He Pou a Rangi
Climate Change Commission

2023 Advice on the direction of policy for the Government's second **emissions reduction plan**

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Disclosure statement

As anticipated by the appointment criteria, the Climate Change Commissioners come from varying fields such as adaptation, agriculture, economics, te ao Māori and the Māori-Crown relationship.

While a number of board members continue to hold roles within these fields, our advice is independent and evidence-based.

You can read more about our board members on the Climate Change Commission website. The Commission regularly updates and publishes on its website a register of relevant board interests.

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Te Karere a te Tumu

Kua tīmata kē te ahunga o te ao ki te whakawhiti atu ki tētahi anamata tukuwaro iti. Ko tēnei ahunga he whakarite i tētahi āheinga nui rawa atu ki a Aotearoa, ā, ehara i te herenga noa iho.

Ki 2050, ka ahu tō mātou whenua kia noho hei papori tika, huamaha, tukuwaro iti, āhuarangi pakari hoki.

Mēnā ka whai i ngā nekenga ināia tonu nei, ka hoki whakamuri ana te tangata me te kī he pōturi tā mātou tīmatatanga, engari he mahi tonu i tutuki, ka mutu, mō te waenga o ngā tau 2020 i eke katoatia ā mātou mahi. Ka noho hei ekenga nui ki tētahi taumata pai ake i tō ngā kawenga o te wā.

E eke ai te ōhanga, me noho tonu ki ngā taumata ōhanga o te ao kei reira ētahi atu whenua e whakakore wawe ana i te waro. Ko ngā hua me ngā kaupapa ka tere tupu ōna mākete whai rawa he iti ōna tukuwaro kei ōna whakaputa hua, he tautoko rānei i te ao iti te tukuwaro.

Ko ngā hua ōhanga me ngā hua pāpori – pēnei i ngā tūranga mahi hou me te pakari hoki – ka ahu mai i ngā tukanga e ākina ana kia whakawhiti atu i ngā hinuwaro whai hiko. He mea nui ki a mātou anō kia whai hiko whakakore waro. Ko ngā ahu matapūngao me ngā aronga kia pai ake tēnei rāngai, te ahuwaka me ngā ahuwhare he āheinga katoa ki ngā pakihi hou, ngā kaupapa hou me ngā tūranga mahi. Mā te whakatere pūngao pai ka penapena pūtea ki ngā pakihi me ngā kāinga, ka mutu, he whakapiki ake i te āhuru me te haumaru o te noho.

Inā rā te pikinga, ko ngā hokomaha whenua maha he whakapūmau i te whakahekenga tukuwaro ki ō rātou hokomaha. Mā te whakaheke i te tukuwaro a Aotearoa i ōna hokonga tāwāhi, ka taea e tēnei whenua te mau ki ngā takohanga ki te ao, ka mutu, ko te ora o ngā hua hokohoko – pēnei i te miraka, ngā hua a Rongo me te mātai – ka hokona tonutia e ngā kaihokohoko o te ao.

Ko te kai me ngā whītau o te motu, nāna tonu i hua mai i te $56 piriona tāra ki te tau mai i Hune 2023, ka noho pea hei tino tauira ki ēnei momo āheinga. Mā te tiki wawe iho i ngā hangarau me ngā tikanga o te wā, te tohutohu tika a te Kāwanatanga i ōna tukanga, te whakapūmau i te hangarau hou, te hoatu rānei ki a Aotearoa kia tutuki i ōna ahunga me te kaupare i ngā whakawhiu ka whakaputaina e te ahuwhenua.

Ko tātou katoa ka whai hua i te nui o te tangata whakamahi i ngā momo pahi me ngā pahikara, kaua ko ngā waka hiko anake. Ka taea e tātou te whakaheke tukuwaro mā te whakapiki i ngā kōwhiringa waka ki a Aotearoa whānui.

Mā te panoni i ō mātou taone me ngā taone nui me te whakaheke i te nui o ngā tāngata ka whakamahi motoka tētahi āhua whakaheke i te nui o ngā tāngata ka aitua, ka mate rānei ki ō tātou rori me te whakatenatena i te hauora ki ō mātou hapori. Ko ngā panonitanga ki te whakatika i ngā ara hikoi, ara pahikara me ngā rori matua tētahi mahinga hei oranga ki te iwi whānui. Mā te mahere me te hanga tika i ngā wāhi ka hua mai he hapori tautika, he pikinga hauora, ā, he whakamahinga ngao pai hoki.

Nō Huripari Gabriel ka parekuratia te motu whānui i tēnei tau, i Pepuere, ā, ko te whakamau ki ngā whiu o te āhuarangi tētahi tino herenga ki te kōrero nui mō ngā mahi mā te taiao. Ko te āwhā tētahi o ngā mea maha i pāngia whānuitia e ngā hunga me ngā kāinga i ngā tau e rua kua hori. Ko ētahi rohe, pēnei i Te Tairāwhiti, e hia kē nei ngā patunga. Mā te tūtohu i tētahi ara whakamua ki te whakawhitianga tētahi tino mahi mā Aotearoa i tōna urupare taiao. Heoi anō, ko ngā whakatau ki ngā tikanga āhuarangi me whai waahi atu ki te whakaheke tukuwaro.

He kotahi tonu te aro āhuarangi me te whakaheke tukuwaro – kua kore tētahi e ora i tētahi atu. Mā ngā whakatau mātau ki ngā taone, ngā hanganga, me ngā wharenui ka āhei te whakaheke i ōna tukuwaro, te whakaheke tūraru ki ngā hanganga takutai, ngā wharenui, ngā whenua hoki me te whakapakari i ngā pae hiko me ngā pae pāpāho.

He tino mahi kei ngā ngahere mō te tutuki i ngā ahunga rehukino roa, pēnei i te whakaea i ngā tukuwaro mai i ngā rāngai kei reira ngā tukuwaro e uaua ana ki te whakaheke nā runga i te nui o te utu, i te korenga rānei o ngā hangarau. Me mārama ake te āhua ki ngā tūmomo ngahere e ākina ana e te tukanga taiao. Mā tēnei ka aratakina ngā tukanga me te whakaoreore i ngā penapena pūtea ki ētahi ngahere kē atu me te ākina ake kia whakaheke tukuwaro ki te taha i ngā pakaritanga, te ao koiora me ētahi atu āheinga ka homai e ngā ngahere.

Engari, ehara hoki te whakatō ngahere tētahi mea hei whakakī i te wāhi ki ngā whakahekenga tukuwaro i te mātāpuna. Mā te whakaoreore i ngā whakahekenga tukuwaro katoa ka ara ki te whakarerekē i tō tātou ōhanga me te whakaiti ake i te tūraru a ngā whiunga o te āhuarangi, nātemea kei te noho whakaraerae ngā ngahere ki ngā āwhā me ngā kāpura i te pikinga o te paemahana.

Ka aroha hoki te Kaupapa Hokohoko Tukunga o Aotearoa, kāhore i a ia te mana whakarite i ngā whāinga nātemea ko ngā mahi whakanui i ngā whakahekenga tukuwaro katoa ka whakaiti ake i ngā whāinga kia whakatū ngahere whakamau waro.

Ko te tūhononga Karauna ki te Māori tētahi mea nui ki te whakawhitianga tautika, mō te oranga o ngā iwi katoa o Aotearoa. Ko te nui o ngā iwi me ētahi atu kaipupuru Māori he kaha ki te whakahaere kaupapa taiao me te whakahaere i ētahi tino rawa mō te whakawhitianga ki te whakaheke i te tukuwaro. Me hoatu ki te iwi Māori ngā rawa e tika ana ki te whakatere ake i ngā whakaheke tukuwaro e ai tā ngā tikanga me ngā mātauranga Māori, tuia ko te aro ki ngā wawata o ngā iwi me ngā hapori Māori.

Mēnā rā ka kore hoki he mahi ki tēnei kupu akiaki ka raru te tūpono o Aotearoa ki tētahi anamata hua nui, ā, ka noho kē te onamata o te utu heahea e piki tonu ana. Ka whai hoki ko tēnei utu o te whakaheke tukuwaro me te whakataimaha anō i ngā whakareanga hou, tuia hoki he whakaiti i ngā kōwhiringa me te whakaea i ngā rarururu nei. Mā te tārewa ka riro te āheinga nui ki a tātou katoa.

Hei whakamāmā me te whakamārama noa ki ēna kaiwhakatau ki te wāhi tuku moni, ka āhei te Kāwanatanga te whakarite i tētahi huarahi aro ki ngā whakahekenga rehukino ki te mātāpuna tonu. Mā tēnei haepapa, āpiti atu ko ngā tukanga, ka ākina a Aotearoa ki tētahi anamata ora.

Dr Rod Carr, Chair

Chair's message

A global transition to a low emissions future is already underway. This change brings an enormous opportunity for Aotearoa New Zealand, it is not just an obligation.

In 2050, our country could be a cleaner, greener, low emissions, climate-resilient society.

If we take the necessary steps now, people will look back and say we were slow to get started and behind the curve, but by the middle of the 2020s we got our act together. This led to a better place than it would have been if we just kept on doing what we were doing.

For our economy to thrive, we need to stay competitive in a global economy where other countries are rapidly decarbonising. The products and services that will have fast-growing demand in affluent markets are those that have low emissions in their production, or support low emissions ways of living.

Economic and social benefits – such as job creation and resilience – will come from policies that support transitioning away from fossil fuels to electrification. It is in our own self-interest to decarbonise energy production and use. Renewable energy industries and measures to improve how efficient industry, transport and buildings are will provide opportunities for new businesses, services and jobs. Greater energy efficiency can save money for businesses and households, and improve building comfort and safety.

Increasingly, multinational retailers are committing to reducing emissions throughout their supply chains. By reducing the emissions footprint of Aotearoa New Zealand's exports, the country can both contribute to its global commitments and ensure our export products – such as dairy, fresh produce and steel – remain sought after by global buyers.

The country's food and fibre industry, which brought in export earnings of $56 billion for the year to June 2023, could be at the forefront of realising these opportunities. Rapidly adopting existing technologies and practices, having a clear direction on policy from government, and embracing emerging technology, could allow Aotearoa New Zealand to achieve its targets while limiting impacts from, and on, agricultural production.

All of us benefit from more people using public and active transport, not just electric vehicles. We can reduce emissions by ensuring there are more transport options for all New Zealanders.

Making changes to our towns and cities that reduce how much people have to rely on cars will also reduce how many people are injured and killed on our roads and contribute to better overall health in our communities. Changes that improve walking, cycling, and public transport will also contribute to a healthier population overall. Well-planned and designed urban spaces can also result in greater social equity, improved health outcomes, and more efficient energy use.

Since Cyclone Gabrielle devastated swathes of the country in February this year, adapting to climate change has been a bigger part of the conversation on climate action. The storm was one of several that have had a widespread impact on lives and livelihoods over the past two years. Some regions, like Tairāwhiti, have been hit multiple times. Charting a path forward on adaptation is an important part of Aotearoa New Zealand's climate response. However, decisions about adapting to climate change must also consider how to reduce emissions.

Adapting to climate change and reducing emissions are interlinked – one cannot be addressed without considering the other. Smart decisions on urban form, infrastructure, and buildings can reduce their emissions footprint, reduce risks to coastal infrastructure, buildings, and land, and strengthen the resilience of electricity and communication networks.

Forests are critical to meeting the long-lived gases target, particularly to balance emissions from industries where emissions are hard to reduce due to cost or technology not being available. More clarity is needed on the types of forests encouraged by climate policy. This will guide policies and encourage investment in a mix of forests that better support reducing emissions alongside resilience, biodiversity and the multiple other benefits forests provide.

However, planting forests is not a substitute for reducing emissions at source. Driving gross emissions reductions is essential for transforming our economy and lessening the risk posed by the impacts of climate change, as forests are becoming more vulnerable to storms and fires as the world warms.

Unfortunately, the New Zealand Emissions Trading Scheme is not structured to deliver these outcomes because it allows the incentive for gross emissions reductions to be undermined as more action is taken to enhance carbon storage by forests.

The Crown-Māori relationship is critical for an equitable transition, for the benefit of all people of Aotearoa New Zealand. Many iwi and other Māori landowners have a strong commitment to climate action and control significant assets that can contribute to a low emissions transition. Iwi/Māori should be given the resources to accelerate emissions reduction in accordance with tikanga and mātauranga Māori, and while realising the aspirations of their people and communities.

A lack of urgent and immediate action on this advice will mean that Aotearoa New Zealand's chance for a prosperous and thriving future will be traded for maintaining an increasingly unaffordable status quo. It will also shift the burden of reducing emissions to the next generation, while simultaneously reducing the options they have to tackle the problems ahead. Delay will mean an opportunity denied for us all.

To give clarity and confidence to those who decide where to invest, the Government could set a path focused on reducing greenhouse gas emissions at source. This fundamental step, along with aligning policies to this path, will help move Aotearoa New Zealand towards to a better future.

Dr Rod Carr, Chair

Te kupu a te Pou

Kei te nuku whakamua a Aotearoa ki te tutuki i ngā ahunga āhuatanga - ā, me koke tonu.

He mārama te ahunga mā tō mātou whenua ki ngā tau e rima whakamutunga ki tēnei tau-ngahuru, te wā ka arongia te mahere tukuwaro tuarua.

Ka whakaatu atu ngā mahi o te Komihana mēnā ka tutuki ngā whakahekenga tukuwaro e tika ana ki ngā toronga katoa ki te ōhanga, ki ia reanga o te Kāwanatanga, me ngā kāinga o ia hapori.

Ko te onamata te wā tika ki te whakatere ake i ngā mahi āhuarangi hei whakaheke i ngā tukunga rehukino. Inā rā te piki i ngā pīnakitanga ki te taumata, he aro ki ā mātou ahunga ā motu me ōna herenga ki te Kawenata o Parī. Ā, me koke tonu.

Ko te haepapa ki te Komihana he tuku i te kupu akiaki motuhake, kounga hoki ki te Kāwanatanga. Ko tēnei rīpoata he whakamārama i te ahunga o ngā tukanga hei tutuki i te tahua tukuwaro tuarua me te noho tonu tae noa ki te tutukinga o te ahunga 2050.

Ko tā mātou kupu akiaki he whai whakaaro ki ngā kōrero me ngā taunakitanga o te hia mano tāngata nō Aotearoa, mā roto i ngā uiuinga maha i ngā tau a te Komihana whakahaere, ki ngā hui me ngā wānanga hoki e hāngai mai ana ki tēnei anō kupu akiaki.

Hei te hiku o 2024, me tuku e Kāwanatanga tōna mahere whakaheke tukuwaro tuarua.

Kei te Kāwanatanga ngā kōwhiringa ki ngā mana tukanga hei whakaoreore ake i ngā mahi, ā, me aro tō rātou mahere ki te whakamārama he aha ēna mana me te pānga ki ngā mahinga tukuwaro.

Ki ngā reanga amokapua, ka māma te kupu akiaki a te Komihana. Me aro te mahere a te Kāwanatanga ki te whakanui i ngā mahi whakawhitianga, he whakamahea ake ngā āraitanga, me te ākina ake ngā pūtea kia tae ki nga hangahanga me ngā auahatanga hei kōwhiringa whakaheke tukuwaro ki ngā uri ā haere ake nei.

Ko te takerenui o ngā mahi āwhina he tino aronga mā te Kāwanatanga, ā, me mārama tō rātou e anga ana ki te whakaheke tukuwaro ki te mātāpuna.

Kei ia rāngai ngā āheinga e taea ai e mātou te hiki ake. Ko te whakapiki wawe i te matapūngai me te poro ko ngā whakamahanatanga tukuwaro he tino whāinga ki te tahua tukuwaro tuarua.

Mā te mahi ināia tonu nei ki te paewaka tētahi whakatutukinga nui ki tahua tukuwaro tuatoru. Mā ngā panonitanga ki te tukupara me ngā tukuwaro ahuwhenua he tino wāhanga o te tutuki i te ahunga mēwaro.

Ko te whakarito ngahere hei ngōngō i ngā tukuwaro ka āhei ki te tautoko kia eke ki ngā ahunga āhuarangi tairoa, engari ko te whakatō ngahere hou ka kore e āki ki te tutuki i te tahua tukuwaro tuarua, nātemea ka hia te roa kia whakatupu me te whakarito i ngā waro.

Me aro te Kāwanatanga te mana o te iwi Māori ki ēnei whakahekenga tukuwaro.

Ko tō mātou kupu akiaki he whakaoreore i te Kāwanatanga kia whakamana i te noho o te mātauranga Māori ki ngā mahinga āhuarangi me te whakaurua ētahi rauemi ake ki ngā iwi Māori hei whakatere ake i te whakahekenga tukuwaro.

Nātemea kua tīmata kē te anga whakamua, kei reira ngā tūraru nui ki te whakatārewa, ki te whakatōmuri hoki i ngā toa kua whakawhiwhingia. Ā, ki te kore he anga tōtika, ka kore pea he mahinga. Mehemea kāhore e tika ana te tohutohu, ka tukituki pea ko ngā mahi ā ngā tāngata ki ngā mahi hoki a ngā ratonga.

Ko te tūraru nui i tēnei wā ko te whakatārewa. Tērā pea ka tau hei rironga poto ki te tahua tukuwaro tuatahi, ka rongo kau i ngā pānga nui ā haere ake te wā.

Ko tā te Kāwanatanga mahi he whakatau i te āhua o ngā whakaheke tukuwaro me ngā tohu aupeehi a te āhuarangi ki a tātou katoa. Ko ngā whakatūwheratanga, ngā whakatōtanga, ki hea haere ai, he aha hoki ngā mahi me tutuki ngā tino whāinga. I te pikinga ake, me aro hoki e tātou kia ahu ki te nuku me te pānoni ngā āhuatanga o reira.

Kei te ahu mātou ki te wā wāwahi. I ahu mai tēnei i ngā panonitanga kua whakaritea ngātahitia e te ao ki te whakatika i te āhuarangi me te pikinga o ngā momo patunga o te āhuarangi kua roa e mahi ana i āna mahi.

Heoi anō, he ratonga ō mātou ka tū hei ringa wāwāhi. Kei a mātou ngā mātauranga, ngā taputapu me ngā hangarau e wātea ana ki a mātou hei mahi, hei tutuki hoki i a mātou ahunga āhuarangi.

Mā te whakamana i te wāwāhitanga me tō mātou ratonga ake, ka tāea te tūtohu ake i ngā āheinga.

Ko te nui o ngā mahi ka aro ki te whakaheke tukuwaro hei ākina tātou i ngā āhuatanga maha. Ko te tuku moni ki ngā matapūngao ka waimeha ko ngā whiunga, ko tō mana ki ngā hokonga hinu.

Mā te tuku moni ki te paewaka hiko, ngā wharenui tukuwaro iti, me ngā paewaka matawhānui ka heke te utu o te noho whare me whakatika ake i te hau me te oranga tangata.

Ko te tuku moni te ahuwhenua tukuwaro iti, te ōhanga toiora, me te ōhanga taketake ka hua mai he āheinga ōhanga hou. Ko te tuku moni ngā ngahere taketake ka ākina te whakarauora anō i ngā rākau me ngā manu, te whakaheke i te waimeha, me te whakatika anō i te wai.

E mihi kau ana ki ngā pou Komihana i arataki mai i tēnei kupu akiaki me te Tari nā koutou tonu i whakaputa, arā ko ngā hunga kua homai kōrero ki a mātou ma roto i ngā tono-uiui, ki ērā hoki kua tikina kētia ngā āheinga hei oranga ki te anamata ora.

Kua eke ki te wā mā te Kāwanatanga anō te whakatau i te mahere, he tuhituhi ake i ngā mahinga tukanga, ka mutu ko te hanga i ngā whakaritenga hei whakamahinga ki re tahua tukuwaro tuarua.

Jo Hendy, Chief Executive

Chief Executive's message

Aotearoa New Zealand is now making measurable progress on climate change – and we must keep going.

The country's task is clear for the second half of this decade, the period covered by the second emissions reduction plan. The Commission's work shows that achieving the necessary emissions reductions will require effort across every sector of the economy, every level of government, and households in every community.

Now is the time to ramp up climate action to reduce our greenhouse gas emissions. We are a few steps into scaling the summit that our domestic goals and the Paris Agreement represent. And we must keep going.

The Commission's role is to give independent, expert advice to the Government. This report describes the direction of policy needed to achieve the second emissions budget and keep the country on track for the 2050 target.

Our advice is based on rigorous research and expert analysis. Our work has been informed by the views and evidence of thousands of New Zealanders, shared with us through extensive engagements held over the course of the Commission's existence, and in hui and wānanga focused specifically on this advice.

By the end of 2024, the Government must release the second emissions reduction plan.

The Government has choices in the policy levers they can use to scale up action, and their plan will need to describe which levers they intend to use and demonstrate the impact that will have on emissions.

At a high level, the Commission's advice is simple. The Government's plan will need to provide incentives for change, lower barriers to making changes, and support investment in infrastructure and innovation to provide people with low emissions choices into the future.

Fundamental to supporting this investment is the need for the Government to be clear on how much we are aiming to reduce emissions at their source. Clarity on gross emissions reduction will help guide better policy and lead to greater confidence to make investment decisions that support the transition.

Every sector has opportunities that the country will need to leverage. Rapidly increasing renewable electricity generation and cutting process heat emissions is critical for achieving the second emissions budget. Acting now on transport will be critical for achieving the third emissions budget. Changes in waste and agriculture emissions will be critical for achieving the methane target.

Planting forests to soak up emissions can help us reach our longer-term climate change goals, but planting new forests will not help achieve the second emissions budget, because trees take time to grow and store carbon.

The Government must consider the role iwi/Māori play in our emissions reductions. Our advice encourages the Government to recognise the role of mātauranga Māori in climate action and to introduce ways to directly allocate resources to iwi/Māori to accelerate emissions reductions.

Because the country has just begun to make progress, there are significant risks that could slow, or even reverse, the efforts made so far. Without a clear direction, there could be inaction. Without coordination, people and organisations may end up working at cross purposes.

The clearest risk in this moment is delay. What might appear to be a small shortfall in the first emissions budget could become a much larger shortfall in the second budget, and the impact will accumulate over time.

Government plans on how to reduce emissions also need to factor in the impact that climate change is going to have on all of us. What we build or plant, where it goes, and how it is done will all matter. Increasingly, we will also be confronted with the need to move or change what is already there.

We are heading into a period of disruption. This comes from both the changes that the world is collectively making to tackle climate change and the increasingly devastating weather events from the climate change that is already baked in.

However, we have agency in the face of this disruption. We have the knowledge, tools and technologies available to us to act and meet our climate targets.

By acknowledging both the disruption and our own agency, we will be able to identify opportunities.

Many of the actions that will reduce emissions will help us in other ways too.

Investing in renewable energy will reduce the inflationary impacts of dependency on oil imports.

Investing in electric transport, low emissions buildings, and public transport will reduce the cost of living and improve air quality and health.

Investing in low emissions agriculture, the bioeconomy, and the circular economy will create new economic opportunities. Investing in native forests will help restore our native plants and animals, reduce erosion, and improve water quality.

I offer my gratitude to the Climate Change Commissioners who guided this advice and Commission staff who produced it, the people who contributed to it through speaking with us and through submissions, and those who are already seizing the opportunities to contribute to a better future.

Now it is over to the Government to set the plan, do the detailed policy work, and create the conditions that will deliver the second emissions budget.

Jo Hendy, Chief Executive

Te Whakarākei Matua

E rārangi mai nei i tō mātou tūranga ki Te Ture Urupare Āhuarangi 2002 (te Ture), kua whakaritea e He Pou a Rangi (te Komihana) tōna kupu akiaki ki te Kāwanatanga mō te ahunga o te tukanga ki te mahere tuarua ki ngā whakaheke tukuwaro, e whakamarumaru ai te tuarua o ngā tahua tukuwaro (2026-2030).

Nā te Ture i whakatūria i te ahunga 2050 mā Aotearoa, nā whai anō te huarahi ki tōna tutukinga. Kei raro i te Ture, ka whakaritea e te Kāwanatanga ngā tahua tukuwaro – e tau ai te katoa o ngā tukuwaro kua whakaaetia mō te rima tau te roa – ngā mahere whakaheke tukuwaro, e tohu ana i ngā mahi e tutuki ai ēnā tahua.

Kua whanake i a mātou tēnei kupu akiaki mō te painga tonu kia ākina te Kāwanatanga kia tutuki i tōna mahi whakarite i ngā tukanga me ngā rautaki e tutuki ai i te tuarua o ngā tahua tukuwaro me te whakapūmau i tā Aotearoa noho ki te tutuki i te tuatoru o ngā tahua tukuwaro me te ahunga 2050.

Inā rā te noho hei hinonga Karauna motuhake, ko tō mātou kupu akiaki he kōrero rangahau, he mātauranga tiketike kua ākina e ngā mōhioranga me ngā taunakitanga a te uiuinga roroa. Ko tō mātou aronga he ahunga tukanga taunga me te mārama. Mā te mārama me te mōhio ka tika te tū a ngā kāinga, ngā pakihi me ngā hapori ki te utu i ngā āheinga tukuwaro iti, ka mutu, he tino aronga hei whakawhiti atu i a Aotearoa ki tētahi anamata ora, āhuarangi pakari me te tukuwaro iti.

E herea nei e te Ture, kia whakaritea e te Kāwanatanga ngā whakahau me te whānuitanga ki te kupu akiaki kei tēnei ripoata, mō mua tonu i te whakaritenga o te mahere whakaheke tukuwaro tuarua ā te 2024. Ko ngā tukanga me ngā rautaki kei tērā mahere he hanga i te tūāpapa o tā Aotearoa ahunga ki te tutuki i te tahua tukuwaro tuarua, te tahua tukuwaro tuatoru me te ahunga 2050.

E heke ana ngā tukuwaro, engari me piki tonu te mahi a te Kāwanatanga

Ko te whakawhitianga ki tētahi anamata tukuwaro iti he tohu i tētahi āheinga ki tētahi anamata ora, hua nui hoki mā Aotearoa. Ko ngā kāinga, ngā pakihi me ngā hapori he whakamauru i te āhuarangi e hua mai ai he hau ora, e heke ai te utu ki te ngāo, he āheinga ki te makete hou, e heke ai te tūraru o te pikinga utu kei te heke mai, ā, kia nui ake te mārire o te noho, kia haumaru hoki te noho i te ao.

Inā rā te aro ki ngā waka whai hiko, te whakawhiti kē atu i te tahu waro me te aro ki te hiranga o te whakaheke tukuwaro ahuwhenua he tohu tērā i te pūmau o tā Aotearoa tutuki i tētahi anamata tukuwaro iti, ka mutu, ko te anga whakamua.

Ko te tatauranga hou ki Ngā Inenga Rehukino he whakaatu i tā Aotearoa whakaheke i tōna utu whakaheke i ngā tukunga rehukino ki 2020 me 2021. Hei tā Tatauranga Aotearoa, he rite tonu taua mahi, anō o ngā tukunga katoa o te ahumahi me ngā kāinga he heke mā te 3.9% mai i 2021 ki 2022.

Me mahi te Kāwanatanga ināia tonu nei ki te whakawhanake i taua mahinga me te whakawhānui, te whakakaha me te whakatere i te whakapeto ngoi kia tutuki i tā Aotearoa kaupapa āhuarangi.

Ki tēnei rīpoata he whakaahua i te tukanga Kāwanatanga o te Oketopa 2023. Kei ia Kāwanatanga ōna ake tukanga matua me ngā aronga matua hei mahinga mō te taha ki te Āhuarangi.

Ki tēnei kupu akiaki, he aronga whai hua tō mātou titiro, he tūtohu i ngā āheinga mā te Kāwanatanga mō te whakarite i te mahere whakaheke tukuwaro tuarua me te whakatakoto i ngā tino āheinga me ngā tūraru hei tohu i te whakataunga tika.

Ko ā mātou whakahau ki te Kāwanatanga he tūtohu i ngā wāhanga e tika ana hei mahi, māna ko hea whakapau kaha ai ki te whakarapa me te whakatere kia tutuki i te tuarua o ngā tahua tukuwaro me ngā ahunga whakaheke tukuwaro tahuaroa o Aotearoa e ai rā i te Ture. Mā tēnei, ka ahu mai me te whakatupu hoki tō mātou kupu akiaki i o mātou mahinga ō mua, arā i tō mātou rīpoata a *Ināia tonu nei* 2021.

Ko ēnei whakahau he aro ki ngā mahi whakaheke tukuwaro me ērā hoki o ngā 'hunga mahi', e tautoko ana i te hunga kei te uru mai me te whakapau kaha ki te tutuki i ngā tahua me ngā ahunga tukuwaro. Ki ia wāhanga, me te whānuitanga hoki o te ao-tukanga, kua tūtohua e mātou ngā ārai o te wā e whakapōrearea ana i ngā kōwhiringa tukuwaro iti, me te haere o ngā tino utu ki ngā whakarerekētanga ā haere ake nei.

E toru ngā wāhanga kua wahia ki tēnei kupu akiaki:

- **Tuatahi:** He whakamārama i te whakaahua nui
- **Tuarua:** Ngā ritenga toa
- **Tuatoru:** Ngā kowhiringa tukuwaro iti ki ngā ahumahi me te ao-tukanga

Kei ia wāhanga ētahi tino kōrero e aro ana ki ētahi tino wāhanga e taea ai e te Kāwanatanga te tutuki i ngā hua whakaheke tukuwaro, ka mutu, ko te horopaki me te inenga tika ki ā mātou whakahau.

Te herenga ki te ao

E tau nei tēnei kupu akiaki ki te mahere whakaheke tukuwaro tuarua, kei roto i tā Aotearoa mahi tahi nei me te ao e ai tā te Kirimana o Parī e here nei i te pikinga Māhanga 1.5*C, ki roto tonu i ngā whakahekenga tukuwaro ki te motu.

Kāhore tonu, ā, ehara hoki i te whakapaunga katoa a Aotearoa ki te kakari i te āhuarangi ki tā te Kirimana o Parī me ētahi atu kirimana, mahinga rānei o te ao. Ahakoa tonu ētahi ēnei whakapaunga whānui o te ao te aronga matua ki tēnei kupu akiaki, he wāhanga kōrero tonu kei roto, ā, mā ngā mahi a te motu ki te tutuki i ōna tahua tukuwaro ka taea tonu te ākina ētahi o ērā ahunga.

Ngā pēke pūtea e tutuki ai te tahua tukuwaro e penapena tonu ai ngā moni ki te tairoa

Mā *Ināia tonu nei*, i aro nui ki te aromatawai tahuaroa me te whai rautaki e ai tā ngā herenga ki te Ture, i konā ka ārahina te whanaketanga o te huarahi 2035: te ara tiketike. Kei te ara tiketike te whakaatu i te nui o ngā mahi me ngā hua ka puta ki te motu mō te tutuki i te ahunga 2050 hei tā ngā whakahau a te Ture me te whakarite i ngā āheinga e rite mai ai ki te pōrarutanga. Ko tēnei ara he tūāpapa ki tō mātou kupu akiaki e whakahau nei i ngā reanga tahua tukuwaro 2022-2025, 2026-2030, me 2031-2035

Ki tēnei mahi tonu te whakaatu hoki ko ā mātou whakahau ki ngā reanga tahua tukuwaro he whakahīhī, engari he tutukinga ka taea. Ko tō mātou pae ōhanga he tohu i te ao ōhanga me tōna tup e ai tā ngā whakahau tahua tukuwaro. I tātari mātou ko te reanga ki te utu putanga ā motu (GDP) ka noho ki te takiwā o te 0.5% tauraro i 2035 me te 1.2% tauraro 2050 ki tō tētahi atu horopaki kei reira te pōturi ki te whakaheke tukuwaro, ā, he whakataunga tēnei e kitea ana i ngā whāinga kei tāwāhi.

Mā o mātou mahi o *Ināia tonu nei*, i kitea rā ahakoa te wawe o ngā utu e tika ana kia whakaheke tukuwaro he rite ki ō mātou matapae tahua tukuwaro, ka piki ake pea i ngā penapena pūtea mō te anamata. Ki ō mātou tātari ka tae mai ngā tau 2040, ka taea e Aotearoa te penapena i te takiwā o te $2 piriona ia tau.

I tūtohua e mātou ēnei tūpono penapena mā te tirotiro ki ngā utu o te whakawhitianga ki te whakaheke tukuwaro ki ngā wāhanga e toru; ngā motoka, te mahana ki te ātea me ngā moana, ka mutu te whakatepe kai. Ko ēnei tonu he utu ki te takiwā o te toru koata o ngā whakahekenga ki ngā rehukino roa hei 2035, hei tā te ara tiketike.

Ko ngā matapae ki ngā panonitanga ki ngā motoka, ngā wharenui, me te whakatepe kai he whakaatu atu mehemea ka whakakorea e ngā kāinga me ngā pakihi te waro me te tahuri ki te hiko mō te whakamahana me te waka, ka piki te tūpono o ngā utu ki te wā poto, engari ka tīmata te hekenga hei te hiku o ngā tau 2020, ā ka heke rawatia hei te waenga o ngā tau 2030.

Ko ngā hua ki tētahi ōhanga whai hiko, e kitea ai te kaupare a ngā kiriraru me ngā pakihi i tētahi anamata tāmi ahumoni e hānga ana ki te pikinga o ngā utu penehini waro he mea aro i te ao, mā roto hoki i te pāhi o Te Ture Whakaheke Tāmi Ahumoni ki Amerika me te tupu ritorito o te kōmaru ki Ahitereiria.

1: Te whakarite i te whare

Kei te tuatahi o tā mātou ripoata he whakarite i te katoa o te horopaki ki tēnei kupu akiaki.

Tuarua: Tā mātou i rongo

Ko tēnei rīpoata he kōrero ki ngā whakaaro me ngā taunakitanga o te manomano tāngata huri i Aotearoa, i homai nei mā ngā uiuinga i whakatūria ki te roanga o te Komihana mahi, ka mutu, ki ngā hui me ngā wānanga i aro tika ki te wā ki te tuarua o ngā tahua tukuwaro.

I te 26 o Aperira 2023, i whakaputaina te kupu hukihuki o tēnei kupu akiaki hei uiuinga mā te hapori. Ki ngā wiki e waru i whai muri mai, ka tūtaki, ka whakarongo hoki ki te iwi Māori, ngā pou mātauranga, ngā pakihi, ngā hapori, ngā kaipāmu, ngā kaunihera ā rohe, ngā ratonga kāwanatanga-kore, ngā ratonga kāwanatanga me ngā hunga maha mō te whakamātau me te whakapaipai i ā mātou mahi.

Mā te kaupapa o Maui.Tech, i mahi tahi ki ngā iwi maha nō ngā rohe ki tētahi aronga rangahau mai i te tirohanga Māori e mārama ai ngā tino whiunga a te āhuarangi.

Ko ngā uiuinga ki te kupu hukihuki i mutu i te 20 o Hune 2023. Nā te Tari o te Komihana i pānui, i aromatawai, i tātari hoki i te 300 tono i tae mai ki a mātou. I konei i ā mātou aromatawai, i arotake anō te aronga, ngā whakatau, ngā kōrero whakakapi me ngā whakahau e tika ana ki tēnei.

Ki te roanga o tēnei rīpoata, tā mātou muramura i ngā tino kaupapa me ngā akoranga nā ngā uiuinga, ā, ki hea hoki te haerenga o tō mātou kupu akiaki i tahuri hei tā mātou i rongo.

Ko tētahi o ēnā kaupapa kia aro mai te Kāwanatanga ki te whakatenatena i te tangata kia kuhu mai me te whai kia mahi ki te whakaheke tukuwaro, hei tauira mā te punaha whai rawa me te whakapāpā ki te motu kia tautokotia te panoni waiaro.

Ko ngā tono a ngā kaunihera ā rohe he rite tonu tō rātou hiahia kia mārakerake ai ngā mahi e tika ki a rātou mō te whakawhitianga, me te mea nei, ko ō rātou moni me ā rātou rauemi tukanga me hānga hoki ki ā rātou haepapa.

Ko tā ngā urupare he kōrero ki te hirahira kia tautika te whakawhitianga ki te ahumahi me te papori, ā, he tautoko hoki i ngā hapori kia whakawhiti ki te ora me te aro tonu ki ngā whiunga a tētahi āhuarangi e mahana haere ana.

I rongo hoki ko te māramatanga ki te ahunga o te Kāwanatanga mō te tukanga āhuarangi he tino kaupapa e whakamana ana i te haerenga, inā rā ko te tuinga me te hāngai o te ahunga ki ngā tini ahumahi o waenga i te kāwanatanga me ngā kaunihera ā rohe. Ki ngā wāhanga maha o te kupu akiaki, he rongo ki ngā nawe o te tūraru kei ngā tukanga ka tukituki ki a rātou anō, nā whai anō ka kore hoki e tutuki rawa ngā tahua tukuwaro.

Ko ā mātou mātai he whakaatu i te tūraru ki tā Aotearoa kaupapa me ōna tukanga kāhore tonu e tika nei tōna hāngai ki te tutuki i te tuarua o ngā tahua tukuwaro, ka mutu, ngā aronga tahuaroa ki te whakaheke tukuwaro

Ko tā mātou whakahau ki te Kāwanatanga, kia hāngai, kia aro hoki ngā whakahaere me ngā hua tukanga kei roto, kei waenga hoki i ngā reanga kāwanatanga kei te katoa o ngā ahumahi o te ōhanga, hei tautoko i te tika o te haerenga o te mahere tukuwaro tuarua.

2: Te mātai ki te ora

Ko te wāhanga tuarua o te ripoata he kōrero ki tā te Kāwanatanga whakarite i ngā heipūtanga e tutuki ai ngā tahua tukuwaro.

E rārangi mai nā i te rīpoata Taumata Aro Āhuarangi, e tika ai te mahinga āhuarangi me whai tautoko i te Kāwanatanga, he mana whakahaere e whānui nei te toronga, ngā kaupapa arataki, he ture, he tukanga, he rautaki hoki, tuia ko te urunga ki te huamoni me te hangarau. Mā te whakawhanake, mā te whakahaere, mā te arotātai tika i te tukanga āhuarangi hei tautoko i tētahi whakawhitianga ki te whakaiti tukuwaro me whai tohutohu ki te whānuitanga o ngā ratonga kāwanatanga me ngā reanga Kāwanatanga, arā hoki ko te iwi Māori. Ko ngā wāhanga he aro ki ngā wāhi e tiro nei i ngā mahi a te Kāwanatanga me ngā whiunga ka rongo ki ngā ahumahi maha me ngā hapori, ka mutu, ko te utu me te pūtea, te utu tukuwaro me te ara hoki ki te waro-kore. Mā te whakarite kia tika te tūāpapa, ka tika hoki tā Aotearoa tutuki i ngā ahunga āhuarangi, inā hoki te ārahi kia tika te whakaheke tukuwaro ki te katoa o ngā wā tahua tukuwaro.

Tuatoru: Ngā nuka ki te tahua tukuwaro tuarua

E whakaatu tika mai nei ngā kōrero taunaki e tutuki ai te tuarua me te tuatorua o ngā tahua tukuwaro me ngana kia eke rawa ngā reanga katoa o te kāwanatanga me te katoa o ōna ahumahi.

Kei te mahere whakaheke tukuwaro tuatahi, nā te Kāwanatanga anō te whakarite i ngā ahunga iti maha, ki te katoa o ngā tukuwaro ki ia ahumahi ki ia wā tahua. Mā te taurite i ēnei ahunga iti ki te horopaki tūāpapa a te Kāwanatanga, e whakamana ana i ngā tukuwaro o mua i te taenga mai o ngā tukanga a te mahere whakaheke tukuwaro tuatahi, ā, ka kitea ngā whakahekenga tukuwaro anō ka rongo o waho atu o ngā mahi o ia rā, o ia rā.

Ki te tuarua o ngā tahua tukuwaro:

- te katoa o ngā tatau whakaheke tukuwaro e whakapaetia ana ki te 43.5 $MtCO_2e$
- te hea nui rawa (takiwā o te 40%) e matapaetia ana ka ahu mai i te ao pūngao me te ahumahi, katoa he 17.4 $MtCO_2e$
- ko te ahu motoka, te ahuwhenua me te ahu ngahere ko tōna matapae whakaheke tukuwaro he 7-8 $MtCO_2e$
- ko te toenga he 3.3 $MtCO_2e$ ko te matapae hoki ka puta i ngā para me ngā haukōwhai.

Ka taea te whakatere me te whakahoro tika i te whakaheke tukuwaro mā te pūhiko me te huamahana, mā te mata-pūngao me te whakawhiti atu i te tahuwaro me te whakamahana hinuwaro. Ko ngā tino āheinga kei ngā ahumahi ko te whakapiki i te nui o ngā waka pūhiko, tewhakawhiti atu ki te motoka waroiti, te whakatika haere i ngā tikanga pāmu me te whakaheke i te mahi tukupara matamata ki te kōpū o te whenua.

Ko ngā whakatau kei te wā tahua tukuwaro tuarua ka whai pānga ki tā Aotearoa āheinga ki te tutuki i te tuatoru o ngā tahua tukuwaro. Hei tauira, ko te pikinga nui o ngā whakaheke tukuwaro e matapaetia ana ki te ahu waka kei te tuatoru o ngā tahua tukuwaro, he piripono ki te pikinga wawae o ngā hokonga waka pūhiko i ngā tau 2020. I te korenga o tērā momo pikinga, ko ngā waka tukuwaro nui ka tere tau, nā whai anō te mahi nui o te whakaheke tukwaro ki te ahuwaka he nui te utu, he kino hoki.

Ka whakaatu tēnei i te takeo iti ki te wāhanga e haere tata mai nei, me te mea, ka piki ake pea te utu me ngā tukuwaro ki te wā tahua.

Hei tēnei hoki, ko ngā tukanga kei te mahere whakaheke tukuwaro tuatahi ka whai waahi atu ki te tutukihanga o te tahua tukuwaro tuarua neke atu. Ki te mahere whakaheke tukuwaro tuatahi, ka whakaputa i te Kāwanatanga tētahi aroā ki te reanga o ngā whakaheke tukuwaro e matapaetia ana ki ia ahumahi, i te huanga mai o ngā tukanga ki te mahere, ki waho ki te 2035. Ko te akoranga o tēnei aroā he noho hei tūāpapa ki ō mātou aromatawai mō ngā mahi hei whai mā te Kāwanatanga ki te tutuki i te tuarua o ngā tahua tukuwaro me te whai kia tutuki i a Aotearoa ngā ahunga tahuaroa.

Kei raro i te ngā matapae Kāwanatanga o te wā, i whakaputa i te Tīhema 2022, e tutuki ai te tahua tukuwaro tuarua me 20.7 $MtCO_2e$ ngā whakaheke tukuwaro hei tāpiri atu ki ngā tukanga me ngā inenga kua mana. Inā rā ka nui ake i ngā tukanga kua maheretia, ka tau hoki ko ngā inenga o te mahere whakaheke tukuwaro tuatahi, 14.0 $MtCO_2e$ te tāpae anō o ngā whakaheke tukuwaro ka hiahia.

Inā hoki te mahi a ngā ngahere he tino tūranga ki te tutuki i ngā tahua tukuwaro, mā te whakatō i ngā rākau tauhou ki ngā wā tahua tukuwaro ka kore hoki e ākina te whakaheke tukuwaro ki taua wā tonu. E pēnei ana nātemea ki te panoni ngā whenua pātītī hei ngahere, ka puta te hauhā ki te ātea, ā, ko ngā rākau tauhou i te nuinga o te wā ka whā tau anō i tōna whakatō ka kite i te utu ki ēnei hauwaro.

Tuawhā:
He ara ki te warokore

He kōwhiringa kei te Kāwanatanga mō te huinga ki te utu whakaheke tukuwaro (ngā whakahekenga tukuwaro ki te pūtake) me ngā tangohanga hauhā (mātua nā ngā ngahere) ka ngana ki te tutuki me te whakatere i te papa tukuwaro ki ngā rehukino tahuaroa hei te 2050, e ai rā te Ture.

Ka taea pea e te Kāwanatanga te aro ki tētahi ara utu whakaheke tukuwaro, e iti ake ngā tangohanga. Māna, ka tutuki i te waro-kore mā te whakapiki i ngā tangohanga me te whakatere ake i ngā tukuwaro ki ngā rehukino tahuaroa mō muri ake i te 2050, ka tau rānei mā ngā ritenga me te pikinga wawe i ngā nama tangohanga ki te ātea.

Engari, nātemea he herenga ki te nui o te waro ka taea e te whenua, kāhore pea e tika ana kia aro ki ngā tangohanga waro o te ngahere anake, ā, ki te tahuaroa hoki. Ko ngā waro ka tau ki te kōpū o te whenua kua tere piki te raru ki ngā kāpura me ngā waipuke. Ki te kore te Kāwanatanga aro e kaha ki te whakaheke i ngā rehukino, ka raru ngā tikanga, ka tōmuri hoki te tutukinga o te ahunga 2050.

Ko te whakaheke i te katoa o ngā tukuwaro te huarahi kei te tino tautokotia e te Taumata Aro Āhuarangi (IPCC). Mā te whakaheke i te katoa o ngā tukuwaro ka whai hua, whai āheinga pēnei i ngā kāinga me ngā whare ora, he āheinga ki ngā mākete hou, me te whakaora ake i te tangata, ka mutu, he kōwhiringa ki ngā rangatahi me ngā whakareanga hou.

