisions about where and how to build infrastructure assets and the communities infrastructure supports. Costs for future adaptation should also be included in the business case / decision-making process to ensure that future costs are understood and planned for as part of creating intergenerational equity.

It is important that He Pou a Rangi reflect the fact that Te Waihanga does not have a decision- or investment-making function, and does not have any directive or coercive powers. Therefore, in the absence of legislative change, we simply cannot give effect to recommended time-critical necessary action 6(e): "*...Government require the Infrastructure Commission to include climate change as part of its decision- and investment-making framework, including embedded emissions and climate resilience*".

There are a number of Agencies, including Te Waihanga, working to develop policies and tools to integrate climate change mitigation and adaptation into the decision-making process, including through resource management reform, the development of the National Adaptation and Emissions Reduction Plans, and the Building for Climate Programme. Treasury have built a shadow price for carbon into its cost-benefit analysis model and Cabinet has agreed that a Climate Implications of Policy Assessment (CIPA) tool be completed for relevant policy proposals seeking new funding.

Te Waihanga will continue to work with agencies across Government to support better decision-making, but time-critical necessary action 6(e) must sit across multiple agencies, and not solely with Te Waihanga. Te Waihanga would be pleased to work with He Pou a Rangi, the Treasury and other relevant Crown agencies to refine this recommendation before He Pou a Rangi's advice is finalised.

Te Waihanga also observe that it is important that legislative frameworks are in place early to enable innovation, and support the uptake of new technologies. Aotearoa's decision- and investment-making system should encourage infrastructure asset owners and service providers (including the private sector) to confidently invest in innovation and the adoption of low-carbon technologies. For example, current frameworks for gas and transport fuels are not fit for purpose when considering the uptake of hydrogen. This may also include pricing for regulated providers to enable them to price risk, new technology uptake and innovation.

Carbon leakage

The ETS has an important role to play in incentivising the uptake and innovation of low-carbon initiatives. We do however have concerns about potentially perverse outcomes in the construction materials sector due to carbon leakage at the border.

Policy and price settings could mean that the import of carbon intensive construction materials is increasingly favoured, particularly if they are manufactured in jurisdictions that don't internalise the cost of carbon in the same way, or at the same pace, as Aotearoa. For example, steel and cement are already imported into Aotearoa based on price, and this could be exacerbated, leading to onshore manufacturers becoming less viable with no carbon reduction benefit.

We support He Pou a Rangi continuing to work with other Crown agencies to explore solutions to leakage, and encourage He Pou a Rangi to consider construction materials, including steel, cement, and aluminium, in this work.

Consultation Question 20: Do you agree with Budget recommendation 5 on the rules for measuring progress? Is there anything we should change any why?

Te Waihanga strongly support further thinking on how consumption-based emissions accounting can be used to augment the whole-of-economy approach taken using the production methodology, at least at the infrastructure asset level.

While we do not disagree that the production-based approach is most appropriate at the whole-of-economy, and international, level, we see that consumption accounting, and potentially setting targets for consumption, is particularly important for infrastructure assets where emissions cannot be avoided.

There is an implicit assumption that low-carbon technologies will be developed and adopted in construction materials manufacturing, but it must be acknowledged that this is on the horizon and not available today. In the meantime it will be important to adopt the low-carbon construction approaches that are available today, to build low embodied carbon infrastructure (and over the first budget period).

Adoption of these approaches often requires standards, codes and construction methodologies to evolve. For example, roading asset owners may need to revise pavement standards to allow for the incorporation of recycled material. More generally, development or maintenance programmes may need to be staged differently to allow for the use of low-Portland cement concrete, which takes longer to cure. These approaches are available today, but are often not incentivised, and will not necessarily be further incentivised as a result of He Pou a Rangi's draft advice.

Beginning to account for the embodied carbon in all infrastructure construction and maintenance, and in the longer term, setting reduction targets in a similar way to the operational targets that are increasingly common for buildings, may be the best way to ensure that available low-carbon construction approaches are adopted over the first budget period, and that new technologies are implemented in Aotearoa when they become available. Measurement and targeting would require the use of consumption-based accounting at the asset level, and for that to be standardised at the national level.

Te Waihanga therefore strongly support He Pou a Rangi continuing to work with StatsNZ to progress this accounting approach, and Te Waihanga would be pleased to support this process.