Kia mōhio noa nā te Kāwanatanga te whakamārama me te whakamōhio atu i tōna aronga ki te tatau katoa me te tatau whai hua ki ngā whakahekenga tukuwaro, inā te whakawhiunga ki te whainga o te tataunga kore ki te tutukinga o te ahunga 2050, ka mutu, ngā tūraru me ngā pānga nui ka tukia e Aotearoa.

Mā te mārama hoki ka ākinā te tutukinga o ngā ahunga āhuarangi. Ki ngā kāinga, pakihi, hapori, me ngā kaunihera ā rohe, he tino mahi kia whai ko tētahi ara mārakerake, tautika hoki ki te tatau kore e eke ai ngā mahi whakataunga. Mēnā ka tū whakahī ēnei hoa-tāpui i te anga whakamua, ka taea te pena pūtea ki ngā hangarau iti te tukuwaro pēnei i ngā whakangao-koropupū, ngā pūngao whakamahana rānei, me te mea, he tohua ngā kōwhiringa me ngā mahere e tika ana ki ngā ahunga whakaheke tukuwaro.

E whakahau ana i te Kāwanatanga kia pūmau ki ētahi tino reanga ki ngā rehukino katoa me ngā tangowaro ki te tuara me te tuatoru o ngā tahua tukuwaro me te whakahāngai i ngā tukanga ki te tutuki, te eke rā anō rānei ngā whakaheke tukuwaro ki ngā tahua. Ko ngā tukuwaro katoa me kaua e eke atu i te 362 $MtCO_2e$ ki te tahua tukuwaro tuarua, kauaka rā te 322 $MtCO_2e$ ki te tahua tukuwaro tuatoru.

He tino mahi ināia tonu nei kia rite ki ngā hua tahuaroa mō tētahi whakawhitianga whakahaere pai. Ka āhei te Kāwanatanga te whakaū i ngā tukanga e tika ana ki te tutuki i ngā whakahekenga tukuwaro, ā, mā ngā ratonga hoki te whakamahere me te penapena i ngā whakataunga tika ki te katoatanga o ngā hua tukuwaro kua matapaetia e te Kāwanatanga.

E whakahau ana e mātou ki te Kāwanatanga kia whakamōhio i te tohuatanga o ngā reanga ki te katoa o ngā rehukino me ngā tangowaro i te ngāhere ki te 2050, ki tua rā hoki e ārahi ai ngā whakatau tukunga.

Mā ēnei tohuatanga reanga me te whakaū me whakawhanake ki tētahi hononga ki te iwi Māori e ai rā e Te Tiriti o Waitangi.

Tuarima:
Utu tukuwaro

Ko te Kaupapa Hokohoko o Aotearoa (NZ ETS) te tūāpapa o tā Aotearoa rautaki ki te whakaheke i ngā rehukino. Mā te utu ki ngā tukuwaro ka rerekē ngā utu ki ngā hokohoko me ngā mahinga huri i te ao ōhanga. Ka whakaaweawe tēnei i ngā waiaro ki ngā kaiwhakarite hua me ngā kaihokohoko mā te whakaiti i te tukunga nui ki ngā mahi, ka mutu, te whakanui i ngā kōwhiringa iti te tukuwaro.

Ko ā mātou arotātai he whakaatu atu ko te noho a NZ ETS kāhore e tūpono nui nei ka whakaoreore i te katoa o ngā whakaheke tukuwaro kua whakahau nei e *Te Tuawhā: Te Ara ki te Warokore*, arā te ahunga ki te tutuki i ngā tukunga o ngā rehukino tairoa e pūmau tonu nei i tana haere.

Ko ngā tukanga āhuarangi a Aotearoa me mahi ngātahi ki te tangowaro me te whakatō ngahere, inā rā ēnei mea e rua he mahi nui te whakawhitianga ki te tukuwaro iti toitū, tautika hoki. Ahakoa tā NZ ETS he whakarite i ētahi mahinga ōhanga ki te whakatupu rākau, he mahi hoki kei ngā tangowaro ki ngā ngāhere hei whakaiti i te whakahau kia whakaheke tukuwaro ki te mātāpuna. Ki te wāhanga e whai tata mai nā, e matapaetia ana ka hua mai i te NZ ETS te kaha whakatō ngahere, engari rā ka herea ngā whakahekenga tukuwaro katoa anake.

Ko ngā hua ki tēnei he kōrero ki tā Aotearoa ka mahue i ngā whakahekenga tukuwaro katoa e rārangi ana i *Te Tuawhā: Te Ara ki te Warokore*, e aro ana ki te whakaora anō i te hunga rangatahi me ngā whakareanga hou, te whakahou i te ōhanga e taea ai e ngā pakihi te whakaū i tētahi ao tukuwaro iti. Kei konā hoki ngā pānga ki te tangata me ngā rohe, arā i ngā mahi a te tangata ki te whenua, koia tonu ko ngā hapori kei ngā takiwā e aukaha ana i ngā mahinga whenua a te tangata.

Hei āpiti atu, mai i ngā tauwaenga 2030 ki tua atu kua kore te NZ ETS e whakarite i ētahi tino whakahau mō te whakatō ngahere ki te tutuki i te tatau kore ki ngā rehukino hei 2050. Ahakoa he tawhiti tonu, me rite ināia tata nei tētahi mahere whakarite i ēnei whakarawerawe, inā rā tōna mahuetanga ki ngā tau mutunga 2030 ka whai pānga ki te ngahere i mua noa hoki i tēnā. Mā te penapena i tētahi whakatōnga ngahere ka noho hei whakatau pae tawhiti tēnei, ā, me whakahī tonu mai te aro a ngā kaipenapena ka whai hua ki ngā tau tekau kei mua kei te aroaro.

E whakahau nei e mātou ki te Kāwanatanga kia hāngai te punaha utu-tukuwaro ki ngā reanga kei te hiahia ki ngā tukuwaro katoa mō te tuarua me te tuatoru o ngā tahua tukuwaro, ā, ki te ahunga tatau kore 2050 me te pānoni i te NZ ETS kia whakawahia ngā whakarawerawe ki ngā whakaheke tukuwaro katoa kei ērā e tono ana ki ngā ngahere, me te mea, he whakarite kia tukanga pai ki ngā tangowaro o te ngahere tae noa, ki tua atu hoki i a 2050.

Ko te hanga hou ki ngā whakarawerawe tukuwaro me whai whakaaro ki ngā taera motuhake me ngā kōrero tuku iho ki ngā whenua a te Māori[i] me te whai kōwhiringa mō tū kotahi mai ki te iwi Māori e ai rā e Te Tiriti o Waitangi.

I waenga i te putanga o te kupu hukihuki o Apereira 2023 me te whakaputanga o tēnei kupu akiaki tūturu, nā te Kāwanatanga anō i whakahaere i tētahi uiuinga tūmatawhānui mō te tūranga a te ahungahere ki te NZ ETs hei tā te arotake i te kaupapa. E anga atu ana te arotake ki te tātai ake i te haepapa tika ki te NZ ETS hei āki i te whakahekenga tukuwaro, inā hoki te mahi hei tautoko i ngā tangohanga, ngā hua hoki, ngā hokonga me ngā tūraru o te panoni i a NZ ETS.

i. Ko ngā 'taitara whenua a te Māori' me 'ngā kaipupuru Māori' ka whakamahia ki tēnei rīpoata hei kōrero ki te kotahi o ngā kaipupuru ki te whenua Māori (e ai rā e Te Ture Whenua Māori 1993) me ētahi atu ratonga whenua Māori e pēnei ana. Ko te momo matua ki te kotahitanga o ngā kaipupuru me te pānga ki ngā whenua whakahaere, ngā āheinga ki te haumitanga (kei tō mātou kupu akiaki ki te whenua Māori kei *Ināia tonu nei*, tirohia ngā whārangi 158 me 217).

Ko te arotake nei he tino kauneke whakamua ki te whakawhanake i tētahi hanga hou ki te NZ ETS e āki tika mai i a Aotearoa ki te whakaheke i te katoa o ngā tukuwaro, āpiti atu ko te whakatupu ngahere me te tangowaro i te ātea. Me wawe tōna anga whakamua, inā hoki te mahi tōmuri he pōhauhau i te anamata ki a NZ ETS, kātahi ka here ko tōna mahi ki te penapena i ngā whakahekenga tukuwaro. Ko tētahi tino take ki te wāhanga whai ka muri iho kei te arotake he arotātai i ngā whakaritenga whitianga ka uru ki ngā uiuinga ahu ngahere mengā ahunga ngahere kei te kaupapa nei.

E tupu haere ana te hiahia ki te whakawhānui i te tirohanga o NZ ETS kiatuia ko ētahi atu mahinga waro, arā hei tauira ko te hauhake o ngā hua wahie, ngā oneone, ngā hua whenua, ngā repo, te ao o Tangaroa ('waro a Tangoroa'). Heoi anō, ka kore pea a NZ ETS e tika ana hei rauemi tukanga ki te katoa o ēnei āheinga. He nui tonu ngā whakaritenga kei te mahi a te tangata ki te whenua, ā, ki te whakaurua ki te NZ ETS – hei ko tāna he aro noa iho ki te waro – he whakaputa i ngā hua kīhai i matapaetia, ka mutu, he mea whakawhāiti rawa ki ngā hua whakahekenga tukuwaro, koia ka riro ētahi atu hua, pēnei i ngā mahinga rauropi, te whānuitanga rānei ki tēnei ao rauropi.

Ka noho hei kaupapa matua ki te Kāwanatanga te whakatau i ngā hua o te arotake a NZ ETS, ā, me whai mō mua i ētahi atu whakatau ki ngā whānuitanga o ngā mahi kei NZ ETS, pēnei I ēnei mahinga hou, mahinga whenua rānei, nātemea ko ēnei whakaurunga he ngāhoro ake i tā te kaupapa pukenga ki te kawe i te whakahekenga o ngā tukuwaro katoa.

Ko ētahi o ngā āheinga tangowaro, pēnei i ngā huawhenua me ngā huawaro, kāhore anō kia whakaurua kia whakaurua ki tā Aotearoa kawenga i tōna ine tukuwaro ki ngā ahunga (tātai ahunga). He tino aronga kia whai waahi atu ngā whakataunga ki te NZ ETS, kia tīmata te tātai rānei i ēnā ki ngā ahunga kei mehameha ngā mahi o tā Aotearoa kaupare i te āhuarangi.

Kei *Ināia tonu nei*, nā mātou i ākina kia whānui ake ngā tātai ahunga ki waho atu o te whakaritenga ki ngā ahunga o te wā, māna ka arotake ngā ahunga kia toitū tonu tōna mana. He mea nui kia rite mai ki ngā whakararu i te momori o Aotearoa ki te tutuki i ngā ahunga āhuarangi, nā whai anō kia āta rite mai ki te whakatau i te aronga a NZ ETS, ā, kia wawe hoki tēnei whakataunga.

Ko ētahi kamupene e whakaputa hua ana, ā, he whakaheke tukuwaro tōna mahi, he taurite hoki ki ngā hua e whakaputa ana i tāwahi ka utu kore ngā tauhokohoko kei NZ ETS (tohanga utu kore). Ka anga tēnei ki te kaupare i te tūraru ki ēnei momo pakihi mō te hekenga o ngā hua ki nā ngā utu NZ ETS, koia ka anga ki te whakapiki i ngā hua o tāwāhi, nā whai anō ka piki ngā tukuwaro o te ao (uru tukuwaro).

Ko te tukanga o te wā ki te tohanga utu kore kāhore e tau ana ki tā NZ ETS whakarawerawe i te tatau kore ki ngā rehukino tairoa hei 2050.

Inā hoki te Kāwanatanga he whakatau i tētahi pire āmenehana hei whakatika i te pikinga o ngā tohanga (ko ngā kamupene ēnei he nui ake tōna whakawhiwhinga ki ēnei tohanga), me panoni anō i te rerenga o te wā. Ko ngā tūraru:

- ko ngā hua kei ngā tohanga utu kore e haere tahi ana ki te utu ki ngā kai utu take
- ngā panonitanga ki te ao hurihuri me ōna whakawhiunga ki te tūraru uru tukuwaro
- ngā āheinga ka whakaaturia e ētahi atu kōwhiringa, pēnei i ngā tohanga anō o ngā rawa ki te utu i ngā whakaheke tukuwaro, te toro rānei ki ētahi atu momo ārai hei kaupare i te uru tukuwaro.

Tuaono: Te rere kapa me te puna moni

Mā te penapena, mā te whakawhiti ki tētahi ao ōhanga tukuwaro iti ka mārama ki te ao ōhanga. Ko tō mātou arotātai he whakaatu atu ka iti ake te utu ki te motu haere ake te wā i ngā penapena whakaheke tukuwaro nei, māna ko te noho tonu ki ngā hinuwaro (me te hoko i ngā utu hinuwaro i tōna utu e piki haere ana nā te pikinga o te tāmi ahumoni).

Ko ngā whakaheke tukuwaro e tutuki ai e Aotearoa ngā ahunga āhuarangi he tata tonu, ā, ka taea te utu mehemea kei te tika te hanga ki ngā ritenga. Ko te penapena me ahumoni te tūāpapa ki te whakahekenga tukuwaro ki ia rāngai tūmatanui, ki tā te wāhanga kei te tuarua o ngā mahere whakaheke tukuwaro. Mō ināia tonu nei te mahi a te Kāwanatanga ki te whakaora ake i ngā whakahaerenga ki te rāngai tūmatanwhānui, te rāngai tūmatawhāiti me ngā kaipenapena o roto.

Ko te penapena tūmatawhāiti he haepapa nui kia tūtuki i ngā tahua tukuwaro. Ki te rīpoata 2021 nā UNFCCC i tōna kaupapa o Terenga ki te Warokore he kite ake mai i 2026, ko te $4.5 tiriona tāra amerikana te utu ā-ao ki te whakakore-waro ki ia tau e tutuki ai te waro kore hei te 2050, arā ko ngā kaipenapena tūmatawhāiti ka eke ki te tatau o te 70% o ērā penapena.

Ko te āhua o tā te Kāwanatanga penapena i ngā pūtea tūmatawhānui he tino mahi hoki ki te whakaiti i te tukuwaro, ā, ki tā Aotearoa kaha ki te tutuki i ngā tahua tukuwaro ka pānga ki tā te Kāwanatanga penapena e hāngai ana ki ngā ahunga āhuarangi. Ko ngā whakatau pūtea a te Kāwanatanga he tohutohu i ngā hirahiratanga ki a Aotearoa me te whakaatu atu i te momo panonitanga ka taea ki tēnei horopaki whānui.

Kei roto iho i ā mātou mahi ki *Ināia tonu nei*, i whakataurite te ara tiketike ki te uptake o ngā tukanga i whakatau tonu i mua i te tuatahi o ngā mahere whakaheke tukuwaro e rongo katoa ai ngā pitomata me whai hei tutuki i te ahunga 2050. I kitea e mātou mō te whakaheke tukuwaro me te haere tahi me ngā tahua tukuwaro ki te whakangao-hiko, te hātepe kai, te taiao a te tangata, ngā rori, me te whakatupu ngahere me whai ko ētahi pūtea anō e tatauhia ana ki te $38 piriona tāra (ngā moni 2021).

Ko te matapae o ēna pūtea tāpiri ki ngā tau 2022 ki 2050, kei te takiwā o te haurua o tēnā nama ($18 piriona) me whai ki te tuarua ki te tuatoru hoki o ngā wā tahua tukuwaro e noho tonu ai a Aotearoa ki te ara tutuki i ngā tahua o te anamata.

Heoi anō, he nui rawa ngā ārai e kaupare ana i te whakaoreore o ngā pūtea me te toronga e tika ana ki te tutuki i ngā tahua tukuwaro me te ākina ngā ahunga whakapakari i te taiao. E whakahau ana mātou ki te Kāwanatanga kia whakahekea ngā taiapa – pēnei i ngā ture, ngā ritenga papori me ngā mana whakahaere – hei whakaoreore i te utu tūmatawhānui me te utu tūmatawhāiti hei tutuki i ngā tahua tukuwaro.

Ko ngā kōwhiringa hei kaupare i ēnei ārai ko:

- te āmenetanga o ngā waehanga ki te pūnaha take (hei tauira, ko te whakarerekē i ngā tukuhanga takarawa me ngā rēti ki ngā kaupapa kua whakaaetia)
- He tohatoha me te whakaheke i ngā tūraru ki ngā kaipenapena tūmatawhāiti, hei whakaaweawe i ētahi atu pūtea ki ngā kaupapa iti nei tōna tukuwaro.
- ko te horapa i ētahi atu ahumoni tārewa, i kona te Kāwanatanga, te ratonga tūmatawhāiti he whai moni hei utu i tētahi kaupapa, kātahi ka whakahoki i ēnā moni me te moni whakaranea ki te pēke pūtea
- he whakamōhio atu ki ngā rāngai ahumoni ngā mātauranga āhuarangi me te tohutohu tika atu, ka mutu, ko te ārahi i ngā ratonga tūmatawhānui, ratonga tūmatawhāiti hoki me whai rīpoata.
- ko te whakawhanake i te kohinga raraunga, te whakatōpūtanga (te tāketanga), me ngā whakaraupapatanga o ngā punaha āhuarangi e tika ana ki ngā penapena pūtea ki a Aotearoa.

Hei tāpiri atu, ko te whakamino me te whakakotahi o ngā aratakinga penapena pūtea a te Kāwanatanga ka ākina a Aotearoa i tōna whakawhitianga kia mārama, kia tautika, kia kotahi mai ki te whakapeto i te nui o te ngoi, te whakaiti i ngā takaroatanga, me te whakaoreore i ngā uri, ngā pakihi, ngā ratonga, me ngā hapori ki te kawe tika i ngā mahi. Ka tau hei tino mahi i te anga whakamua ki te kaupare i ngā ārai a te ture me ngā ritenga pāpori kei ngā momo reanga ki te kāwanatanga me ōna hunga whakatau.

Tuawhitu: Rangahau, pūtaiao, auahatanga, me te hangarau

Mō te tutuki i ngā tahua tukuwaro me whakatere ake te āhua o tā Aotearoa rangahau, pūtaiao, auaha, pūnaha rangahau (RSI&T), e whakarite nei i te mātauranga me ngā akoranga ki te whanake i ētahi kōwhiringa hou mō te tukuwaro iti, ā, e pai nei te utu, e tika nei tana āhua ki te wā. Ko te pūnaha rangahau (RSI&T) he whakarite kia whai mai te tangata ki te kaupapa nei huri i te motu.

Ko ēnei mahi, kei te whānuitanga o ngā rāngai tūmatanui me te rāngai tūmataiti, he hanga i ētahi hinu hou, i ētahi tikanga hou ki te whakatena pūngao, ka mutu, ko te whakawhanake i ētahi atu huarahi tika, hangarau tika rānei ki te whakaheke i te tukuwaro.

Mā roto i te penapena pūtea, ngā ture, ngā hokonga, ngā whakatau hokohoko, ngā whanaketanga ki te hungamahi, ngā rawa me te whakawhanake hangahanga me ngā pae-ritenga.

Ko te ora o ngā pūtea me ngā kaupapa tētahi tino whāinga ki te whakapūmau i ngā hungamahi ki te pūtaiao āhuarangi me ngā pūkenga kua whanake mai i te ngāhuru o ngā tau. Mā te mōhio ki aro o te penapena pūtea, mā te tautoko i ētahi aronga mārama ki te pūtaiao me te rangahau āhuarangi te āheinga hei tautoko i te kauneke whakamua me te taurima i ngā hangarau hou.

Mēnā ka wātea ki te katoa ngā raraunga me ngā kōrero ki te āhuarangi, pēnei i te huarere, te wai, te moana, te hauāwhio, ngā reanga rehukino ka whai māramatanga a Aotearoa kei te huri haere te taiao. Heoi anō mō nāianei, ko ngā utu me ngā ritenga tūmatawhānui mō te tohaina o ngā raraunga ki ngā ratonga kāwanatanga me ngā Pou Rangahau Karauna kei te kapi tōna urunga.

E whakahau nei e mātou ki te Kāwanatanga kia tūturu te whiu o ngā penapena pūtea, ā, me piki ake te tūtohutohu me te toronga o ngā mahi kia puare te kuhunga ki ngā raraunga āhuarangi me ngā kōrero hei whakatenatena i te pūnaha rangahau, pūtaiao, auaha me te hangarau hei tautoko i te whakatutukinga o ngā tahua tukuwaro me te ahunga 2050.

Tuawaru: Whāia ngā tapuwae

He tūranga nui kei te iwi Māori mō te tutuki i ngā tahua tukuwaro me te ahunga 2050. Mā te mahi tahi, arā te noho a te Kāwanatanga ki te iwi Māori ka whakatere ake te whakawhitianga kia iti te tukuwaro me te whakakotahi mai i ngā hapori āhuarangi pakari.

He tino whāinga te tūhononga a te Karauna ki te Māori i tōna whakarite i te tuarua o ngā mahere whakaheke tukuwaro, inā hoki ko tōna haerenga he tino herenga hei tutuki i tētahi whakawhitianga tautika, mō te oranga tonutanga o Aotearoa whānui. Mō te tutuki o tā Aotearoa i tētahi whakawhitianga mātārite, mātāuru, mātātika hoki ki tētahi anamata tukuwaro iti, me whai waahi atu te iwi Māori:

- ka whakatīnana i tō rātou rangatiratanga me tō rātou mana motuhake
- he kuhu ki ngā rawa me ngā kōrero hei tutuki i te whakahekenga tukuwaro ki tō rātou takiwā
- he whakatenatena i ngā hapori kia pakari, kia rite hoki ki ngā whiunga o te āhuarangi, inā rā ko te whakapūmau i ngā mana tuku iho arā o te iho atua me te iho matua, te taiao me ngā tikanga Māori.

Hei tutuki ake i tēnei, me whai whakaaro te Kāwanatanga tētahi tūranga Māori ki te arataki a te motu mō te whakaheke tukuwaro, arā me whāiti rawa te arataki ki ngā hiahia o te takiwā. Ko te whakarite i te iwi Māori kia whai rawa, kia whakaoreore hoki ki te whakatere i ngā whakahekenga tukuwaro e ai rā ngā tikanga me ngā mātauranga Māori, ka mutu, ko te whakatīnana ake i ngā awhero o ā rātou uri me ngā hapori.

E whakahau ana mātou ki te Kāwanatanga kia whai waahi atu ki te toha tika atu ngā rawa ki a ngāi Māori me te tuku herekore atu ngā pūtea ki ngā kaipupuru Māori hei whakaoreore i a rātou kia whakatere iho ngā whakahekenga tukuwaro me ngā tangohanga e ai rā ō rātou arotakenga me ō rātou whāinga matua.

Ko te nui hoki o ngā iwi me ētahi atu kaipupuru Māori he herenga nui ki te whakatika i te taiao me te whakarite i ētahi tino rawa e āhei ai te mahinga nui o te whakawhiti ki te tukuwaro iti. Mā te kotahi o ngā tikanga, ngā mātāpono, ngā rawa me te pikinga o ngā uri Māori e tātai ana ki ngā iwi me ētahi atu rōpū, kei te iwi Māori tonu te whānuitanga o ngā pūkenga, ngā āheinga, me ngā mātauranga e taea ai te whakahaere wawe mēnā rā ka tae mai he take ohotata ki te taiao.

Mā te whakatere ake i te māramatanga ki te mātauranga Māori mā roto i te mahi tahi ki ngā iwi me ngā hapū ka tupu mai ko ētahi tino rongoā mō te āhuarangi, ā, ka hāngai hoki ki te takiwā. Mehemea ka whakawhanake i tētahi tukanga, ā, kāhore he aronga ki te ao Māori, ki ngā tikanga me ngā mātauranga Māori, ka ahu pea ki te patu, te tāmi rānei i te mana o te Māori ki te kaupare me te whai urupare ki te āhuarangi.

E whakahau nei e mātou ki te Kāwanatanga kia whakamana te iwi Māori ki te arataki i te raranga o ngā mātauranga Māori ki ngā tukutuku tukanga, te whanaketanga, te whakamahinga hoki ki ngā reanga kāwanatanga me ngā reanga kaunihera ā rohe. Tuia ki tēnei ko te whakarite mai i ngā iwi me ngā hapū ki ngā rawa e tika ana.

Tuaiwa: Te whakawhitianga tautika

Ka ora tētahi whakawhitianga taurite, tautahi, tautika hoki, nātemea ka noho ki te tohutohu i ngā whakatau me tōna pānga ki ngā tūmomo iwi huri i te motu. Mēnā ka piki ake te pai o ngā tukanga me te kaupare i ngā tūraru pokerehū, me whakahaere e te Kāwanatanga ngā whiunga me te whakapiki ake i ngā hua me ngā āheinga ki ngā mahi whakaheke tukuwaro.

Mā te whakaheke tukuwaro ka taea ngā āheinga hauora, te whakapiki ake i te oranga hinengaro ki ngā hunga rangatahi me te whakatika ngā raruraru o ngā uauatanga oranga tinana, pēnei i te makariri, te whare mātaotao e kino nei te hau, ka mutu, ko ngā rangahau kei te kī ake he $15.6 piriona tāra te utu ki ngā pānga hauora mā Aotearoa ia tau.

Ko ētahi rāngai, ētahi rohe me ētahi hapori ka nui ake te whiunga ki a rātou i tō ētahi atu, nā runga i te āhua o te whakaheke tukuwaro. Nā reira, he mea nui te taha whakatere me te kawenga o te whakawhitianga kia tika tōna tohutohu e whai wā ai ngā pakihi me ngā hapori te whakarite ki ngā panonitanga.

Ko ngā rāngai pēnei i ngā ahu matapūngao (arā te ngao hauwai, te ngao hau ki tāwahi, te ngao waiora me te ngao ngāwhā), ko te whakawhitianga ki tētahi ōhanga tukuwaro iti he piki ake i te tūpono ka nui kē te hungamahi, inā hoki ko ngā rāngai tukuwaro nui (arā te rāngai mātai, rāngai konumohe, te rānga whakaputa pūmatū) ka kitea pea te hekenga.

Ahakoa ngā panonitanga ki te hungamahi ki ētahi rāngai tukunga nui te matapae ka rerekē haere, ko te aro ki ngā whakangungu i te hungamahi me te tautoko i ngā uri me ngā hapori tētahi tino mahi e taea ai e Aotearoa te ahu tika i ngā uauatanga me ngā pōhēhētanga ki te whakawhitianga nei.

Mehemea ka aro te *Rautaki Whakawhitianga Tautika* kia pono i tōna aro ki te whakatika ngā whiunga ki te wā tahua tukuwaro tuarua, ka kitea me uru tika mai ngā āheinga.

Inā te kōrero nui, ko te rautaki he aro noa iho ki ngā whiunga e hāngai ana ki ngā tukanga whakahekenga tukuwaro. Engari, ki te hē ngā whakaheke tukuwaro me ngā mahi whakawhitianga ka whai mai pea ētahi whakatau me te whakaiti tētahi i tētahi, koi whakarite mai he whakataunga ki te tutuki kotahi mai i ēnā ahunga e rua. He mārakerake tēnei kōrero ki te Huripari o Gabrielle, inā hoki te Kāwanatanga he hoki atu ki tōna *Tukanga Kāwanatanga ki Ngā Waka me Ngā rori* me te whāiti o te titiro ki ngā whakaheke tukuwaro me te whai kē i ngā whakatikahanga i ngā hangahanga me te whakapakari ake i ngā punaha rori.

E whakahau nei i a mātou ki te Kāwanatanga kia whānui te titiro o tōna *Rautaki Whakawhitianga Tautika* me te whakauru i ngā whiunga o te āhuarangi me te whakawhitianga hei mahi whakamauru hoki.

Ko ngā tūraru me ngā ārai, pēnei i ngā utu o te wā, te iti o te wā me te iti hoki o ngā rawa, te pitomata ki ngā whiunga taurite kore a ngā utu tukuwaro, te wāhirua o ngā momo whakanui – inā rā ko te tangata, te ratonga rānei kei te whakawhiwhia ki ngā rawa, engari he rerekē tonu te kaiwhiwhi – ka uaua ake ki ētahi ki te whakaheke tukuwaro. Ko ētahi hapori me aro ki te ākina mā te whakawhitianga, pēnei tonu i te āki e oreore ai te ngakinga o ngā āheinga ki te whakaheke tukuwaro me ōna utu.

Nā reira tonu te hirahiratanga a te Kāwanatanga i tōna Rautaki Whakawhitianga Tautika kia whai waahi ki tētahi urupare matatini hei whakahaere tika i te whakawhitianga nui ki tētahi ōhanga tukuwaro iti.

Ahakoa rā te rautaki kei te whanake tonu, ko ngā rawa o te wā e hiki nei i ngā ahunga, pēnei i Te Kaupapa Pūngao Tika me te Whakatikahanga o Ngā Kāinga, he whakahaere tonu i āna mahi ki te hiki ake i te tika me te whakaheke tonu i te tukuwaro. E whakahau nei e mātou ki te Kāwanatanga kia ū tonu ki te whakamahi i ngā ara tukanga hei kaupare i ngā whiunga āhuarangi, kia rite mai te Rautaki Whakawhitianga Tautika, māna ka taria te wā kia tutuki he mahinga whakatika āhuarangi.

3: Kōwhiringa tukuwaro iti mā ngā rāngai me ngā whakahaere

Ko te wāhanga tuatoru he aro ki te kupu akiaki me ngā whakahau ki te Kāwanatanga, ki ngā tūmomo rāngai me ngā pūnaha me tōna āheinga ki te tutuki i te tahua tukuwaro tuarua.

Ahakoa ēnei wāhanga he aro ki ngā tūwāhi o te ōhanga, ka whai wāhi tonu te tukanga ki te whakahāngai i ngā hua rāngai me ngā hua tukanga (e ai ki te Whakahau 1). Ki ēnei wāhanga, ka tirohia ngā hononga kei ngā tūwāhi o te kupu akiaki, ki te wāhi hoki ki ngā whakaheke tukuwaro, mēnā rā kei te hāngai ki te tahua tukuwaro tuarua me te aro hoki a ngā kaunihera ā rohe me te kāwanatanga.

Tuangahuru: Ahuwhenua

Ko ngā whakaheke tukunga rehukino kei te ahuwhenua te pūtake o tā Aotearoa tutuki i ngā ahunga whakaheke tukuwaro. Ko ngā tatau ahuwhenua, he 91% o ngā tukunga huamēwaro me te 94% o ngā tukunga rehuota, ko rāua tahi ka eke ki te 49% o ngā tukunga rehukino katoa.

Ko te rāngai nei kua tutuki tonu ētahi mahinga whakaheke tukuwaro, engari me nui kē atu ngā panonitanga e tutuki ai e Aotearoa ōna ahunga whakaheke tukuwaro.

Mā tētahi herenga utu pai mō te whakaheke i ngā tukuwaro ki te ahuwhenua, ka āhei te Kāwanatanga ki te whakarite i ētahi āhuatanga e tutuki ai te tahua tukuwaro tuarua me ngā wāhanga hua mēwaro kei te ahunga 2050 (arā te whakaheke i te hua mēwaro ki te 10%, he iti iho i ngā reanga 2017 hei te 2030, arā a 24-7% iti iho i ngā reanga 2017 hei te 2050 ki tua rā anō.

Ki *Ināia tonu nei*, ka whakahau e mātou ki te Kāwanatanga kia ū a ia ki ngā herenga utu me te whakanui i ngā mahinga pāmu i ōna whakaheke tukuwaro. Ki tō mātou rīpoata *Te Kauneke ki tētahi utu tukuwaro ki te ahuwhenua*, ka ākina e mātou ngā herenga utu pāmu (kaua ko tētahi pūnaha whakareanga), inā rā ko ō mātou aromatawai he whakaatu atu i te whakahaerenga o tētahi pūnaha matatini ka nui te aro a ngā kaipāmu me te whakatenatena i tētahi mahinga whānui ki te whakaheke tukuwaro.

I Akuhata 2023, ka whakarite te Kāwanatanga tōna mahere matua ki tētahi utu taumata-pāmu, rehukino-tairua ka kōkiringia ā te 2025.

Ko tā mātou e whakahau nei ki te Kāwanatanga ināia tonu nei, ko te kōkiri ake i ngā pūnaha utu tukuwaro ki te ahuwhenua me te whakawhānui tonu i ngā tirohanga ki ngā tikanga me ngā hangarau tukuwaro, me te whakanui hoki ko te mahi whakaheke tukunga huamēwaro e tutuki tika atu i ngā wāhanga tukunga mēwaro 2030 kei te ahunga 2050 me te ahunga katoa o 2050. Ko te herenga utu he whakamana i ngā tikanga tukuwaro iti o te wā nei pēnei i ngā pūnaha pai me ngā hangarau pēnei i ngā kauparenga mēwaro.

Ko ngā hangarau hou, te whakamahinga o ngā whenua, me ngā whakarauoratanga ki te pāmu kaahu ki te ākina te rāngai kia ora ake ai ki te tutuki i ēnei whāinga, nā whai tonu ko te here i ngā whiunga ka pāngia e te ahuwhenua. Ko ētahi o ēnei whakawhitianga he āpiti i ētahi atu āheinga; mā te whakawhānui i ngā mahi ki te whenua ka pakari ake te ōhanga me te taiao, ka pai ake te koiora, ka piki ake te ora ki te wai me te one.

Ki te noho ki tētahi tūranga pai me te whai i ngā āheinga ki te whakawhitianga o te rāngai ahuwhenua, me whai waahi atu ngā kaipāmu ki te tautoko e tika ana ki te whakaheke tukuwaro. Ko ngā ratonga arataki – ngā ratonga whakaako i ngā mātauranga, ngā kupu akiaki me te whai tautoko – ka noho hei tino mātauranga mō te whakaiti tukuwaro, ā, ko ngā hangarau ka ākina tika mehemea kei te aro ki ngā wāhanga pakihi e tika ana.

E whakahau nei e mātou ki te Kāwanatanga kia kaha ake te taha arataki me ngā wāhanga āwhina ki ngā kaipāmu hei whakatere ake i ngā whakamahinga whenua whānui, ka mutu, ko te whakamahi i ngā hangarau me ngā tikanga e tika ana ki te whakaheke i ngā tukuwaro katoa e hāngai ana ki ngā tahua tukuwaro me te ahunga 2050.

Inā rā te hāngai a te Kāwanatanga i tōna nohoanga ki te Tiriti o Waitangi, ko ngā ritenga tukanga kei te mahere whakaheke tukuwaro tuarua me aro:

- kia aro ki tā te ahuwhenua mahi ki te ōhanga Māori
- ko ngā momo o te whenua Māori, tuia ko ngā momo rāhui me ngā taimahatanga ki ngā whenua, o te whai moni hoki
- te hononga a te Māori i ōna herenga whakapapa ki te taiao

Ko ngā aratakinga me ngā mahi āwhina me hanga, me tūtohu, me whakamana hoki e te tūhono nui ki te iwi Māori, ā, me whanake hoki e te mahi tahi ki tēnei rāngai.

Mā tahi:
Te hanga a te tangata

Ko te āhua o ngā taone nui, ngā taone iti me ngā hapori he pānga ōna ki ngā tukuwaro a te whenua, a ngā rori, a ngā wharenui, a te pūngao, a te para hoki. Ko ngā tukanga herenga roa, mahere roa, whakataunga pūtea hoki kei te hānga ki te taiao kua hangaia e te tangata ka tutuki pea te tahua tukuwaro tuarua me te whakaoreore i a Aotearoa ki te tutuki hoki i ōna ahunga āhuarangi tairoa. Ā, koinei tonu ko ngā aronga Māori ki te whakamahi i te mātauranga Māori ki ōna whakataunga.

Kei roto tonu tēnei i ngā rangahau o te ao, arā ki ia tangata, ko ngā tukunga rehukino ki ngā taone mātātini ka heke i te haurua ki ngā wāhi kāhore i te mātātoru. Engari, ko tētahi wāhanga nui ko te wāhi mātātini ka kore tonu e kitea ki ngā takutai whakaraerae, ki ngā takenga whenua rānei, ki ngā takiwā rānei kua hukea e ngā tūraru āhuarangi e piki ai te tūpono ki ngā hapori me ngā punaha, pēnei tonu i ngā pae hiko me ngā pae pāpāho ka raru i te rironga, ka raru rānei i te pikinga utu.

E whakahau nei e mātou ki te Kāwanatanga kia tika ngā pūhaha mahere e tautoko ai te whanake o ngā taone me te whai whakaaro ki te whakaheke tukuwaro, te whakaheke hoki i ngā āmaimai ki te āhuarangi.

Ki ngā uiuinga, ka rangona e mātou te whanui o ngā kōrero e hiahia ana kia pai ake te tohutohu o ngā tukanga hei kaupare tonu i ngā tūponotanga ki ngā hua ka puta, te whai haere hoki i tētahi aratakinga a te motu ki te whakarite i tētahi ao tukuwaro iti. He mārama katoa te kite atu i ngā kino o te whakarite matapūngao hei tukanga, pēnei i ngā tukitukinga o waenga i Te Whakataunga Matapūngao (NPS-REG) me Te Whakataunga Whakahaere Wai Māori (NPS-FM).

Ki te wāhanga tahua tukuwaro tuarua, ko te Rautaki Mahere ā-Motu, ngā rautaki ā rohe, ngā mahere taketake me te taiao tangata, me ētahi atu rauemi tukanga ā motu ka kōkiringia, ka āmenehia rānei. Mā te mārama me te tōtika o ngā tohutohu me kite atu i ngā momo ture me ngā momo rauemi tukanga hei tautoko i tā Aotearoa whakawhiti atu ki tētahi pāpori tukuwaro iti.

Ko āhua o ngā hangahanga, ngā whanaketanga, ngā whakamahinga me te whakatūria o ngā wharenui ka whai pānga ki tō tātou mōhio ki te āhuarangi, ā haere ake nei. Ahakoa rā te pai me te whakamahinga o ngā wharenui o nāia tonu nei he rerekē ki ia rohe huri i Aotearoa, he hangarau tonu hei whakaora ake, hei haumaru ake, hei whakapai ake i te ngoi. Ko te mahi o te whakauru pātu whakamahana, te whakatika ake i ngā matapihi, te whakakaha i ngā ārai hei kaupare i te huarere, me te whakawhiti atu i te hinuwaro hei whakamahana i te whare me te tao kai.

Ki tō rātou oranga, ko ngā hangarau pēnei i ngā mihini whakaputa werawera ka penapena pūtea te kainoho, inā hoki ka pai ake te āhua o te tēnei momo pūngao i ētahi atu momo pūngao, pēnei i ngā mihini mahana rehurehu. Heoi anō, kāhore e nui ana ngā tohu whakanui ki ngā mahi nei inā ra tonu ko ngā utu me ngā taputapu ki tēnei momo whakaritenga, te āhua ki ngā inenga o te wāhi, me ngā hē o te whakatika whare.

E whakahau nei e mātou ki te Kāwanatanga kia whakatere ake te āhua ki ngā whakapaipai mō te ora, mō te pakari me te tukuwaro iti.

Ko te nui o ngā kāinga, ngā pakihi, ngā marae, me ngā hapori ka whakamahi tonu i te hinuwaro ki te whakamahana whare, te tao kai me te whakawera i te wai, ka mutu, kei te piki tonu ngā hononga hou ki te hinuwaro.

Mā te whakamahi tonu i te hinuwaro ka āpiti atu he utu anō ki ngā kaihokohoko me te hiki ake i ngā take tautika mā ngā whakareanga hou. Ko te urunga o te hinuwaro ka kuhuna ki te wā tahua tukuwaro tuarua ka kitea ōna hua hei te 2050 rā anō, ahakoa te mōhio he iti tonu te utu kia hoko i ngā mea pai, pēnei i te hiko.

Ko ngā kainoho taone me ngā kaipakihi iti kei te takiwā o te 65% te hokonga o ngā paipa rehurehu, ahakoa rā te whakamahinga he 20% te nui. I ngā rā o mua, ko te whakamahinga rehurehu me te tohatoha o ēna utu kei te wāhi o te 40-45% te tatau waenga ki te pire rehurehu.

Ki te tutuki i te ahunga 2050, te whakamahi i ngā rehuwaro hei whakamahana ake i te wai me te wāhi ki ngā taiao tangata me whakaheke. E whakahau nei e mātou ki te Kāwanatanga kia kaupare te urunga o ngā hanga rehuwaro hou me ngā hononga ki ngā wharenui, haunga ko ngā wāhi kāhore he hangarau whakatenatena i te tukuwaro iti.

Mā rua:
Ōhanga taketake me te ōhanga toiora

Ko ngā rawa o Aotearoa he whai haere i tētahi toronga tōtika: tango-hanga-whakamahi-tukupara. Māna, ko te ōhanga taketake – he whakaoreore i te whakamahinga pūrua, te whakatika, te whakahou, me te hangarua – kia kounga te whakamahinga o te ngao me te rawa.

Ko ngā kōrero taunaki kua whai waewae ko te whakaheke tukuwaro he āheiga ōna ki ngā rautaki ōhanga taketake. Ko te pono me te tika o ngā whakamahinga taketake ki ēnei tino matū (ranutoka, mātai, kirihou, me te konumohe) tētahi wāhi e ākina ai te whakaheke i ngā tukunga rehukino mā te 40% hei 2050. Ā, mā te whakamahi i ngā aronga taketake ki te ao o te kai ka eke pea mā te te tata ki te 49% whakahekenga i ngā tukunga o te ao.

Mā te whakatenatena ki te tukanga ka tere piki te horapa taketake o ngā hua mā roto mai i ngā kaiwhakaputa hua me ngā kaiwhakarite hua ki uta ka mau ki te haepapa tukuwaro me ngā tūkinotanga o ā rātou oranga ki ngā hua me ngā mahi whakaiti i ēnei momo whiunga. Mā roto i te tukanga whakatika, e whakarite nei i te mana ki ngā kaihokohoko kia whakatikaina ōna hokonga, mā roto tonu i te tūwhera ki ngā kōrero, ngā rauemi me ngā wāhanga, ka āhei pea e Aotearoa te whakaheke i te para hiko, mā te 19.2 kirokaramu ki ia wāhanga.

E whakahau nei e mātou hoki kia renarena te ao hokohoko me te whakawhānui te taha ki ngā hua me ngā kopaki hei ārai tonu i ngā tukuwaro ki ēnā momo para.

Ko ngā matapae te kōrero ko te mahi whakatūwhera whare me te tangohanga o ēnā para ka eke ki te 50% o ngā para katoa ngā rangona e Aotearoa, tuia ko te 20% ka haere ki te ruaparanui me te 80% ka haere ki ngā ruaparapai. Rawa atu, ko ēnei momo para, ko te para rākau tētahi tino, e tuku hauwaro ana i tōna huanga, i tōna kawenga, me tōna tangohanga. Ko ngā tukuwaro ka taea tonu te whakaheke mā te panoni i te para rākau hei whakamahinga pūrua.

E whakahau nei i a mātou ki te Kāwanatanga kia whakatau ngā matū para rākau hei aronga matua ki te whakaheke tukuwaro ki te whakatūwhera me te tangohanga whare.

Ko te 'ōhanga toiora' he kōrero ki ngā wāhanga o te ōhanga e whakamahi ngā rawa matapūngao hei whakaputa kai, whakaputa hua, whakaputa ngao hoki.

Mā ngā kōwhiringa kē ki ngā mahinga me ngā whakahaerenga tukuwaro nui, ka āhei te ōhanga toiora te whakapau kaha ki te whakaheke tukuwaro ki te taipoto me te tairoa. Hei tauira, ko tā te Komihama ara tiketike, te whakamahinga o ngā hinuora (ngā kiri-taitea me ngā wahie taikākā) kia hipa ko ngā tino hinuwaro (pōhatuwaro me te penehīni). Mā te hipa i ngā tukuwaro 1.5 $MtCO_2e$ ki te wā tahua tukuwaro tuatahi, 4.8 $MtCO_2e$ ki te wā tahua tukuwaro tuarua, me te 8.1 $MtCO_2e$ ki te wā tahua tukuwaro tuatoru.

Hei tāpiri ki te momori ki ngā whakamauru me ngā whakawhitianga āhuarangi, ko te pitomata ki te ōhanga toiora ka piki pea te uara ki te katoa o te ōhanga. Ko te tatau o te ōhanga taketake, toiora nei o te ao ka eke pea ki te $7.7 tiriona tāra amerikana hei te 2030.

Ko tā Aotearoa ōhanga toiora he aro ki ngā rāngai matua o te ahuwhenua me te ahurākau hei hua hokohoko ki tāwāhi. Ko te pae ōhanga toiora hou he whakamahi i ngā rawa taketake, te whakaiti paranui me te parakino me te whakawhiti atu i ngā hinuwaro - me te tautoko i ngā hua pāpori me ngā hua ōhanga.

Inā hoki te matapae o te hiahia ki ngā hinu rerekē hei kaupare i te hinuwaro ka nui kē mai te tūpono o te hipa i tā Aotearoa pūkenga ki te whakaputa i ngā hinutoiora, me whai rautaki ki tēnei whakamahinga rawa koiora. Mā te momori ki ngā tahua tukuwaro mā roto mai i te ōhanga toiora kei te āhua o te mōhio ki ngā raraunga me ngā mātauranga. Hei tauira, ko ngā kaiuru mākete me mōhio ki te hua toiora me te pai o tōna mahi ki ngā huawaro e ōrite mai nā re mahi ki te whānaketanga o te ōhanga toiora

E whakahau nei e mātou ki te Kāwanatanga kia whai aratakinga whakamarumaru me te whakaoreore i tētahi pae tukanga ki te whakatere ake i te ōhanga toiora e whakaheke ai ngā tukuwaro me te whakapakari ake i ngā i te āhuarangi, te here hoki i te tukinga o ngā rāngai.

Mā toru: Matapūngao me tōna rāngai

Ko te panoni te mana tukuhiko me ngā mana whakahaere hei ārahi i tētahi tino mahinga whakaheke tukuwaro ki te wā tahua tukuwaro tuarua, arawa atu ko ngā matapae katoa o te 17.4 $MtCO_2e$, te 40% rānei o ngā whakahekenga katoa me tutuki e te tahua.

He rite tēnei ki tā te rāngai tukuwaro i 2021 (17.4 $MtCO_2e$), e 20% o tā Aotearoa tukuwaro katoa ki tērā tau. Ko tā te Kāwanatanga ahunga ki te tukuwaro ki te ngao me te rāngai he tauwaenga 14.6 $MtCO_2e$ ia tau ki te tahua tukuwaro tuarua.

Ko ngā tukuwaro ngao he hanga e ngā mahinga o ia rā pēnei i te whakamahana me te whakamātao i ngā whare. Ko ngā tukuwaro ki te rāngai ka ahu mai i ngā mahinga pēnei i te tahuwaro hei pūngao.

Ko te mahinga hiko me ngā whakahaerenga tē tātā i ngā mana whenua me ngā mana moana kei te Tiriti o Waitangi, nā runga i te mōhio ko te hangahanga ka whai pānga hoki ki te Taiao.

Ko te whakahiko te mea nui ki te tangowaro, ā, ko te pūnaha me aro ki te whakaputa i ētahi tino mahinga whakaheke tukuwaro engari kia tau tonu te noho, kia ngāwari te utu ki te ngao. Ko te matapūngao me wawe tōna kōkiri me tōna kawenga. E tika ai te kawenga, e matapae nei i a mātou ki ia tau mai i 2025 neke atu, ko te matapūngao ka eke atu i te 1 TWh ki ia tau me whai wāhi ki te hanga. E hāngai ana tēnei ki te takiwā o te rua whenua haupūngao nui o ia tau (ahakoa kei te matapae ka tini ngā momo matapūngao, pēnei i ngā pūngao ngāwhānau me ngā pūngao kōmaru).

E matapaetia ana te rāngai pūngao ko ngā rawa ki te anamata hei tutuki i te wawata nui kia noho hei ōhanga whai hiko ka eke pea te nama katoa ki te $42 piriona hei te 2030 ki te whānuitanga o te whakaritenga, te tukuhanga, me te whakaputanga ki ngā ratonga. Ka aro tēnei ki te patu i te itinga o ngā moni kua tukuna i ngā tau ki muri, te tutuki i ngā hiahia o te anamata me te whakapakari i te hangahanga nui.

Heoi anō, ko ngā ritenga tukanga me ētahi atu pānga kei te whakapōrearea me te whakatōmuri i te whakatūwheratanga, nā whai anō ka piki ngā tukuwaro. Ko te pūnaha me ōna whakaaetanga he whakatenatena i tētahi whakatūwheratanga kounga, tere hoki i te matapūngao, engari me kaha ake te aronga ki te kaupare i ngā ārai o te whakatūwhera matapūngao hou kei whai whakaaetanga anō tēnei whakareanga. Kua piki rā te hiahia ināianei kia tere whakapai i te pūnaha.

E whakahau nei e mātou ki te Kāwanatanga kia aro, kia whakatere hoki te whakatuwhera i te matapūngao me te noho ki ngā pae hiko e tautoko ana i te whanake me te tupu mai o tēnei momo mahinga.

Ko ngā hua me anga whakamua mā roto tonu i te tūhononga ki te iwi Māori, inā hoki te tūpono o ngā whakawhiu ki te mana whenua me te mana moana, ka mutu, ka mutu, tō rātou rangatiratanga.

Ko te whakaheke wawe i ngā tukuwaro ki tēnei rāngai he tino mahi hei whakatutuki i te tahua tukuwaro tuarua. Ko te tino tangowaro ka taea e te tau tīmatanga ki te tau waenga o ngā paemahana ki ngā wā tahua tukuwaro tuatahi, tuarua hoki. Ki te ara tiketike a te Komihana, ka heke ngā tukuwaro a te rāngai mai i 10.9 $MtCO_2e$ i 2021 ki 8.9 $MtCO_2e$ ā te 2030.

Heoi anō, he ārai (pēnei i ngā rāhui tūturu me ngā uauatanga ki te hungamahi) me anga ki te whakatika me te whakaheke tonu ngā tukuwaro ki te rāngai. Hei tauira, kāhore e eke ana te tatau o ngā uri i Aotearoa nei ngā pūkenga me ngā mātauranga (arā te kaihanga arokaha, ngā kaipūhiko, ngā kaiwhakaritewaimahana me ngā kaitūhono taputapu) hei kawe me te whakatere nei i ngā kaupapa whakaheke tukuwaro ki te ōhanga.

Ahakoa rā te Kāwanatanga he aro ki ngā ārai utu nui o te tauiti ki te tauwaenga mō te paehana, he āheinga kei reira hei whakaheke tonu i te tukuwaro mēnā i reira te ākina o te tukanga te kaupare i ngā ārai kore utu. Ki ētahi atu rāngai ka kore e whiwhi i te aha, nā whai anō te korenga o ngā mātauranga, ngā tukanga rānei ki te whakaheke tukuwaro.

E whakahau nei i a mātou ki te Kāwanatanga kia whakatere ake te whakakore waro ki ngā whakaputa werawera me te whai kē i ngā āheinga ki te whakaheke tukuwaro ki te whānuitanga o ētahi atu rāngai.

Mā te tutuki i te wāhanga warokore ki te ahunga 2050 ka ngana te whakahekenga o te whakamahi hinuwaro me te whakapiki ake i te tukuhanga me te pai o te matapūngao. Ko ēnei panonitanga he aro ki ngā hiahia o ngā iwi me ngā hapori hei kawe i ētahi tino kaupapa ki te whānuitanga o te ngāwari me te māmā o te utu, te pakaritanga, te oranga, me ngā āheinga ki te ōhanga pāpori.

Mā whā: Te wao me ētahi atu mātāwaro

Ko ngā ngahere, me tāna he tango me te pupuri waro i te ātea, he tino mahi ēnei e noho tonu ai ki te tutuki i te wāhanga warokore o te ahunga 2050.

Inā hoki ngā ngahere ka roa kē nei tōna whakarito, tōna whakatupu, me te kitenga atu o tōna pānga nui ki te waro ātea, ā, me wawe tonu te ahu o te tukanga. Tuia katoatia, ko te hononga nui o te ngahere me te taitara whenua Māori, te whakapapa hoki a te Māori, arā ko tōna mana ki te whenua me te taiao he whakaoreore anō i te hiahia nui kia whai tukanga e whakamana tonu ana i te Te Tiriti o Waitangi.

Me whai anō ko te aratakinga a te tukanga hei whakamārama ake i te haepapa a ngā ngahere - arā ko ngā wāhi me ngā tūmomo ngahere - e tutuki tonu nei i ngā tahua tukuwaro me te ahunga whakaheke tukuwaro 2050.

Hei tā ngā ahunga whāiti kei te rāngai ki te mahere whakaheke tukuwaro tuatahi, he tatau katoa o te 57.2 $MtCO_2e$ ka tangohia me te whakarito ki ngā ngahere ki te wā tahua tukuwaro tuarua, te 81.6 $MtCO_2e$ ki te tuatoru.

Ki te ara tiketike a te Komihana he whakaatu ka taea te tutuki i ēnei ahunga mā te whakatō i te 30,000 heketea ia tau me ngā ngāhere o iwi kē (rākau paina), me te 20,000 heketea ki ngā ngahere taketake kia tae mai a 2035.

Mō te wa nei, ko ngā utu whakanui kua whakaritea e NZ ETS he tohua te momo wao ki Aotearoa nei, ā, ka whānui hoki ngā whakawhiunga. Mā te aro ki te tini o ngā āheinga ki te taiao, ki te tuakiritanga, ki te pāpori me te ōhanga kei ngā ngahere, ā, ka āhei ngā whakataunga ki ngā tukanga hei ārahi hoki i te whakamauru me te whakawhitianga o te āhuarangi, ka mutu, ko tōna pakaritanga hoki.

Ahakoa he nui tonu ngā āheinga a ngā ngahere, pēnei i te whakatikahanga o te wai me te hau, arā anō ko te tau o te whenua, he nui noa atu ngā uauatanga i tō ngā ngahere whakamahinga hei rautaki tangowaro. Kei ngā ngahere te tūraru o te uruwaro nā te waipuke, nā te kāpura, nā te pōrearea, nā te urutā, nā te tangata hoki ka pēnei rawa. He nui hoki ngā raru ki te utu o te whakarito ngahere taketake, me ngā nawe ki ngā whakamahinga whenua me tōna rite mai.

Ko te tangowaro tairoa me whai wāhi atu kia toronga matatini, mahinga maha, me te whenua pakari. E whakahau nei i a mātou ki te Kāwanatanga kia āta kōrerotia ngā haepapa ki ngā tūmomo ngahere e tutuki ai ngā tahua me ngā ahunga tukuwaro. Ka rerekē te pānga a ngā tini ngāhere ki ngā kawenga, nga inenga ōhanga pāpori, ngā rohe, me te pakaritanga o ki ngā tūraru me te āhuarangi hei tā hoki i te pūmautanga ki Te Tiriti o Waitangi.

Kātahi anō te Kāwanatanga ka tūwhera te whanaketanga i tētahi Rautaki Tangowaro - ka whakaurua ki te mahere whakaheke tukuwaro tuarua - e tohua ai te āhua o ngā mahi tangowaro me tōna tutuki i te ngā tahua tukuwaro me te Inenga Whakapau Kaha kei te kawenata o Pari.

Hei tā tēnei rautaki, he mea nui te whai i ngā mātāpono tāpiritanga (te mahi tangowaro e hāngai ana ki te tāpiritanga ki ngā mahinga o te wā nei) me tōna kaha (te roa o te waro ka noho whakarito), me te whakauru hei tūtohu ki ngā mahinga tangowaro.

Mā rima: Te paewaka

Ko ngā tukuwaro a ngā waka, e eke atu nei i te 18% o tā Aotearoa tukunga rehukino i 2021, me whakaheke rawatia, ka mutu, me anga ki tētahi whāinga e tutuki ai te ahunga 2050.

Ko te paewaka he tūhono i ngā uri, ngā whānau, me ngā hapori ki a rātou anō me ngā wāhi e taea ai te ako, te mahi, te noho me te tākaro. Ka tuku i te nui o ngā hua maha me ngā kaupapa maha huri i Aotearoa. Heoi anō, ko te paewaka he tino kāinga mā ngā tukunga rehukino. Neke atu i te 90% o ērā tukuwaro he ahu mai i ngā rori. He tata ki te 70% o ngā tukuwaro ki te rori he ahu mai i ngā waka taumaha iti (kei raro iho i te 3.5 tana) me te takiwā o te 30% ka ahu mai i ngā waka taumaha nui (kei runga ake i te 3.5 tana). Ko ngā toenga tukuwaro nō te rererangi (6%), te waipuke (1.5%) me te tereina (he iti iho i te (1%).

Ko ō mātou arotātai, he ākina e ngā aronga whai mana ki te ao, ā, ka taea te whakaheke tukuwaro mā te kaupare, te whakawhitianga, me te whakatikatika i ngā paewaka. Hei tauira, ko te whakaheke i te tawhiti me te whakarerekē i ngā haerenga tata ki te paeora (hīkoi me te pahikara) ka āhei te tutuki i tā te Kāwanatanga ahunga o te whakaheke i ngā kiromita Waka (VKT) ki te waka taumaha iti mā te 20%, he rite tēnei ki te pūtake o ngā ahunga mō 2035.

Ko te hanga paewaka ka tautoko i te hīkoi, i te eke pahikara, me te paewaka matawhānui ka rite te hunga tukuwaro o Aotearoa ētahi āhuatanga ki te tūhonohono. Engari, ko te hangahanga i Aotearoa kei te pērā tonu te itinga o te utu. Ko tā te Komihana o Te Waihanga matapae kei te $100 piriona te takarepa o te hangahanga.

Mō te tangata kotahi, he 5% anake o ngā kiromita i takahia nō te paeora mai i 2019-2022, ā, kei te takamuri a Aotearoa i ētahi atu whenua ki te whai paewaka iti te tukuwaro.

Hei tāpiri atu, ko ngā mahere me ngā whakaaetanga he whakamau nawe maha, me te nui hoki o ngā kaupapa nui kāhore tonu i tika te utu a ngā kaunihera ā rohe me ngā kāwanatanga. Ko ngā horopaki e rua he hanga ārai anō i te tutukinga o ngā whakaheke ki te tukuwaro o ngā paewaka ki tētahi terenga horo.

E whakahau nei e mātou ki te Kāwanatanga kia māmā ake ngā mahere me te whakapiki i ngā utu ki ngā paewaka herenga maha e eke ai te taha paewaka matawhānui me te paeora. He whakahau anō ki te Kāwanatanga kia whai moni hei moni tairoa ki te hanga wawe mai i ngā paepahikara me ngā kawenga tere ki ngā taone nui te tangata.

Tuia te pikinga o te hīkoi, te pahikara me te paewaka matawhānui, ko te whakawhitianga ki ngā hangarau warokore, te whakaheke tukuwaro rānei ki ngā paewaka whakakore waro. Engari, he nui ngā ārai ki te hikitanga o ngā paewaka matawhānui, me ngā wāhi hiko ki te paewaka matawhāiti, i konei ka ākina te waka hiko. E whakahau nei i a mātou ki te Kāwanatanga kia whai taunga paewaka hiko maha, he whakamahea hoki i ngā ārai.

Ahakoa ngā waka taumaha iti me ngā taraka he 19% o ngā waka, ka 49% tōna whakamahinga tukuwaro ki te paewaka katoa. Atu i ngā tino rāngai, he matapae 1.5 piriona rita o te hinu me te hinu taraka kei ngā rori mātāmuri, arā he 3.9 $MtCO_2e$ ia tau, he hāngai hoki ki te tino wāhanga o ngā waka rori mātāmuri.

Ko ngā waka haere rori mātāmuri he tini he maha ōna momo, arā ko ngā taraka iti, ko ngā taraka wīrā oneone (ATV), he tarakihana, he mihini nui hoki pēnei i ngā tarakihana hauhake, ngā kaikeri whenua, ngā mihini ngahere, ngā waka moana hoki. Ko te waka pēnei e tukuwaro kore ana, he iti noa iho nā te nui o te utu, te herenga hoki i ngā momo waka nei, me te kore tautoko i tēnei momo paewaka.

Hei kaupare i ngā tukuwaro a ēnei waka, me whai ko ngā tukanga whakanui i te mahi whakakore waro. E whakahau nei i a mātou ki te Kāwanatanga kia whakatere ake i te mahinga a ngā waka mahi, ngā wēne me ngā taraka iti kia whai i te warokore.

Mā ono: Ngā tukupara

Ko te whakaheke tukuwaro tētahi tino wāhanga ki ngā mahi a te Kāwanatanga hei whakaoreore i a Aotearoa kia tutuki i te wāhanga koiora mēwaro 2030 o ōna ahunga whakaheke tukuwaro mō 2050, inā te 9.1% o ēnei tukuwaro nō ngā para koiora e matemate ana ki ngā ruapara.

Ka taea e te Kāwanatanga te whakatere i te whakaheke tukuwaro ki ngā tukumēwaro kei ngā ruapara mā te whakaheke i te nui o ngā para koiora ka uru ki te ruapara me te whakaora anō i ngā punaha karo haurehu.

Mā te kaupare me te whakahaere i te para koiora ka tika atu te whakaheke tukuwaro. Heoi anō, kua kore e taea te karo te wāhi ki ngā para koiora o te ruapara, te wāhi rānei ki ngā tukanga ka hia nei te roa ki te whakamana, ā, ko ngā punaha karo haurehu pai o te ruapara ka whakaoreore i te whakaheke tukuwaro me te whakapiki i te auahatanga.

E whakahau nei i a mātou ki te Kāwanatanga kia mau ki ngā pūnaha me ngā hangarau karo haurehu ka toro whānui, ka mahi tika hoki. Me whai tēnei i ngā raraunga papai, pakari hoki, i kona tō mātou whakahau ki te Kāwanatanga kia piki ake makatika me te pono o ngā raraunga karo raurehu.

Me penapena pūtea ki ngā punaha para koira me ngā tukutuku hangarua ki roto tonu i te wā tahua tukuwaro tuarua. Mēnā rā kua kore tētahi mahere tahuaroa ki te tukutuku para, ka kore pea a Aotearoa e whakawhanake i ngā whare e tika ana ki te whakarerekē rawatia ngā para koiora i ngā hei te 2030.

Ko ngā whare whakawera para hei pūngao te pitomata ki te whakaiti i ngā ahunga anamata ki te whakaheke para me te hangarua, ā, ka raru pea ko te whakamahinga me te anga whakamua ki ngā kōwhiringa whakaputa matapūngao. He tino kaupapa ngā whakatūpato ki te tukanga whakawera para hei pūngao me ngā tūtohu penapena pūtea.

Ko ngā haukōwhai, he hou atu ki te whakakīa ngā rehukino whakakore i te ātea-tahi, ā, he rehukino taikaha rawa. Nā tō rātou pitomata whakamahana, he tino mahi kia arotātai tika ngā haukōwhai, ā, ko ngā ture, pēnei i ngā herenga tūtohu me ngā tūwhāinga i te haukōwhai, me whakature. Ko te whakahaere i ngā whiunga o ngā haukōwhai ki te wā tahua tukuwaro tuarua me whai hoki ko ngā inenga hei kaupare i ngā urunga haukōwhai me te mau ki ngā tangohau e tika ana mō mua i te hangarua, i te tukupara rānei.

Ko ngā tikanga me ngā aratakinga pai ko te ākina ngā aromātao whakangungu, whakahaere me te ine hoki, āpiti atu ko te ākina te whakawhitianga, pēnā rā ka ākina hoki e te kāwanatanga. Ko ngā rāhui ki ngā urunga me ngā hokonga o ngā taputapu e whakahiko ana e te rehukino haukōwhai, ka kaupare te whakamahinga o ēnei momo rehurehu ki ngā wāhi kei reira ētahi atu rehurehu pai kē.

Ko te ekenga kia tautika tētahi herenga nui ki te whakaheke i te tukuwaro mai i ngā waro. Ā, mā te ākina a te rautaki kāwanatanga me te tuku moni ki te whakamahinga anō i ngā toenga-kainui ka eke pea ki te tautika me te āki hoki i te oranga o ngā whānau maha kua pōkaikahatia e te kore kai i Aotearoa nei.

Executive summary

In line with our role as laid out in the Climate Change Response Act 2002 (the Act), He Pou a Rangi Climate Change Commission has prepared this advice to the Government on the direction of policy for its second emissions reduction plan, which will cover the second emissions budget period (2026-2030).

The Act established Aotearoa New Zealand's 2050 target, as well as the process for reaching it. Under the Act, the Government sets emissions budgets – which confirm the total allowable net emissions across a five-year period – and emissions reduction plans, which outline the actions it will take to achieve those budgets.

We have developed this advice in the interests of helping the Government fulfil its role in setting policies and strategies to meet the second emissions budget and ensuring Aotearoa New Zealand is on track to achieve the third emissions budget and the 2050 target.

As an independent Crown entity, our advice is based on research and expert analysis and has been informed by insights and evidence drawn from extensive engagement and consultation. Our focus is on clear and stable policy direction. Clarity and certainty will give households, businesses, and communities confidence to take up and invest in low emissions opportunities and are key to Aotearoa New Zealand's transition to a thriving, climate-resilient, and low emissions future.

As required by the Act, the Government will consider the recommendations and broader advice in this report before setting the second emissions reduction plan at the end of 2024. The policies and strategies in that plan will form the base of Aotearoa New Zealand's approach to achieving the second emissions budget, third emissions budget, and 2050 target.

Emissions are decreasing, but further Government action is needed

The transition to a low emissions future presents the opportunity for a healthier and more prosperous future for New Zealanders. For households, businesses, and communities, mitigating climate change will result in cleaner air, lower overall energy costs, new market opportunities, reduced risk of future inflation, and living in safer, more stable environments.

The uptake of electric vehicles, movement away from coal, and awareness of the importance of reducing agricultural emissions indicate that the country is committed to achieving a low emissions future, and is making real progress.

The latest National Greenhouse Gas Inventory data shows that Aotearoa New Zealand reduced its gross greenhouse gas emissions in 2020 and 2021. According to Stats NZ, that pattern has continued, with total industry and household emissions decreasing 3.9% from 2021 to 2022.

Government action is now needed to build on that momentum and to broaden, strengthen, and accelerate efforts to meet Aotearoa New Zealand's climate change objectives.

This report reflects Government policy as of October 2023. Each Government will have its own policy priorities and preferred approaches to action in relation to climate change.

In this advice, we take an outcomes-focused approach, identifying options the Government has in setting the second emissions reduction plan and laying out key opportunities and risks to inform decision-making.

Our recommendations to the Government identify areas where there are critical gaps in action, or where efforts need to be strengthened or accelerated to meet the second emissions budget and Aotearoa New Zealand's longer-term emissions reduction targets in a manner compliant with the Act. In this way, our advice draws from and builds on our previous work, including our 2021 report *Ināia tonu nei*.

These recommendations include actions that directly reduce emissions and those that are 'enablers', which support people to participate in and contribute to efforts to achieve emissions budgets and targets. For each sector, and across the broader system, we have identified where barriers currently deter low emissions choices, and where strategic investment can help drive deeper change over time.

Our advice report is divided into three parts:

- **Part 1:** Setting the scene
- **Part 2:** Fundamentals for success
- **Part 3:** Low emissions options for sectors and systems

Each part contains chapters focused on specific areas where Government action is needed to achieve emissions reduction outcomes, including the context and rationale for our recommendations.

International context

This advice is centred on the second emissions reduction plan, which is part of Aotearoa New Zealand contributing to the global effort under the Paris Agreement to limit warming to 1.5°C through domestic emissions reductions.

It is not, however, the full contribution that Aotearoa New Zealand makes to combatting climate change under either the Paris Agreement or other international pledges or activities. While these wider international efforts are not the main focus of this advice, they inform some aspects of it, and domestic action to meet emissions budgets can support achievement of these other goals.

Investments required to meet emissions budgets will save money in the long term

As part of *Ināia tonu nei*, we undertook extensive analysis and modelling in accordance with the matters required by the Act, which led to the development of a pathway to 2035: the demonstration path. The demonstration path reflects a suite of actions and outcomes that would set the country up to deliver the 2050 target in line with the Act's considerations and create options to manage uncertainty. This path was used as a basis for our advice recommending emissions budget levels for 2022–2025, 2026–2030, and 2031–2035.

This work included demonstrating that our recommended emissions budget levels were both ambitious and achievable. Our economic modelling indicated that the economy would continue to grow under the recommended emissions budgets. We assessed that the level of gross domestic product (GDP) could be around 0.5% lower in 2035 and 1.2% lower in 2050 than it would be in a scenario when there was slower action to reduce emissions, a conclusion consistent with findings overseas.

Through our work in *Ināia tonu nei*, we found that that while substantial investment is required to lower emissions in line with our proposed emissions budgets, this will likely be outweighed by larger future cost savings. Our analysis shows that by the 2040s, Aotearoa New Zealand can save around $2 billion each year.

We determined these potential savings by looking at the costs of transitioning to low emissions across three key areas: road transport, space and water heating, and food processing. These areas account for around three-quarters of the reductions in long-lived greenhouse gas emissions by 2035 under the demonstration path.

Our projections for change across road transport, buildings and food processing showed if households and businesses decarbonise by electrifying heat and transport, costs would likely increase over the short term, but begin decreasing by the late 2020s, and decrease more sharply by the mid-2030s.

The economic benefits of an electrified economy, where citizens and businesses can avoid future inflation related to the rise of fossil fuel prices, are being recognised internationally, including through the enactment of the Inflation Reduction Act in the United States and the rapid growth of solar generation in Australia.

Part 1: Setting the scene

This first part of our report provides overall context for this advice.

Chapter 2: What we heard

This report has been informed by the perspectives and evidence of thousands of New Zealanders from across the motu, shared with us through engagements held over the course of the Commission's existence, and in hui and wānanga focused specifically on the second emissions budget period.

On 26 April 2023, we released the draft version of this advice to the public for consultation. Over the next eight weeks, we met with and heard from iwi/Māori, academics, businesses, communities, farmers, local government, NGOs, sector bodies, and individuals with the purpose of testing and improving our work.

We worked with iwi/Māori across multiple rohe on a case study approach to understanding the specific effects of climate change from an iwi/Māori-led perspective, called the Maui.Tech project.

Consultation on our draft advice closed on 20 June 2023. Commission staff read, considered, and analysed the approximately 300 submissions we received. As a result of our submissions analysis, we re-evaluated our approach, judgments, conclusions, and recommendations where appropriate.

Throughout this report, we have highlighted key themes and insights from consultation, and where our advice has shifted as a result of what we heard.

One such theme was the need for Government action to make it more possible for people to participate in and contribute to emissions reduction efforts, for example through effective funding mechanisms and national campaigns to support behaviour change.

Submissions from local government consistently expressed the need for more clarity on what is required of them in the transition and that their funding and legislative tools need to be consistent with those responsibilities.

Respondents discussed the importance of an equitable transition across sectors and society, and of supporting communities to adapt to change while navigating the impacts of a warming climate.

We heard that clarity on the Government's direction of climate change policy is key to empowering action, as is a cohesive and aligned approach across sectors and between central and local government. Across multiple areas of our advice, we heard concerns about the risk of policies unintentionally contradicting each other, making efforts to meet emissions budgets less effective.

Our analysis shows there is a risk that Aotearoa New Zealand's institutional and regulatory environment is not sufficiently aligned to enable meeting the second emissions budget or longer-term emissions reduction targets.

We recommend the Government align and coordinate institutional and regulatory outcomes within and between levels of government and across all sectors of the economy to support the coherent implementation of the second emissions reduction plan.

Part 2: Fundamentals for success

The second part of our report discusses how the Government can set conditions for achieving emissions budgets.

As outlined in the latest IPCC report, effective climate action is enabled by political commitment, well-aligned multilevel governance, institutional frameworks, laws, policies, and strategies, as well as access to finance and technology.

Developing, implementing, and monitoring effective climate policy which supports an equitable transition to low emissions will require coordination across a wide range of government agencies and levels of government, as well as with iwi/Māori.

Chapters focus on areas where Government actions will impact across multiple sectors and communities, including investment and finance, emissions pricing, and setting a path to net zero. Getting these fundamentals right is critical for achieving Aotearoa New Zealand's climate targets, as they will lead to effective emissions reduction across all emissions budget periods.

Chapter 3: The task for the second emissions budget

Evidence clearly demonstrates that meeting the second and third emissions budgets will require concerted and timely action at all levels of government and across all sectors.

In the first emissions reduction plan, the Government set sector sub-targets, expressed as the total emissions for each sector in each budget period. Comparing these sub-targets with the government's baseline scenario, which represents emissions prior to the introduction of policies from the first emissions reduction plan, shows where further emissions reductions are needed beyond 'business as usual'.

For the second emissions budget:

- the total quantity of emissions reductions needed is estimated at 43.5 $MtCO_2e$
- the largest share (around 40%) is expected to come from energy and industry, totalling 17.4 $MtCO_2e$
- the transport, agriculture, and forestry sectors are each expected to deliver reductions of 7-8 $MtCO_2e$
- the remaining 3.3 $MtCO_2e$ is expected to come from waste and F-gases.

The fastest and most substantial emissions reductions are possible in electricity and heat production, through new renewable generation and moving away from coal and fossil gas heating. The main opportunities across other sectors include increasing electric vehicle uptake, shifting to low carbon transport, ongoing improvements in farming practices, and reducing organic waste disposal to landfills.

Decisions made in the second emissions budget period will impact Aotearoa New Zealand's ability to meet the third emissions budget. For example, the large jump in emissions reductions expected from transport in the third emissions budget relies on a rapid scaling up of electric vehicle sales in the 2020s. Without that early scaling up, a higher-emissions vehicle fleet will be locked in, making the necessary emissions reductions from transport more costly and disruptive.

This shows how seemingly small delays in the near term can lead to much higher costs and/or emissions over a budget period.

Similarly, policies in the first emissions reduction plan will contribute to meeting the second emissions budget and beyond. In the first emissions reduction plan, the Government released an assessment of the level of emissions reductions expected in each sector as a result of the plan's policies, out to 2035. Our reflection on this assessment provides a foundation for our analysis on what further Government action is needed to meet the second emissions budget and enable achievement of Aotearoa New Zealand's longer-term targets.

Under the latest government projections, published in Dec 2022, meeting the second emissions budget will require 20.7 $MtCO_2e$[i] of emissions reductions in addition to the policies and measures already in place.[ii] If further planned policies and measures from the first emissions reduction plan were put in place, 14.0 $MtCO_2e$ of additional emissions reductions would be needed.

While forests will continue to play a critical role in achieving emissions budgets, planting exotic forests during a given emissions budget period will not help to reduce net emissions in that same period. This is because when grassland is converted to forest, carbon dioxide is released into the atmosphere, and exotic trees generally do not "pay back" these carbon losses until four years after their planting.

i. For this figure, Commission analysis of the government's December 2022 emissions projects (adjusted for continued operation of the aluminium smelter) has an uncertainty range of 4.4 to 38.9 $MtCO_2e$, meaning the actual figure is expected to fall within that interval.

ii. Table 4.1 on page 45 shows the policies and measures included in both the 'with existing measures' and 'with additional measure' scenarios. < https://environment.govt.nz/assets/publications/New-Zealands-Fifth-Biennial-Report.pdf>

Chapter 4: A path to net zero

The Government has choices about the combination of gross emissions reductions (emissions reduced at the source) and carbon dioxide removals (primarily by forests) it will use to reach and sustain net zero emissions of long-lived greenhouse gases by 2050, as required by the Act.

The Government could set a path focused on gross emissions reductions, thereby requiring fewer removals. Alternatively, net zero could be achieved by increasing removals and sustained by ensuring any emissions of long-lived greenhouses gases after 2050 are balanced by an equal or greater quantity of removals from the atmosphere.

However, because the amount of carbon that can be stored on land is limited, an approach solely reliant on forest carbon removals is not viable indefinitely. Carbon stored on land is also increasingly vulnerable to events like fires and floods. If the Government's approach does not result in strong reductions of greenhouse gas emissions, achieving the 2050 target in a durable and equitable manner will be at risk.

Reducing gross emissions is a pathway strongly recommended by the Intergovernmental Panel on Climate Change (IPCC). Reducing gross emissions will bring benefits and opportunities including healthier homes and buildings, new market opportunities, and improved lives and choices for young people and future generations.

It is important that the Government clarifies and communicates its approach to gross and net emissions reductions, as this will impact how the net zero component of the 2050 target is met and the risks and impacts Aotearoa New Zealand will face as a result.

Clarity can also help make climate goals more achievable. For households, businesses, investors, communities, and local government, a clear and stable path to net zero is important for informed decision-making. If these stakeholders are confident on the way forward, they can invest in low emissions technologies like biomass boilers or heat pumps, and make choices and plans that are compatible with emissions reduction targets.

We recommend the Government commit to specific levels of gross greenhouse gas emissions and carbon dioxide removals for the second and third emissions budgets and align policies to achieve or exceed the emissions reductions in the budgets. Gross emissions should not exceed 362 $MtCO_2e$ for the second emissions budget nor 322 $MtCO_2e$ for the third emissions budget.

Setting out intended long-term outcomes now is important for a well-managed transition. The Government can ensure appropriate and comprehensive policies are put in place to achieve necessary gross emissions reductions, and sectors can make planning and investment decisions consistent with the overall emissions outcomes envisioned by the Government.

We recommend the Government communicate indicative levels of gross greenhouse gas emissions and carbon dioxide removals out to 2050 and beyond to guide policy decisions.

These committed and indicative levels must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

Chapter 5: Emissions pricing

The New Zealand Emissions Trading Scheme (NZ ETS) is central to Aotearoa New Zealand's strategy to reduce greenhouse gas emissions. Putting a price on emissions changes the relative prices of goods and services across the economy. This influences the behaviour of both producers and consumers by discouraging high emitting activities and rewarding low emissions choices.

Our analysis shows that the NZ ETS as it is currently structured is highly unlikely to drive the gross emissions reductions recommended in *Chapter 4: A path to net zero* for reaching net zero emissions of long-lived greenhouse gases in a way that can be sustained.

Aotearoa New Zealand's climate policies need to encourage both decarbonisation and afforestation, as both have essential roles to play in an equitable and sustainable low emissions transition. While the NZ ETS creates strong economic drivers for planting trees, it also allows carbon dioxide removals by forests to undermine the incentive to reduce emissions at their source. In the near term, this is expected to result in the NZ ETS driving extensive afforestation but only limited gross emissions reductions.

The consequences of this include that Aotearoa New Zealand will miss out on the gross emissions reductions that, as outlined in *Chapter 4: A path to net zero*, are important for improving the lives of young people and future generations, and modernising the economy so businesses are fit to compete in a low emissions world. It also has impacts for people and regions affected by land-use change, particularly rural communities that thrive on a diversity of land uses.

In addition, from the mid-2030s onwards the NZ ETS will not provide the durable incentives for planting the forests needed to reach net zero long-lived greenhouse gas emissions by 2050. Although this point is some years away, a plan to provide these incentives needs to be developed soon, as their absence in the late 2030s will impact forestry well before then. Investing in planting a forest is a long-term decision and investors need to have confidence about returns for decades into the future.

We recommend the Government align the emissions pricing system with the desired levels of gross emissions for the second and third emissions budget, and with the net zero 2050 target by amending the NZ ETS to separate the incentives for gross emissions reductions from those applying to forests, and by providing durable incentives for carbon dioxide removals by forests through to, and beyond, 2050.

The redesign of emissions pricing incentives must consider the unique characteristics and historical circumstances of land owned by Māori[iii] and options must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

Between the April 2023 release of our draft advice and the publication of this final advice, the Government ran a public consultation on the role of forestry in the NZ ETS as part of a review of the scheme. The review aims to assess the desired role of the NZ ETS in driving gross emissions reductions while continuing to support removals, as well as the benefits, trade-offs, and risks of changing the NZ ETS.

iii. The terms 'land owned by Māori' and 'Māori landowners' are used in this report to cover the collective owners of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes. The distinctive characteristic is the collective ownership structure and its impact on land management and investment opportunities (as in our advice about Māori land in *Ināia tonu nei*, see pages 158 and 217).

This review is an important step towards developing a new structure for the NZ ETS so that it can better support Aotearoa New Zealand to reduce gross emissions, in addition to growing forests to remove carbon dioxide from the atmosphere. Its progression is also urgent, as prolonged uncertainty about the future of the NZ ETS will limit its ability to drive investments in reducing emissions. A key issue for the review's next stage will be to examine what transitional arrangements should apply to existing forestry participants and forestry units already circulating in the scheme.

There is growing interest in expanding the scope of the NZ ETS to include other carbon-storing activities, for example using harvested wood products, soils, vegetation, wetlands, or the marine environment ('blue carbon'). However, the NZ ETS may not be the best suited policy tool for all these opportunities. Land uses have multiple functions, and including them in the NZ ETS – which by its nature focuses only on carbon – could lead to unintended consequences caused by narrowly pursuing emissions reduction outcomes at the expense of other benefits, such as biodiversity or wider ecosystem services.

It will be important for the Government to determine the outcome of the NZ ETS review before making any decisions about expanding the coverage of the NZ ETS to include these new activities or land uses, as their inclusion could further erode the scheme's ability to drive gross emissions reductions.

Some carbon dioxide removal opportunities, such as vegetation and peatlands, are not yet included in Aotearoa New Zealand's method for measuring emissions against targets (target accounting). It is important that any decisions to include them in the NZ ETS or begin counting them towards targets do not weaken Aotearoa New Zealand's efforts to address climate change.

In *Ināia tonu nei*, we advised that expanding target accounting beyond the scope used to set existing targets would be cause for a review of the targets to ensure their integrity. This is important to prevent undermining the ambition of Aotearoa New Zealand's climate commitments, and is another reason to make decisions regarding the scope of the NZ ETS carefully, and with due consideration.

Some companies that produce goods in an emissions-intensive way and compete with goods produced overseas receive free allocations of units in the NZ ETS (industrial free allocation). This aims to address the risk that these businesses will reduce production due to the NZ ETS costs, leading to an increase in production offshore that increases global emissions (emissions leakage).

Current industrial free allocation policy is inconsistent with the NZ ETS incentivising net zero long-lived gas emissions by 2050.

While the Government recently passed an amendment Bill which aims to correct over-allocation (where firms are receiving more units than they need), further change will be needed over time. Issues to consider include:

- the benefits of industrial free allocations alongside the cost to taxpayers
- the changing international landscape and how this impacts the risk of emissions leakage
- the opportunities presented by other options, such as reallocating resources to invest in emissions reduction or exploring other means of addressing emissions leakage.

Chapter 6: Investment and finance

Investing in a shift to a low emissions economy makes good economic sense. Our analysis shows it would cost the country less over time to invest in emissions reductions, than it would to stay dependent on fossil fuels (and pay higher fuel costs later as fuel prices rise with inflation).

The emissions reductions required to meet Aotearoa New Zealand's climate change goals are within reach and can be funded if the right settings are created. Investment and finance is fundamental to emissions reductions in every sector, and as part of the second emissions reduction plan, Government action is needed to improve the operating environment for public, private, and institutional investors.

Private investment has an important role in achieving emissions budgets. A 2021 report from the UNFCCC's Race to Zero campaign found that from 2026, a global investment of USD $4.5 trillion in decarbonisation per year is needed to reach net zero by 2050, with private actors accounting for up to 70% of those investments.

The way the Government invests public funds to lower emissions also matters, and Aotearoa New Zealand's ability to meet emissions budgets will be impacted by whether Government investments are in alignment with climate targets. Government investment decisions also send a message about what is important to New Zealanders and demonstrate the kind of change possible at a large scale.

As part of our work in *Ināia tonu nei*, we compared the demonstration path to the baseline of policies set before the first emissions reduction plan was implemented to get an overall sense of the potential investment needed to achieve the 2050 target. We found that reducing emissions in line with emissions budgets across electricity generation, food processing, the built environment, road transport, and native afforestation would require an additional investment of around $38 billion (in 2021 dollars).[iv]

That estimate of additional investment spanned the years 2022 to 2050, with roughly half of that amount ($18 billion) needed in the second and third emissions budget periods to put Aotearoa New Zealand on a path to achieve future targets.

iv. This figure represents the difference between the demonstration path and the current policy reference baseline in our advice in *Ināia tonu nei*. It is only intended to provide an overall sense of potential investment needs rather than the full picture, as it did not include sectors such as agriculture nor assess different financing costs. Actual figures will also vary based on decisions made about the transition.

However, there are several barriers preventing the mobilisation of investment at the pace and scale required to meet emissions budgets and support climate resilience goals. We recommend the Government reduce the barriers – including regulatory, institutional, and ownership barriers – to mobilising public and private investment required to meet emissions budgets.

Its options to address these barriers include:

- amending components of the tax system (for example, adjusting depreciation schedules and rates for eligible projects)
- sharing and reducing investment risks with private investors, to attract more investment for low emissions projects
- further exploring debt financing, where a governmental or private sector organisation borrows money to fund a project and then pays the lender back with interest
- facilitating increasing climate knowledge in the finance sector and greater coordination and guidance for public and private reporting entities
- developing data collection, classification (or 'taxonomy'), and verification systems for climate friendly investment in Aotearoa New Zealand.

In addition, an integrated and centralised Government investment approach would help to guide Aotearoa New Zealand's transition and ensure a clear, consistent, joined up approach to maximise impact, minimise delays, and better enable individuals, businesses, agencies, and communities to play an active role. This would be a strong step forward in addressing regulatory and institutional barriers that may exist between different levels of government or state actors.

Chapter 7: Research, science, innovation, and technology

Meeting emissions budgets will require an accelerated transformation of Aotearoa New Zealand's research, science, innovation, and technology (RSI&T) system, which provides knowledge and insights to develop new low emissions options that are domestically relevant and affordable. The RSI&T system can also make existing solutions more accessible across the motu.

These activities, occurring across public and private sectors, include inventing new fuels and new ways of generating energy, and developing more efficient processes or technologies to reduce emissions from agriculture.

Through investment, regulations, procurement, trade agreements, workforce development, resource and development infrastructure, and standards-setting, the Government can facilitate and drive innovation.

Continuity in funding and programmes will be key in ensuring that the climate change science capacity and capability developed over the last decade is maintained. Targeted investment, supported by a clear set of priorities for climate change science and research, is needed to support the progression and adoption of new technologies.

Freely available climate change data and information, including on weather, water, ocean, air quality, and greenhouse gas levels, informs our understanding of how Aotearoa New Zealand's climate is changing. Currently, however, public fees and limitations on sharing data across government organisations and Crown Research Institutes are constraining access.

We recommend the Government provide adequate targeted investment and increased coordination and facilitate widespread sharing of freely available climate change data and information to enable a research, science, innovation, and technology system that supports achieving emissions budgets and the 2050 target.

Chapter 8: Whāia ngā tapuwae

Iwi/Māori have a key role in meeting emissions budgets and the 2050 target. Through partnership, the Government and iwi/Māori can accelerate the transition to low emissions and collectively build climate-resilient communities.

Close regard for the Crown-Māori relationship is important in setting the second emissions reduction plan, as its effectiveness is critical for an equitable transition, for the benefit of all New Zealanders. For Aotearoa New Zealand to achieve a fair, inclusive, and equitable transition to a low emissions future, iwi/Māori need to be able to:

- actively exercise rangatiratanga and mana motuhake
- access resources and information to achieve emissions reductions within their takiwā
- ensure their communities are resilient and are able to adapt to the effects of climate change while maintaining intergenerational economic, environmental, social, and cultural wellbeing.

To achieve this, it will be important for the Government to consider the role of iwi/Māori in the country's approach to reducing emissions as well as their specific, localised needs. This includes ensuring iwi/Māori are resourced and enabled to accelerate emissions reduction in accordance with tikanga and mātauranga Māori, and while realising the aspirations of their people and communities.

We recommend the Government introduce ways to directly allocate resources to iwi/Māori and augment funding to Māori landowners to enable them to accelerate emissions reductions and removals in accordance with their assessments and priorities.

Many iwi and other Māori landowners have a strong commitment to climate action and control significant assets that can contribute to a scalable low emissions transition. Through shared tikanga, values, assets, and an increasing number of Māori affiliated to iwi and other collectives, iwi/Māori have a range of skills, capabilities, and knowledge that can be mobilised quickly in response to climate emergencies.

Accelerating a general understanding of mātauranga Māori through collaboration with local iwi and hapū will build more locally relevant and enduring climate change solutions. If policy is developed without consideration of te ao Māori or inclusion of mātauranga Māori methodologies, it may lead to inequitable impacts and/or limit the ability of iwi/Māori to address and respond to climate change.

We recommend the Government ensure iwi/Māori are empowered to lead the weaving of mātauranga Māori into policy design, development, and implementation at central and local government levels. This includes providing sufficient resources to iwi and hapū.

Chapter 9: An equitable transition

A fair, inclusive, and equitable transition will endure, because it will be based on considering how decisions will affect different groups of people around the country. To increase policy effectiveness and avoid unintended consequences, the Government will need to manage the impacts and maximise the benefits and opportunities of actions to reduce emissions.

Acting to reduce emissions can provide health benefits, including improving mental health for young people and addressing the causes of physical health challenges related to cold, damp housing and air pollution, which research suggests costs Aotearoa New Zealand $15.6 billion per year in health impacts.

Some industries, regions, and communities will be more affected than others by action to reduce emissions. It is important that the speed and nature of the transition is well signalled to allow time for businesses and communities to manage the change.

For sectors like renewable energy (including offshore wind, solar, and geothermal), the transition to a low emissions economy will likely mean an increase in demand for workers, while industries associated with higher emissions (such as steel, aluminium, or chemical production) may see a decrease.

While workforce changes in higher emitting sectors are expected to occur gradually, attention to workforce training and support for individuals and communities will be important to ensure New Zealanders have what they need to effectively navigate challenges and uncertainties associated with the transition.

If the Government's Equitable Transitions Strategy is to meaningfully address equity impacts in the second emissions budget period, implementation is urgently needed.

As announced, the strategy will only consider impacts related to emissions reduction policies. However, failing to consider emissions reduction and adaptation together can lead to decisions to prioritise one over the other, rather than making decisions that meet both goals. This was evident in the wake of Cyclone Gabrielle, with the Government revising its *Government Policy Statement on land transport* to focus less on reducing emissions and more on reconstructing or relocating damaged infrastructure and building greater resilience into the land transport system.

We recommend the Government expand the scope of the Equitable Transitions Strategy to also include the impacts of climate change and adaptation as well as mitigation.

Risks and barriers, including upfront costs, a lack of time and resources, the potential for inequitable impacts from emissions pricing, and split incentives – where the person or entity who could make a change is different from the beneficiary of that change – can make it harder for some to lower their emissions. Some communities will need targeted support through the transition, including support which enables them to take advantage of opportunities to reduce emissions and associated costs.

It is therefore highly important for the Government's upcoming Equitable Transitions Strategy to provide a comprehensive response to manage equity during the transition to a low emissions economy.

While the strategy remains in development, existing means of providing targeted support, such as the Energy Efficiency and Conservation Authority's Warmer Kiwi Homes programme, will continue play a crucial role in promoting equity while simultaneously reducing emissions. We recommend the Government manage the impacts of climate policies using existing policy levers until the Equitable Transitions Strategy is implemented, rather than delaying climate action.

Part 3: Low emissions options for sectors and systems

The third part of our report contains advice and recommendations for Government action within specific sectors and systems, each with an important part to play in meeting the second emissions budget.

Although these chapters are each focused on respective areas of the economy, effective policy requires the alignment of institutional and regulatory outcomes (as emphasised in Recommendation 1). Throughout these chapters, we note connections to other areas of our advice, and where emissions reductions in line with the second emissions budget will depend on coordination between local and national government.

Chapter 10: Agriculture

Reductions in greenhouse gas emissions from agriculture are central to meeting Aotearoa New Zealand's emissions reduction targets. Agriculture accounts for 91% of biogenic methane emissions and 94% of nitrous oxide emissions, together representing approximately 49% of gross greenhouse gas emissions.

The sector has already made progress in reducing emissions, but further changes will be needed to meet Aotearoa New Zealand's emissions reduction goals.

An effective agricultural emissions pricing system is a key tool for the Government to help meet the second emissions budget and to ensure achievement of the biogenic methane components of the 2050 target (reducing biogenic methane to 10% below 2017 levels by 2030, and 24–47% below 2017 levels by and beyond 2050).

In *Ināia tonu nei*, we recommended the Government commit to a pricing mechanism to incentivise on-farm emissions reductions. In our 2022 report *Progress towards agricultural emissions pricing*, we supported a farm-level pricing system for methane (rather than a processor-level), as our analysis showed that a more detailed system would be able to recognise and incentivise a greater range of on-farm actions by farmers to reduce emissions.

In August 2023, the Government set a final plan for a farm-level, split-gas levy to commence in 2025.

We now recommend the Government advance the agricultural emissions pricing system to continuously broaden the range of recognised low emissions practices and technologies, and to incentivise gross biogenic methane emissions reductions in a manner consistent with achieving the 2030 biogenic methane component of the 2050 target and the 2050 target in full. The pricing system should recognise existing low emissions practices such as alternative feed types and technologies in the pipeline like methane inhibitors.

New technologies, some land-use diversification, and on-farm efficiency increases will also help the sector make the change needed to achieve these goals while limiting impacts on agricultural production. Many of these shifts offer additional benefits; diversifying land can lead to economic and climate resilience, and increased biodiversity, water quality, and soil health, as well as benefits for rural communities who rely on livestock production.

To be in the best position to seize opportunities associated with transitioning the agriculture sector, farmers will require adequate support to reduce emissions. Advisory and extension services – services which support farmers with knowledge, advice, and support – will be important sources of information on which low emissions practices and technologies will be most effective and appropriate for each specific business.

We recommend the Government enhance advisory and extension services to farmers to accelerate land-use diversification and uptake of the technology and practices required to reduce gross emissions in line with emissions budgets and the 2050 target.

In line with the Government's partnership under Te Tiriti/The Treaty, policy settings for the second emissions reduction plan need to reflect:

- the significant part agriculture plays in the Māori economy
- the unique characteristics of land owned by Māori, including specific constraints and challenges around land tenure and access to capital
- the relationship Māori have as tangata whenua to te taiao.

Advisory and extension services must therefore be co-designed, coordinated, and implemented in partnership with iwi/Māori, and should be developed in collaboration with industry.

Chapter 11: Built environment

The way cities, towns, and communities are designed affects emissions from land use, transport, buildings, energy, and waste. Well-integrated policy, planning, and funding decisions related to the built environment can help to meet the second emissions budget and enable Aotearoa New Zealand to achieve its longer-term climate targets. This includes Māori-led approaches to weaving mātauranga Māori into decision-making.

International studies have demonstrated that, per person, greenhouse gas emissions in denser urban areas are less than half of those in in low density areas. However, it is important that density does not occur in vulnerable coastal or lowland locations, or areas exposed to climate-related hazards that increase the risk that communities and systems such as electricity and communication networks will experience loss and incur more costs in the future.

We recommend the Government ensure planning systems are integrated and support building urban areas upward and mixing uses in order to reduce emissions, while decreasing susceptibility to climate-related risks.

In consultation, we heard from a range of respondents calling for greater policy coordination to address potential conflicting system outcomes, seeking a consistent national approach to delivering low emissions infrastructure. There are clear barriers to developing renewable generation under existing legislation, including the unresolved conflicts between various National Policy Statements.

During the second emissions budget period, the National Planning Framework, regional spatial strategies, natural and built environment plans, and other national policy instruments will be introduced or amended. Appropriate and clear direction will need to be reflected across all relevant Acts and policy instruments to support the transition to a low emissions society.

How buildings are designed, built, used, and located will impact emissions and our ability to adapt to climate change for generations. While the condition and performance of existing buildings is highly variable across Aotearoa New Zealand, there are technologies that can make them healthier, safer, and more energy efficient. These include installing insulation, upgrading windows, improving weathertightness, and switching away from fossil fuel heating and cooking.

Over their lifetime, technologies like heat pumps can save consumers money, as they are more energy efficient than their higher emissions alternatives, like gas heaters. However, there are currently limited incentives to retrofit given the upfront costs associated with equipment and installation, potential space requirements, and disruptions during construction.

We recommend the Government accelerate comprehensive retrofits to deliver healthy, resilient, low emissions buildings.

Many households, businesses, marae, and community centres use fossil gas for heating, cooking, and hot water, and the number of new connections to the fossil gas network continues to grow.

Continued fossil gas use will add additional cost to consumers and raise equity issues for future generations. Fossil gas installation that occurs during the second emissions budget period could endure to 2050 and beyond, despite affordable and technically viable low emissions alternatives, like electricity, being available now.

Residential and small commercial customers contribute around 65% of the total revenue of gas pipeline businesses despite only consuming around 20% of the volume. Historically, gas transmission and distribution charges have made up approximately 40-45% of the average consumer gas bill.

To meet the 2050 target, the use of fossil gas to heat water and space in the built environment needs to decrease. We recommend the Government prevent the installation of new fossil gas infrastructure and connections in buildings except where there are no technically viable low emissions alternatives.

Chapter 12: Circular economy and bioeconomy

Aotearoa New Zealand's resource use largely follows a linear pattern: extract-make-use-dispose. In contrast, a circular economy – encouraging reuse, repair, regeneration, and recycling – optimises energy and resource use.

Established international evidence demonstrates the emissions reductions possible through circular economy strategies. Efficient and more circular use of materials in just four key industrial materials (cement, steel, plastics, and aluminium) could help reduce global greenhouse emissions by 40% by 2050. Similarly, using circular approaches within the food system could reduce global emissions by nearly half.

Regulated product stewardship increases the circularity of products through the producers and importers taking responsibility for the waste and negative environmental impacts generated throughout a product's lifecycle and taking action to minimise these impacts. Through right to repair legislation, which establishes a legislative right for a consumer to repair their products through access to information, tools, and parts, Aotearoa New Zealand could reduce its electronic waste, estimated at 19.2 kg per capita.

We recommend the Government strengthen product stewardship and expand coverage across products and packaging to help avoid emissions associated with waste.

Estimates suggest that construction and demolition waste may represent up to 50% of all waste generated in Aotearoa New Zealand, with approximately 20% going to landfill and 80% going to cleanfill sites. Among this type of waste, wood waste is common, generating emissions through its production, transport, and disposal. Emissions can be reduced by diverting wood waste away from landfill for reuse.

We recommend the Government declare construction material wood waste as a priority product to help reduce emissions from construction and demolition waste.

The 'bioeconomy' refers to the parts of the economy that use renewable biological resources (biomass) to produce food, products, and energy.

By offering alternatives to higher emissions activities and processes, the bioeconomy can contribute to emissions reductions in the short and long term. For example, in the Commission's demonstration path, use of biofuels (such as forestry residue and pulp logs) avoided significant fossil fuel emissions (from coal and petrol). Avoided emissions were estimated at 1.5 $MtCO_2e$ in the first emissions budget period, 4.8 $MtCO_2e$ in the second emissions budget period, and 8.1 $MtCO_2e$ in the third emissions budget period.

In addition to contributing to climate change mitigation and adaptation, the bioeconomy has the potential to increase the value of the economy overall. The value of the global circular bioeconomy is estimated to reach US $7.7 trillion by 2030.

Aotearoa New Zealand's bioeconomy is currently centred on primary agricultural and forestry industries, which mainly produce exports. The 'new' bioeconomy model involves using sustainable natural resources, reducing waste and pollution, and transitioning away from fossil fuel dependence – all in support of economic and social outcomes.

As sector projections suggest that demand for fossil fuel replacements is likely to quickly exceed Aotearoa New Zealand's capacity to produce biomass fuels, a strategic approach to the use of bioresources is needed. Contributing to emissions budgets through the bioeconomy also depends on access to robust data and information. For example, market participants need to know that a bio-based product will perform at the same level as the equivalent carbon-intensive product for the bioeconomy to develop.

We recommend the Government provide overarching guidance and an enabling regulatory framework to advance a circular bioeconomy that reduces emissions and increases resilience to climate change, ensuring cross-sector coherence.

Chapter 13: Energy and industry

Changing energy supply and industrial processes can lead to significant emissions reductions within the second emissions budget period, with projections totalling 17.4 $MtCO_2e$, or 40% of the total reductions needed to meet the budget.

This figure is equal to this sector's emissions in 2021 (also 17.4 $MtCO_2e$), which represents over 20% of Aotearoa New Zealand's total emissions for that year. The Government's sector sub-target for energy and industry emissions averages 14.6 $MtCO_2e$ per year for the second emissions budget.

Energy emissions are generated through everyday activities like heating and cooling homes. Industrial emissions come from activities like burning coal to generate electricity.

Both energy supply operations and industrial processes can invoke mana whenua and mana moana interests under Te Tiriti/The Treaty, given the extent of the infrastructure involved and associated impacts on te taiao.

Electrification is key for decarbonisation, and the system must be able to deliver secure, affordable, and low emissions electricity. Renewable electricity generation build therefore needs to scale up quickly. To meet anticipated demand, we estimate that each year from 2025, generation that can supply over 1 TWh per year will need to be built. This is equivalent to around two very large wind farms being completed every year (although we expect a mixture of renewable generation types, including geothermal and solar).

Energy sector estimates of future investment needed indicate that realising the vision of an electrified economy could require an estimated total investment of $42 billion by 2030 across generation, transmission, and distribution infrastructure providers. This would address historical under-investment, meet future needs, and strengthen grid resilience.

However, policy settings and other factors are creating investment uncertainty and delaying build, which could directly increase emissions. The consenting system can enable a fast-paced and sustained build of renewable generation, but stronger direction is needed to remove barriers to building new renewable generation or reconsenting existing generation. Improving grid resilience has also become increasingly urgent.

We recommend the Government prioritise and accelerate renewable electricity generation build and ensure electricity networks can support growth and variability of demand and supply.

These outcomes must be progressed in partnership with iwi/Māori, particularly considering potential implications for mana whenua and mana moana and their rights and interests.

Rapidly reducing industrial emissions is crucial to meeting the second emissions budget. Significant decarbonisation can occur in low-to-medium temperature process heat during the first and second emissions budget periods. Under the Commission's demonstration path, industrial emissions reduce from 10.9 $MtCO_2e$ in 2021 to 8.9 $MtCO_2e$ in 2030.

However, there are barriers (including technical constraints and workforce challenges) that need to be addressed to reduce industrial emissions. For example, there are not enough people in Aotearoa New Zealand with the required skills and expertise (including design engineers, electricians, boilermakers, and fitters/turners) to deliver emissions reduction projects across the economy simultaneously and at pace.

While to date the Government has focused on capital cost barriers in low-to-medium temperature process heat, there are opportunities for further emissions reductions if policy support was put in place to address a range of non-price barriers. There are some sectors that have received little attention to date, resulting in a lack of information or enabling policies to reduce emissions.

We recommend the Government accelerate the decarbonisation of process heat and pursue opportunities to reduce emissions across other industrial sectors.

Meeting the net zero component of the 2050 target will require steadily phasing down fossil fuel use and maximising the supply and efficient use of renewable energy. Making these changes in a way that focuses on people and communities can deliver positive outcomes across energy affordability and accessibility, community resilience, health, and socio-economic opportunities.

Chapter 14: Forests and other carbon stocks

Forests, which remove and store carbon from the atmosphere, are critical to the pathway to achieving the net zero component of the 2050 target.

As forests take a long time to establish, grow, and begin having an impact on carbon in the atmosphere, clear policy direction is needed quickly. At the same time, the strong connection between forestry and Māori land ownership, and the relationship Māori have as tangata whenua to te taiao, emphasises the need for policy to be developed in a manner that honours Te Tiriti o Waitangi/The Treaty of Waitangi.

Further policy direction is needed to clarify the role of forests – including the area and types of forestry – to achieve emissions budgets and the 2050 emissions reduction target.

According to the sector sub-targets in the first emissions reduction plan, a net total of 57.2 $MtCO_2e$ are to be removed and stored by forests in the second emissions budget period, and 81.6 $MtCO_2e$ in the third. The Commission's demonstration path shows these targets could be achieved by planting an average of around 30,000 hectares per year of fast-growing exotic forests (*Pinus radiata*) and 20,000 hectares per year of native forests through to 2035.

Currently, incentives created by the NZ ETS largely determine the forest landscape of Aotearoa New Zealand, with wide-ranging implications. By considering the many environmental, cultural, social, and economic benefits forests provide, policy decisions can be aligned to better support climate change mitigation, adaptation, and resilience.

While forests offer significant benefits, including improving water and air quality as well as land stabilisation, there are also significant challenges related to using forests as a carbon removal strategy. Forests carry a risk of carbon release due to floods, fires, pests, storms, disease, and human activity. There are also issues related to the cost of establishing native forests, and concerns over land-use change and land availability.

Long-term carbon removal therefore needs to be maintained via diverse, multifunctional, and resilient landscapes. We recommend the Government clarify the intended roles of different types of forests in achieving emissions budgets and targets. The effects of different types of forests on ecosystem services, socioeconomic factors, rural communities, and resilience to hazards and climate change must be considered in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

The Government has recently launched the development of a Carbon Removals Strategy – intended to be included in the second emissions reduction plan – which will consider how carbon removal activities can be used to meet emissions budgets and the Nationally Determined Contribution under the Paris Agreement.

As part of this strategy, it will be important to consider the principles of additionality (the concept that activities to carbon removals only matter if they are in addition to the status quo) and permanence (how long carbon is expected to be stored), and to include them as criteria for any recognised removal activities.

Chapter 15: Transport

Transport emissions, which made up 18% of Aotearoa New Zealand's gross greenhouse gas emissions in 2021, need to reduce rapidly and on a steepening trajectory to achieve the 2050 target.

The transport system connects individuals, whānau, and communities to one another and to places where they learn, work, live, and play. It delivers essential goods and services around the country.

However, the transport system is also a major source of greenhouse gas emissions. More than 90% of those emissions come from road transport. Nearly 70% of road emissions come from light vehicles (those under 3.5 gross tonnes) and about 30% come from heavy vehicles (those over 3.5 gross tonnes). The remaining transport emissions are from domestic aviation (6%), shipping (1.5%) and rail (less than 1%).

Our analysis, supported by internationally recognised approaches, shows that emissions can be reduced by avoiding, shifting, and improving transport use. For example, reducing trip distances and changing short trips to active transport (walking and cycling) can help achieve the Government's target of reducing Vehicle Kilometres Travelled (VKT) in the light vehicle fleet by 20%, relative to the baseline projection, by 2035.

Transport infrastructure that supports safe walking, cycling, and public transport provides New Zealanders with low emissions ways to connect. However, infrastructure in Aotearoa New Zealand has been consistently underfunded. Te Waihanga Infrastructure Commission estimates the current day infrastructure deficit to be approximately $100 billion.

Delivering a low emissions transport system in Aotearoa New Zealand will require significant investment to overcome the existing infrastructure deficit, and a reorientation of this funding to prioritise infrastructure that enables low emissions forms of transport.

Local governments are responsible for a large portion of the funding for transport infrastructure and make many of the funding decisions that shape cities. Ensuring adequate funding to achieve needed emissions reductions will require stronger coordination between central, regional, and city/district entities.

Per person, only 5% of kilometres travelled were by active or public transport between 2019–2022, meaning Aotearoa New Zealand is lagging behind many countries when it comes to uptake of low emissions transport.

In addition, the current planning and consenting processes contain significant complexities, and major projects are funded inconsistently between central and local government. Both contexts create additional barriers to delivering low emissions transport infrastructure at the pace required.

We recommend the Government simplify planning and increase investment in integrated transport infrastructure and services that optimise public and active transport. We also recommend the Government provide dedicated long-term funding for the construction of integrated cycle and rapid transport networks in major population centres.

Alongside increasing walking, cycling, and public transport, transitioning vehicles to zero or low emissions technologies will play a critical role in decarbonising transport. Charging infrastructure, both public and private, is crucial to the success of the transition to electric vehicles. However, there are barriers to increasing both public and private vehicle charging infrastructure which will need to be overcome to support electric vehicle uptake.

These barriers include the capacity of existing electricity distribution lines, which can be partly managed by requiring smart charging, and by adopting default off-peak charging (ordinarily overnight) to reduce the burden on the grid, allow cost effective investments in infrastructure, and reduce costs for homeowners.

We recommend the Government rapidly upscale vehicle charging infrastructure, including removing existing barriers.

While light commercial vehicles and trucks constitute only 19% of vehicles, they contribute 49% of road transport emissions. Outside of core transport sectors, an estimated 1.5 billion litres of petrol and diesel are consumed in off-road applications, contributing 3.9 $MtCO_2e$ per year, with a significant portion coming from off-road vehicles.

Off-road vehicles encompass many types of vehicles, including utes, all-terrain vehicles (ATVs), and tractors, as well as heavy machinery like combine harvesters, diggers, forest machinery, and recreational marine activities. Uptake of zero emissions commercial and off-road vehicles is currently slow due to a combination of significantly higher cost, limited supply, and the lack of supporting infrastructure.

To address the emissions from these vehicles, policies incentivising decarbonisation will be required. We recommend the Government accelerate the uptake of zero emissions commercial vehicles, including vans, utes, trucks, and offroad vehicles.

Chapter 16: Waste and fluorinated gases

Reducing waste emissions is a key area for Government action to enable Aotearoa New Zealand to achieve the 2030 biogenic methane component of its 2050 emissions reduction target, as 9.1% of these emissions come from organic waste breaking down in landfill.

The Government can accelerate a reduction in methane emissions from landfills by decreasing the volume of organic waste that goes to landfill and improving landfill gas capture systems.

Avoiding and managing organic waste directly reduces emissions. However, where the disposal of organic waste to landfill cannot be avoided, or where regulations will take several years to take effect, highly efficient landfill gas capture systems will enable emissions reduction and increase innovation.

We recommend the Government ensure the use of landfill gas capture systems and technologies is widespread and efficient. This will require robust and reliable data, and we therefore also recommend the Government improve the accuracy and transparency of landfill gas capture data.

Investment in organic waste processing and resource recovery infrastructure is needed within the second emissions budget period. Without a long-term waste infrastructure plan, Aotearoa New Zealand may not develop the facilities necessary to significantly divert organic waste away from landfill by 2030.

Thermal waste-to-energy facilities have the potential to undermine future goals for waste reduction and recycling and could displace the use and advancement of renewable electricity generation options. A precautionary approach to waste-to-energy policy and investment considerations is therefore important.

F-gases, commonly introduced to replace harmful ozone-depleting substances, are powerful greenhouse gases. Because of their high warming potential, it is important that F-gases are appropriately monitored, and that regulation, including requirements for F-gas labelling and traceability, is enforced. Managing the impact of F-gases during the second emissions budget period will also require measures that prevent F-gas leakage and ensure appropriate degassing prior to recycling or disposal.

Industry best practice guidance and guidelines to support refrigerant training, management, and tracking could further support the transition, especially if supported by government oversight. Restrictions targeting the import and sale of equipment pre-charged with greenhouse F-gases would prevent continued use of these gases in areas where viable alternatives exist.

Equity is inherently connected with reducing emissions from waste. More strategic government support and resourcing to support food rescue could also promote equity and support wellbeing for many people facing food insecurity in Aotearoa New Zealand.

Final Recommendations

This section shows our initial proposed recommendations, which were in the draft advice we consulted on, as well as our final recommendations to the Government.

Recommendation proposed in draft advice	Final recommendation **We recommend that in its second emissions reduction plan, the Government:**
New recommendation following consultation.	**#1** **Align and coordinate institutional and regulatory outcomes within and between levels of government and across all sectors of the economy to support the coherent implementation of the second emissions reduction plan.**
Commit to a specific level of gross emissions for the second and third emissions budgets no less ambitious than 362 $MtCO_2e$ and 322 $MtCO_2e$ respectively, and ensure that its policy choices align with delivering this outcome.	**#2** **Commit to specific levels of gross greenhouse gas emissions and carbon dioxide removals for the second and third emissions budgets and align policies to achieve or exceed the emissions reductions in the budgets. Gross emissions should not exceed 362 $MtCO_2e$ for the second emissions budget nor 322 $MtCO_2e$ for the third emissions budget.** **The levels the Government commits to for gross emissions and carbon dioxide removals must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.**

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
Communicate indicative levels of gross emissions and carbon dioxide removals from forestry out to 2050 and beyond to guide policy development.	**#3** **Communicate indicative levels of gross greenhouse gas emissions and carbon dioxide removals out to 2050 and beyond to guide policy decisions.** **The levels the Government communicates for gross emissions and carbon dioxide removals must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.**
Make the emissions pricing system consistent with delivering the specific levels of gross emissions for the second and third emissions budgets, and with the 2050 net zero target, by: a. implementing an amended NZ ETS that separates the incentives for gross emissions reductions from those applying to forestry b. developing an approach that can provide durable incentives for net carbon dioxide removals by forests through to and beyond 2050.	**#4** **Align the emissions pricing system with delivering the desired levels of gross emissions for the second and third emissions budgets, and with the 2050 net zero target, by:** **a. amending the NZ ETS to separate the incentives for gross emissions reductions from those applying to forests** **b. providing durable incentives for net carbon dioxide removals by forests through to, and beyond, 2050.** **The redesign of emissions pricing incentives must take into account the unique characteristics and historical circumstances of land owned by Māori[ii] and options must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.**
New recommendation following consultation.	**#5** **Reduce the barriers – including regulatory, institutional, and ownership barriers – to mobilising the public and private investment required to meet emissions budgets.**

i. The terms 'land owned by Māori' and 'Māori landowners' are used in this report to cover the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes. The distinctive characteristic is the collective ownership structure and its impact on land management and investment opportunities (as in our advice about Māori land in *Ināia tonu nei*, pp. 158 & 217).

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
New recommendation following consultation.	**#6** **Provide adequate targeted investment and increased coordination, and facilitate widespread sharing of freely available climate change data and information to enable a research, science, innovation, and technology system that supports achieving emissions budgets and the 2050 target.**
Accelerate Iwi/Māori emissions reductions in conjunction with climate change adaptation initiatives by exploring and implementing a mechanism to allocate resourcing direct to Iwi, and increase funding to Māori landowners (Te Ture Whenua entities).	**#7** **Introduce ways to directly allocate resources to iwi/Māori and augment funding to Māori landowners to enable them to accelerate emissions reductions and removals in accordance with their assessments and priorities.**
Ensure Iwi/Māori can drive the integration of mātauranga Māori into policy design, development, and implementation at central and local government level, by delivering sufficient resources to iwi/hapū.	**#8** **Ensure iwi/Māori are empowered to lead the weaving of mātauranga Māori into policy design, development, and implementation at central and local government levels. This includes providing sufficient resources to iwi and hapū.**
Enable a fair, inclusive, and equitable transition for New Zealanders by expanding the scope of the Equitable Transitions Strategy to include compounding impacts of climate change and adaptation as well as mitigation.	**#9** **Expand the scope of the Equitable Transitions Strategy to also include the impacts of climate change and adaptation as well as mitigation.**

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
Make use of existing mechanisms to manage impacts of climate policies in the interim, rather than delaying climate action.	**#10** **Manage the impacts of climate policies using existing policy levers until the Equitable Transitions Strategy is implemented, rather than delaying climate action.**
Advance the agricultural emissions pricing system to: a. enable recognition of a broader range of emissions-reducing practices and technologies b. incentivise gross emissions reductions in line with the 2050 target.	**#11** **Advance the agricultural emissions pricing system to:** **a. continuously broaden the range of recognised low emissions practices and technologies** **b. incentivise gross biogenic methane emissions reductions in a manner consistent with achieving the 2030 biogenic methane component of the 2050 target and putting the country on a trajectory to achieve the 2050 target in full.**
Enhance advisory and extension services to farmers to enable them to respond to pricing and accelerate the adoption of emissions-efficient practices, appropriate land-use diversification, and emerging technologies to reduce gross emissions. These services should be co-designed and implemented in partnership with industry and Iwi/Māori.	**#12** **Enhance advisory and extension services to farmers to accelerate land-use diversification and uptake of the technology and practices required to reduce gross emissions in line with emissions budgets and the 2050 target.** **These services must be co-designed, coordinated, and implemented in partnership with iwi/Māori, and should be developed in collaboration with industry.**
Implement an integrated planning system that builds urban areas upward and mixes uses while incrementally reducing climate risks.	**#13** **Ensure planning systems are integrated and support building urban areas upward and mixing uses in order to reduce emissions, while decreasing susceptibility to climate-related risks.**

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
Incentivise comprehensive retrofits to deliver healthy, resilient, low emissions buildings.	**#14** **Accelerate comprehensive retrofits to deliver healthy, resilient, low emissions buildings.**
Prohibit the new installation of fossil gas in buildings where there are affordable and technically viable low emissions alternatives in order to safeguard consumers from the costs of locking in new fossil gas infrastructure.	**#15** **Prevent the installation of new fossil gas infrastructure and connections in buildings except where there are no technically viable low emissions alternatives.**
New recommendation following consultation.	**#16** **Strengthen product stewardship and expand coverage across products and packaging to help avoid emissions associated with waste.**
New recommendation following consultation.	**#17** **Declare construction material wood waste as a priority product to help reduce emissions from construction and demolition waste.**
New recommendation following consultation.	**#18** **Provide overarching guidance and an enabling regulatory framework to advance a circular bioeconomy that reduces emissions and increases resilience to climate change, ensuring cross-sector coherence.**

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
Prioritise and accelerate renewable electricity generation build and ensure electricity distribution networks can support growth and variability of demand and supply.	**#19** **Prioritise and accelerate renewable electricity generation build and ensure electricity networks can support growth and variability of demand and supply.** **These outcomes must be progressed in partnership with iwi/Māori, particularly considering potential implications for mana whenua and mana moana and their rights and interests.**
Pursue more widespread process heat decarbonisation and establish mechanisms for other industrial sectors and processes to decarbonise.	**#20** **Accelerate the decarbonisation of process heat and pursue opportunities to reduce emissions across other industrial sectors.**
Set and implement integrated objectives for the role of forests with respect to emissions mitigation and adaptation, while giving effect to the principles of Te Tiriti o Waitangi/ The Treaty of Waitangi.	**#21** **Clarify the intended roles of different types of forests in achieving emissions budgets and targets. The effects of different types of forests on ecosystem services, socioeconomic factors, rural communities, and resilience to hazards and climate change must be considered in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.**
Simplify planning and increase funding of integrated transport networks that optimise public and active transport.	**#22** **Simplify planning and increase investment in integrated transport infrastructure and services that optimise public and active transport.**
For major population centres, the Government should also complete cycleway networks by 2030 and take steps to complete rapid transport networks by 2035.	**#23** **Provide dedicated long-term funding for the construction of integrated cycle and rapid transport networks in major population centres.**

Recommendation proposed in draft advice	Final recommendation We recommend that in its second emissions reduction plan, the Government:
Rapidly resolve the barriers to scaling up vehicle charging infrastructure.	**#24** **Rapidly upscale vehicle charging infrastructure, including removing existing barriers.**
Develop incentives to accelerate the uptake of zero emissions commercial vehicles, including vans, utes and trucks.	**#25** **Accelerate the uptake of zero emissions commercial vehicles, including vans, utes, trucks, and offroad vehicles.**
Apply regulatory and policy instruments to achieve the optimal use and efficiency of landfill gas capture systems and technologies at all landfills.	**#26** **Ensure the use of landfill gas capture systems and technologies is widespread and efficient.**
Improve the accuracy and transparency of landfill gas capture data by reviewing and strengthening relevant regulatory and policy tools.	**#27** **Improve the accuracy and transparency of landfill gas capture data.**

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

He Pou a Rangi
The Climate Change Commission's te reo Māori name, meaning 'a pillar of the sky'. The concept considers our role as upholders of the sky. We are honouring the sky and, in turn, have a duty to care for it

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[ii]

motu
country, nation, island

rohe
regions, tribal districts, territories

hui
meetings

wānanga
workshops, discussions

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

mana motuhake
mana through self-government and self-determination, control over one's own destiny

takiwā
districts, regions, often interchangeable with *rohe*, or can be a subsection of a *rohe*

ii. He Pou a Rangi Climate Change Commission, *Ināia tonu nei*: *a low emissions future for Aotearoa* (Wellington: He Pou a Rangi Climate Change Commission, 2021) <https://www.climatecommission.govt.nz/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf> [accessed 18 September 2023] (pp. 158 & 217).

1: Te whakarite i te whare

Part 1
Setting the scene

Te Komihana – He Pou a Rangi

He hinonga Karauna motuhake te Komihana nei a He Pou a Rangi i whakatūria e Te Ture Urupare Āhuarangi 2002 (te Ture) hei:

- **whakarite i te kupu-akiaki kia kounga, kia whai taunakitanga hoki mā ngā kāwanatanga hou, mō te whakamauru i te āhuarangi me te rite ki ngā whiunga kei te āhuarangi.**
- **aromatawai, hei arotake hoki i te anga whakamua o te whakaheke tukuwaro me te whakawhiti ki te rehu tika.**

E tautoko ana Te Komihana i tētahi Poari kei reira he kaikomihana nō ngā ao kanorau. Ko tō mātou Tari he whānui ō rātou pūkenga, pēnei i te tukanga hapori, te ao Māori, te ahu whenua, te pūtaiao āhuarangi, te ao ōhanga, te ao pūngao, te ao ngahere, te ao hauora, te aohanga, te aowaka, te mahere taone, ka mutu, te aopara.

Ko te tirohanga me ngā wā kua wharitea ki te kupu akiaki a te Komihana, kei roto tonu i te Ture. Kei te Minita Āhuarangi te tikanga rā kia tono motuhake ki te Komihana ki tētahi kupu akiaki, ā, ki te kaupapa hoki.

Kei te Ture te mana ki te Komihana kia tō māi i te taunakitanga tika o te wā, te tātaritanga me te whakaaro whānui ki ngā whiunga a te āhuarangi, ka mutu, ki te pānga ki a Aotearoa ā-tairoa nei.

Kei te Ture hoki te tohutohu i a mātou kia whai whakaaro ki te hononga a te Karauna ki te Māori, ki te ao Māori me ōna tino pānga ki te iwi Māori, i ā mātou mahi. Tuia rā ko te whakawhanake i ētahi hononga pono ki te iwi Māori, te mahi kia mātau ki ngā whakaaro whānui, ki ngā hiahia me ngā awhero o te iwi Māori, te mōhio ki te mana me ngā tikanga o te iwi Māori, ka mutu, kia tika te rapa o te hononga e tika ai te urunga ki o mātou mahi.

Kāhore mātou mō te whakarite tukanga, ā kāhore he herenga ki te Kāwanatanga kia whai i tā mātou kupu akiaki. Engari, kei te Ture tonu ētahi hinonga e mau nei i te Kāwanatanga kia whakautu tūmatawhānui i tō mātou kupu akiaki (tuia ko ngā whakatau ki ngā rironga), te whai whakaaro rānei ki te Komihana i tana kupu me ōna whakatau. Ko ēnei herenga he tautoko i te motuhake o te kupu akiaki kia whai whakaaro ki tā te whenua urupare ki te āhuarangi e ngā kāwanatanga o te wā.

Ko te kupu akiaki a te Komihana he aro ki ngā hua e matapaki mai nā i te Kāwanatanga hohenga me te tukanga me ngā kōwhiringa kei ngā mana whakahaere – tuia ko ngā āheinga me ngā tūraru kua kitea ki ngā tūmomo kōwhiringa. Ko te ahunga ko te tautoko i te Kāwanatanga kia tutuki i tana mahi kia whai i ngā ahunga āhuarangi e ai rā e Te Ture.

Ka ahu ki te tūtohu i ngā hua a te āhuarangi e tūturu nei, e rongo nei i te ao tūroa. Nā reira, kua whakaritea tō mātou kupu akiaki mō te kāwanatanga me ngā kaunihera ā rohe, mō te tangata me ngā kāinga, mō te ao pākihi me te hapori, mō te iwi Māori, ka mutu, ki te ōhanga me te taiao o Aotearoa whānui, mō nāianei me ngā rā kei tua.

Ko tēnei te tūāpapa ki tō mātou mahere mahi, anō o te whakarite i te kupu akiaki motuhake, kounga hoki ki te Kāwanatanga mō tā Aotearoa whakamauru me te whakarite ki ngā whiunga a te āhuarangi me te whakawhiti atu ki tētahi anamata ora, āhuarangi-pakari me te tukuwaro iti.

E ono ngā hua tukanga ka tukuna e Te Komihana ki 2024

Hei tā te Ture, mō te roanga o 2024 me tuku kia ono ngā wāhanga o te kupu akiaki ki te Kāwanatanga:

- te whakarite kupu akiaki ki te Kāwanatanga mō te herenga hokohoko me ng ritenga hokohoko mō te Kaupapa Hokohoko Tukunga o Aotearoa (NZ ETS) mō 2025-2029
- -he tātari me te arotake i te anga mua o te tutuki i te tuarua o ngā tahua tukuwaro (2026-2030) me te tuatoru o ngā tahua tukuwaro (2031-2035) me te ahunga 2050, tuia ko te aromatawai i te taunga tika me te urunga tika o te tuatahi ki te mahere whakaheke tukuwaro
- aromatawai me te arotake i te anga mua o te Mahere Urutau-ā-Motu tuatahi, arā hoki ko tōna urutau me te tika o tana haere.
- arotake i te ahunga whakaheke tukuwaro 2050
- arotake i te urunga o ngā tukuwaro mai i ngā kaipuke me ngā rererangi o te ao ki te ahunga 2050
- whakarite kupu akiaki mō te whakarite mai i te tuawhā o ngā tahua tukuwaro (2036-2040)

Ka whakautu hoki i a mātou i ngā momo tono ki te kupu akiaki, ki ngā momo kaupapa kei te Minita Āhuarangi

Mō te roanga ake ki tā te Komihana mahere mahinga whakamua haere ki tō mātou paetukutuku, www.climatecommission.govt.nz.

Te Komihana – He Pou a Rangi
About He Pou a Rangi Climate Change Commission

He Pou a Rangi Climate Change Commission is an independent Crown entity established by the Climate Change Response Act 2002 (the Act) to:

- **provide expert, evidence-based advice to successive governments on mitigating climate change and adapting to the effects of climate change**
- **monitor and review progress towards emissions reduction and adaptation goals.**

The Commission is supported by a Board of Commissioners from diverse fields. Our staff have a range of expertise, including public policy, kaupapa Māori, agriculture, climate science, economics, energy, forests, health, modelling, transport, urban planning, and waste.

The scope and timeframes for the Commission's advice are set out in the Act. The Minister of Climate Change may also make a specific request to the Commission for advice on any topic.

The Act requires the Commission to draw from the best available evidence and analysis and think broadly about the impacts of climate change and the implications for Aotearoa New Zealand over time.

The Act also directs us to consider the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori in our work. This involves building meaningful and respectful relationships with iwi/Māori, working to understand the diverse perspectives, needs, and aspirations of iwi/Māori, recognising Māori rights and interests, and enabling active partnership and participation in our work.

We do not set policy, and the Government has no obligation to accept our advice. However, for much of our advice the Act does require the Government to provide a public response (including reasons for any departure), or to consider the Commission's advice in its decision-making. These obligations help ensure independent advice on the country's climate change response is given due consideration by successive governments.

The Commission's advice focuses on the outcomes that can result from government action and policy, and the options that decision-makers have – including the opportunities and risks presented by different options. The aim is to support the Government to fulfil its role under the Act, including achieving emissions budgets and the 2050 target.

We work to identify climate change outcomes that are realistic and achievable in the real world. We therefore consider what our advice means for central and local government, for individuals and households, for business sectors and communities, for iwi/Māori, and for Aotearoa New Zealand's economy and environment now and into the future.

This is the foundation of our programme of work providing the Government with independent, expert advice on how Aotearoa New Zealand can mitigate and adapt to the effects of climate change and transition to a thriving, climate-resilient, and low emissions future.

The Commission will provide six statutory deliverables in 2024

In accordance with the Act, over the course of 2024 we will deliver six pieces of advice to the Government. We will:

- provide the Government with advice on the unit limits and price control settings for the New Zealand Emissions Trading Scheme (NZ ETS) for 2025–2029
- monitor and report on progress towards meeting the second emissions budget (2026–2030) and third emissions budget (2031–2035) and the 2050 target, including assessing the adequacy and implementation of the first emissions reduction plan
- assess and report on the progress of the first national adaptation plan, including its implementation and effectiveness
- review the 2050 emissions reduction target
- review the inclusion of emissions from international shipping and aviation in the 2050 target
- provide advice for the preparation of the fourth emissions budget (2036–2040).

Under the Act, we must also respond to any specific requests for advice on any topic from the Minister of Climate Change. We have been asked to provide advice to the Government to help inform Aotearoa New Zealand's second Nationally Determined Contribution under the Paris Agreement. This advice is to be provided to the Minister of Climate Change by 31 December 2024.

More information on the Commission's forward work programme can be found on our website, www.climatecommission.govt.nz.

Tuatahi: Chapter 1

Kupu Whakataki
Introduction

Greenhouse gas emissions come from everyday activities, including the way people heat and cool buildings, travel, produce food, and dispose of waste. Once in the atmosphere, they trap the sun's heat, causing changes to the climate and negative, intensifying impacts to homes, communities, the economy, the environment, and human health.

In 2015, Aotearoa New Zealand's Government met with global leaders in Paris and agreed to limit global temperature rise through all parties acting to address greenhouse gas emissions at home, and through international cooperation. This led to Parliament passing the Climate Change Response (Zero Carbon) Amendment Act in 2019.

The Government is now required by law to regularly put in place plans to reduce emissions. The first emissions reduction plan, set in 2021, covers the years 2021–2025.

In 2024, the Government must set its second emissions reduction plan, covering the years 2026–2030. This report provides our advice to the Minister of Climate Change on the direction of policy required in that plan.

The purpose of this report

As laid out in the Climate Change Response Act 2002 (the Act), the role of He Pou a Rangi Climate Change Commission (the Commission) is to provide independent, evidence-based advice to successive governments on the actions needed to achieve Aotearoa New Zealand's climate change mitigation and adaptation goals.

The Act established the 2050 target as Aotearoa New Zealand's domestic emissions reduction target, as well as the process for reaching it. Under the Act, the Government sets emissions budgets – which confirm the total allowable net emissions across a five-year period – and emissions reduction plans, which outline the actions it will take to achieve those budgets.

We have prepared this advice to help the Government fulfil its role in setting policies and strategies to meet the second emissions budget and ensure Aotearoa New Zealand is on track to achieve the 2050 target.

As an independent Crown entity, our advice is based on research and expert analysis, and has been informed by insights and evidence drawn from extensive engagement and consultation.

This report reflects Government policy as of October 2023. Each Government will have its own policy priorities and preferred approaches to action in relation to climate change. We take an outcomes-focused approach, identifying options the Government has in setting the second emissions reduction plan and laying out key opportunities and risks to inform decision-making.

Our focus is on clear and stable policy direction. Clarity and certainty will give households, businesses, and communities confidence to take up and invest in low emissions opportunities and are key to Aotearoa New Zealand's transition to a thriving, climate-resilient, and low emissions future.

Throughout our engagements and in consultation on the draft version of this advice, New Zealanders have been clear that action on climate change is important. However, there is not universal agreement on the path forward. This underlines the importance of our commitment to taking an inclusive approach and working collaboratively to identify the outcomes needed to meet Aotearoa New Zealand's climate goals.

As required by the Act, the Government will consider the recommendations and broader advice in this report before setting the second emissions reduction plan at the end of 2024.

The wider context for this advice

At the Commission, we consistently work to identify climate change actions and outcomes that are realistic and achievable in the real world. We therefore consider what our advice means for central and local government, individuals and households, business sectors and communities, iwi/Māori, and Aotearoa New Zealand's economy and environment, now and into the future.

For all New Zealanders, the transition to low emissions presents an opportunity for a better future. For households, mitigating climate change will bring cleaner air, warmer and drier homes, and lower overall energy costs. For businesses, reducing supply chain and operational emissions will mean they can remain competitive in markets with increasing expectations for climate-friendly products and services. For communities, lowering emissions will mean protecting taonga tuku iho and living in safer, more stable environments with a decreased risk of costly and dangerous extreme weather events.

As the Government considers the policies and strategies it will put in place to realise these opportunities, it will need to consider the wider domestic and international environment.

As we deliver this advice, Aotearoa New Zealand is facing several challenges, including ongoing concerns around the cost of living and continuing supply chain challenges post-COVID-19. The Ministry for the Environment and Stats NZ have together released *Our Atmosphere and Climate 2023*, which states that long-term annual average temperatures are rising in Aotearoa New Zealand, and extreme weather events like Cyclone Gabrielle are becoming more frequent and intense with climate change.[1]

The global context regarding climate change is also shifting. September 2023 broke monthly temperature records by a wide margin, exceeding the previous average global temperature by 0.5°C. With June, July, and August also having surpassed previous records, the chances that 2023 will end up as the warmest year on record are at estimated at 99%.[2]

The Intergovernmental Panel on Climate Change (IPCC) has released its latest findings in the Sixth Assessment Report, finding that human activities have caused the earth's surface temperature to increase by 1.1°C compared to 1850–1900 levels. Consequences of this increase in temperature have been observed, including increases in sea temperature and sea level rise, as well as increasing intensity of events such as drought, heatwaves, and heavy rainfall. Terrestrial, freshwater, and ocean ecosystems have also been substantially damaged as a result of climate change.[3]

The IPCC further states that acting to limit temperature rise to below two degrees will cost far less than the impacts associated with a more than two degree rise. It outlines that delayed action will lock in high emissions infrastructure and make future change more difficult. Near-term actions need to be supported by policies that can help to mitigate the impact of disruptive social change and high upfront costs.[4]

There have also been changes to the landscape of international climate action. Since the 2021 release of *Ināia tonu nei* – our first report to the Government, which included advice and recommendations on the first emissions reduction plan – there have been significant advances at Conferences of Parties (COPs) to the United Nations Framework Convention on Climate Change (UNFCCC), including full implementation of the Paris Agreement and an increasing focus on the reform of global financial systems.

Key partners, including the United States and Australia, have increased the ambition of their climate change responses. At the same time, the UNFCCC stocktake leading into the 2023 COP is expected to provide a global "moment for course correction" to ramp up efforts to avoid the worst consequences of climate change.

The European Union (EU) is showing leadership with its "Fit for 55" programme, aimed at delivering a 55% reduction in emissions across the EU by 2030. The programme includes reforms to the EU's emissions trading scheme, a gradual introduction of carbon border adjustments (tariffs on some categories of high emissions imports to level the playing field for lower emissions EU producers), binding commitments to reduce emissions from land use, investment in sustainable aviation, and all new buildings being zero emissions by 2030 and existing buildings by 2050.[5]

These domestic and global events demonstrate the importance of Government action on climate change, and of putting the right policies in place during the second emissions budget period.

About the transition to a low emissions economy

Aotearoa New Zealand has set a 2050 target for emissions reductions

The Act provides the framework by which Aotearoa New Zealand can minimise and adapt to the impacts of climate change. This includes contributing to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5°C above pre-industrial levels.

The Climate Change Response (Zero Carbon) Amendment Act (passed in 2019) established key elements of Aotearoa New Zealand's approach to reducing greenhouse gas emissions, including:

- putting into law a 2050 emissions reduction target
- establishing a system of emissions budgets to act as stepping-stones towards Aotearoa New Zealand's long-term targets
- making the development and implementation of climate change policies a requirement
- establishing the Climate Change Commission to provide independent, evidence-based advice and monitoring across successive governments.

The 2050 emissions reduction target has three parts. The 2050 net zero component covers all domestic sources of greenhouse gases except biogenic methane (methane produced by living things and processes, in other words from livestock and waste). The other two components of the overall 2050 target set two stages for reductions of gross emissions of biogenic methane.

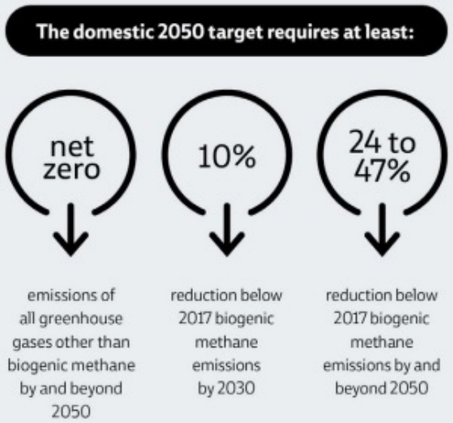

Figure 1.1: Aotearoa New Zealand's domestic 2050 target

Box 1.1: How we discuss emissions

Gross and net emissions

This report discusses two ways of measuring greenhouse gas emissions. Gross emissions are calculations of the total greenhouse gases produced. Net emissions take into account the removal of carbon dioxide from the atmosphere that happens at the same time, for example through absorption by trees, plants, soil, and in ocean processes.

Our calculation of 'gross emissions' includes those from:

- agriculture
- energy and industry
- transport
- waste and fluorinated gases (F-gases).

'Net emissions' are calculated by combining the total gross emissions and subtracting measurable carbon dioxide removals. In Aotearoa New Zealand, most carbon dioxide removals are by forests, which take in and store carbon dioxide from the atmosphere as they grow.

Split-gas approach

The units we use in this report for measures of emissions reflect the structure of the 2050 target, distinguishing between biogenic methane emissions and all other greenhouse gases.

We present biogenic methane emissions in units of megatonnes of methane ($MtCH_4$). We refer to all other greenhouse gases (carbon dioxide, nitrous oxide, F-gases, and non-biogenic methane) with the label of 'long-lived greenhouse gases'. These are expressed in units of megatonnes of carbon dioxide equivalent ($MtCO_2e$).

The calculations we use for presenting emissions as $MtCO_2e$ are based on the values used by the National Greenhouse Gas Inventory (GHG Inventory) called 'Global Warming Potential over 100 years' (GWP_{100}), as updated in the *IPCC's Fifth Assessment Report* (AR5).

We expect the Government will set future emissions budgets using the GWP_{100} values for consistency with the GHG Inventory and have used the $MtCO_2e$ units for our 'all gases' calculations.

The National Greenhouse Gas Inventory analyses Aotearoa New Zealand's current emissions profile

The latest Greenhouse Gas Inventory (GHG Inventory) data published by the Ministry for the Environment in 2023 shows that Aotearoa New Zealand reduced its gross greenhouse gas emissions in 2020 and 2021. According to Stats NZ, that pattern of reduced emissions has continued to 2022, with total industry and household emissions decreasing 3.9% from 2021 to 2022.[6]

The GHG Inventory shows that in 2021, biogenic methane emissions totalled 1.29 $MtCH_4$, with gross emissions of long-lived greenhouse gases equalling 43.8 $MtCO_2e$ (**Figure 1.2**).

In Aotearoa New Zealand, most biogenic methane emissions (approximately 91%) come from agriculture, primarily from ruminant livestock such as cows and sheep. The remainder (approximately 9%) come from the decay of organic waste.

More than three-quarters of long-lived greenhouse gas emissions come from transport, energy, and industry, mainly through the burning of fossil fuels in vehicles, factories, and homes. Around 20% come from agriculture, mainly nitrous oxide emissions caused by livestock urine and fertiliser use. The remainder come from F-gases (which are commonly used as refrigerants), wastewater treatment, and the burning of waste.

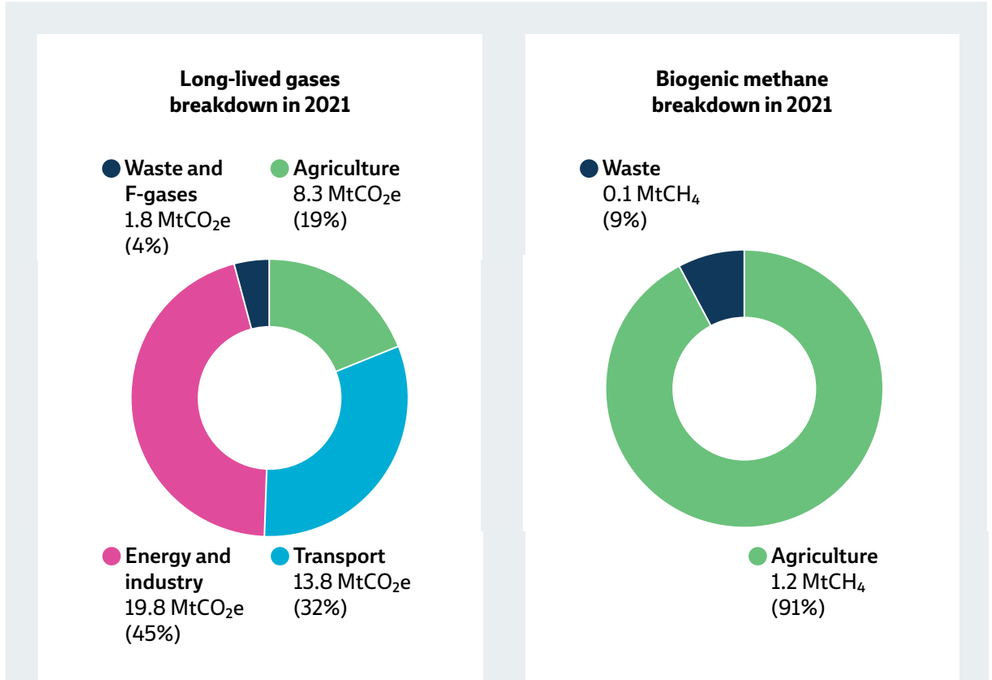

Figure 1.2: Aotearoa New Zealand's emissions of biogenic methane and other greenhouse gases by sector in 2021

Source: Commission analysis of the 2023 GHG Inventory containing 2021 data[7]
Note: CO_2e emissions expressed using GWP_{100} values from the IPCC's *Fifth Assessment Report* (AR5)

The Commission's demonstration path informed our advice on budget levels for the first, second, and third emissions budgets

As outlined in the Act, emissions budgets act as stepping-stones to achieving the 2050 target. Each represents the total quantity of greenhouse gas emissions allowed during an emissions budget period, expressed as a net amount of carbon dioxide equivalent (CO_2e). Emissions budgets cover a period of five calendar years each (except the first emissions budget, which covers the four-year period 2022–2025).

Each emissions budget must be set with a view to meeting the 2050 target and contributing to the global goal of limiting warming to 1.5°C. They must also be set in a way that allows them to be met domestically (through action within Aotearoa New Zealand).

As part of our 2021 report *Ināia tonu nei*, we undertook extensive analysis and modelling in accordance with the matters required by the Act. This included the potential economic, social, and environmental effects of climate change action across time and regions, the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori.

Our analysis led to the development of a pathway to 2035: the demonstration path. The demonstration path reflects a suite of actions and outcomes that would set the country up to deliver the 2050 target in line with the Act's considerations and create options to manage uncertainty. This path was used as a basis for our advice recommending emissions budget levels for 2022–2025, 2026–2030, and 2031–2035.

This work included demonstrating that our recommended emissions budget levels were both ambitious and achievable. Our economic modelling indicated that the economy would continue to grow under the recommended emissions budgets. We assessed that the level of gross domestic product (GDP) could be around 0.5% lower in 2035 and 1.2% lower in 2050 than it would be in a scenario when there was slower action to reduce emissions, a conclusion consistent with findings overseas.

The real-world accuracy of this modelling is somewhat limited, however, as the scenario compared against the demonstration path was one with a low level of action on climate change. As shown through successive meetings of the COP and the emerging rules for Nationally Determined Contributions under the Paris Agreement (discussed below in the section on Aotearoa New Zealand's global contributions), inaction is not a credible strategy.

Investments required to meet emissions budgets will save money in the long term

In many cases, investments made now in energy efficiency, electric vehicles, renewable electricity, improving on-farm efficiency, and others, will more than pay for themselves in the long term.

As demonstrated by the enactment of the Inflation Reduction Act in the United States and the rapid growth of solar generation in Australia, electrifying the economy helps citizens and business avoid future inflation related to the rise of fossil fuel prices.

Through our work in *Ināia tonu nei*, we found that while substantial investment is required to lower emissions in line with our proposed emissions budgets, this will likely be outweighed by larger future cost savings. Our analysis shows that by the 2040s, Aotearoa New Zealand can save around $2 billion each year.

We determined these potential savings by looking at the costs of transitioning to low emissions across three key areas: road transport, space and water heating, and food processing. These areas account for around three-quarters of the reductions in long-lived greenhouse gas emissions by 2035 under the demonstration path.

We estimated yearly costs related to vehicles, boilers and appliances, fuel and electricity use, maintenance, and other associated expenses across two scenarios: one where action is taken in line with the demonstration path and the other where emissions reductions occur more slowly. This allowed us to see where there could be costs and where there could be savings from taking these actions over time.

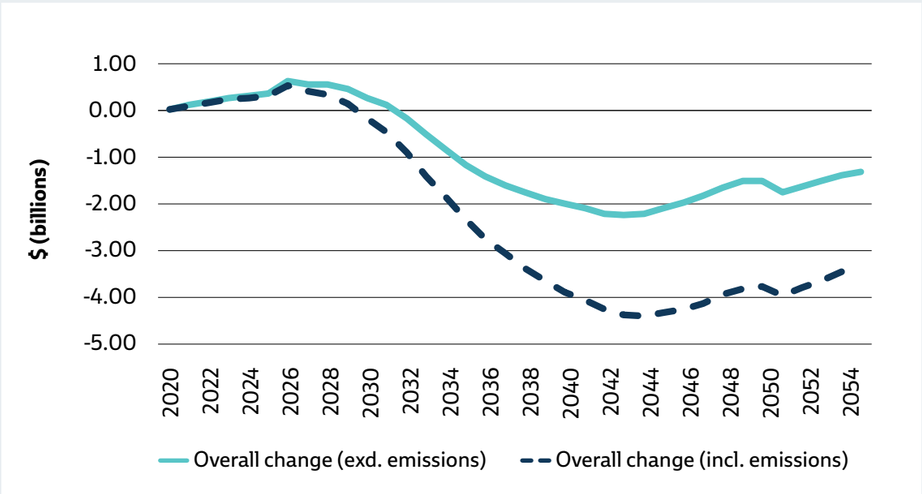

Figure 1.3: Projected annual costs from fuel switching in road transport, space and water hearing, and food processing

In **Figure 1.3**, the solid light blue line shows that if households and businesses decarbonise by electrifying heat and transport, costs would likely increase over the short term, but begin decreasing by the late 2020s, and decrease more sharply by the mid-2030s. If calculations include avoided emissions – emissions reductions that occur outside of a product's lifecycle or value chain but are still a result of that product – savings would be even greater (the dotted line).

Overall, we found that substantial additional investment will be required over the coming decades to switch to electric vehicles and expand electricity supply and vehicle charging infrastructure. However, these costs are expected to be more than outweighed by savings in petrol and diesel use, along with lower maintenance costs.

A system of emissions budgets and emissions reduction plans has been agreed to meet the 2050 target

In May 2022, the Minister of Climate Change sought support from the House of Representatives for the first three emissions budgets (2022–2025, 2026–2030, 2031–2035), proposed in line with our recommendations. All parties but one voted in favour, and the motion passed 107 votes to 10.

In the first emissions reduction plan, the Government outlined sub-targets, also based on the demonstration path, which identified by sector the emissions reductions required to meet emissions budgets (see *Chapter 3: The task for the second emissions budget*). These were developed as a tool to track progress towards meeting emissions budgets across areas of the economy.

The amount of budgeted carbon dioxide equivalent for the first, second, and third budget periods is shown in **Table 1.1** in the $MtCO_2e$ units used for all-gases calculations.

Table 1.1: The Government's emissions budgets[8]

Budget period	2022–25 (Budget 1)	2026–30 (Budget 2)	2031–35 (Budget 3)
Emissions budget	290 $MtCO_2e$	305 $MtCO_2e$	240 $MtCO_2e$
Annual average emissions	72.5 $MtCO_2e$	61 $MtCO_2e$	48 $MtCO_2e$

About this advice

Sector sub-targets provide benchmarks to assess where action is needed during the second emissions budget period

This advice focuses on the outcomes necessary to achieve the second emissions budget, as well as future budgets where these are significant for Aotearoa New Zealand's ability to meet the 2050 target. Using the sector sub-targets as benchmarks, we discuss options the Government has in setting its second emissions reduction plan, including the opportunities and risks presented by different decisions.

To identify *where* Government action is needed, we compare current emissions projections to the sector sub-targets. This shows us where efforts need to be strengthened or accelerated to meet the second emissions budget and beyond.

To identify options for *how* Government can close these gaps, we compare current policy to a policy framework based on international best practice, and applied a prioritisation framework to assess the merits of potential options.

Under the Act, there is the possibility for the Government to change the second and third emissions budgets in response to our review of the 2050 target and/or as part of development of the fourth emissions budget. We discuss this further in the section *Other relevant pieces of advice* below.

We revised and strengthened our advice based on engagement and consultation with the public

To support the development of the draft version of this advice, we engaged extensively through hui and regional visits focused specifically on the second emissions budget period, helping us understand the issues, barriers, and opportunities identified by iwi/Māori representatives and stakeholders as being important for us to cover through this work.

Before finalising our advice to the Government, we consulted extensively on a draft version of this report over the course of eight weeks (from 26 April to 20 June 2023), seeking input from iwi/Māori, academics, businesses, community groups, farmers, government agencies, local government, industry groups, NGOs, and individuals. We received over 300 individual submissions in response, each of which we considered and analysed, identifying themes within chapters and across the breadth of the advice. Through this consultation we tested, refined, and improved our advice by broadening our evidence base and seeking out perspectives from New Zealanders across the motu.

Evidence and engagement are at the centre of meaningful and effective action on climate change, and this work was critical to ensuring we have a strong understanding of the different needs, perspectives, and concerns of the people of Aotearoa New Zealand. We discuss the details of what we heard and how it shaped our final advice in *Chapter 2: What we heard*.

We updated our advice to reflect events and announcements from the Government since we published our draft report

To support the transparency of our advice across successive governments, we have noted in this report relevant policy actions announced and implemented within the first emissions reduction period.

These include significant announcements made since we published the draft version of this report in April 2023. As part of our work to finalise our advice, we reviewed the implications of these changes, and updated figures, calculations, references, and discussions.

Policy announcements made since we published our draft report include the following:

- In April 2023, Aotearoa New Zealand's latest Greenhouse Gas Inventory was published. The 2023 inventory contains emissions and removals data from 1990 to 2021, major emissions trends, and the methodology used to estimate emissions and removals.
- In May 2023, public consultation closed on a strategy for electric vehicle charging.
- In August 2023, the Government set a final proposed plan for a farm-level split gas levy to commence in October 2025.
- In August 2023, the Natural and Built Environment Act and Spatial Planning Act passed into law, as did the Climate Change Response (Late Penalties and Industrial Allocation) Amendment Act.
- In August 2023, public consultation closed on proposals to redesign the New Zealand Emissions Trading Scheme (NZ ETS) and its permanent forestry category.
- The Government is consulting until 2 November 2023 on advancing Aotearoa New Zealand's energy transition, including a draft Gas Transition Plan, Interim Hydrogen Roadmap, proposed regulations on offshore renewable energy, electricity market measures, and a fossil-fuel baseload electricity ban.

Other relevant pieces of advice

While emissions reduction plans are a central component to Aotearoa New Zealand's climate change strategy, they are not the only way for the Government to take action, nor the only area of focus for the Commission.

From 2024, the Commission will provide annual reports assessing Aotearoa New Zealand's progress towards meeting emissions budgets and the 2050 target

A key part of the Commission's role is monitoring and reporting on Aotearoa New Zealand's progress towards meeting its climate change mitigation goals, including its emissions budgets and targets.

Our monitoring role is important for independently assessing and publicly reporting on how the country is tracking against emissions budgets as well as the effectiveness and delivery of emissions reduction plans. This advice will increase the transparency and accessibility of information regarding the Government's progress on mitigating climate change, and help the Government to develop policy, adjust plans, and make course corrections where necessary.

There is a clear separation in the Act in our advisory and our monitoring roles. This means our work currently underway on assessing the adequacy of the first emissions reduction plan and its implementation is ***not*** incorporated in our analysis for this report. That assessment will, however, be available to the Government to build into its development of the second emissions reduction plan following publication in mid-2024.

We will also evaluate progress at the end of each emissions budget period and share our findings with the Government and the public. The first end-of-budget-period assessment report will be delivered no later than December 2027, two years after the first budget period ends in December 2025.

In 2024, the Commission will make recommendations on the fourth emissions budget and report on its review of the 2050 target

By 31 December 2024, the Commission must provide the Government with advice to enable the preparation of the fourth emissions budget, and recommend any needed changes to emissions budgets one, two, and three.

In addition, every five years, the Commission is required under the Act to conduct an independent review of Aotearoa New Zealand's legislated 2050 emissions reduction target and provide advice on whether any changes should be made. Our first such advice is due to the Government on 31 December 2024.

At the same time as that review, we will provide advice on whether the 2050 target should be amended to include emissions from international shipping and aviation – and if so, how.

Any potential effects that advice could have on previously set emissions budgets – and on the emissions reduction plans to achieve them – will be clearly signalled to the Government in our reports.

The advice in this report is on the direction of policy required to meet the emissions budgets in place at the time of writing, and is not intended to address the outcomes that could emerge from the Government's reactions to those future deliverables.

Aotearoa New Zealand's first Nationally Determined Contribution and other international context

Aotearoa New Zealand has joined international efforts to address climate change alongside its domestic targets. This advice does not address this wider programme of work, as emissions reduction plans are focused specifically on domestic action led by the Government to meet emissions budgets, the domestic 2050 target, and Aotearoa New Zealand's domestic contribution to limiting warming to 1.5°C.

However, our commitments to international efforts are relevant to this advice, as emissions reductions resulting from emissions reduction plans will contribute towards meeting them. International targets can go beyond Aotearoa New Zealand's domestic emissions reduction targets. Overachieving emissions budgets – in other words achieving greater emissions reductions than required within an emissions budget period – will help close any gaps between Aotearoa New Zealand's domestic and global commitments.

International context

Advances in climate action give Aotearoa New Zealand the opportunity to access billions of dollars in trade deals as other countries incorporate climate requirements in fair trade agreements. For example, in July 2023, Aotearoa New Zealand signed a free trade agreement with the EU, worth NZ$20.2 billion annually in 2022.[9] The agreement seeks cooperation on climate solutions while holding each other accountable for commitments made under the Paris Agreement.[10]

Increasingly, multi-national retailers are committing to reducing emissions throughout their supply chains, including forest and agricultural emissions related to the creation of their products and services.[11] By reducing the emissions footprint of Aotearoa New Zealand's exported products, the country can both contribute to its global commitments and ensure exports such as dairy, fresh produce, and steel remain sought after by global suppliers.

Following through on this advice will in many cases contribute towards achievement of the United Nations Sustainable Development Goals (SDGs). The SDGs are a series of 17 integrated global goals adopted in 2015. They include targets to, by 2030, integrate climate change measures into national policies, strategies, and planning, and improve institutional capacity on climate change mitigation.[12]

Aotearoa New Zealand has also signed up to the Global Methane Pledge to take voluntary actions to contribute to a collective effort to reduce global methane emissions by at least 30% from 2020 levels by 2030, which could eliminate over 0.2˚C warming by 2050.[13] The pledge aims to catalyse global action and strengthen support for international initiatives to reduce methane emissions by advancing technical and policy work that will support participants' domestic actions. The Global Methane Pledge has over 100 countries on board, representing nearly 50% of global human-caused methane emissions and over two thirds of global gross domestic product (GDP).[14]

Aotearoa New Zealand's primary contribution to the pledge is through progress towards the biogenic methane components of the 2050 target and actions to reduce emissions in agriculture and waste.

The Nationally Determined Contribution and offshore mitigation

Under the Paris Agreement, every five years participating countries submit an updated Nationally Determined Contribution (NDC) to the UNFCCC. NDCs represent the part each country is committing to play to reduce emissions and adapt to the impacts of climate change, and must reflect the country's highest possible ambition.

In 2021, the Government updated Aotearoa New Zealand's NDC, which is now to reduce emissions by 50% below gross 2005 levels by 2030. The expectation is that this target will be met through a combination of domestic actions achieved through emissions reduction plans – a combination of emissions reductions and carbon removals by forests – and through offshore mitigation, or when Aotearoa New Zealand pays for emissions reductions or removals that occur offshore.

Offshore mitigation is expected to make a substantial contribution. In 2022, the Commission estimated that if the Government achieves its first and second domestic emissions budgets, 99 $MtCO_2e$ of offshore mitigation will be needed to meet the NDC.[15]

In *Ināia tonu nei*, the Commission provided advice on the NDC in response to a specific request from the Minister of Climate Change.

In October 2023, the Minister of Climate Change made another special request that we provide advice to help inform Aotearoa New Zealand's second NDC, which must be set by 2025 and will cover 2031–2035. The Commission's advice will be provided to the Minister of Climate Change by 31 December 2024.[16]

The foundations of the Commission's thinking

We used multiple tools in developing this advice, including the Government's sector sub-targets and a suite of frameworks, to help us consider where action is most needed and the opportunities and risks associated with different options available to the Government.

Using the sector sub-targets and current emissions projections, we assessed where Aotearoa New Zealand is at greatest risk of not achieving the second emissions budget or being off-track to achieving the 2050 target. In these areas, efforts need to be strengthened or accelerated through the second emissions reduction plan to meet the second emissions budget and beyond.

Our next step was to consider the options available to the Government to address these gaps. The Act requires us to consider a range of matters in carrying out our analysis and developing our advice, with sections 5M and 5ZC setting out what must be specifically considered when advising on an emissions reduction plan.

The Commission has used two tools to work through these considerations:

- a policy framework
- a prioritisation framework, created using sections 5M and 5ZC of the Act.

We applied our policy framework in relevant chapters to support our assessment of the opportunities, barriers, and potential solutions to reducing emissions, as well as the critical gaps in the current policy landscape, the potential for co-benefits, and wellbeing impacts.

We used our prioritisation framework to assess the expected impacts and co-benefits of potential directions of policy, and what advice should be lifted to the level of a formal recommendation to the Government.

For each sector, and across the broader system, we identified where barriers currently deter low emissions choices, and where strategic investment can help drive deeper change over time.

He Ara Waiora

Our overarching approach to analysis has been informed by the framework 'He Ara Waiora – A Pathway Towards Wellbeing', which was designed through engagement with iwi/Māori and in collaboration with the Treasury.

Drawing from mātauranga Māori, it is a tool to help build understanding of iwi/Māori perspectives on wellbeing and improve awareness of how policy can impact iwi/Māori, with the goal of achieving more equitable policy outcomes.

He Ara Waiora is anchored in wairua as a source of wellbeing. Te taiao sits at the centre, reflecting an ao Māori perspective that environmental wellbeing is a precursor to human wellbeing.

The framework also identifies four dimensions of wellbeing within te ira tangata, the human realm:

- **mana tuku iho** – identity and belonging
- **mana tauutuutu** – individual and community rights and responsibilities
- **mana āheinga** – aspiration and capability
- **mana whanake** – sustainable prosperity.

In addition to thinking about integrated policy design, applying tikanga helps to qualify how policy will enhance intergenerational wellbeing. He Ara Waiora sets out the following tikanga to support policy development:

- **manaakitanga** – having a deep ethic of care towards the people and systems involved
- **tikanga** – ensuring the right decision-makers are involved, and the right decision-making process is implemented
- **whanaungatanga** – being mindful of the relationship between all things, our connections to each other and how we connect to our whenua
- **kotahitanga** – taking an inclusive approach and working collaboratively with other agencies/organisations, to have access to the best information, and to do the best work we can, collectively.

Consultation feedback

This approach to developing our draft advice received general support in consultation. Many submitters called for us to go further, expressing a desire to see more ambition and greater urgency from both the Commission and the Government.

Across multiple areas, we heard concerns about the potential for climate policies to create inequitable impacts. Submissions highlighted the need for an equitable transition that honours Te Tiriti o Waitangi/The Treaty of Waitangi and is fairly funded, clearly communicated, and affordable for New Zealanders.

As part of our work to consider consultation feedback and finalise our advice, we reapplied this approach and made changes to our recommendations and broader advice where appropriate.

Policy direction

As described in *Ināia tonu nei*, our approach to developing advice on policy direction is informed by international research showing that developing and implementing a comprehensive suite of climate policies is the most effective way to combat climate change.[17]

As with *Ināia tonu nei*, we developed this advice using our policy framework, adapted from one created by international researchers for their work on Planetary Economics.[18]

We use this policy framework to identify policies that can address the gaps in action identified using the sector sub-targets. The framework prioritises effective policies that target a range of different challenges and reduce emissions in a way that supports other goals like improving health, increasing biodiversity, reducing existing inequities, and addressing historic grievances. The framework also helps us identify policies that are not in alignment with Aotearoa New Zealand's climate goals so that they can considered for amendment or removal.

Elements of our policy approach

The Commission's overall vision is of a fair, inclusive, and equitable transition to a thriving, climate-resilient, and low emissions Aotearoa New Zealand. This can be found at the centre of our revised policy framework, below.

The climate transition can bring significant benefits to New Zealanders, including cleaner air, healthier homes, improved wellbeing for young people, and lower overall household energy costs. A fair, inclusive, and equitable transition involves making sure that those benefits are shared across society, and that any negative impacts do not disproportionately fall on those least able to adjust.

Our approach to developing advice on policy direction for the Government's second emissions reduction plan is summarised in **Figure 1.4** and explained further below.

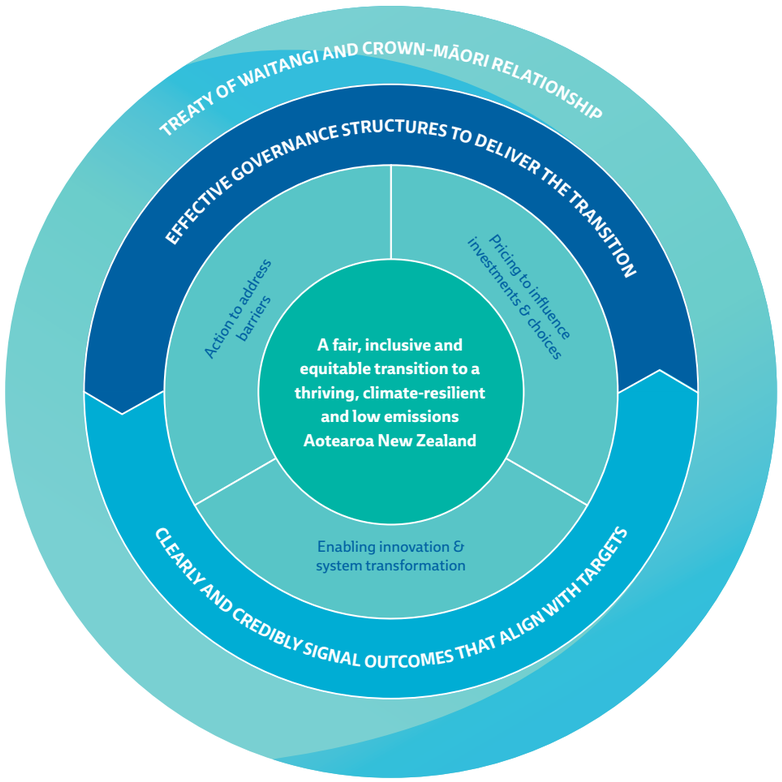

Figure 1.4: The Commission's policy framework

Creating an enabling environment

An enabling environment is one that supports people to participate in and contribute to Aotearoa New Zealand's efforts to achieve emissions budgets and targets. The elements of an enabling environment are:

- the Crown-Māori relationship
- clearly and credibly signalled outcomes that align with targets
- effective governance structures for delivering the transition.

Consultation submissions across multiple chapters emphasised the critical importance of Aotearoa New Zealand's enabling systems in the transition, stressing that they need to be designed to achieve emissions reductions in line with emissions budgets and the 2050 target.

Te Tiriti of Waitangi/The Treaty of Waitangi and the Crown-Māori relationship

An enabling environment must be firmly rooted in Te Tiriti o Waitangi/The Treaty of Waitangi principles, including partnership, participation, active protection, and equity. These principles underpin the unique relationship between the Government and tangata whenua.

The Climate Change Response Act 2002 specifies that we must give consideration to the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori in developing our advice.

Over the last two years, we have been working with iwi/Māori across multiple rohe on a project called Maui.Tech, which takes a case study approach to understanding the specific effects of climate change from an iwi/Māori-led perspective.

These case studies, and the diverse views and knowledges included within them, are building our understanding of how iwi/Māori are experiencing the effects of climate change. The case studies and the enduring relationships developing between participants and the Commission continue to provide us with a body of localised mātauranga Māori and expert evidence we can refer to as we develop and refine our advice.

Clearly and credibly signalled outcomes that align with targets

An enabling environment is also dependent on the Government signalling policy changes well in advance, while articulating a clear and credible vision for the future of different sectors, industries, and communities. People need to understand the speed and direction of travel for transitioning to a low emissions Aotearoa New Zealand.

This is reflected in the purpose of the Climate Change Response Act 2002, which is intended to support the implementation of clear and stable climate change policies.

This requires the Government to take a long-term view and present a clear strategy for achieving climate goals. This will provide households, communities, businesses, and investors with the predictability that they need to make informed decisions, participate in emissions reductions, and effectively plan for the future.

Effective governance structures to deliver the transition

As outlined in the latest IPCC report, effective climate action is enabled by political commitment, well-aligned multilevel governance, institutional frameworks, laws, policies, and strategies, as well as access to finance and technology.[19]

Developing, implementing, and monitoring effective climate policy which supports an equitable transition to low emissions will require coordination across a wide range of government agencies and levels of government, as well as with iwi/Māori.

We heard from consultation submissions that to empower action, a clear direction on climate policy and a cohesive policy approach across sectors and between central and local government is needed.

Local government plays an important role in the transition. Councils make decisions on land use, urban form, road and transport services, housing, water management (stormwater, wastewater, and water supply), waste management, flood risk management, and coastal management which all embody emissions and our ability to reduce them.

Consistently, consultation submissions from local government expressed the need for more clarity on what is required of them in the transition and for funding and legislative tools to be consistent with those responsibilities.

Good governance structures and institutional arrangements support stability, achievability, and coordination and keep the Government focused on long-term goals. Without effective institutional governance structures, there is a risk that policies will unintentionally contradict each other, making efforts to meet emissions budgets less effective.

Taking action on climate change will require effective actions across all of society. To support this, legislative and policy alignment across government agencies will be necessary for delivering low emissions outcomes. Alignment will be needed across many pieces of legislation, including the Local Government Act, the Building Act and Code, and the reforms of the Resource Management Act (the Spatial Planning Act and the Natural and Built Environment Act). We discuss the importance of policy alignment further throughout this report, including in *Chapter 10: Agriculture, Chapter 11: Built environment,* and *Chapter 13 Energy and industry*.

The 'mainstreaming' of climate change considerations across government policies and procedures is necessary for coherence and alignment.[20] Consistent signalling across investments, policy statements, directions to officials, and internal policies and directives is important to ensure that all regulatory and policy frameworks are aligned with low emissions objectives. Tax levers, procurement procedures, and cost benefit and regulatory impact analysis are all instruments that can be used to support climate outcomes.

Different agencies also give different weighting to various concerns in their decision-making. To ensure that climate change goals are not undermined, it is crucial that climate change is considered in the development of all new policies, regulations, and requests for funding.[21]

Driving the creation of options

Driving the creation of low emissions options in different sectors and across the economy is critical to a successful transition. The availability of choice enables individuals, businesses, and communities to make the decisions that work best in their context.

There are three main pillars of policy intervention that will support this:

- pricing to influence investments and choices
- action to address barriers
- enabling innovation and system transformation.

Emissions pricing and other market incentives to influence investments and choices

Emissions pricing incentivises businesses and individuals to make choices that lower emissions. The main pricing tool in Aotearoa New Zealand is the New Zealand Emissions Trading Scheme (NZ ETS), but there are others that can also be used to incentivise investments and choices, such as taxation, electricity pricing, grants, and subsidies.

Emissions pricing is a strong and flexible lever for tackling climate change and has broad coverage, affecting a wide range of decisions. However, no single policy will be able to overcome all the barriers to reducing emissions. Some sectors have characteristics that impact how effective emissions pricing can be, and some characteristics of the NZ ETS itself also moderate its ability to drive emissions reductions.

Complementary policies that sit alongside emissions pricing can put people and businesses in a better position to respond to a rising emissions price and lower their exposure and vulnerability to that price.

Regulation, information, and other action to address barriers

There are a range of structural, political, and behavioural barriers that prevent people and businesses from making the most of cost-effective opportunities to reduce emissions. These barriers vary by sector. Removing these barriers can boost responses to the emissions price and decrease the overall cost of reducing emissions.

Measures which can address these sorts of barriers include standards or regulation, information, support to address capacity gaps, and removing regulatory barriers that impede emissions reduction.

Enabling innovation and system transformation

To achieve the scale and pace of change required for the transition, systems need to be designed in a manner that enables individuals, businesses, and communities to accelerate and sustain their emissions reductions.

There are many areas where low emissions options do not exist or are not yet commercially available at scale. Addressing these gaps will require investment in efforts to create and adopt innovative systems, infrastructure, and technologies that provide better and less costly ways of reducing emissions.

Assessing the merits of different options for action

Our policy framework helped us identify possible courses of action the Government might take to address a risk to meeting the second emissions budget.

We applied our prioritisation framework to ensure our advice would be informed by consideration of a number of factors set out in the Act and would help identify efforts with the greatest potential for positive impact. We also used this framework to help us determine which elements to raise as formal recommendations to the Government.

The prioritisation framework includes six aspects that are critical to consider when developing our advice:

- the **potential** of an effort to support meeting the second emissions budget (and where relevant the third emissions budget, with a view to the 2050 target), considering scale, scientific evidence, technological development, economic feasibility, and cost
- the **gap** in policy or ability to realise the opportunity, or in the ability to achieve an equitable and sustainable transition
- the **pace and timing** of the action in terms of sufficiency for meeting the second emissions budget and/or laying the foundations for achieving the third emissions budget and the 2050 target
- what **risks** are associated or present, including: to the achievement and permanence of emissions reductions or carbon dioxide removals; to the ability to adapt to climate change; and to other aspects of the environment or ecology
- what **equity** considerations are relevant, including intergenerational equity; distributional effects on sectors, regions, and social groups; and issues relevant to the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori
- what **co-benefits** the opportunity brings, for example to health, wellbeing, economic development, other environmental or ecological factors, and the ability to adapt to climate change.

In *Appendix 1*, we discuss how these six issues connect with matters that the Commission is required to consider in developing its advice on emissions reduction plans under the Act.

How we applied our approach

Our approach to recommendations

Our recommendations are tightly focused on identifying and addressing critical gaps and areas requiring urgent strengthening and acceleration to achieve the second emissions budget and support Aotearoa New Zealand's longer-term emissions reduction targets in a manner compliant with the Act.

These recommendations include actions that directly reduce emissions and actions that are 'enablers' – those which will create the conditions for outcomes to be delivered and to achieve emissions budgets and targets.

We will be assessing progress and gaps in action in more detail across all sectors through our monitoring review in 2024.

This advice builds on our existing base of evidence and insights

This advice has been informed not only by the policy approach discussed above, but by evidence and insights gathered through engagements and analysis conducted over the course of the Commission's existence.

We have collected and analysed data and evidence from a wide range of credible sources and reviewed a broad range of literature to support this work. Since the Commission's founding in 2019, we have delivered several pieces of advice to the Government, and with each we have expanded our collective evidence base.

Our previous advice to the Government includes:

- *Ināia tonu nei: a low emissions future for Aotearoa*
- *Advice on Agricultural Assistance: How financial assistance could support Aotearoa New Zealand's agricultural emissions pricing system*
- *Progress towards agricultural emissions pricing: Assessing how ready farmers and the agriculture sector are for emissions pricing, and advice on what work still needs to be done*
- *Advice on NZ ETS unit limits and price control settings for 2023–2027*
- *Advice on NZ ETS unit limits and price control settings for 2024–2028.*

As the second emissions budget and sector sub-targets have already been set in line with extensive analysis and modelling on both the part of government and the Commission, we have not undertaken new scenario work or extensive modelling. Rather, our advice in this report is premised on identifying how these set targets can be achieved in a practical and equitable manner.

How we have structured our advice

This report is structured by chapters, each identifying by theme the overarching opportunities and challenges ahead of Aotearoa New Zealand as it seeks to meet the second emissions budget and transition to a low emissions future.

Through consultation, we heard strong and widespread calls to strengthen our advice on the importance of actions and systems that support people to participate in and contribute to efforts to reduce emissions. In response, we have made some changes to the final structure of this report, grouping together chapters focused on how the Government can set conditions for achieving emissions budgets through actions that will impact across multiple sectors and communities.

Informed by our evidence base and engagement insights, we have applied our prioritisation framework and identified recommendations which outline the critical and urgent actions needed to achieve the second emissions budget in a manner compliant with the Act. These can be found throughout the report.

Each recommendation indicates that we have found evidence of a risk to meeting the second emissions budget and/or Aotearoa New Zealand's longer-term emissions reduction targets in a manner compliant with the Act. They are intended to serve as a signal to the Government that if action is not taken in alignment with our recommendations, other actions of equal or greater impact will be required.

Under the Act, the Government's second emissions reduction plan must include:

- sector-specific policies to reduce emissions and increase emissions removals
- a multi-sector strategy to meet emissions budgets and improve the ability of sectors to adapt to the effects of climate change
- a strategy to minimise impacts from reducing emissions on employees and employers, regions, iwi/Māori, and wider communities, including the funding for actions to reduce emissions
- any other policies or strategies that the Minister considers necessary.

We have structured our advice to cover the elements needed to enable the Government's preparation of the next emissions reduction plan for 2026–2030. This is set out in three parts:

Part 1: Setting the scene

About He Pou a Rangi Climate Change Commission
Chapter 1 – Introduction
Chapter 2 – What we heard

Part 2: The fundamentals for success

Chapter 3 – The task for the second emissions budget
Chapter 4 – A path to net zero
Chapter 5 – Emissions pricing
Chapter 6 – Investment and finance
Chapter 7 – Research, science, innovation, and technology
Chapter 8 – Whāia ngā tapuwae
Chapter 9 – An equitable transition

Part 3: Low emissions options for sectors and systems

Chapter 10 – Agriculture
Chapter 11 – Built environment
Chapter 12 – Circular economy and bioeconomy
Chapter 13 – Energy and industry
Chapter 14 – Forests and other carbon stocks
Chapter 15 – Transport
Chapter 16 – Waste and fluorinated gases

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

He Pou a Rangi
The Climate Change Commission's te reo Māori name, meaning 'a pillar of the sky'. The concept considers our role as upholders of the sky. We are honouring the sky and, in turn, have a duty to care for it

taonga tuku iho
a treasure that is handed down, cultural heritage

hui
meetings

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices

wairua
spirit, soul – spirit of a person which exists beyond death. It is the non-physical spirit, distinct from the body and the mauri

te taiao
the world, Earth, the natural world, the environment

tangata whenua
local people, indigenous people – people born of the whenua, of the placenta and of the land where the people's ancestors have lived and where their placenta are buried

Tā mātou i rongo
What we heard

Introduction

We understand that people are at the heart of action on climate change. For our advice to be meaningful and pragmatic, it must reflect the expertise, experiences, needs, and aspirations of the people of Aotearoa New Zealand.

While the Government makes decisions on climate change policy, it is individuals, households, businesses, and communities who are dealing with the impacts of climate change first-hand and taking action to bring the country closer to achieving its emissions reduction goals.

This advice has therefore been informed by the views and evidence of thousands of New Zealanders from across the motu, shared with us through case studies and an extensive engagement and consultation process.

Pre-consultation engagement

In developing the draft version of this advice, the Commission drew from evidence and insights gathered from engagements held over the course of the Commission's existence.

In addition, Commissioners and staff met with sector representatives, organisations, and individuals in hui and wānanga focused specifically on the second emissions budget period. These pre-consultation engagements, which took place primarily in the last quarter of 2022, helped staff understand what issues, barriers, and opportunities were viewed by stakeholders as being important for the Commission to cover in its advice.

We held hui and regional visits in Southland, Taranaki, Nelson/Tasman, Hawke's Bay, Rotorua, and Taupō, with a specific focus on ensuring we were visiting with people and in areas we had not heard from recently.

Consultation

On 26 April 2023, we released the draft version of this advice to the public for consultation, seeking evidence, perspectives, insights, and other information that would test and help improve our work.

Over the following eight weeks, Commissioners and staff met with and heard from iwi/Māori, academics, businesses, communities, farmers, local government, NGOs, sector bodies, and individuals.

We sought feedback across multiple channels, including through an online submissions process, virtual Q&As, and in-person engagements.

We invited respondents to provide their thoughts on specific chapters, or to make a submission on our draft advice as a whole.

During the consultation period we:

- held briefings for the media, stakeholders, and government agencies
- hosted open online events attended by hundreds of New Zealanders and focused on specific areas of our draft advice, as well as further online events in partnership with entities like Local Government New Zealand, the Institute of Directors NZ, the Sustainable Business Network, and Business NZ
- engaged specifically with iwi/Māori through hui ā-tinana and multiple online events
- held in-person events in Auckland, Christchurch, Dunedin, Hawke's Bay, Nelson, New Plymouth, Timaru, and Wellington
- spoke at tertiary institutions, including panel discussions at the University of Canterbury, Massey University, and University of Otago
- spoke at forestry forums in Rotorua and Christchurch, organised in conjunction with the New Zealand Farm Forestry Association and the New Zealand Forest Owners Association
- engaged with a wide group of NGO stakeholders including Auckland Action Against Poverty, New Zealand Climate Action Network, the Pacific Climate Warriors, the Disabled Person's Assembly, Climate Health Aotearoa, the Climate Psychology Taskforce, and with rangatahi at The Hive in Auckland.

Some planned engagements were not able to go ahead, including a session with the union E tū that was unable to proceed due to illness, and a series of workshops with Federated Farmers that were unable to proceed due to the impact of a large number of ongoing government consultations on key elected farmer leaders, the requirements of the Federated Farmers provincial Annual General Meeting season, and seasonal on-farm work demands.

Some planned engagements with iwi/Māori were also unable to proceed due to sickness and tangihanga.

Maui.Tech case studies

The Climate Change Response Act 2002 specifies that we must give consideration to the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori.

Throughout 2022 and 2023, the Commission has worked with iwi/Māori across multiple rohe on a case study approach to understanding the specific effects of climate change from an iwi/Māori-led perspective. This project is named Maui.Tech, speaking to the potential of mātauranga Māori-informed innovation and its benefits for the wellbeing of all.

The 13 case studies feature evidence and insights from whānau, hapū, iwi, ahuwhenua trusts, and other Māori landowners from different tribal rohe and with different asset and resource profiles including agriculture, forestry, geothermal, and coastal. We took this approach to ensure the diversity of evidence shared with us is reflective of the diversity of te ao Māori.

These case studies are building our understanding of how iwi/Māori are experiencing the effects of climate change. They enable iwi/Māori to tell their own stories in their own way about what matters to them in the transition to a low emissions future.

The case studies and the enduring relationships developing between participants and the Commission continue to provide us with a body of localised mātauranga Māori and expert evidence we can refer to as we develop and refine our advice. This knowledge is part of the body of evidence we have used to test and finalise our advice on the direction of policy for the second emissions reduction plan.

Submissions analysis and incorporating the results of consultation

Consultation on our draft advice closed on 20 June 2023. We received approximately 300 submissions in total, around half of which were from businesses and business groups, a third from individuals, and the remainder from local government, iwi/Māori, universities, NGOs, and advocacy groups.

Commission staff have read and considered each piece of consultation feedback we received, whether it was provided through an online submission, by email, or shared with us through a public webinar or in-person engagement.

Submissions and evidence from iwi/Māori – including evidence provided through the Maui.Tech project – have been analysed according to Māori data sovereignty principles under technical guidance from Māori data scientists.

We have analysed submissions and identified themes both within chapters and across the breadth of our advice. Where new evidence was presented, we have looked into it carefully and considered its potential impact on our work.

As a result of our submissions analysis, we re-evaluated our approach, judgments, conclusions, and recommendations where appropriate. In this process, we considered:

- Has any significant new evidence emerged through the consultation process?
- Have any standout themes been identified through the submissions received?
- Has the Government released any new consultation or policy documents that require us to amend our draft advice?
- How do any potential new recommendations sit within our policy and prioritisation frameworks?

Before confirming the final recommendations in this advice, our Board of Commissioners discussed the themes and evidence from submissions, and considered whether the updated report appropriately reflected the outcomes of our consultation.

In this chapter, and throughout this report, we have highlighted key themes and insights from consultation and where our advice has shifted based on what we heard. While these changes are in response to feedback and evidence we received from New Zealanders, they do not and cannot represent the full diversity of views shared with us.

Broad themes and Introduction

Our overall approach

Throughout our early engagements and in consultation, we heard consistent agreement from New Zealanders that action on climate change is important. While there is not universal consensus on the path forward, submissions were broadly supportive of our draft advice on the direction of policy for the second emissions reduction plan.

Many submitters called for us to go further with our advice, expressing a desire to see more ambition and greater urgency from both the Commission and the Government.

While most of our proposed recommendations received support, some respondents felt they did not adequately convey the urgency of action required. Some wanted to see more detail in our recommendations, while others wanted recommendations to remain focused on outcomes.

Across multiple areas, we heard concerns about the potential for climate policies to create inequitable impacts. Submissions highlighted the need for an equitable transition that honours Te Tiriti o Waitangi/The Treaty of Waitangi and is fairly funded, clearly communicated, and affordable for New Zealanders.

Our approach to developing our draft advice, including our application of our policy and prioritisation frameworks, received general support through consultation. Some submitters shared different ideas on how our frameworks could be used, but we did not receive evidence or information to cause us to consider a fundamental change in how we undertook our analysis.

Across multiple areas, we heard concerns about the potential for climate policies to create inequitable impacts. Submissions highlighted the need for an equitable transition that honours Te Tiriti o Waitangi/The Treaty of Waitangi and is fairly funded, clearly communicated, and affordable for New Zealanders.

An enabling environment

Submissions across multiple chapters pointed to the need for Aotearoa New Zealand's systems such as education, infrastructure, transport, and energy distribution to be designed in a way that supports people to reduce emissions in line with emissions budgets and the 2050 target.

We heard from respondents that to empower action, a clear direction on climate policy and a cohesive policy approach across sectors and between central and local government is needed.

Respondents also emphasised the importance of including recommendations in chapters focused on how the Government can set conditions for achieving emissions budgets; concerned that important actions in investment and finance; research, science, innovation, and technology; and the circular economy and bioeconomy could otherwise be seen as less vital to the transition.

We saw support for increasing research efforts and for a more integrated planning system to help achieve innovative, coordinated, and sustained emissions reductions across sectors.

Investment and finance requirements were a central focus of many submissions. We heard requests for greater clarity on the investment and finance implications of our advice across multiple chapters. Submitters also wanted to better understand the Government's approach to funding the transition, and the role businesses have to play in supporting emissions reduction.

We heard from a range of respondents, including from local government and iwi/Māori, that effective funding mechanisms are necessary enablers for emissions reduction. Others stressed that central government funding cycles need to meet the long-term planning required for a transition.

Education as an enabler

Submitters emphasised the importance of education across multiple chapters, identifying it as a strong lever for enabling and maintaining emissions reduction and climate change adaptation. While the Commission itself does not have a role in public education, many of these respondents wanted to see a stronger narrative in our advice about the role of education in the transition.

We heard that education is a powerful lever for enabling an equitable transition. As highlighted in both our draft and final advice, upskilling and retraining offers individuals, businesses, and communities greater mobility and agency. Education that enhances public awareness about climate change enables people to participate in decision-making and better understand and respond to climate-related impacts.

Some submitters wanted to see more information about behaviour change as a mechanism for reducing emissions across different systems and sectors.

The role of local government

Consistently, submissions from local government expressed the need for more clarity on what is required of them in the transition, highlighting the need for funding and legislative tools to be consistent with those responsibilities.

Central government funding was noted as being especially important for supporting the localised decarbonisation of transport and the built environment.

The importance of an equitable transition

Many submissions, including those from local government, had a strong focus on the potential equity impacts of the transition to a low emissions future.

Respondents discussed the importance of an equitable transition across sectors and society, and of supporting communities to adapt to change and navigate the impacts of a warming climate. We heard references to the language of a "just transition", with submitters wanting to ensure climate policies would not exacerbate existing inequalities.

Submitters also wanted more specific information as to how iwi/Māori will be supported through the transition, as well as rural communities and businesses. We also heard calls for clarity on the role businesses have to play in supporting emissions reduction.

How we responded

We took another look at our recommendations, evaluating each on whether it was focused appropriately on outcomes and reflected the wider context of our advice, including the level of urgency. Where the evidence supported adding a new recommendation, we did so. Our final report includes new recommendations on:

- aligning institutional and regulatory outcomes
- investment and finance
- the circular economy and bioeconomy
- research, science, innovation, and technology.

We heard widespread calls to strengthen our advice on the importance of an enabling environment – one that supports people to participate in and contribute to emissions reduction efforts. In response, we reviewed our draft advice and, where appropriate, more clearly emphasised the impact of enabling systems and actions throughout. We restructured our report to more accurately reflect how chapters focused on Aotearoa New Zealand's enabling environment relate to other areas of focus.

In response to requests around the financial implications of our advice, we added a section in *Chapter 1: Introduction* outlining that investments required to meet emissions budgets will save money in the long term.

Our analysis shows that while significant investment in areas like energy efficiency, electric vehicles, renewable electricity and improving on-farm efficiency will be required over the coming decades, this is likely to be outweighed by the future cost savings. Under our modelling, annual cost savings exceed the additional costs incurred by the third emissions budget period.

In response to feedback requesting an increased focus on education, we strengthened areas of our advice which discuss the importance of widespread access to information about climate change as a means of supporting greater agency and good decision-making. We also emphasised the opportunities that workforce training, retraining, and upskilling offer to support the transition to a low emissions economy.

We examined and analysed evidence and insights about local government, an equitable transition, and the role of an enabling environment gathered through the development of this advice and *Ināia tonu nei*. We then applied our policy and prioritisation frameworks and as a result have added a recommendation below about cross-government and cross-sector outcomes alignment.

Recommendation

This recommendation seeks to address the risk that Aotearoa New Zealand's institutional and regulatory environment is not sufficiently aligned to enable the meeting of the second emissions budget or longer-term emissions reduction targets.

Recommendation 1

We recommend that in its second emissions reduction plan, the Government:

1. Align and coordinate institutional and regulatory outcomes within and between levels of government and across all sectors of the economy to support the coherent implementation of the second emissions reduction plan.

The task for the second emissions budget

Likely due to the broad, foundational nature of *The task for the second emissions budget,* we received a wide range of submissions on this chapter.

A common theme was the need for greater clarity from the Government on Aotearoa New Zealand's approach to emissions reduction, at both national and local levels.

Local government submissions expressed a desire for more detail on how emissions will be reduced within regions and communities. We heard about the importance of aligning regional planning with central government direction on the source of gross emissions reductions.

Submitters also emphasised that emissions budgets are an upper limit or ceiling for emissions, and that reducing emissions beyond budget requirements (known as overachieving budgets) offers a number of benefits, including making the achievement of future emissions budgets more likely. These respondents called for us to communicate this point more clearly in our advice and to highlight options that could enable Aotearoa New Zealand to overachieve the second emissions budget.

We heard concerns that agricultural emissions pricing may not be ready in 2025 given current progress. This would put at risk both the 2030 biogenic methane component of the 2050 target and the sector sub-target for agriculture identified in the Government's first emissions reduction plan.

As this advice is focused solely on actions the Government can take to meet emissions budgets, some of the feedback we received in response to this chapter can be more fully considered through our upcoming advice on the fourth emissions budget and the review of the 2050 target, or through our work monitoring emissions reduction and the national adaptation plan. Feedback in this category included:

- interest in more ambitious gross emissions reductions within the second emissions budget period
- suggestions that recent international efforts may require further future domestic ambition
- commentary on accounting rules, including the relative impact of biogenic methane emissions versus long-lived greenhouse gases
- calls for separate emissions budgets for biogenic methane emissions and long-lived gas emissions
- requests for greater alignment of reporting across domestic and international commitments.

These submissions will therefore be considered as part of our analysis for our upcoming advice.

How we responded

In response to feedback, we added text that clarifies the purpose and function of emissions budgets as setting upper limits for emissions. We also more clearly identified the benefits of overachieving the second emissions budget, including increasing the likelihood of meeting future emissions budgets and the 2050 target, and helping to close any gaps between Aotearoa New Zealand's domestic and global commitments to mitigate climate change.

Our draft advice discussed the importance of achieving the 2030 biogenic methane component of the 2050 target. In response to concerns raised in submissions about whether Aotearoa New Zealand is on track to achieve this target, we have included additional text and figures emphasising where further action is needed. Our final advice states that implementing agricultural emissions pricing from 2025 will be key to closing the gap to meeting the sector sub-target for agriculture.

In response to local government requests for more detail regarding regional emissions reduction, we added a diagram illustrating activities with the greatest potential for emissions reduction across the first, second, and third emissions budgets. This information is also now in our table of 2030 benchmarks for action, and is intended in part to help regions and communities identify and prioritise the actions they will take and support.

We also added more discussion on the role of forests in an approach that prioritises gross emissions reductions and made a number of related changes to *Chapter 4: A path to net zero*.

A path to net zero

Respondents were generally supportive of our proposed recommendations in this chapter, with some calling for an increase in ambition both from the Commission and the Government in relation to gross emissions reductions.

We heard broad agreement that the Government should commit to specific levels of gross emissions for the second and third emissions budgets, and calls to include levels of carbon dioxide removals by forests alongside levels of gross emissions in our final recommendations.

Respondents sought more information on the role of forests within an approach that protects the incentives for gross emissions reductions. Some were concerned about Aotearoa New Zealand's current reliance on forests to meet emissions reduction targets and supported exploring and enacting other methods. Others wanted to see our advice acknowledge that changing land to forest offers emissions reductions.

Those who did not support the overall direction of our draft advice cited economic concerns, as well as concerns that impacts would land unfairly on industries with limited ability to reduce emissions, and industries involved in carbon removal by forests. Others referred to the Act, saying it does not require gross emissions levels to be set.

Local government bodies made a range of suggestions, including:

- that the Commission strengthen its calls for central government to provide clarity regarding the role of local government in meeting emissions budgets and the 2050 target, as well as central government funding to support them to meet those responsibilities
- that regional emissions sub-targets be developed in consideration of each region's unique economic activities
- that national coordination and reporting frameworks be developed.

How we responded

We strengthened our advice on the importance of reducing gross emissions and provided further detail and evidence about land-based carbon removals, including what happens over time. We also added a section specifying our recommended levels of gross emissions and carbon dioxide removals for the second and third emissions budgets,with discussion on how we came to these levels.

Following feedback about the potential economic impacts of our advice and requests for more clarity on the financial implications of our approach, we added a section in *Chapter 1: Introduction* outlining that investments required to meet emissions budgets will save money in the long term.

In response to feedback relating to forests and potential impacts for industries involved in carbon removals by forests, we added text to further emphasise their importance in achieving and maintaining net zero.

We also heard concerns that impacts could unfairly land on industries with limited ability to reduce their emissions. In *Chapter 13: Energy and industry*, we discuss that for these industries, incremental progress can be supported and accelerated through a strong research, science, innovation, and technology system, and by mobilising private finance to support new technologies.

Some respondents provided feedback regarding our recommendation that the Government set out intended levels of gross emissions, saying that the Act does not require gross emissions levels to be set. While the Act does not require these levels to be set, being transparent about the level of gross emissions reduction and carbon dioxide removals will lead to more certainty for businesses and better policy decisions, especially regarding the operation of the New Zealand Emissions Trading Scheme (NZ ETS). More detail is set out in *Chapter 4: A path to net zero*.

In response to local government requests, we strengthened our advice on the importance of effective governance structures to deliver the transition (*Chapter 1: Introduction*). Our new text discusses the important role of local government, which makes decisions on land use, urban form, road and transport services, and waste management. We added a new recommendation (Recommendation 1) on aligning and coordinating outcomes within and between levels of government and across all sectors of the economy to support the coherent implementation of the second emissions reduction plan.

We re-examined our proposed recommendations in response to calls to include levels of carbon dioxide removals alongside gross emissions reductions, and updated Recommendations 2 and 3 to recommend that the Government commit to specific levels for both.

Feedback highlighting the need for an equitable transition that honours Te Tiriti/ The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/ The Treaty. Recommendations 2 and 3 now include further specificity regarding partnership with iwi/Māori as levels of gross emissions and carbon dioxide removals are set.

Emissions pricing

Submissions on emissions pricing were diverse, with respondents expressing both strong agreement and disagreement with our proposed recommendations.

We heard significant support from a range of respondents for our proposed recommendation for separating the incentives for gross emissions reductions from those applying to forestry. Some of these submitters expressed wanting to prioritise gross emissions reductions and others for the New Zealand Emissions Trading Scheme (NZ ETS) to incentivise native forests over exotic. We also heard concerns about risks created by monocultural exotic forests and the negative impacts on rural communities and the environment as a result of rapid and extensive forest planting driven by the NZ ETS.

Some respondents advocated for an emissions pricing system that would support the overachievement of emissions budgets and for Aotearoa New Zealand to achieve net negative emissions over the long term.

We heard from some NZ ETS participants who agreed that the scheme's incentive structure needs to change. However, most of these respondents also expressed concern about how such change might be carried out. Several felt that any change should not undermine investments already made under the current structure, and that changes should only apply on a forward-looking basis.

We heard from some business and industry groups – many of whom were related to the forestry sector – who did not support differentiating the incentives for forests and gross emissions reductions. Their reasons included questioning the evidence supporting the Commission's proposed recommendation, whether it is necessary to use the NZ ETS to drive decarbonisation, and whether this approach was consistent with Aotearoa New Zealand's climate change legislation.

We also heard concerns that the proposed recommendation could create uncertainty that would lead to unfair economic impacts on forestry businesses, emitters, and households, and discourage investment in the new forests needed to reach Aotearoa New Zealand's emissions reduction targets.

The section of our proposed recommendation that states the Government should develop durable incentives for net removals by forests through to and beyond 2050 was supported by submitters who commented on it.

Submissions and case study evidence from iwi/Māori

From some iwi/Māori representatives, we heard a desire for greater and more consistent support for protecting, restoring, and establishing native forests. We heard that any government incentives for forest planting should also encourage good forest management, using a holistic approach that restores mauri. Respondents also called for recognition of a wider range of options for storing carbon, especially methods that encourage biodiversity and enable local climate change solutions.

Some respondents acknowledged that a focus on forestry within the NZ ETS could detract from momentum on gross emissions reductions. Others shared a sense that forestry is currently treated unfairly in comparison to agriculture, and that any amendments that affect already-registered forests would be unjust.

Through Maui.Tech, we heard from some NZ ETS participants who are having to weigh the high potential for revenue from growing pine forests alongside aspirations to transition to native indigenous forests and enhance biodiversity (we discuss this issue further in *Chapter 5: Emissions pricing*).

Others emphasised the importance of ensuring any NZ ETS advice or policy reflected sufficient consideration of Māori rights and interests.

We heard about the importance of upholding Te Tiriti/The Treaty in developing objectives for the role of forestry or amending the NZ ETS. Submissions also emphasised the need to acknowledge the impacts of colonisation and past injustices in a manner which supports Māori leadership in mātauranga Māori, and the rights of iwi/Māori to develop their lands for the benefit of their people.

Multiple submitters wanted the scope of the NZ ETS to be expanded beyond forests to other ways of removing and storing carbon.

Several submitters expressed scepticism about whether the NZ ETS could ever be an effective mechanism for reducing emissions. These respondents advocated for a wider range of policy instruments to be deployed, or for the NZ ETS to be replaced with alternatives such as Tradeable Energy Quotas (TEQs), taxes, bans, or rationing.

Some submitters in favour of maintaining the NZ ETS as a key tool for reducing emissions also highlighted its disproportionate impact on certain groups in society. They advocated for targeted policies to support such groups, including through recycling NZ ETS proceeds and consideration of a carbon rebate to low-income households.

A significant number of submitters strongly advocated for industrial free allocation to be eliminated or rapidly phased out, saying that the policy is unfair, increases costs for others, and is not in alignment with the 2050 target.

In contrast, a number of businesses and business groups were not in favour of reducing industrial free allocation, particularly those who are recipients of it. Some stated that industrial free allocation was necessary to allow emissions intensive and trade exposed (EITE) industries to fund their emissions reduction activities, and expressed doubt that the risk of emissions leakage has meaningfully reduced in recent years.

Submitters, both in favour and opposed to the reduction of industrial free allocation, expressed interest in introducing a carbon border adjustment mechanism (CBAM) to address emissions leakage risks, although some recognised that this would not be effective for export industries.

How we responded

Since the publication of our draft advice, the Government has announced and/or launched several initiatives related to the NZ ETS and our advice in this chapter. We revised our chapter to reflect these updates, including adding text commenting on the Government's NZ ETS review and the opportunities it presents to strengthen the emissions reduction potential of the scheme.

We also added discussion of the Government's decision to develop a Carbon Removals Strategy, intended to become part of the second emissions reduction plan, and of the recently passed amendments to legislation that enable updates to aspects of industrial free allocation. In response to feedback where submitters expressed differing opinions about the implications of our advice, we went through the chapter and identified opportunities to add information and/or clarify our meaning.

In particular, we received significant feedback from individuals and entities involved in forestry disputing our case for amending NZ ETS incentives. This was mainly on the basis that the Government's NZ ETS review had undermined confidence to invest in afforestation, and so concern about high afforestation rates undermining gross emissions was misplaced.

We clarified in our advice that these recent events have altered the status quo described in our draft advice and take Aotearoa New Zealand off the potential future emissions pathway described there. They do not, however, invalidate the identified issues related to the economics of afforestation compared with reducing gross emissions. These issues mean the current structure of the NZ ETS is not fit for driving either the gross emissions reductions or the removals by forests needed to meet emissions budgets and the 2050 target in an equitable and sustainable way.

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 4 now includes further specificity regarding partnership with iwi/Māori as emissions pricing incentives are redesigned.

In response to the mixed feedback on our industrial free allocation advice, we included more discussion of emissions leakage risk and highlighted what some other jurisdictions are doing to evolve their industrial free allocation policies. Given the high interest in a carbon border adjustment mechanism as a way to address emissions leakage, we included more information on what the Government has already committed to in terms of investigating this option as part of its first emissions reduction plan.

We did not substantively change the advice in response to submissions questioning the need for emissions pricing at all or advocating to replace the NZ ETS entirely with alternative policies. We continue to stand behind the conclusions we set out in our advice on the first emissions reduction plan, *Ināia tonu nei*. These include that emissions pricing policies are a key pillar of an effective and comprehensive climate policy package (see chapter 11, page 213), and that dismantling the NZ ETS would likely delay much needed action to reduce emissions (see chapter 13, pages 239–240).

Investment and finance

We received support for broadening, deepening, and accelerating investment and finance for emissions reduction. While some submitters recognised positive steps in financing a low emissions, climate-resilient economy, many expressed concerns that a lack of enabling conditions is preventing capital from being redirected at pace. We heard strong views that not having a recommendation in this chapter compromises finance as a critical enabler of the transition.

Consistently, we heard that greater support and recognition is needed for local government – including expanded financing options – and that a national climate investment strategy would need to clarify and reflect the roles and responsibilities of local and central government.

Respondents were positive about our draft advice regarding the merits of an investment strategy that includes both climate change mitigation and adaptation, with some calling for net zero investment and finance plans to be developed for each sector.

Submitters also generally agreed with our position that greater support is needed for iwi/Māori to reduce their emissions and invest in a low emissions economy.

Submissions and case study evidence from iwi/Māori

In submissions and through engagement we heard from iwi/Māori representatives that the current systems for obtaining funding are inaccessible and inequitable. Respondents noted difficulty in competing with larger organisations with greater resources to dedicate to seeking funding, and the need to protect Māori intellectual property and mātauranga Māori throughout any funding process.

Some Maui.Tech participants discussed the comparatively lower contribution to climate change from iwi/Māori over time, and a corresponding need for greater Crown funding for Māori-led responses to climate change. Some participants from commercial sectors highlighted the emissions reductions that could result from greater support for developments in energy and carbon farming.

We also heard that current funding is a substantial barrier to iwi/Māori taking action to reduce emissions. Cost was identified as a challenge for land-use change and getting climate certification. Some respondents expressed that current investment and financing systems appeared to penalise those trying to do the right thing. Respondents called for more diverse incentives and support (including ones consistent with tikanga) to promote action.

Some submitters wanted greater clarity on the public and private investments that will be required for low emissions transformations in the economy, requesting that we build on previous work to calculate the capital investment needed to meet emissions budgets. They agreed that transparency and accountability could be strengthened through the development of a taxonomy which would clearly classify which investments are environmentally sustainable.

Some respondents reported that they are still encountering more barriers related to low emissions investments than with emissions-intensive alternatives.

They suggested that the Government could help ease these barriers by using guarantees or tax incentives to bolster the supply of private low emissions solutions.

How we responded

In response to feedback that our advice should offer more urgency and greater clarity on what action is needed, we revised the chapter to more clearly identify the existing barriers to public and private investment in the transition to low emissions. We also added more direct discussion of the opportunities available to the Government to address those barriers.

In light of the evidence, as well as strong views we received through consultation, we re-evaluated whether our draft advice appropriately reflected our policy and prioritisation frameworks. As a result, we added a new recommendation focused on addressing the current barriers to mobilising public and private investment to meet emissions budgets.

We added new text discussing our estimate from *Ināia tonu nei* on additional capital investment required to meet the 2050 target. We provided further context and analysis on this estimate, finding there is need for capital to be directed into priority climate investments across both emissions reduction and adaptation to improve resilience.

We also updated the name of the chapter to better reflect its content, and adjusted its position within the report structure to ensure that investment and finance is understood to be a fundamental element of success across all sectors.

Research, science, innovation, and technology

We heard broad support for our draft advice on research, science, innovation and technology (RSI&T). As with other chapters relating to creating an enabling environment, we also received feedback that the absence of a recommendation could lead to reduced effort in this area.

We heard that a healthy RSI&T system is fundamental to expanding options for gross emissions reductions and removals, and that it provides the tools and information needed to increase resilience to the impacts of climate change.

Many submitters agreed that current levels of investment and ambition related to the RSI&T system are insufficient and need to be increased. We also heard that improved coordination and collaboration across the RSI&T system is required, both between and within the public and private sectors, to avoid duplication of effort.

Submissions and case study evidence from iwi/Māori

From iwi/Māori representatives, we heard concerns regarding the lack of consideration given to indigenous innovations due to international competition and little support for smaller local projects and initiatives.

Through Maui.Tech, we heard about the importance of Māori-led research and calls for the Crown to enable Māori-led innovation, with some participants seeking 50% partnership in government-funded research.

Some Maui.Tech participants discussed the importance of enabling research and information-sharing, including through kura and schools, to support iwi and hapū to develop climate change response strategies based on their unique intergenerational knowledge and local observational methods.

We heard from a broad range of submitters, including councils, businesses, and research organisations, that free and accessible data is crucial to transforming Aotearoa New Zealand into a thriving, climate-resilient, and low emissions society. These submitters highlighted numerous examples of barriers to accessing data, including fees for public good information.

Respondents commonly pointed out that investment in RSI&T needs to be linked to science-policy objectives and outcomes. We heard that the current system heavily favours novelty, and that this risks disjointed outcomes and insufficient investment in important proposals that could more directly support climate objectives. These respondents argued that continuing with this approach will not enable the emissions reductions and removals solutions needed to achieve emissions budgets and the 2050 target.

Technology roadmaps were raised as a tool that can guide development and investment in the RSI&T system. We also heard that innovative technology and solutions need to be made less risky to investors, and that technology roadmaps could help satisfy this need.

We also heard requests to include in our advice discussion of how digital technologies can further accelerate emissions reductions and how funding educators can help support research.

How we responded

In light of the evidence and strong views we received through consultation, we re-evaluated whether our draft advice sufficiently reflected the risks to achieving emissions budgets if adequate investment in RSI&T is not made at pace. We looked at the current gaps in the system using our policy and prioritisation frameworks, and as a result added a new recommendation focused on addressing those gaps.

As with the other chapters related to ensuring an enabling environment, we adjusted the position of this chapter within the report structure to better reflect that a robust RSI&T system is a fundamental element of success across all sectors.

We also more clearly identified how investment in the RSI&T system can be prioritised, and added discussion of the tools (like technology roadmaps) available to guide decision-making in this area.

Whāia ngā tapuwae

We heard broad support for our proposed recommendation that the Government accelerate iwi/Māori emissions reductions by exploring and implementing a mechanism to directly allocate resourcing to iwi/Māori and increasing funding to Māori landowners.

Through consultation and Maui.Tech case studies we heard that although iwi/Māori have not significantly contributed to the causes of climate change, they are displaying emissions reduction leadership, including applying intergenerational strategies and changing their social and economic goals to align with environmental outcomes. Through Maui.Tech, we also heard that iwi/Māori are helping create new opportunities by undertaking research and development of innovative, new technology such as biopolymer products.

We heard concerns that the Crown has not done enough to acknowledge iwi/Māori climate change leadership and calls for greater financial recognition to be afforded to iwi/Māori who have a carbon deficit across the entirety of their rohe. Respondents suggested that Māori collective owners of land be resourced further to help develop their leadership for the benefit of all of Aotearoa New Zealand.

Some respondents saw our draft advice as too restrictive and suggested that we should recommend multiple resourcing mechanisms. We also heard suggestions to broaden this recommendation to include all Māori landowners rather than having a specific focus on Te Ture Whenua Māori entities.

Respondents shared concerns that the Crown has not done enough to ensure that iwi/Māori have strong pathways and means to further reduce their emissions. As with *Ināia tonu nei*, respondents told us about the financial barriers that exist as a result of historic land ownership issues, which have often relegated iwi/Māori to marginal land. This disincentivises emissions reductions by limiting land-use and financial opportunities.

Through submissions and from Maui.Tech participants involved in commercial forestry, agricultural, and geothermal operations, we heard concerns about the costs required to certify business operations as carbon neutral or negative.

We heard that strengthening iwi/Māori emissions reductions will require addressing these barriers and providing further resourcing for education, localised emissions reductions initiatives, science and mātauranga Māori, rohe-specific climate adaptation and emergency management efforts. We also clearly heard that providing iwi/Māori with sufficient time to consult with the Crown is important.

We received broad support for our proposed recommendation regarding iwi/Māori directing the role of mātauranga Māori in policy design, development, and implementation at central and local government level.

The majority of those we spoke to highlighted that the decision to incorporate local mātauranga must be in the hands of mana whenua and be non-extractive. Others voiced reluctance to share their mātauranga Māori and mātauranga ā-iwi with local and central government, citing concerns about how the knowledge would be used and protected.

Across the board, respondents emphasised that appropriate resourcing to iwi and hapū is a critical element of this proposed recommendation, and that the Government must engage with iwi and hapū as Treaty partners, not as stakeholders.

How we responded

We updated this chapter to reflect some of the key messages we heard from iwi/Māori in our consultation and through Maui.Tech case studies, including that the leadership of iwi/Māori is crucial to Aotearoa New Zealand's climate change response, and investing directly in iwi/Māori will help Aotearoa New Zealand accelerate emissions reductions and enhance preparedness for climate change adaptation.

In response to feedback that Recommendation 7 was too narrow, we re-evaluated our analysis and as a result broadened our recommended means of allocating resource. We also expanded the focus to be on all Māori landowners (not just Te Ture Whenua Māori entities) and clarified that the manner of iwi/Māori emissions reductions and removals should be set by iwi/Māori and driven by their assessments and priorities.

We added text about the importance of protecting mātauranga ā-iwi and ā-hapu in implementing Recommendation 8. We revised Recommendation 8 to remove the word 'integration' following feedback that it could be misinterpreted – the recommendation now discusses the "weaving of mātauranga Māori". We also clarified that providing resources is *part* of the action needed by the Government, not the entirety.

An equitable transition

We received broad support for our draft advice and proposed recommendations in this chapter.

Submitters expressed a desire for further discussion on the mental and physical health co-benefits of emissions reduction policies, arguing that mitigating climate change could significantly reduce the country's health-related costs. We heard calls to focus more on the potential mental health impacts of climate change, with heightened anxiety related to climate change – particularly among rangatahi – emerging as a major area of concern.

Submissions and case study evidence from iwi/Māori

From iwi/Māori representatives, we heard that the wellbeing of Māori can be maintained and enhanced throughout the transition to low emissions by supporting continued positive relationships with whenua and taonga species, and enhancing biodiversity. We heard calls for the Crown to provide more funding and land to allow iwi to adapt proactively and on their terms.

Respondents highlighted that an equitable transition for Māori needs to be Māori-led, and that any transition decisions should involve Māori in a meaningful way and at a local level.

From Maui.Tech participants, we heard about the positive impact of Māori leading their community responses to climate change, particularly given their unique standing as tangata whenua with whakapapa to te taiao.

This whakapapa also means that climate change presents a unique wellbeing risk for Māori, because harm to the environment, such as loss of taonga species, is akin to losing a family member.

Other participants spoke to the importance of recognising that climate change impacts are intergenerational and unique for each iwi; those fearing for their descendants are experiencing harm today. We also heard about the negative wellbeing impacts caused by a diminishing ability to offer manaakitanga or support youth development as the health of the environment is threatened.

Respondents noted that current relationships between Māori and local councils can be ineffective and can stifle proactive adaptation to climate change rather than supporting it. We heard that resilience is best supported through local councils working with Māori to ensure that Māori shape plans that impact them.

The importance of education emerged as a feedback theme for this chapter. Multiple submitters strongly advocated for the establishment of education and training initiatives aimed at supporting individuals, the public, and communities to effectively navigate challenges and uncertainties associated with the transition. We also heard agreement with our draft advice that education aimed at upskilling and retraining workers will enable people to adapt to changes to the employment landscape.

We saw strong support for our proposed recommendation regarding the expansion of the Equitable Transitions Strategy to include climate change adaptation concerns as well as those related to the impacts of emissions mitigation policy or outcomes.

Some respondents expressed a strong sense of urgency and concern regarding how the Equitable Transitions Strategy is developed and implemented. We heard that the need for the strategy is pressing, and that our advice should clarify how an expanded strategy could be implemented in a timely and effective manner.

A significant number of submitters expressed their full support for our proposed recommendation that the Government use existing policy levers to address inequitable impacts related to climate change policy, rather than delay action on issues of equity or the climate.

We heard about the importance of an equitable transition, with respondents emphasising the need to ensure sufficient support for those who may be least able to navigate the transition or adapt to a changing climate. Submitters expressed significant interest in intergenerational equity and the impact of climate change and emissions reduction policies on young people.

Many highlighted the importance of effectively including specific groups, including rangatahi – particularly rangatahi Māori and Pacific youth – as well as immigrants, those living in rural areas, the LGBTQIA+ community, people in lower socio-economic circumstances, and disabled people in the design and implementation of climate change policies and strategies.

How we responded

Our changes to this chapter focused primarily on clarifying our thinking. We restructured much of the chapter to more clearly lay out the challenges and opportunities presented by the second emissions budget period in relation to an equitable transition. We moved a section on recycling NZ ETS proceeds into *Chapter 6: Investment and finance*.

We added more detail into the sections about education and training, and the health co-benefits impacts associated with taking climate action. We also added a new section about community involvement.

We updated the chapter title and made minor edits to our recommendations to better reflect our analysis and conclusions.

Agriculture

As with *Ināia tonu nei*, we received a diversity of responses to our draft advice on agriculture.

Most respondents agreed with our draft advice that land-use change and diversification are important levers for reducing agricultural emissions. Some urged us to go further and include the transition to horticulture in our recommendations.

Most submitters were supportive of our proposed recommendation that the Government, in partnership with iwi/Māori and in collaboration with industry, enhance advisory and extension services to farmers to better enable them to respond to emissions pricing and reduce gross emissions.

We heard some concern that services across the government and existing organisations could be duplicated. These respondents called for cross-sector coordination focused on adding value and aligning with wider environmental outcomes.

Our proposed recommendation regarding the agricultural emissions pricing system received more mixed views. Many submitters agreed with the Commission that if Aotearoa New Zealand is to meet its legislated emissions reduction targets, agricultural emissions pricing cannot be delayed. We heard some calls for an increase in ambition and urgency in this area of our advice, and requests that we impress more strongly upon Government the consequences of recent delays.

Some submitters did not support having any agricultural emissions pricing system as part of the second emissions reduction plan, arguing that such action would not result in fair, sustainable emissions reductions, with specific concern for potential impacts on farmers and rural communities.

These submitters suggested that prior to pricing methane or nitrous oxide emissions from agricultural production, the biogenic methane components of the 2050 target should be reviewed, emissions reduction technology should be made more commercially available, and the risk of emissions leakage should be assessed.

We also received submissions highlighting the importance of research and technology in reducing agricultural emissions and urging the Commission to strengthen our advice on streamlining the regulatory processes for the approval of new technologies. These submitters viewed this action as critical for getting emissions reduction technology into the hands of farmers.

Submissions and case study evidence from iwi/Māori

Responses from iwi/Māori on agriculture were also diverse. Several comments reflected on the knowledge and financial barriers faced by farmers taking positive environmental action.

We heard from multiple respondents about the potential for working collectively to make change. Others discussed a shift to horticulture (particularly kiwifruit) as a way to reduce emissions while also bringing employment to regions.

Several Maui.Tech participants discussed the importance of tino rangatiratanga in fulfilling the ancestral obligation of kaitiakitanga, and using tikanga-led practices within agricultural contexts to pursue cultural success alongside commercial success. Examples shared included maintaining drinkable freshwater and addressing risks from historic and present-day land-use change.

Some consultation respondents emphasised the need for action (and therefore funding) at multiple levels, with whānau, hapū, and individual Māori driving agricultural change along with post-settlement governance entities.

How we responded

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 12 now includes further specificity regarding partnership with iwi/Māori as services to farmers are enhanced.

Recommendation 12 also reflects feedback we received about the importance of collaboration with industry to ensure services add meaningful value and are not unnecessarily duplicated between government and industry good organisations.

We more clearly emphasised the importance of an equitable transition in our advice about working with regional councils and in partnership with iwi/Māori when developing land-use approaches.

Some submitters wanted to see a more detailed policy recommendation specific to land-use change from agriculture to horticulture. However, as our role is to provide advice on the direction of policy, rather than give detailed policy recommendations, we did not amend our recommendation.

Instead, we strengthened areas of our advice related to this feedback. Our final advice discusses the importance of the Government working in partnership with iwi/Māori and in collaboration with food and fibre producers and industries to identify and support options for land-use diversification. We then discuss the benefits (biological emissions reduction) and challenges (lack of infrastructure, access to water, or labour) related to changing land from agriculture to horticulture.

We updated our advice to reflect the Government's announcement on its plan for an agricultural emissions pricing system, which confirmed a split-gas approach with pricing to commence from Oct 2025 (rather than Jan 2025). We also added content to discuss environmental safety regulation alongside food safety.

As a result of mixed feedback regarding our advice and recommendation on advancing an agricultural emissions pricing system, we reviewed the available evidence and re-examined Recommendation 11 to ensure it builds on what we learned through *Ināia tonu nei* and our advice on *Progress towards agricultural emissions pricing*, and *Agricultural Assistance*.

We found that the implementation and rapid advancement of agricultural emissions pricing will provide a necessary tool to incentivise the emissions reductions required by 2030 and beyond.

While existing policies, mainly related to freshwater quality, will achieve part of the near-term methane reductions required by 2030, the effect of those policies is uncertain and there is little evidence that they will be sufficient. An effective pricing mechanism would provide the Government with a key additional tool to ensure that the 2030 biogenic methane component of the 2050 target will be met, and that agriculture mitigation contributes to meeting the second emissions budget.

How we responded (continued)

Advancing to a more detailed pricing system within the second emissions budget period would recognise and reward more emissions reduction actions, allowing farmers to reduce emissions while limiting impacts on production. It would also provide more choice about how to respond to price signals, enabling farmers to make decisions that best align with the wellbeing of their businesses.

Financial assistance could provide a means to limiting disruptive change to the agricultural sector. The Government could also choose to give targeted assistance based on certain criteria to manage more specific impacts.

Under the Act, the Commission is due to provide the Government with advice regarding its review of the 2050 target in December 2024. This review, which include the biogenic methane components of the target, will consider all relevant evidence and will involve consultation with the public.

Built environment

Our draft advice on the built environment received a diversity of responses, with many supporting our first two proposed recommendations, and some offering countering opinions on the third.

Consistently, local government called for central government to provide greater support. They cited clarity of their roles, responsibilities, and decision pathways, appropriate funding, and access to finance and legislative tools as being key to effective local government action.

Submissions and case study evidence from iwi/Māori

Many iwi/Māori respondents emphasised that equitable outcomes are dependent on genuine partnership with iwi/Māori and Māori leadership in decision-making related to the built environment.

Several Maui.Tech participants referred to the alienation of iwi/Māori from their whenua as a result of Crown actions, and the emerging context of land loss from climate change. Participants also highlighted the importance of ensuring Māori built environments, such as marae and papakāinga, are resilient in the face of climate change.

We heard about the need to protect infrastructure within rurally isolated communities, including roads and access to essential services, and about maintaining and protecting wāhi tapu, flora and fauna, and native bush, including in urban spaces.

Our first proposed recommendation, on integrating the planning system to build urban areas upwards and mix uses (meaning enable a mix of commercial, residential, and other types of developments) while reducing climate-related risks, received broad support.

Some submitters raised questions about potential impacts to housing affordability and buildability and sought assurance that groups such as those on lower incomes would not be adversely impacted. Others, including local government, discussed the possibility of extending this proposed recommendation to cover embodied carbon and whole-of-life emissions.

A range of respondents called for greater policy coordination to address potential conflicting system outcomes, seeking a consistent national approach to delivering low emissions infrastructure.

We heard concerns that certain climate risks could be exacerbated as a result of increased densification, with submitters emphasising that density needs to be done well and calling for greater focus on the role of greenspaces and biodiversity in dense urban areas.

There was also general support for our proposed recommendation that the Government accelerate comprehensive retrofits to deliver healthy, resilient, and low emissions buildings. Some thought that commercial buildings should be required (rather than encouraged or enabled) to make changes. Others suggested that, to prevent increasing inequality, support should first target those in most need.

Local government submissions strongly supported this proposed recommendation. However, a few other submitters saw our proposal as redundant, given the existing Warmer Kiwi Homes programme. They suggested instead that the Government should more strictly enforce existing rules such as the Healthy Homes Standards.

There were mixed views on our proposed recommendation that the Government prohibit new fossil gas installation in buildings where there are affordable and technically viable low emissions alternatives.

We heard requests for more clarity on what would be exempt under the proposed recommendation and questions of who would determine what is affordable, and how. Some respondents emphasised the need to phase out fossil fuel use in buildings entirely.

Other submitters viewed the proposed recommendation as overly prescriptive and premature, saying it could negatively impact fuel diversity and resilience, consumer choice, investment in renewable gases, and risk placing significant pressure on electricity distribution networks due to increased demand. They suggested that instead, Government should bring forward the development of the gas transition plan and national energy strategy.

This viewpoint was complemented by several submitters who urged greater discussion on the role of decentralised energy systems as a resilience measure for communities.

How we responded

To reflect what we heard from consultation, we included additional discussion on embodied carbon, and how education, training, and behaviour change can support emissions reduction. We also added evidence about the key role of electrification in reducing emissions from building heating.

We strenghtened our advice on policy cohesion, pointing to the need to address current unresolved conflicts and support policy alignment through clear central government direction.

Recommendations 13 and 14 received broad support, and we made only minor changes to improve their clarity.

An integrated planning system that results in 'density done well' provides the opportunity to ensure that future generations across all income levels inherit a high quality, low emissions urban environment. Rather than seeking regulation which would impact building costs and housing affordability, Recommendation 13 seeks to address the misalignment between existing urban form and Aotearoa New Zealand's emissions reduction targets.

Retrofitting existing buildings can be complex. There are currently limited incentives to retrofit given the upfront costs associated with equipment and installation, potential space requirements, and disruptions during construction. Recommendation 14 reflects our analysis findings that incentives to retrofit are preferable to regulation.

Recommendation 14 is intentionally broader than the existing Warmer Kiwi Homes programme. Installing insulation, upgrading windows, improving weathertightness, and switching away from fossil fuel heating and cooking can improve health outcomes, reduce exposure to a rising carbon and fuel prices, increase resilience to extreme weather events, and lower overall running costs. However, these come with upfront purchase and installation costs, which is what the recommendation seeks to help overcome.

Recommendation 15 got a more mixed reception, and we used our policy and prioritisation frameworks to evaluate whether any changes were needed. Our analysis showed that the investment required to continuously expand fossil gas infrastructure would be recovered from consumers, some of whom may not have a choice in what fuel they use or have the ability to change energy use patterns. This could effectively lock in their exposure to a rising carbon price and fossil fuel costs.

Some respondents felt that fossil fuel use in buildings should be phased out entirely. While our recommendation is aimed at limiting the installation of new fossil gas connections, encouraging and incentivising the installation of electric and induction technologies will lead to both short and long-term emissions reductions. As a result of this analysis and in response to feedback, we revised the recommendation to be more outcomes focused.

Circular economy and bioeconomy

Feedback regarding our draft advice on the circular economy and bioeconomy was somewhat mixed. As with other chapters focused on creating and supporting an enabling environment for decarbonisation, we heard strong calls to include recommendations, as action in this area is necessary to meet emissions budgets.

Some submissions emphasised the need for local government to be supported to participate in the transition to a more circular economy and sustainable bioeconomy. We heard about the importance of working in partnership with iwi/Māori and in collaboration with business to achieve desired outcomes. Some submitters wanted a focus on degrowth, where economic activity would be decreased as a means of reducing emissions.

Other respondents, however, were less certain about the concept of a circular economy, expressing doubts about whether economic growth and decarbonisation can be compatible.

Submissions and case study evidence from iwi/Māori

From iwi/Māori representatives, we heard support for a push towards a circular bioeconomy as a means of generating opportunities. Some respondents reflected on the need for a more holistic view towards reducing emissions, and ensuring that interrelated issues are not considered in isolation.

Similarly, several Maui.Tech participants emphasised the interconnectedness of the natural world and the scope for Māori landowners and commercial entities to lead bioproduct innovation in the bioeconomy.

Circular economy

We heard general support for our proposed recommendation to accelerate the transition to a more circular economy.

Many submissions, particularly those from local government, requested that the Commission expand our advice to address the opportunities to avoid the generation of construction and demolition waste and to reduce the amount of this waste – and waste more generally – sent to landfill.

Respondents identified waste timber as requiring particular attention, as it could help fill the anticipated increase in demand for biomass resources and reduce emissions from landfill. Waste timber's frequent contamination with the heavy metal preservative CCA (copper, chrome, arsenic) was identified as a challenge to reducing the volume of timber sent to landfill. Potential solutions suggested by submissions included product stewardship or introducing bans on the use of CCA.

We received numerous requests for the Commission to provide more direct support for advancing product stewardship, which submitters viewed as a key opportunity to reduce supply chain emissions. Some voiced concern that our draft was at risk of missing a critical opportunity to establish the pathway for product policy and effective product stewardship.

Bioeconomy

We heard calls for a recommendation to address the barriers limiting the transition to a more sustainable bioeconomy. Submitters requested that we present to the Government options such as reinstating the sustainable biofuels obligation, introducing waste minimisation policies to address plastic waste, and planning for circular and bioeconomy infrastructure.

Numerous submitters identified the need for better data, as well as robust economic modelling and analysis. We also heard support for advancing a national information-sharing platform focused on bioeconomy-related research and market opportunities.

We heard strong support for the Government to conduct a biomass strategic use assessment, as sector projections suggest that the demand for fossil fuel alternatives is likely to quickly exceed Aotearoa New Zealand's capacity to produce biomass fuels.

Respondents also discussed the importance of enhancing industry-user confidence in biofuel development, including the potential introduction of an accreditation scheme to support funding decisions.

Several submitters were of the view that production forests should be recognised as a 'sustainable' supply of timber and biomass in a circular bioeconomy and that harvested wood products have a role to play in meeting Aotearoa New Zealand's Nationally Determined Contribution under the Paris Agreement. Some submitters requested more focus on the potential of harvested wood products to displace fossil fuels, plastic packaging, concrete, and steel.

The circular economy and bioeconomy strategy

Submissions on the circular economy and bioeconomy strategy stressed its importance, and that it should cover both climate change adaptation and mitigation.

We heard some concerns that waste infrastructure planning is currently disconnected from the strategy, and that the lack of coordination may inhibit progress towards respective goals.

Some respondents advocated for the strategy to include investment in a wide range of organics processing systems and identifying onshore recycling and processing facilities waste.

How we responded

We revised the structure of this chapter for clarity, adjusted its position within the report structure, and included new content to better explain the concept of a circular bioeconomy and its role in climate change mitigation.

In light of evidence and strong feedback provided through consultation, we re-examined our draft advice in this chapter to determine whether it appropriately reflected our policy and prioritisation frameworks, and our assessment of the risks to emissions budgets caused by gaps in action.

As a result, we added two new recommendations related to the circular economy – one focused on strengthening product stewardship and the other on reducing emissions from construction and demolition waste.

We also added a new recommendation focused on the guidance and regulation needed to advance a circular bioeconomy, reflecting evidence and feedback that there is currently a lack of clarity, direction, and momentum required to realise the benefits of a sustainable bioeconomy.

Energy and industry

Our draft advice on energy and industry, including our proposed recommendations, received broad support.

Several submitters suggested that we extend our proposed recommendation about renewable electricity generation and electricity distribution networks to encompass the transmission network. Others expressed a desire for the proposed recommendation to address the whole energy system rather than focusing on aspects of the electricity system.

We also heard from local government about the importance of energy security and equity, and the potential role for community-level distributed generation to improve resilience.

Many submitters also wanted our advice to urge the Government to deliver on actions from the emissions reduction plan, including accelerating the development of the gas transition plan and national energy strategy to reduce uncertainty for businesses and councils.

The critical role of electricity distribution businesses was a strong theme. Many submitters wanted our advice to highlight the importance of regulatory frameworks that encourage and enable proactive investment and innovation in critical areas for climate change mitigation and resilience.

Most agreed that there is a need for clearer direction on balancing and resolving potential conflicts between system outcomes, and for greater policy coordination across central government regarding the resource management system.

Submissions and case study evidence from iwi/Māori

We heard from iwi/Māori representatives that there is a strong desire for more action around sustainable energy, but that barriers are hindering progress. Some respondents indicated that price was a barrier to more sustainable energy use (such as the uptake of electric vehicles), while others noted they were unsure of what leadership in this space might look like.

We heard suggestions that solutions could include storytelling to overcome local resistance and change mindsets, and that appropriate partnership and additional support could better enable iwi and hapū to transition their energy generation and use.

Some Maui.Tech participants discussed their involvement in a range of energy initiatives, such as geothermal and bio-energy research and innovation, and shared their aspirations to build independent renewable energy supplies.

Overall, respondents identified infrastructure as a key component of the energy transition and found the consenting system to be a significant barrier.

Many of these submitters raised specific concerns that the Natural and Built Environment Act and the Spatial Planning Act will not address climate change more effectively than the current Resource Management Act. Local government submissions called for transitional plans and clear guidance, and expressed interest in being more involved in developing the national energy strategy.

We also heard broad support for our proposed recommendation that the Government pursue more widespread decarbonisation of process heat and establish mechanisms for other industrial sectors and processes to decarbonise. Some suggested we expand the proposed recommendation to explicitly include heavy industries with hard-to-abate emissions.

Several industry submitters suggested a new recommendation urging the Government to support the development of new low emissions gases, including through policy and coordination.

As in other areas of our advice, submitters highlighted challenges related to workforce capacity and capability. They pointed to the need for the Government to have clear objectives around immigration policies, workforce development, and the education system to ensure Aotearoa New Zealand has the expertise required to reduce emissions in line with emissions budgets.

How we responded

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 19 now includes further specificity regarding partnership with iwi/Māori as renewable electricity generation build is accelerated, and electricity networks are strengthened and upgraded.

Several submitters suggested we extend our proposed recommendation about renewable electricity generation and electricity distribution networks to encompass the transmission network. We amended Recommendation 19 by removing the word 'distribution' to ensure it applies to transmission and distribution networks. In the body of our advice, we added text emphasising that transmission infrastructure investments have long lead times and are often inconsistent in level and frequency.

Some respondents expressed a desire for the proposed recommendation to address the whole energy system rather than focusing on aspects of the electricity system. As this was covered in our advice in *Ināia tonu nei*, this advice instead highlights electricity supply, which is critical to meeting emissions budgets but has associated barriers which need to be addressed during the second budget period. We do note in our report that the electricity system is highly interlinked with other sectors such as gas and industry.

We heard from local government about the importance of energy security and equity, and the potential role for community-level distributed generation to improve resilience. In our advice we acknowledge community-scale and local renewable energy generation projects and their potential benefits, and that a careful and managed transformation of the energy system is needed to maintain energy security, affordability and reduce emissions.

Several industry submitters suggested a new recommendation urging the Government to support the development of new low emissions gases including through policy and coordination. However, our analysis finds there is insufficient evidence around the possible future availability of biogas – including its accessibility, economic viability, and cost to consumers – to warrant continued expansion of the gas network. While we did not include this suggestion in our final advice, we do note that considered assessment by the Government of the future role and cost of these gases is needed.

Our changes to the text also include adding a cross-reference to *Chapter 12: Circular economy and bioeconomy* to address the suggestion from some submitters that a new recommendation on low emissions gases be developed. We added clarifying discussion of fossil gas as well as on carbon capture and storage (CCS), carbon capture and utilisation (CCU), and carbon dioxide removal (CDR).

Forests and other carbon stocks

We heard a diversity of opinions regarding the role of forests in achieving emissions budgets and the 2050 target. Broadly, however, submitters supported a focus on gross emissions reductions and our proposed recommendation that the Government set and implement integrated objectives for the role of forests while giving effect to the principles of Te Tiriti o Waitangi/ The Treaty of Waitangi.

Some respondents felt that forests should not play a long-term role, or that planting forests should not be relied on to reach and sustain net zero of long-lived greenhouse gases in accordance with the Act. Others asserted the importance of forests and the need to use them to offset emissions. We heard that carbon removals by forests should not count against fossil carbon, only past deforestation emissions, and that emphasis should be on the permanence and resilience of forests over offsetting emissions.

Overall, we heard support for native forests and more mixed views on the role of production forestry, ranging from strong advocacy to assertions that exotic trees should not be included in the permanent forests category. Some respondents wanted the Government to incentivise native forests over exotic ones.

Some pointed out that the forestry sector provides resources for carbon removals through wood products (the bioeconomy) and technology-based carbon removal.

Submissions and case study evidence from iwi/Māori

We heard a diverse range of perspectives from iwi/Māori representatives. Several respondents called for greater consistency in NZ ETS pricing and policy to support long-term decision-making on forests, noting that current uncertainties are making planning ahead challenging.

Several Maui.Tech participants cited the importance of collective action to:

- protect forest health and taonga species
- cleanse the atmosphere through healthy forestry
- diversify wood products
- manage erosion risks and reduce sediment flow into rivers resulting from deforestation, including through increasing native forestry.

Consultation respondents identified the cost of moving more towards native forestry as a barrier. Suggestions for incentivising native forestry included reducing the cost of seedlings, government assisting with costs for planting on marginal land, and government supporting landowners to plant natives without the additional costs being passed on to them.

Some noted that good work already being done by Māori in native forestry is largely going unrecognised in the current system. We also heard calls for further research to be conducted to support future decision-making around native forestry.

We heard differing views about how forest types perform in terms of the rate and volume of their carbon storage, and their resilience to pests and storms. A range of submitters told us that our use of the term 'risk' in relation to forests was not clear enough and applied inconsistently across different chapters of our draft advice.

There was overall consensus that acknowledging the multiple benefits of forests – including improving biodiversity, water quality, and land stability – is appropriate and necessary. Submitters called for integrated objectives, holistic management and policies, and avoiding single-issue thinking or decision-making.

However, we also heard that excess exotic forest planting has negative biodiversity and environmental impacts, and that land-use change from agriculture to forestry can present difficulties for rural communities.

For many respondents, the challenges facing the forestry sector are also in some dispute. Some submitters shared their concern about the impact of changing environmental conditions on the ability to grow and maintain forests, subsequently reducing their ability to store carbon long term. Others expressed the view that production forestry management practices will sufficiently address climate-related disturbances to forests.

How we responded

For clarity, we updated the title of the chapter to better reflect its content. We restructured and revised the text to include additional information and to acknowledge some of the concerns and questions raised in consultation.

We amended Recommendation 21 to be more specific about moving Aotearoa New Zealand towards landscapes with durable carbon storage and other co-benefits.

Through submissions, we received feedback that our use of the term 'risk' in relation to forests was unclear and inconsistently applied. In response, we clarified that forests are an important source of carbon removal and storage, but also carry a risk of carbon release due to human activities or events such as floods or fire. We also added a new section on the challenges of using forests as a carbon removal strategy, including difficulties relating to the cost of establishing native trees and competition for land, which is expected to increase as extreme weather events become more common.

We added a new section on the multiple benefits forests provide, and how some practices, including clear-fell harvesting, can reduce these benefits and result in negative outcomes.

We also included discussion of the Government's recently announced Carbon Removal Strategy and its potential impact on how carbon removal activities will be recognised and rewarded. This section includes explanations of the two key characteristics about carbon removal for the purpose of reducing emissions (permanence and additionality) and the factors that affect the contribution forests make to carbon removal and storage (carbon sequestration rates, carbon density, and carbon storage durability).

Transport

While submissions were generally positive regarding the direction of our draft transport advice, we heard calls for greater detail and specificity in our proposed recommendations, and for them to be expanded to include both incentives and regulation to drive change.

Respondents strongly agreed that the relationship between transport planning and land-use planning is interdependent. We heard that an integrated approach between transport and urban development is critical and that these processes should be simplified and fully integrated.

We received consistent feedback that transport infrastructure and services need significantly more funding to achieve decarbonisation in line with emissions budgets. This was particularly emphasised by those involved in delivering these services and infrastructure including local government, who also sought greater clarity of their roles and responsibilities.

Some submissions wanted greater leveraging of private investment to finance the transition, and others stated that funding for low emissions transport should not come at the expense of Aotearoa New Zealand's ability to maintain the existing roading network.

Submissions and case study evidence from iwi/Māori

We heard general agreement with our draft advice that transport provides a significant opportunity to reduce emissions. We heard that Māori land is urban as well as rural, making transport in and out of cities relevant to iwi/Māori and their rights and interests.

Within Maui.Tech, participants active within the tourism industry referenced the need to limit transport-related impacts on te taiao.

While submissions generally agreed it is important to change how people travel, some submitters raised concerns about the proposed deadlines for cycleways and rapid transit. We also received feedback that our draft advice had a disproportionate focus on Aotearoa New Zealand's largest urban centres, with respondents seeking opportunities for more equitable funding allocations across regional and more rural centres.

In addition to changing how people travel, submitters proposed the reintroduction of passenger rail on existing rail lines and a public campaign promoting behaviour change that would reduce consumption, such as using e-scooters and bikes, or working more from home.

Respondents generally supported our proposed recommendation on electric vehicle charging infrastructure and our supporting advice, including on introducing mandatory smart charging, the need for government support for installing charging infrastructure, and the role of public-private partnerships.

Response to our proposed recommendation about accelerating the uptake of zero emissions commercial vehicles was broadly supportive. However, we received feedback that electric vehicles are less accessible for some groups of people, and that focusing on increasing public transport, and safe walking and cycling infrastructure delivers more equitable emissions reduction solutions.

Some submitters expressed interest in alternative fuels, including biofuels and hydrogen, as a means of decarbonising transport, including freight. Others were hesitant to support hydrogen fuels as they are less energy-efficient to produce.

How we responded

Some respondents requested greater detail and specificity in our proposed recommendations, and for them to be expanded to include both incentives and regulation to drive change. However, our role is to provide advice on the direction of policy, rather than to give detailed policy recommendations. The main body of our advice discusses incentives and regulations extensively, including a section on the need for these measures to decarbonise freight, commercial, and offroad vehicles.

Some submissions raised potential equity concerns related to our recommendation about accelerating the uptake of zero emissions commercial vehicles. Our analysis, which included evaluating the evidence and applying our prioritisation and policy frameworks, has led us to keep the recommendation. Our advice emphasises the significant benefits of increasing walking, cycling, and public transport. Recommendations 23 and 24 are focused on enhancing public and active transport options for the public.

In light of evidence and insights provided by submissions, we re-evaluated Recommendations 23 and 24 against our policy and prioritisation framework and as a result, made several revisions.

The changes are intended to provide more clarity, address feedback related to funding, and examine whether cycle and rapid transport network deadlines are achievable. We also evaluated the proposed recommendations to ensure they are appropriately outcomes focused.

Recommendation 25 was amended for clarity, and Recommendation 26 was revised to include 'off-road vehicles', as our analysis found they that although they offer opportunities for emissions reduction, they are not currently being given adequate focus by the Government.

We also added and revised chapter content in response to issues raised in consultation. The chapter now discusses more clearly the mental and physical health benefits of changing how people travel, the opportunities of inter-regional passenger rail, the additional regulatory measures required to increase zero emissions vehicle uptake, and the focus needed now to prepare for the aviation sector to decarbonise in future.

Waste and fluorinated gases

Waste

While we heard diverse opinions on our draft advice on waste, our proposed recommendation, which focused on improving landfill gas capture efficiency, received general support.

Positive reactions from submitters often came with associated requests to strengthen our advice related to waste reduction and avoidance, and discuss the option of banning organic waste disposal to landfill. We also heard calls for the Government to look at ways to increase the circularity of products (see *Chapter 12: Circular economy and bioeconomy*).

We heard support for reducing emissions from historic or closed landfills, and for all disposal sites (or as a minimum, those receiving organic materials) to be included in the New Zealand Emissions Trading Scheme (NZ ETS). Submitters who supported this idea expressed concern that, as the NZ ETS currently only covers active municipal landfills, waste may be diverted to other landfills rather than being reduced.

Some submitters disagreed with our draft advice about phasing out disposing organic waste to landfill, arguing that landfills which meet certain criteria (for example modern, Class 1 landfills) should be considered an appropriate destination where no local alternatives exist. We also heard about the importance of considering how landfill gas systems will change as the types of waste and the means of processing them change over time.

Respondents expressed concern about proposals to establish waste-to-energy facilities in Aotearoa New Zealand. Some were in outright opposition to the technology on the basis that it could inhibit the transition to a circular economy or hamper efforts to develop low impact alternatives.

Of the submissions that discussed strategic infrastructure planning, there was general recognition that this is an important element of ensuring long-term and sustained emissions reduction, with some highlighting the need for this plan to be informed by the circular economy and bioeconomy strategy.

F-gases

We did not receive a high volume of submissions on our draft advice for F-gases, but what we did hear was largely supportive.

Respondents shared concerns that F-gases are being illegally vented during the processing and disposal of products and appliances, and that effective controls are highly important. Some submitters suggested that all refrigerant appliances should be subject to a free take-back scheme as part of a product stewardship system.

Respondents identified the accuracy of F-gas data as an area of concern, with some suggesting that general emissions estimates (estimates looking at all greenhouse gases and not targeted specifically to measuring F-gases) tend to overestimate these emissions by about a factor of two. These submissions promoted directly measuring F-gas levels in the atmosphere to independently assess and improve data accuracy.

How we responded

As a result of consultation feedback, we edited Recommendations 26 and 27 for clarity and to ensure they are appropriately outcomes focused.

Some submitters were of the view that landfills such as modern, Class 1 landfills should be considered an appropriate destination for organic waste where no local alternatives exist. In *Ināia tonu nei*, we recognised the importance of shaping plans in line with the waste hierarchy, which classifies disposal as the least favoured option below waste avoidance or resource recovery. Our current advice builds on this analysis by encouraging the phase out of organic waste disposal to landfill where appropriate diversion facilities exist. In additional to preventing potential methane emissions, alternative methods of organic waste management like composting can have benefits for the environment and for communities.

While submissions generally supported our proposed recommendations, we did receive requests to strengthen our advice. We addressed this feedback through changes to this chapter, and by adding recommendations in *Chapter 12: Circular economy and bioeconomy*.

We revised the chapter text to emphasise the importance of avoiding and reducing waste. This message reiterates and builds on our advice from *Ināia tonu nei*, where we recommended that the New Zealand Waste Strategy (Te rautaki para | Waste strategy) use the waste hierarchy of 'reduce, recover, and dispose' as a guiding principle for action to "significantly decrease waste generation and increase resource recovery".

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

hui ā-tinana
in person meetings

rangatahi
young people, youth

ahuwhenua trusts
land management trusts established under Te Ture Whenua Māori 1993, often used for commercial purposes and led by the trustees who are responsible for governing the whenua on behalf of all owners

rohe
regions, tribal districts, territories

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[i]

mauri
life principle, life force, vital essence - the essential quality and vitality of a being or entity. Can also be used for a physical object, individual, ecosystem, or social group in which this essence is located

Te Ture Whenua Māori entities
refers to any entities administered by Te Ture Whenua Māori Act (TTWM), which provides legal definitions for different types of Māori land ownership. Two types of Māori land are defined – Māori freehold land and Māori customary land. TTWM also refers to general land owned by Māori, which is land privately owned by an individual or a collective. Depending on the circumstances of the owners, it may be determined by the Court to be subject to Te Ture Whenua Māori Act 1993.[ii]

mana whenua
the mana and rights held by those with historic and territorial rights over land in a particular area, authority derived through whakapapa links to that area

mātauranga ā-iwi
Māori knowledge localised to a specific iwi, Māori knowledge within iwi contexts

taonga
treasure, anything prized – applied to anything considered to be of value including socially or culturally valuable objects, resources, phenomena, ideas and techniques

kaitiakitanga
guardianship, stewardship, trusteeship

manaakitanga
hospitality, kindness, generosity, support – the process of showing respect, generosity and care for others

tino rangatiratanga
self-determination, sovereignty, autonomy, self-government

wāhi tapu
sacred place, sacred site such as a burial ground, a battle site, or a place where sacred objects have been placed

te taiao
the world, Earth, the natural world, the environment

i. He Pou a Rangi Climate Change Commission, *Ināia tonu nei*: a low emissions future for Aotearoa (Wellington: He Pou a Rangi Climate Change Commission, 2021) <https://www.climatecommission.govt.nz/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf> [accessed 18 September 2023] (pp. 158 & 217).

ii. Te Kooti Whenua Māori | Māori Land Court, Ngā kupu ture Legal, https://www.māorilandcourt.govt.nz/en/maori-land/legal-terms/> [accessed 18 September 2023].

2: Te mātai ki te ora

Part 2 The fundamentals for success

Tuatoru: Chapter 3

Ngā nuka ki te tahua tukuwaro tuarua
The task for the second emissions budget

Introduction

Evidence clearly demonstrates that meeting the second and third emissions budgets will require concerted and timely action at local and national levels and across all sectors.

This chapter provides an overview of what will be needed to meet the second emissions budget and set the country up to achieve the third emissions budget and Aotearoa New Zealand's longer-term emissions reduction targets. It builds on previous advice from He Pou a Rangi Climate Change Commission (the Commission) on the first three emissions budgets, and policy direction for the first emissions reduction plan (in *Ināia tonu nei*).

Our reflection on the Government's assessment of the expected effect of the first emissions reduction plan underlies our analysis of further actions needed. What is achieved in the second emissions budget period will directly impact what is possible in the third period (2031–2035). Delays in the near term can lead to much higher cumulative emissions in future years.

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice, including the consistent theme that greater clarity is needed on the Government's approach to emissions reduction.

This chapter provides important context for our advice on emissions pricing options (*Chapter 5: Emissions pricing*), and on the low emissions options for sectors and systems (in *Part 3*).

Rather than providing direct recommendations to the Government, we highlight key risks, issues, and opportunities for the Government in deciding its approach to the second emissions reduction plan, and the options it has for achieving emissions budgets.

We anticipate the need for particularly large contributions from electricity generation and process heat in the second emissions budget, and from transport in the third emissions budget. While forests will continue to play a critical role in achieving emissions budgets through carbon dioxide removals, new exotic forest areas will not reduce net emissions in the same period they are planted.

We also note emissions budgets set an upper limit for net emissions of greenhouse gases. Any emissions reductions beyond the minimum required by budgets (known as overachieving budgets) increase the likelihood of meeting later emissions budgets and the 2050 target. For the second emissions budget, overachieving would also reduce the need to purchase offshore mitigation to meet Aotearoa New Zealand's first Nationally Determined Contribution (NDC).

Changes from the draft version of this chapter

In response to feedback, we added text that clarifies the purpose and function of emissions budgets as setting upper limits for emissions. We also more clearly identified the benefits of overachieving the second emissions budget, including increasing the likelihood of meeting future emissions budgets and the 2050 target, and helping to close any gaps between Aotearoa New Zealand's domestic and global commitments to mitigate climate change.

Our draft advice discussed the importance of achieving the 2030 biogenic methane component of the 2050 target. In response to concerns raised in submissions about whether Aotearoa New Zealand is on track to achieve this target, we have included additional text and figures emphasising where further action is needed. Our final advice states that implementing agricultural emissions pricing from 2025 will be key to closing the gap to meeting the sector sub-target for agriculture.

In response to local government requests for more detail regarding regional emissions reduction, we added a diagram illustrating activities with the greatest potential for emissions reduction across the first, second, and third emissions budgets. This information is also now in our table of 2030 benchmarks for action, and is intended in part to help regions and communities identify and prioritise the actions they will take and support.

We also added more discussion on the role of forests in an approach that prioritises gross emissions reductions and made a number of related changes to *Chapter 4: A path to net zero*.

Context

The demonstration path models a way Aotearoa New Zealand can meet the emissions budgets and achieve and sustain the 2050 target

As part of our advice in *Ināia tonu nei*, the Commission developed a set of scenarios to explore in detail how Aotearoa New Zealand can achieve and sustain the 2050 target and contribute to the global efforts to limit the global average temperature increase to 1.5°C above pre-industrial levels. These scenarios tested uncertainty around the pace and nature of technology, looked at behaviour changes that could be achieved over the coming decades, and examined the implications for meeting the 2050 target.

In accordance with the Climate Change Response Act 2002 (the Act), we considered a wide range of matters regarding Aotearoa New Zealand's transition. This included the potential economic, social, and environmental effects across time and across regions, the Crown-Māori relationship, te ao Māori, and specific effects on iwi and Māori.

Together, our analysis led to the development of a pathway to 2035: the demonstration path. The demonstration path reflects a package of actions that would set the country up to deliver the 2050 target in line with the Act's considerations and create options to manage uncertainty. This path was used to set our recommended emissions budget levels for 2022–2025, 2026–2030, and 2031–2035, as illustrated in **Figure 3.1**.

Overall, we sought to create a path that was equitable, ambitious, and achievable.

Our economic modelling indicated that the economy would continue to grow under the recommended emissions budgets. We assessed that the level of gross domestic product (GDP) could be around 0.5% lower in 2035 and 1.2% lower in 2050 than it would be otherwise, a conclusion consistent with findings overseas.

Low emissions technologies and practices invested in now will open up new opportunities and reduce the risk of damaging the country's reputation due to a lack of credible climate action. However, delaying key actions like transitioning to electric vehicles and embedding more efficient farm practices could result in the level of GDP in 2050 falling by around 2.3%.

We updated the demonstration path in 2022 to reflect changes in underlying data sources and bring it into alignment with the budgets set by the Government for the first, second, and third emissions budget periods (see **Box 3.1**).

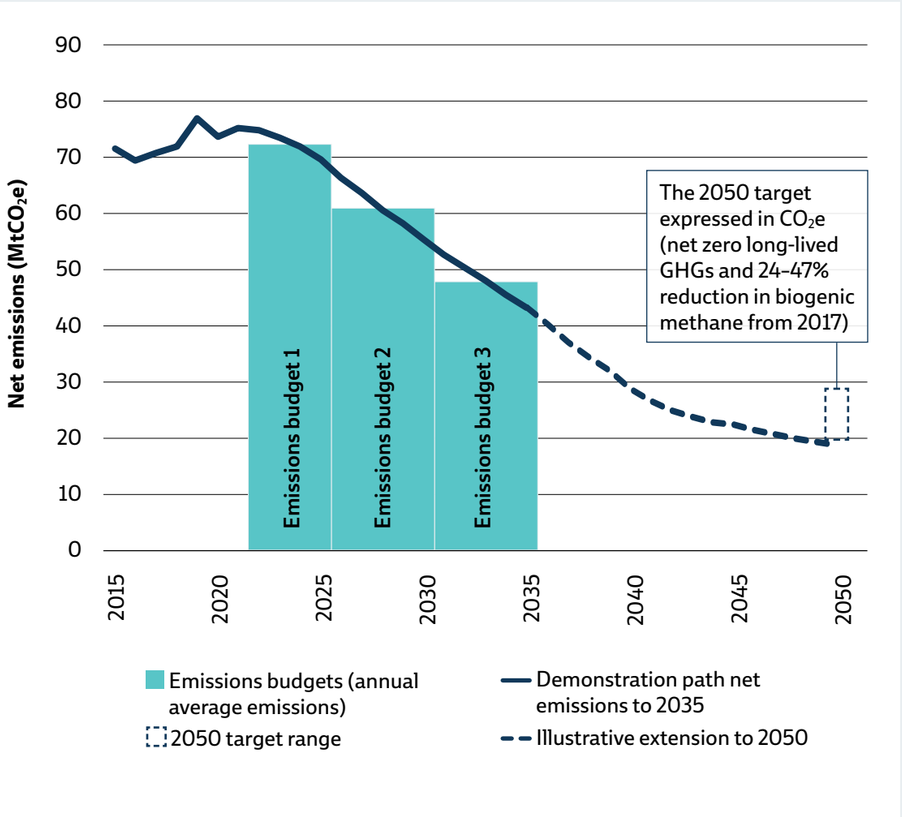

Figure 3.1: The emissions budgets, the 2050 target, and the Commission's demonstration path with illustrative extension to 2050

Source: Commission analysis

Notes:
1. 2022 update to demonstration path (see Box 3.1).
2. Net CO_2e emissions expressed using GWP_{100} values from the IPCC's *Fifth Assessment Report* (AR5) and the 'target accounting' approach for forestry emissions and removals as described in the glossary.
3. Emissions budgets are expressed as a net total but are based on meeting the separate components of the 2050 target.
4. The demonstration path is lower than the 2050 target expressed in CO_2e because it would result in long-lived greenhouse gases meeting net zero around 2040 and then being net negative by 2050.

Box 3.1: Updates to the demonstration path in 2022

In 2022, the Commission made a set of updates to the demonstration path for use in our advice on the New Zealand Emissions Trading Scheme unit limits and price control settings for the years 2023–2027.
We updated our Energy and Emissions in New Zealand (ENZ) model and our scenarios to incorporate new source data and information released since *Ināia tonu nei* was published. This included:

- the 1990-2020 Greenhouse Gas Inventory (published in 2022), which implemented several methodological changes
- updated forestry projections from the Ministry for Primary Industries, which the Government had incorporated in its decisions on the first, second, and third emissions budgets
- decisions and announcements affecting future industrial activity, including the conversion of the Marsden Point oil refinery to an import terminal and the New Zealand Aluminium Smelter owners' revised intention to continue operation beyond 2024.

We published an updated dataset and technical note with our 2022 NZ ETS settings advice and have republished these alongside this advice. This updated version of the demonstration path is used throughout this report.

To meet budgets, concerted and timely action is needed across all sectors of the economy

Our work in *Ināia tonu nei* identified a range of opportunities available now to reduce emissions across all sectors of the economy, as pursuing a range of opportunities will give Aotearoa New Zealand the best chance to deliver on its emissions budgets and the 2050 target.

In some areas, policies and actions may achieve more than is anticipated. In others, progress may be harder than expected. A comprehensive approach will also enable learning and innovation based on new data and information, and course correction when necessary.

At the same time, resources and capacity for change are always subject to limitations and trade-offs. Identifying which actions offer the greatest emissions reduction potential and focusing efforts in those areas will therefore be important for an efficient and affordable transition. Consultation submissions from local government also pointed to the importance of aligning regional planning with central government policy direction on emissions reductions.

As was reiterated in feedback we received through consultation, emissions budgets are the upper limit for allowable emissions rather than a goal. If achieving emissions reductions beyond the emissions budget requirements becomes possible, doing so would offer several advantages, including closing the gap to meeting Aotearoa New Zealand's NDC under the Paris Agreement (see *Chapter 1: Introduction*).

The Government set sector sub-targets based on the Commission's demonstration path to track progress

In the first emissions reduction plan, the Government identified six sector sub-targets as tools to help track progress across key areas of the economy. The sub-targets were based on the Commission's demonstration path from *Ināia tonu nei* and are expressed as the total emissions for each sector in each budget period. Unlike emissions budgets, the sub-targets are not legislated.

Table 3.1 shows the sector sub-targets, also expressed as the annual average emissions for each budget period.

The levels go up from the first to the second emissions budget because the first emissions budget period is a year shorter (four years rather than five years).

Emissions levels from 2019 are shown for comparison. These are taken from the 2021 National Greenhouse Gas Inventory (GHG Inventory), on whose data the sector sub-targets are based. As there have been refinements to the GHG Inventory methodology since these sector sub-targets were set, the Government will need to update these to keep them aligned with Aotearoa New Zealand's current emissions reporting.[i]

Table 3.1: Sector sub-targets in the first emissions reduction plan

	2019 emissions ($MtCO_2e$)	Sector sub-targets ($MtCO_2e$)			Annual average emissions ($MtCO_2e$/year)		
		EB1 (2022–25)	EB2 (2026–30)	EB3 (2031–35)	EB1 (2022–25)	EB2 (2026–30)	EB3 (2031–35)
Transport	16.2	65.9	76.0	56.8	16.5	15.2	11.4
Energy and industry	21.4	70.1	72.8	63.3	17.5	14.6	12.7
Waste	3.7	13.7	14.9	12.7	3.4	3.0	2.5
F-gases	1.7	6.8	7.5	5.9	1.7	1.5	1.2
Agriculture	42.4	159.4	191.0	183.0	39.9	38.2	36.6
Forestry	-7.6	-26.4	-57.2	-81.6	-6.6	-11.4	-16.3
Emissions budgets		290	305	240	72.5	61.0	48.0

Source: Commission analysis of *Aotearoa New Zealand's first emissions reduction plan*[1]

Notes:
1. 2019 emissions are based on the 2021 GHG Inventory for methodological consistency with the sector sub-targets.
2. The total of the sector sub-targets may not match the emissions budgets due to rounding.

i. Government agencies routinely update the methodology and historical data in New Zealand's GHG Inventory to improve the accuracy of the emissions estimates. The 2022 GHG Inventory saw updates in several areas, including the reassigning of a significant quantity of liquid fuel use from transport to stationary energy (see *Aotearoa New Zealand's first emissions reduction plan*, p. 222). The 2023 GHG Inventory resulted in further updates.

Scenario modelling shows where further emissions reductions are needed to meet the sector sub-targets

Both the Commission and Government agencies use baseline scenarios to underpin analysis of emissions reduction scenarios and policies. These baselines represent the expected changes in each sector under a continuation of existing policies and trends, sometimes referred to as 'business as usual'.[ii]

Figure 3.2 illustrates the emissions reductions expected across sectors, spanning the first three emissions budgets. These figures represent the gap between the government's projected baseline emissions prior to the introduction of policies from the first emissions reduction plan and the sector sub-targets. In other words, this shows where further emissions reductions are expected to come from, beyond business as usual, to meet the first three emissions budgets.

These figures include adjustments for the Tiwai Point aluminium smelter remaining open, which increases projected energy and industry emissions.[iii]

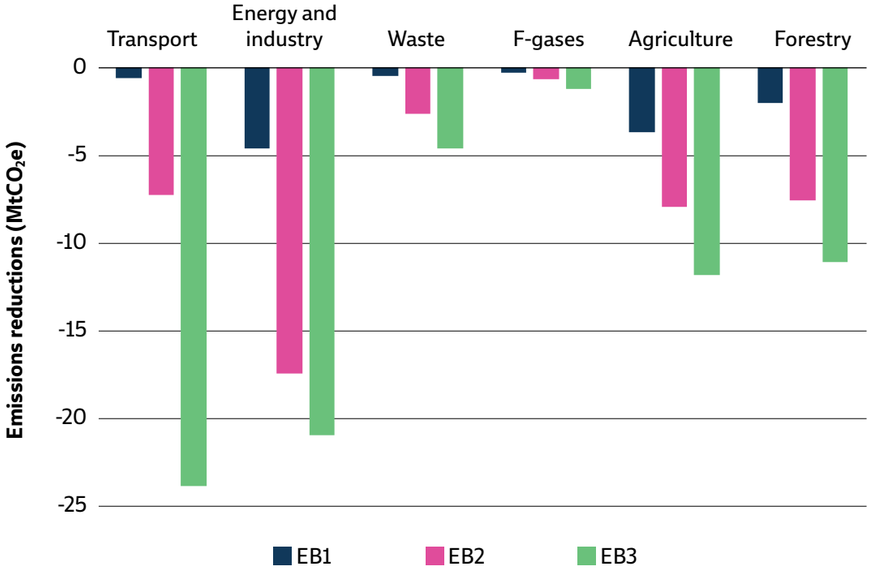

Figure 3.2: Additional emissions reductions needed relative to the government's baseline scenario to meet sector sub-targets in the first emissions reduction plan

Source: Ministry for the Environment[2]

Note:
1. Baseline emissions projections adjusted for oil refinery transition and aluminium smelter remaining open.

ii. For more information see *Ināia tonu nei* Supporting Evidence Chapter 11.

iii. Figures presented in the first emissions reduction plan report assumed the Tiwai Point aluminium smelter would close in 2024. The smelter causes direct process emissions of around 0.6 $MtCO_2e$ per year and has a significant wider effect on emissions from electricity generation. The government estimated the smelter staying open would result in an additional 2.4 $MtCO_2e$, 9.3 $MtCO_2e$, and 3 $MtCO_2e$ in the first, second, and third emissions budgets respectively (*Aotearoa New Zealand's first emissions reduction plan*, p. 222).

For the second emissions budget:

- the total quantity of emissions reductions needed is estimated at 43.5 $MtCO_2e$
- the largest share is expected to come from energy and industry, totalling 17.4 $MtCO_2e$, or around 40%
- the transport, agriculture, and forestry sectors are each expected to deliver reductions of 7–8 $MtCO_2e$
- the remaining 3.3 $MtCO_2e$ is expected to come from waste and F-gases.

The strong contribution expected from energy and industry in the second emissions budget period reflects the need for rapid emissions cuts from electricity and heat production. This can be done by building new renewable generation and switching coal and fossil gas heating in industry and buildings to electricity and biomass.

The main opportunities across other sectors include increased electric vehicle uptake, shifting to low carbon transport, ongoing improvements in farming practices, scaling up native afforestation, and reducing organic waste disposal to landfills.

The second emissions reduction plan must also deliver the 2030 biogenic methane component of the 2050 target

While emissions budgets are expressed as a net quantity of CO_2e including all greenhouse gases, the Government must also consider each of the separate components of the 2050 target. This includes the requirement for biogenic methane emissions to be reduced by at least 10% from 2017 levels by 2030. The second emissions reduction plan needs to ensure Aotearoa New Zealand has the strategies, policies, and actions in place to deliver on this.

The sector sub-targets set by the Government are in line with fulfilling the 2030 biogenic methane target. The Commission's demonstration path (on which these sub-targets were based) sees biogenic methane emissions reduced by more than 12% from 2017 levels by 2030. This anticipates combined reductions of around 11% in agriculture and 29% in waste.[3] In *Ināia tonu nei*, the Commission assessed that these reductions, which go beyond the minimum 10% level required by the 2030 biogenic methane target, are feasible and should be pursued.[4]

Action is needed now to get on track for the second and third emissions budgets and the 2050 target

Figure 3.2 above shows that across all sectors, emissions reductions need to build over time. The reductions achievable in the first emissions budget period are relatively small, as it takes time to implement and scale up actions. In many cases, further time is needed for these to meaningfully reduce emissions.[iv]

For instance:

- The pace at which low carbon technologies can replace high emissions technologies is often limited by the rate assets are retired, as well as other aspects such as workforce availability and capability.
- Low carbon infrastructure takes time to consent and build before it can be used.
- A newly planted forest absorbs little carbon dioxide initially, with the growth and absorption rate increasing over time (to an eventual limit).

These time lags and practical limits on the pace of change highlight the importance of prompt and decisive action to get on track for future emissions budgets and the 2050 target, as emissions reductions accumulate over time.

iv. Total emissions reductions over the first emissions budget also appear smaller because the first budget period is a year shorter.

Delayed action increases cumulative emissions

Figure 3.3 below presents an illustrative example of how a small delay in action can lead to much higher cumulative emissions. In light blue, we show a hypothetical action scaling up from 2022 to deliver 1 $MtCO_2e$ in annual emissions reductions by 2030. In dark blue, we show the same action delayed by two years.

The inset table shows the two-year delay would more than halve the total emissions reductions delivered out to 2030. It also shows how what might appear to be a small shortfall in the first emissions budget could become a much larger shortfall in the second budget, as the impacts of the delay accumulate.

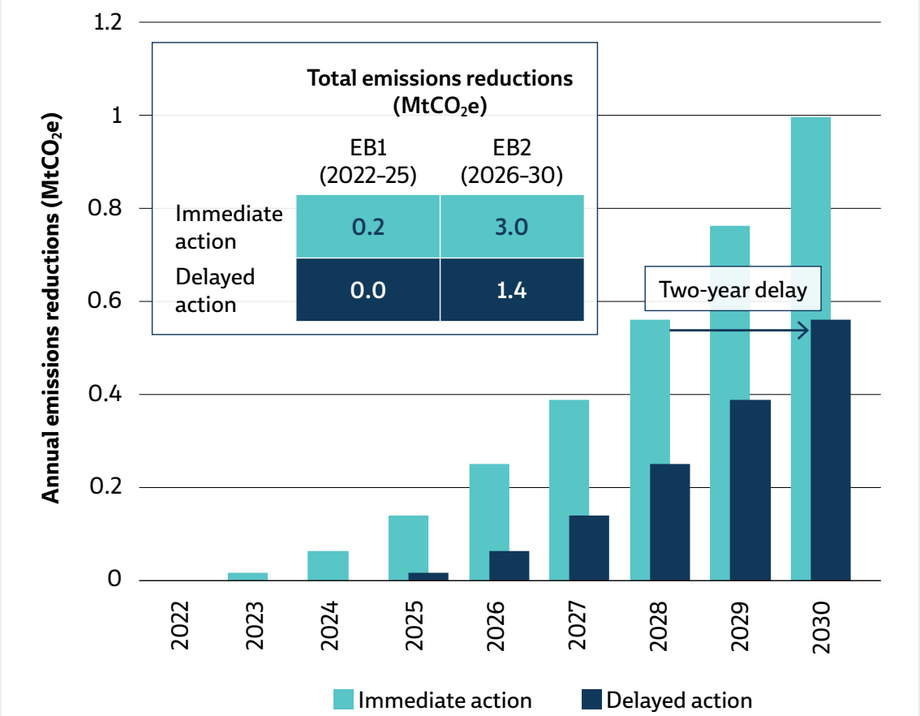

Figure 3.3: Illustrative example of how delayed action leads to higher cumulative emissions. The chart shows annual emissions reductions, and the table shows the sum over each emissions budget period.

Source: Commission analysis

The dynamics of electric vehicle (EV) uptake and the gradual turnover of the vehicle fleet provide a specific example. The large jump in emissions reductions expected from transport in the third emissions budget (see **Figure 3.2**) relies on a rapid scaling up of EV sales in the 2020s to steadily replace internal combustion engine (ICE) vehicles. Without that early scaling up, a higher-emissions vehicle fleet will be locked in and achieving the expected emissions reductions from transport will become more costly and disruptive.

These examples hold important lessons for how the second emissions reduction plan will impact momentum for the third emissions budget period. The ability to meet the third emissions budget will be strongly determined by actions taken before 2030. Likewise, meeting the second emissions budget depends on key actions being taken in the next two years under the first emissions reduction plan.

Box 3.3: How afforestation contributes to net emissions over time

A growing forest reduces net emissions as trees remove carbon dioxide from the atmosphere as they grow. However, there can also be carbon losses – meaning previously stored carbon dioxide is released into the atmosphere – when grassland is converted to a forest.

This box explains how the overall carbon balance changes over time for a newly planted exotic forest on grassland, according to New Zealand's Greenhouse Gas Inventory (GHG Inventory) and the research and data that inform it.[v] This also applies to how emissions and removals from this forest would count towards meeting emissions budgets.

Initial carbon losses can result from loss of existing biomass on the land, including when scrub is cleared before planting. Forest soil also stores less carbon than grassland soils; the GHG Inventory assumes it takes 20 years to reach the new, lower level.

As such, newly planted exotic forests are, on average, initially a source of carbon dioxide before becoming a sink. This means that exotic afforestation, while critical for achieving Aotearoa New Zealand's emissions reduction targets, actually *increases* net emissions for the first few years after planting.[vi]

Figure 3.4 shows the net carbon stock per hectare for a planted exotic forest relative to the land before planting, according to the GHG Inventory. A negative number means that, overall, less carbon is stored on the land than before planting.

The figure shows that the carbon dioxide removed by the growing trees only "pays back" carbon losses four years after planting. Up until then, the emissions from planting the new forest outweigh the removals.

This means that ramping up exotic afforestation during a given emissions budget period will not help to reduce net emissions in that same budget period. For example, exotic forests planted between 2027 and 2030 will increase net emissions during the second emissions budget period. They will also add net emissions towards the first NDC (2021–2030).

Afforestation is a key part of Aotearoa New Zealand's low emissions pathway, but planting new exotic forests does not reduce net emissions in the short term. This is another reason that a focus on gross emissions reductions is needed to meet the second emissions budget.

v. This differs to the way the emissions and removals by forests are recorded in the NZ ETS, which does not account for carbon losses from existing biomass and soil carbon.

vi. Note this is not the case for native afforestation when this is achieved through natural regeneration.

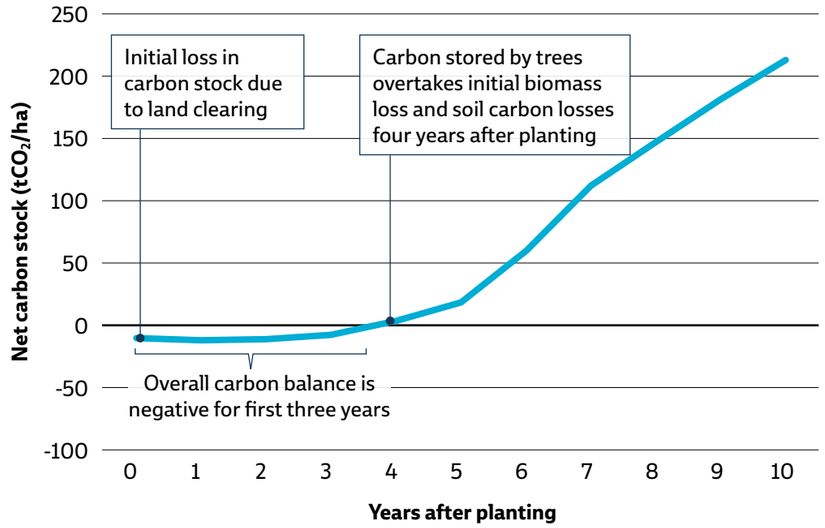

Figure 3.4: The average net carbon stock per hectare for a planted exotic forest over the first 10 years relative to before planting

Source: Commission analysis using data and methodology from the 2022 Greenhouse Gas Inventory

Benchmarking action needed to achieve the second and third emissions budgets can help inform policy decisions

Table 3.2 shows a collection of key changes occurring within sectors by 2030, taken from the demonstration path. This provides a tangible picture of the collective actions needed throughout the economy to meet the second emissions budget and to set up for the third.

This table is not intended as a prescriptive list but as a set of benchmarks to inform policy goals across the different areas, and against which to gauge actions taken.

Actual outcomes could differ, and different combinations of actions and efforts across sectors could also meet the emissions budgets.

The column on the right of the table shows our calculations of the emissions reductions these actions would individually provide over the second budget period. The emissions reductions are measured relative to projected emissions in the Commission's current policy reference scenario (updated in 2022). Care is required when comparing these numbers with those from the Government's first emissions reduction plan due to baseline differences.[vii]

vii. Our projected emissions for some sectors are lower compared with the government baseline in the first emissions reduction plan, due to our incorporation of more recent data and some differences in underlying assumptions and models. Overall, net emissions in our 2022 current policy reference scenario are 6.9 $MtCO_2e$ lower than the government baseline over the second budget period. This would leave a smaller gap of 36.7 $MtCO_2e$ to meet the second emissions budget.

This means the modelled emissions reductions for some actions would be larger when measured against the government's baseline. For example, we estimate that emissions reductions from electricity supply would rise from 3.3 $MtCO_2e$ to around 6.3 $MtCO_2e$ if measured against the government baseline.

Table 3.2: 2030 benchmarks for action to meet the second emissions budget and their modelled emissions reductions, based on the Commission's demonstration path

Sector	2030 benchmarks for action (Changes expressed from 2020 unless stated otherwise)	Emissions reductions from 2026-2030 ($MtCO_2e$, relative to Commission baseline)
Passenger transport	67% of light vehicles entering the fleet and 14% of the total light vehicle fleet are EVs	2.6
	11% fuel efficiency improvement in non-EV light vehicles (from 2019)	No change from baseline
	6.9% reduction in total light vehicle travel below baseline projection through lower demand and mode shift; 1.5% of household passenger kilometres travelled by cycling, and 7.7% household passenger kilometres travelled by public transport	2.2
	98% of buses entering the fleet and 37% of total bus fleet are electric	0.3
Freight	36% of trucks entering the fleet and 3.6% of the total truck fleet are zero emissions	0.5
	16% efficiency improvement in road freight per tonne-kilometre (from 2019)	0.6
	3.5% of freight tonne-kilometres shifted from road to rail and coastal shipping	0.6
Rail, aviation and marine	27%/16%/14% reduction in emissions intensity of rail, aviation and marine transport through efficiency and electrification	0.3
Low carbon liquid fuels	4.8 PJ (135 million litres) used in transport, off-road vehicles, and other uses	1.0
Electricity supply	10.5 TWh increase in renewable generation; Elimination of coal and baseload fossil gas generation; 96% of generation is from renewable sources (excluding co-generation)	3.3
Industry	14 PJ/year of coal use and 6.1 PJ/year of fossil gas use in process heat reduced through fuel switching to biomass and electricity, and efficiency improvements; 12% energy efficiency improvement in food processing	5.9
	12% of new off-road vehicle purchases are electric	0.3
Buildings	3.0 PJ/year reduction in fossil gas use through electrification and efficiency improvements; 25% reduction in energy demand for heating per commercial building and 8% reduction per residential dwelling through energy efficiency improvements	1.9
	7% reduction in other electricity use per building through energy efficiency improvements	Counted under electricity supply
Agriculture	9.4% reduction in emissions per hectare for dairy and 3.2% for sheep and beef farming through lower stocking rates and changes in farm management	6.1
	10% adoption of low-methane sheep through breeding	0.7
	100% of urea fertiliser coated with urease inhibitor	0.1
Horticulture	14,000 hectares of land-use change from livestock farming to horticulture	0.3
Forestry	150,000 hectares of new native forest established	2.2
	360,000 hectares of new exotic forest established	No change from baseline
	Zero deforestation of pre-1990 forests and projected deforestation of post-1989 forests halved from 2026	4.8

Sector	2030 benchmarks for action (Changes expressed from 2020 unless stated otherwise)	Emissions reductions from 2026-2030 ($MtCO_2e$, relative to Commission baseline)
Waste	22% reduction in overall organic waste sent to landfills	0.9
	25% of emissions from landfills currently without capture systems avoided through installation of new capture systems or diversion to other landfills	1.7
F-gases	21% reduction in emissions of hydrofluorocarbons (HFCs)	0.6
Total	Sum of individual actions (excludes interactions)	36.7

Source: Commission analysis using the ENZ model

Notes:
1. Based on the 2022 update to the demonstration path and current policy reference (see Box 3.1).
2. Transport changes are expressed relative to 2019 due to the short-term effects of the COVID-19 pandemic in 2020.
3. Changes in industry fossil gas use exclude projected reductions in methanol production and oil refining.
4. Emissions reductions are measured relative to the projected emissions in the Commission's current policy reference scenario using AR5 metrics. This differs from the government baseline in the first emissions reduction plan (see footnote vii).
5. Emissions reductions were modelled for individual actions and exclude interactions with other measures, except for electricity supply, which is modelled for the demonstration path as a whole.
6. Figures exclude upstream emissions reductions from fossil gas and coal production.

Figure 3.5 shows the modelled emissions reductions across all three emissions budget periods for the actions listed in **Table 3.2**, ordered by their total contribution.

This provides a longer-term view of the impact the actions could have towards meeting the third emissions budget. For example, emissions reductions from electric vehicles increase rapidly once a high share of sales is achieved, and they become the largest contribution in the third budget period.

The figure also highlights the importance of actions in the agriculture and forest sectors to meet emissions budgets and the 2030 biogenic methane target.

Exotic afforestation does not appear in the figure because the level of planting in the demonstration path (and the corresponding reduction in net emissions) is already accounted for in the baseline scenario. However, this remains a critical part of meeting the emission budgets. In the demonstration path, exotic forests deliver net removals of 52.6 $MtCO_2e$ over the second budget period.

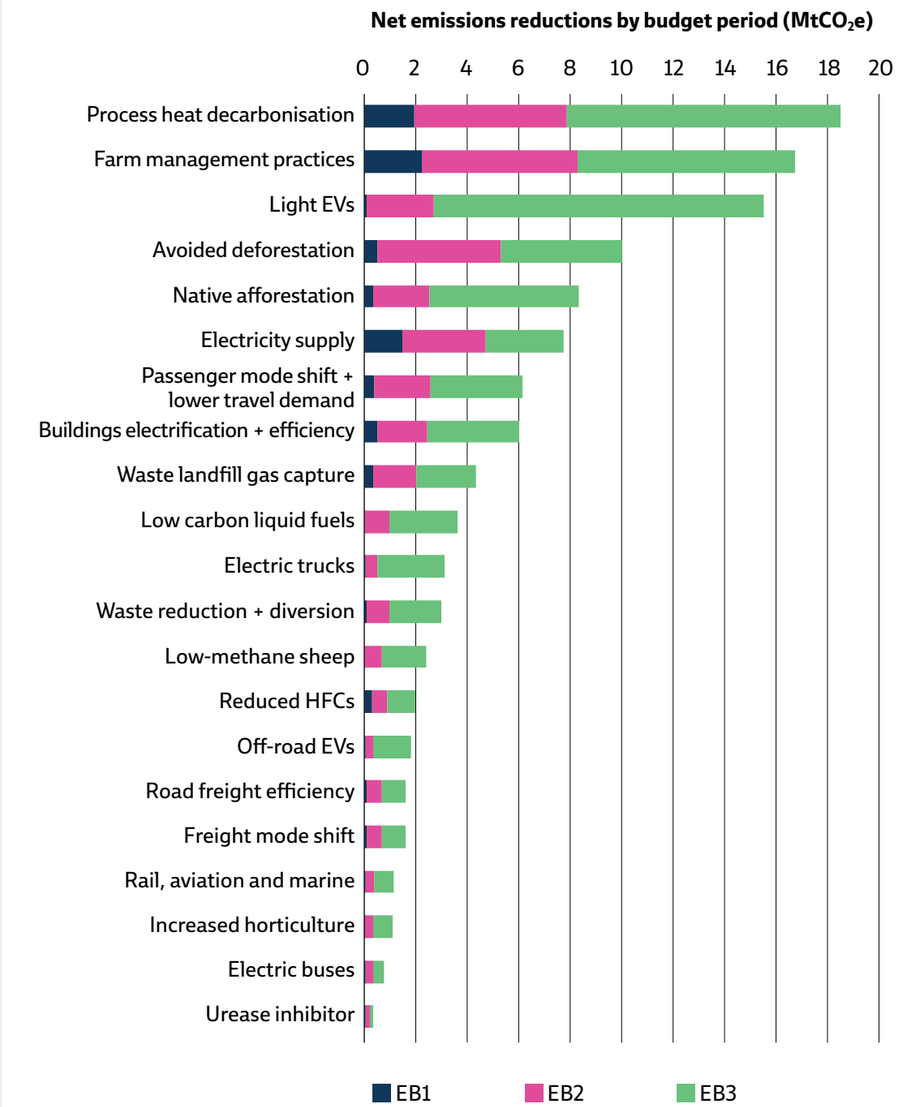

Figure 3.5: Modelled emissions reductions over the first three emissions budgets from the actions in the Commission's demonstration path listed in Table 3.3

Source: Commission analysis using the ENZ model

Notes:
1. Based on the 2022 update to the demonstration path and current policy reference scenario (see Box 3.1).
2. Emissions reductions are measured relative to the projected emissions in the Commission's current policy reference scenario using AR5 metrics. This differs from the government baseline in the first emissions reduction plan (see footnote vii).
3. Emissions reductions were modelled for individual actions and exclude interactions with other measures, except for electricity supply, which is modelled for the demonstration path as a whole.
4. Estimates exclude upstream emissions reductions from fossil gas and coal production.

As discussed in *Chapter 1: Introduction*, the advice in this report builds upon our previous work and considers the Government's response through its first emissions reduction plan. The policies set out in that plan will contribute towards delivering the actions listed above.

For this advice, we did not undertake a detailed mapping or quantitative assessment of policies against these benchmark actions. Rather, our analysis has been guided by our policy and prioritisation frameworks and the approach described in *Chapter 1: Introduction*.

The first emissions reduction plan

While policies in the first emissions reduction plan contribute to meeting future budgets, more action is required

The first emissions reduction plan put forward a set of policy commitments across all sectors. The plan included an assessment of how much the policies were expected to reduce emissions in each sector, noting that not all policies in the plan were quantified.

The assessment extended out to 2035 to look at the impact on emissions reduction across all three set budget periods, though the primary focus of the first plan was to meet the first emissions budget. Alongside the plan, the government published supplementary information and data providing further detail on its quantified policy impact assessment.[5]

In this section, we present and discuss some results from the government's policy impact assessment for the second and third emissions budget periods. This is not an assessment of the adequacy of the first emissions reduction plan for meeting the first emissions budget. In alignment with the Act, the Commission will provide this assessment in its first annual monitoring report on progress towards meeting emissions budgets, due in 2024.

Figure 3.6 shows the total estimated emissions reductions in each sector over the second and third emissions budget periods, compared with the level of reductions needed to meet the sector sub-targets (as shown in **Figure 3.2** earlier). The government produced 'low impact' and 'high impact' estimates for most policies, which are used to provide the ranges shown in the figure.

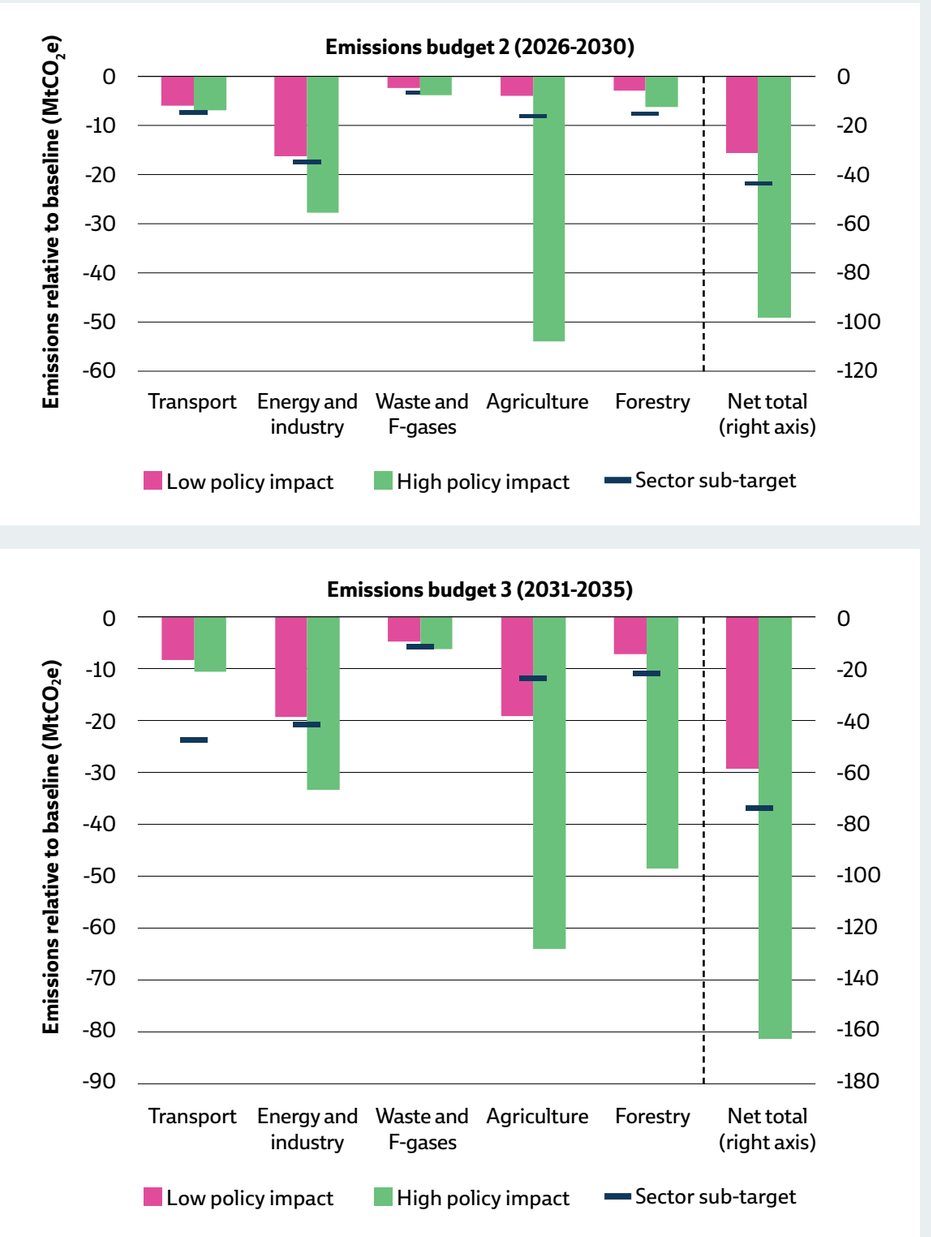

Figure 3.6: Government estimates of the impact of policies in the first emissions reduction plan towards meeting the second (top panel) and third (bottom panel) emissions budgets

Source: Commission analysis of data published with *Aotearoa New Zealand's first emissions reduction plan*[6]

Notes:
1. The ERP data presents multiple ranges for forestry. The range shown is based on Table 14.1 in the ERP.
2. The required emissions reduction for energy and industry assumes the aluminium smelter continues to operate.
3. We have combined the Waste and F-gases sector sub-targets in this figure.

Overall, compared with the estimated 43.5 $MtCO_2e$ net emissions reductions needed to meet the second emissions budget, the government assessment suggests outcomes ranging between a shortfall of 13 $MtCO_2e$ under the 'low policy impact' estimates, and an overachievement of around 55 $MtCO_2e$ under the 'high policy impact' estimates. For the third emissions budget, the possible range expands to between a shortfall of 15 $MtCO_2e$ and an overachievement of 89 $MtCO_2e$.

The potential overachievement under the 'high impact' case comes mainly from agriculture, with further contributions from energy and industry and, in the third emissions budget, from forestry.

In this next section, we provide comment on the assumptions underlying the government estimates and on risks and other relevant issues within each sector.

Overall findings

Our overall findings regarding the government's policy impact assessment for the first emissions reduction plan and its implications for the second and third emissions budgets are:

- The policies in the first emissions reduction plan, if fully implemented, would contribute to meeting the second and third emissions budgets. However, further and stronger policies will likely be needed. This result is not surprising, given the plan's focus on meeting the first emissions budget.
- While the government's policy impact assessment suggests the policies in the first emissions reduction plan could achieve the second and third emissions budgets, there are risks around some of the underlying assumptions and questions regarding the plausibility of its 'high impact' estimates.

These findings are based on our analysis presented below and are subject to the information available. We note the level of data and information provided to the public could be improved in future emissions reduction plans.

Agriculture

Compared with the sector sub-target, the government estimates for the second emissions budget range between a shortfall of 4 $MtCO_2e$ (low impact) and overachievement of 46 $MtCO_2e$ (high impact).

These emissions reductions are solely attributed to 'additional funding for mitigation research', which is expected to accelerate the roll-out of technologies that will reduce agricultural emissions. The specific technology assumptions used were not provided in the reports, making it difficult to understand the numbers and assess their credibility. However, it is clear from the magnitude of the 'high impact' estimate this would rely on new technologies such as a methane inhibitor being rolled out early in the second emissions budget period.

The assessment therefore suggests a likely shortfall for the second emissions budget in the absence of such new technologies.

However, the government's impact assessment did not include the impact of pricing agricultural emissions, beyond a very low price assumed in the baseline.[viii] The pricing scheme developed through the He Waka Eke Noa partnership is designed with the goal of meeting the 2030 biogenic methane target.

Through consultation, we heard concerns that agricultural emissions pricing may not be ready for 2025 given current progress, putting at risk the 2030 biogenic methane component of the 2050 target and the sector sub-target for agriculture in the second emissions budget period. Implementing this from 2025 will be key to closing the gap to meeting agriculture's sector sub-target.

New technologies could significantly boost the ability to cut emissions in agriculture. On this, we note that the Commission's recommended emissions budgets in *Ināia tonu nei* were based on what could be achieved with technologies commercially available at the time. We also signalled that the successful deployment of new technologies could be grounds for tightening the emissions budgets in the future.[7]

Energy and industry

Compared with the sector sub-target, the government estimates for the second emissions budget range between a shortfall of 1.2 $MtCO_2e$ (low impact) and overachievement of 10 $MtCO_2e$ (high impact).

Most of these emissions reductions (around 90% in the high impact case) are expected to result from an increased NZ ETS emissions price and the Government Investment in Decarbonising Industry (GIDI) Fund. However, the Commission's assessment is that there is risk that the government has overestimated how quickly emissions reductions from process heat can be achieved and the 'high impact' outcomes are very unlikely to be plausible (see *Chapter 13: Energy and industry*).

Both the low impact and high impact estimates also assume the emissions price in the NZ ETS rises in line with the Commission's demonstration path. This is at significant risk under the current NZ ETS design which is likely to drive high levels of afforestation, thereby putting downward pressure on the emissions price (see *Chapter 5: Emissions pricing*). Further, the Commission's modelling of the effect of this emissions price path on energy and industry emissions is closer to the government's 'low impact' estimate.

The main figures presented in the Government's first emissions reduction plan assumed the closure of the New Zealand Aluminium Smelter in 2024 in the baseline scenario. As mentioned earlier, the figures we have presented adjust for the smelter remaining open, which the Ministry of Business, Innovation and Employment has estimated would increase baseline emissions in the second emissions budget by 9.3 $MtCO_2e$.

viii. The baseline assumed an emissions price of $35 per tonne CO_2e charged at the processor level at a 95% discount.

While there is uncertainty about the smelter's future, it is critical that the Government plans for a scenario in which it continues operating, to ensure emissions reduction policies are adequate.

If the smelter were to close, this would lead to significantly lower emissions compared with what the Commission used to develop emissions budget recommendations.[ix] This change could be grounds for the Commission to recommend tightening the set emissions budgets when it reviews these as part of its fourth emissions budget advice in 2024.

Forests

Compared with the sector sub-target, the government estimates presented in **Figure 3.6** show a shortfall of between 4.7 and 1.3 $MtCO_2e$ in the second emissions budget. Looking out to the third emissions budget, outcomes range from a shortfall of 4.0 $MtCO_2e$ to an overachievement of 37 $MtCO_2e$.

For context, the Commission's demonstration path had exotic afforestation remaining at the projected baseline level out to 2030 and gradually decreasing from then on, assuming changes to current NZ ETS design and incentives. All additional net emissions reductions came from establishing new native forests and reducing deforestation.

The government estimates include a rising NZ ETS 'price corridor' along with three additional policies aimed at increasing natural carbon sequestration, native afforestation, and supply of woody biomass.[x]

The government's projected range assumes a central NZ ETS price path, with lower removals assuming exotic forests are restricted from registering as permanent forests in the NZ ETS and higher removals assuming they are not restricted.[xi] This suggests a restriction would significantly reduce the rate of exotic afforestation to below the baseline level despite a rising NZ ETS price. However, the strong economic incentives that would remain make this assumption somewhat questionable.

New exotic forest planting is currently proceeding well above earlier expectations: over 64,000 hectares was estimated to be planted in 2022,[8] compared with the government's baseline projection of around 32,000 hectares per year between 2022 and 2030 when the emissions budgets were set. If similar rates were sustained, carbon removals from forestry would significantly exceed sector sub-targets for the second and third emissions budgets.

As already mentioned, under current NZ ETS design higher levels of afforestation are expected to put downward pressure on the emissions price and displace gross emissions reductions (see **Figure 5.1** in *Chapter 5: Emissions pricing*). These interactions were not considered in the government's emissions reduction plan modelling.

ix. In *Ināia tonu nei*, our baseline scenario assumed the closure of the smelter in 2024 based on company statements at the time. We also assumed the Marsden Point oil refinery would continue to operate. However, the refinery converted to an import terminal in 2022, while the smelter owners are currently negotiating a new electricity purchase agreement to continue operation beyond 2024. The effect of these two changes would roughly cancel out in the second emissions budget period, leaving baseline emissions close to what the Commission had originally projected.

x. The impact of these additional policies is estimated at 4.2 $MtCO_2e$ in the second emissions budget and 10.5 $MtCO_2e$ in the third emissions budget.

xi. This range is presented in Table 14.1 in the main ERP report. The ERP technical annex also provides ranges for each case assuming lower or higher NZ ETS price paths based on the NZ ETS 'price corridor' (the auction reserve price and cost containment reserve threshold) in regulations. These suggest an even larger range of possible outcomes for forestry.

Transport

Compared with the sector sub-target, the government estimates for the second emissions budget give a shortfall ranging between 1.4 $MtCO_2e$ (low impact) and 0.5 $MtCO_2e$ (high impact). Looking out to the third emissions budget, the estimated shortfall would increase to 13-16 $MtCO_2e$.

The estimates are the assumed result of a package of policies including the Clean Car Discount and Standard, the Sustainable Biofuels Obligation, and more. The Sustainable Biofuels Obligation was expected to deliver up to half of the total emissions reductions projected for transport. The government's decision to halt this increases its assessed shortfall by around 3.0 $MtCO_2e$ in the second emissions budget and 4.4 $MtCO_2e$ in the third emissions budget.[9]

This would suggest the transport sector is most off track to achieving its sub-targets.

However, uptake of low-emissions vehicles has grown rapidly since the introduction of the Clean Car Discount in 2021, exceeding Te Manatū Waka Ministry of Transport's modelled impact of the Clean Car policy package.[10] The share of electric light vehicle registrations in 2022 grew to over 10% – a level not achieved until 2028 in the Ministry's modelling.[xii] This also exceeds the Commission's demonstration path, which projected a 6% share in 2022, reaching 11% in 2025. The share of hybrids also grew well beyond what was expected.

This highlights the opportunity for electric and hybrid vehicles to deliver significantly higher and faster emissions reductions than previously thought.

The Government also committed to four transport targets in the first emissions reduction plan:

1. reduce total kilometres travelled by the light fleet by 20% by 2035 (relative to baseline)
2. increase zero emissions vehicles to 30% of the light fleet by 2035
3. reduce emissions from freight transport by 35% by 2035
4. reduce the emissions intensity of transport fuel by 10% by 2035.

Its assessment suggests delivering on these would overachieve on the transport sector sub-targets for the second emissions budget and the third emissions budget. While not yet backed by firm policies, it is helpful for the Government to set out clear, quantified outcomes it intends to achieve through its policies to enhance understanding and predictability (see the Commission's policy framework in *Chapter 1: Introduction*).

Waste and F-gases

Compared with the sector sub-targets for the second emissions budget, the government estimates for the waste sector range between a shortfall of 0.7 $MtCO_2e$ and overachievement of 0.1 $MtCO_2e$. For F-gases the range is a shortfall of 0.3 $MtCO_2e$ and overachievement of 0.3 $MtCO_2e$.[11]

The waste sector is important to delivering the 2030 biogenic methane target. While only accounting for 9.5% of biogenic methane emissions in 2017, its relatively higher potential to reduce emissions, as assessed by the Commission, sees it contributing nearly a quarter of the reductions in biogenic methane from 2017 to 2030 in the demonstration path. The policies and actions in the emissions reduction plan broadly align with the demonstration path.

xii. Based on the 'default' scenario which was used in the emissions reduction plan's policy impact assessment.

Recent government emissions projections

The government's latest emissions projections show progress, but a gap remains

The government published further emissions reductions needed to meet budgets in December 2022 as part of Aotearoa New Zealand's reporting obligations under the United Nations Framework Convention on Climate Change.[12] These projections give further evidence of the potential size of the gap to be filled to meet the second and third emissions budgets.

In line with United Nations (UN) reporting guidelines, the government's 'With existing measures' scenario includes currently implemented and adopted policies and measures. The 'With additional measures' scenario includes some further planned policies and measures from the first emissions reduction plan.

Table 3.3 shows the further emissions reductions that would be required to meet the second and third emissions budgets under these latest projections.[xiii] We also show the assessment from the baseline projection used in the first emissions reduction plan, presented in earlier figures in this chapter.

Table 3.3: Further emissions reductions required to meet the second emissions budget under the government's December 2022 emissions projections (adjusted for continued operation of the aluminium smelter)

	Further emissions reductions needed to meet budgets ($MtCO_2e$)	
Relative to:	**EB2 (2026-2030)**	**EB3 (2031-2035)**
First emissions reduction plan baseline (March 2022)	43.5	73.6
Fifth Biennial Report 'With existing measures' scenario (December 2022) [Uncertainty range]	20.7 [4.4 to 38.9]	34.6 [5.2 to 66.5]
Fifth Biennial Report 'With additional measures' scenario (December 2022)	14.0	22.9

Source: Commission analysis of government emissions projections[13]

The latest projections suggest a gap to meeting the second emissions budget of around 21 $MtCO_2e$ under currently implemented policies. With the further policies included in the 'With additional measures' scenario, the gap reduces to 14 $MtCO_2e$.

These show a significant reduction in emissions compared with the previous baseline, which is largely due to assuming a higher NZ ETS emissions price path. However, a gap remains to meeting the second and third emissions budgets, reinforcing our earlier findings. The projections suggest a larger gap than the first emissions reduction plan policy impact assessment.

We provide further information and analysis of the emissions projections in *Appendix 2*.

xiii. We have made an adjustment for the continued operation of the aluminium smelter. As stated earlier, while uncertainty remains, planning on this basis is necessary to ensure efforts are adequate.

Tuawhā: Chapter 4

He ara ki te warokore
A path to net zero

Introduction

The Government has choices to make about the combination of gross emissions reductions (emissions reduced at the source) and removals (primarily by forests) it will use to reach and sustain the net zero greenhouse gas emissions targets set for 2050 and beyond.

Through its second emissions reduction plan, the Government could set a path focused on gross emissions reductions, which would require fewer removals. Alternatively, net zero could be achieved by focusing on increased removals and sustained by ensuring any emissions of long-lived greenhouse gases after 2050 are balanced by an equal or greater quantity of removals from the atmosphere.

The Climate Change Response (Zero Carbon) Amendment Act set the target of reaching net zero emissions of long-lived greenhouse gases by 2050, and then maintaining net zero in each subsequent year,[i] but it did not include a limit on the use of carbon dioxide removals to achieve net zero.

Our advice presents our independent analysis of the risks, issues, and opportunities presented by the options available to Government, including the effects of different approaches on the rate of emissions reductions across budget periods.

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice, including the consistent theme that the clarity of decision-making and communication by Government has a significant effect on engagement and action to achieve the net zero component of the 2050 target.

We note the importance of following appropriate co-design processes mandated under Te Tiriti o Waitangi/The Treaty of Waitangi, and of communicating decisions on the balance of gross and net emissions reductions to the public, as this will impact decision-making for households, businesses, communities, and local government.

i. For ease of presentation, this report refers to all greenhouse gases other than biogenic methane collectively as long-lived greenhouse gases, although this includes a small amount of other short-lived gas emissions (non-biogenic methane and certain fluorinated gases). The 2050 target separately specifies that biogenic methane emissions should reduce by at least 10% by 2030 and between 24% and 47% by 2050 below 2017 levels.

The focus in this chapter for carbon dioxide removals is new forest plantings, which are currently the main source of removals in Aotearoa New Zealand. In the future, other methods of removing and storing carbon dioxide from the atmosphere may also play a role. However, there are currently technological, policy, and cost barriers keeping these methods from being in use. These barriers may eventually be addressed, but the timing for this is uncertain.[ii]

Changes from the draft version of this chapter

We strengthened our advice on the importance of reducing gross emissions and provided further detail and evidence about land-based carbon removals, including what happens over time. We also added a section specifying our recommended levels of gross emissions and carbon dioxide removals for the second and third emissions budgets, with discussion on how we came to these levels.

Following feedback about the potential economic impacts of our advice and requests for more clarity on the financial implications of our approach, we added a section in *Chapter 1: Introduction* outlining that investments required to meet emissions budgets will save money in the long term.

In response to feedback relating to forests and potential impacts for industries involved in carbon removals by forests, we added text to further emphasise their importance in achieving and maintaining net zero.

We also heard concerns that impacts could unfairly land on industries with limited ability to reduce their emissions. In *Chapter 13: Energy and industry*, we discuss that for these industries, incremental progress can be supported and accelerated through a strong research, science, innovation, and technology system, and by mobilising private finance to support new technologies.

Some respondents provided feedback regarding our recommendation that the Government set out intended levels of gross emissions, saying that the Act does not require gross emissions levels to be set. While the Act does not require these levels to be set, being transparent about the level of gross emissions reduction and carbon dioxide removals will lead to more certainty for businesses and better policy decisions, especially regarding the operation of the New Zealand Emissions Trading Scheme (NZ ETS). More detail is set out in *Chapter 4: A path to net zero*.

In response to local government requests, we strengthened our advice on the importance of effective governance structures to deliver the transition (*Chapter 1: Introduction*). Our new text discusses the important role of local government, which makes decisions on land use, urban form, road and transport services, and waste management. We added a new recommendation (Recommendation 1) on aligning and coordinating outcomes within and between levels of government and across all sectors of the economy to support the coherent implementation of the second emissions reduction plan.

We re-examined our proposed recommendations in response to calls to include levels of carbon dioxide removals alongside gross emissions reductions, and updated Recommendations 2 and 3 to recommend that the Government commit to specific levels for both.

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendations 2 and 3 now include further specificity regarding partnership with iwi/Māori as levels of gross emissions and carbon dioxide removals are set.

ii. We note the Government, as part of its recently announced Carbon Removals Strategy, is considering how other carbon removal activities can be recognised and rewarded. The strategy intends to cover activities including biological processes (eg, storing carbon in vegetation, wood products, marine sediment and organic soils), engineered processes (eg, Direct Air Carbon Capture and Storage), and reversing greenhouse emissions from drained organic soils (eg, rewetting drained peatland, restoring wetlands).

Reducing gross emissions will bring benefits

The Climate Change Response Act 2002 (the Act) contains three considerations which are particularly relevant to assessing the role of carbon dioxide removals in achieving net zero long-lived greenhouse gas emissions:

- the principal risks and uncertainties associated with emissions reductions and removals
- the likely impact of actions taken to achieve an emissions budget and the 2050 target, including on the ability to adapt to climate change
- the distribution of those impacts across the regions and communities of Aotearoa New Zealand, and from generation to generation, including specific effects on iwi/Māori.

A lack of clarity on the approach to achieving and sustaining net zero long-lived greenhouse gas emissions by 2050 is likely to create ongoing policy uncertainty and impact decision-making in both the public and private sectors. This could undermine the purpose of the Act to "provide a framework by which Aotearoa New Zealand can develop and implement clear and stable climate change policies"[1] and increase related risks for businesses and investors. Ultimately, prolonged uncertainty is more likely to lead to a more disruptive transition with higher costs and more significant impacts.

Reducing gross emissions is a pathway strongly recommended by the Intergovernmental Panel on Climate Change (IPCC), whose *Sixth Assessment Report* (AR6) states at a high level of confidence that "reaching net zero CO_2 or greenhouse gas emissions primarily requires deep and rapid reductions in gross emissions of CO_2, as well as substantial reductions of non-CO_2 greenhouse gas emissions".[2]

The question of how to meet the 2050 net zero target is therefore of core importance to the second emissions reduction plan.

In *Ināia tonu nei*, the Commission outlined how gross emissions can be reduced across all sectors. A range of opportunities are available through proven clean technologies, alongside supporting changes in behaviour. We showed that gross emissions from road transport can be reduced to almost zero by 2050 through a combination of switching to zero emissions vehicles and increasing walking, cycling, and public transport use. Industrial process heat and buildings can decarbonise by switching to electricity and biomass as fuel sources. Energy efficiency improvements can help reduce emissions across all sectors, including in industrial sectors where emissions reduction is more challenging.

We also showed in *Ināia tonu nei* that reducing gross emissions and transitioning to a low emissions economy could provide significant benefits, including:

- leading to healthier homes and buildings
- encouraging new ways of moving around
- opening up new market opportunities
- changing how land is used and managed
- improving the lives and choices of young people and future generations.

As the world transitions towards low emissions, new markets and low emissions products will be created. At the same time, producers of high emissions products may face challenges as consumers become increasingly aware of the impact of their decisions. If slow to decarbonise, Aotearoa New Zealand risks being left behind in favour of international competitors who are able to show that their products have lower emissions profiles.

Forests have an important role in getting to net zero

As Aotearoa New Zealand's primary method of removing carbon dioxide from the atmosphere, forests will continue to be needed to meet emissions budgets and to achieve and sustain net zero by and beyond 2050. The Commission expects some residual gross long-lived greenhouse gas emissions to remain through to 2050 from sources where there are currently no feasible means to avoid them, such as nitrous oxide emissions from food production. Therefore, in any path to net zero long-lived greenhouse gas emissions, carbon removals from new and existing forests will have an important role to play.

The Commission's demonstration path to meeting the net zero component of the 2050 target includes establishing new native forests to build a long-term carbon sink capable of offsetting residual emissions from sectors with limited ability to reduce their emissions. It also recognises that new exotic forestry planting would be needed to help achieve net zero.

Production forests will also have an important role in developing the bioeconomy (see *Chapter 12: Circular economy and bioeconomy*). Forests are expected to be an important source of biomass feedstock for both direct combustion and conversion into biofuels. Burning biofuels returns carbon stored in trees to the atmosphere rather than adding new carbon from deep under the ground. This can support decarbonisation of industrial process heat and replace liquid fossil fuels.

As tangata whenua, iwi/Māori have cultural and spiritual connections to te taiao and hold an important role in Aotearoa New Zealand's forestry sector. As we discuss further in *Chapter 14: Forests and other carbon stocks*, any policy decisions regarding forests needs to be developed in a manner that honours Te Tiriti o Waitangi/The Treaty of Waitangi.

Carbon stored on land is increasingly vulnerable to disturbance in a warming climate

As trees grow, they absorb carbon dioxide and store carbon. For those removals of carbon dioxide from the atmosphere to be considered permanent, the forest storing that carbon must remain in place indefinitely.

The carbon stored in fossil fuels has been locked away deep underground for millions of years. Burning fossil fuels therefore adds to the amount of carbon in the 'active' carbon cycle – the exchange of carbon between the atmosphere, oceans, vegetation, and soils. Any carbon added to the active carbon cycle means that achieving the 2050 target will require further removals from forests, or additional gross emissions reductions will need to be made elsewhere.

Some consultation submissions were concerned about Aotearoa New Zealand's current reliance on forests to remove carbon from the atmosphere and supported exploring and enacting other methods. The recent experience of Cyclone Gabrielle in Aotearoa New Zealand, and the devastating fires and floods which have occurred across the world with increasing frequency and severity, show how adverse weather events can damage and destroy forests.

Climate change will continue to exacerbate forest fires, strong winds, storms, floods, droughts, pests, and pathogens. Reports from climate experts globally[3] and domestically[4] acknowledge the increasing risks of these events due to a changing climate. Carbon dioxide removals by forests could also be reversed if those forests are harvested or destroyed and not replanted. Because of both natural and human-based risks, land-based carbon removals may not be permanent.[iii]

Policies can reduce risks that land-based carbon removals are reversed, but their ability to ensure permanence over the very long term is limited. For example, the New Zealand Emissions Trading Scheme (NZ ETS) incentivises the maintenance of stored carbon through requirements to surrender units if forests are not replanted. With high enough unit prices, these incentives have proven effective in discouraging deforestation and, if maintained, can be expected to continue do so over the coming decades.

However, it cannot be assumed that policy incentives in place today – no matter how effective – will remain and be appropriately enforced far into the future. Each tonne of carbon dioxide emitted into the atmosphere will remain there for hundreds to thousands of years. To be sure today that a carbon dioxide removal by a forest genuinely compensates for a tonne of emitted carbon dioxide requires confidence that the forest will continue to exist hundreds to thousands of years from now. It is unrealistic to expect any government policy to guarantee forest permanence over these timescales.

The issues raised in this section further highlight the need to prioritise reducing gross emissions in our transition to a low emissions economy.

The Act requires us to stay at net zero beyond 2050

Achieving and sustaining net zero for long-lived greenhouse gases requires long-term planning.

A removals-by-forests approach to meeting emissions budgets and the 2050 target would require ongoing land conversion, since trees reach a natural limit to the amount of carbon they can store.

As part of our analysis in *Ināia tonu nei*, we examined a scenario where there were no constraints placed on the level of carbon removals by forests. We found that, combined with assumptions about how emissions would reduce under the Current Policy Reference case, an increase in the emissions price from $35 to $50 a tonne would come close to meeting net zero long-lived greenhouse gas emissions by 2050.

However, this path would require a greater area of forests to be planted before 2050, and further forests to be planted after 2050 to maintain net zero long-lived greenhouse gas emissions. **Figure 4.1** shows that if there were no further forests planted or policy changes after 2050, long-lived greenhouse gas emissions would bounce back above net zero before 2065 as the forests reached their long-term average carbon storage.

Because the amount of carbon that can be stored on land is ultimately limited, this method is not indefinitely sustainable.

Instead, a "durable net zero" is needed, where any residual emissions of fossil carbon are balanced by more permanent methods of carbon dioxide removal.[5] As Aotearoa New Zealand approaches 2050, processes like carbon capture and storage may become more viable[6] and play an increasingly important role in reaching and maintaining net zero emissions of long-lived greenhouse gases.

iii. Nitrous oxide differs from fossil carbon in its longevity but still has an average atmospheric lifetime of over 100 years. While more of a case can be made for equivalence between land-based carbon removals and nitrous oxide emissions, the risks around permanence still apply.

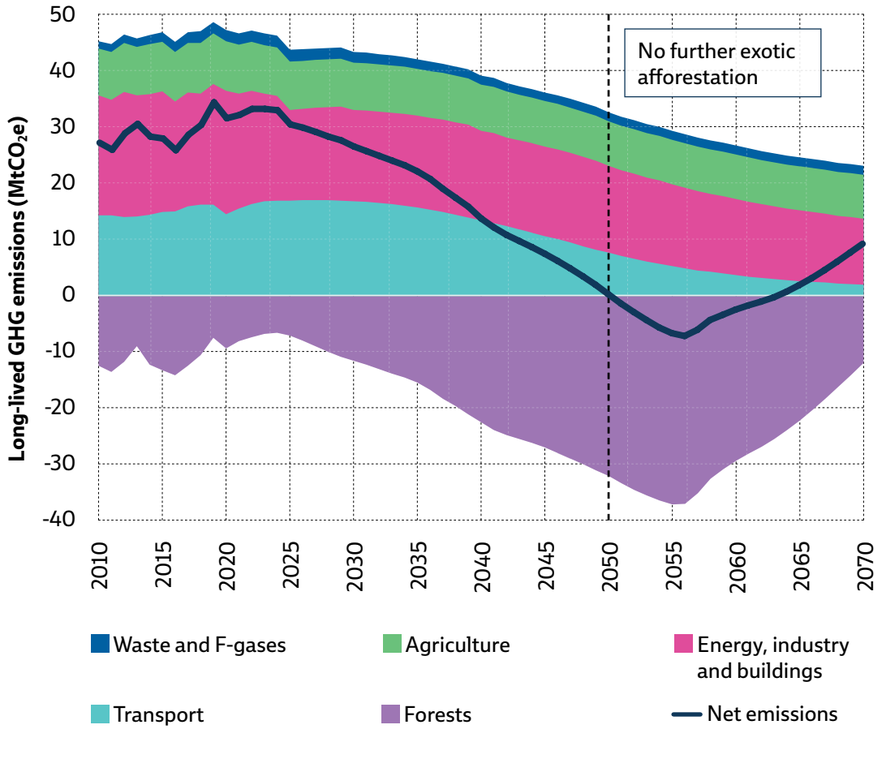

Figure 4.1: Long-lived greenhouse gas emissions in the 'unconstrained removals' scenario, with a $50/tonne emissions value applied to forestry, energy and transport

Source: Commission analysis.

Clarity on the intended contribution from gross emissions reductions is required

In Aotearoa New Zealand, the potential scale of land-based removals is very large relative to the size of gross emissions, especially compared with other developed countries.

Consultation submissions reflected the Commission's position that it is especially important for the Government to define the roles of gross emissions reductions and carbon dioxide removals in achieving the net zero component of the 2050 target, and to decide how far it will go in reducing gross emissions. These decisions will determine the nature of the opportunities, impacts, and risks – including those for iwi/Māori – associated with reaching and sustaining net zero long-lived greenhouse gas emissions.

As the number of countries, companies, and other entities with net zero goals grows, so too does scrutiny of plans to deliver on commitments. Many climate researchers and organisations have recommended that net zero commitments should focus foremost on directly reducing emissions and should specify intended levels of gross emissions reductions.[7] Doing so will enhance transparency and credibility and provide more direction and certainty for policy-makers and investors on the shape of the transition.

Transparency about the level of gross emissions and carbon dioxide removals will lead to better policy

In *Ināia tonu nei*, the Commission set out a recommended breakdown of gases (including emissions and removals) that would enable Aotearoa New Zealand to meet the first three emissions budgets and be on track to achieve the 2050 target in a manner compliant with the Act.

The Government's response to this recommendation was ambiguous, "agreeing in part" with the recommendation and saying it will implement policies that will result in a balance "along similar lines to those produced by the Commission in its modelling".[8] While the first emissions reduction plan sets out sector sub-targets, these have been communicated as a tool for tracking progress rather than binding targets.

The Government has not specified the intended level of gross emissions and carbon dioxide removals for the second and third emissions budgets, making it difficult to ensure appropriate and comprehensive policies are put in place to achieve necessary gross emissions reductions.

This ambiguity creates risks for the transition. Without a clear signal from Government, it is difficult for businesses to know whether their investments are consistent with the path the Government intends to follow. Low emissions investments relying on an emissions price to be economic may not proceed if businesses are unsure about the degree to which removals can be substituted for gross reductions.

The ambiguity about the intended level of gross emissions is a particular problem for the operation of the NZ ETS. To design and operate effective climate policies, and particularly to run the NZ ETS, it is essential to have a clear objective for the balance sought between gross reductions and carbon removals. This issue is discussed further in *Chapter 5: Emissions pricing*.

Box 4.1: Levels of gross emissions and carbon dioxide removals for the second and third emissions budgets

Meeting the second and third emissions budgets while reducing gross emissions will require the Government to commit to specific levels of gross emissions and carbon dioxide removals for each budget. Sector sub-targets (see Table 3.2 in *Chapter 3: The task for the second emissions budget*) are maximum levels of emissions and minimum levels of carbon dioxide removals that have been indicated by the Government. We recommend that these figures be used as the upper limits for gross emissions and minimum levels of carbon dioxide removals.

These figures are summarised here:

- 305 $MtCO_2e$ of net emissions including 57 $MtCO_2e$ of carbon dioxide removals for the second emissions budget. This sets a gross emissions ceiling of 362 $MtCO_2e$ for the second emissions budget.
- 240 $MtCO_2e$ of net emissions including 82 $MtCO_2e$ of carbon dioxide removals for the third emissions budget. This sets a gross emissions ceiling of 322 $MtCO_2e$ for the third emissions budget.

Recommendation

This recommendation seeks to address the challenges related to balancing carbon removals and gross emissions reductions and to help enable Aotearoa New Zealand to meet the second emissions budget and its longer-term emissions reduction targets.

Recommendation 2

We recommend that in its second emissions reduction plan, the Government:

2. Commit to specific levels of gross greenhouse gas emissions and carbon dioxide removals for the second and third emissions budgets and align policies to achieve or exceed the emissions reductions in the budgets. Gross emissions should not exceed 362 $MtCO_2e$ for the second emissions budget nor 322 $MtCO_2e$ for the third emissions budget.

   The levels the Government commits to for gross emissions and carbon dioxide removals must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

Uncertainty in the desired levels of emissions and removals out to 2050 will have costs

It would also be helpful for Government to set out an indicative range for the level of gross emissions it is intending for 2050, and the role it sees gross emissions reductions playing in achieving net zero long-lived greenhouse gas emissions.

Setting out intended long-term outcomes now is important for a well-managed transition. This can guide and support sectors to make planning and investment decisions consistent with the overall emissions outcomes envisioned by the Government. By not setting out a long-term path for gross emissions, the Government would risk locking in continued investment that is not compatible with meeting targets.

Signalling a path is not intended to restrict the Government from changing course in the future if necessary. It is not possible now to prescribe how emissions should reduce all the way to 2050, and adjustments and adaptations should occur as new information becomes available. However, such a path can signal the overall direction of travel intended by the Government and galvanise coordinated action across the economy, leading to more effective outcomes.

Recommendation

This recommendation seeks to address the challenges related to signalling a long-term path for gross emissions reduction and the need for Aotearoa New Zealand's approach to continue to be responsive to new climate change information, technologies, and barriers.

Recommendation 3

We recommend that in its second emissions reduction plan the Government:

3. Communicate indicative levels of gross greenhouse gas emissions and carbon dioxide removals from forestry out to 2050 and beyond to guide policy decisions.

   The levels the Government communicates for gross emissions and carbon dioxide removals must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

tangata whenua
local people, indigenous people – people born of the whenua, of the placenta and of the land where the people's ancestors have lived and where their placenta are buried.

te taiao
the world, Earth, the natural world, the environment

Tuarima: Chapter 5

Utu tukuwaro
Emissions pricing

Introduction

The New Zealand Emissions Trading Scheme (NZ ETS) is Aotearoa New Zealand's main emissions pricing tool and central to the Government's strategy to reduce greenhouse gas emissions. However, it requires urgent redesign to achieve emissions budgets and the 2050 target.

This chapter presents the choices Government has around the NZ ETS as part of policy settings in the second emissions reduction plan. It reflects the scheme's importance in encouraging emissions reduction at the source (decarbonisation) and increasing forest area, as both have essential roles in an equitable and sustainable low emissions transition. The NZ ETS covers around half of the country's emissions, with the major exception being biological emissions from agriculture (see *Chapter 10: Agriculture*).[i]

Putting a price on emissions changes the relative prices of goods and services across the economy. This influences the behaviour of both producers and consumers by discouraging high emitting activities and rewarding low emissions choices.

It promotes cost-effective emissions reductions by empowering businesses and individuals to make their own decisions about how to reduce emissions based on their own circumstances, rather than mandating specific actions that must be taken.

Our analysis shows that the NZ ETS as it is currently structured is highly unlikely to drive the gross emissions reductions recommended in *Chapter 4: A path to net zero* for reaching net zero emissions of long-lived greenhouse gases in a way that can be sustained.

Aotearoa New Zealand's climate policies need to encourage both decarbonisation and afforestation, as both have essential roles to play in an equitable and sustainable low emissions transition.

While the NZ ETS creates strong economic drivers for planting trees, it also allows carbon dioxide removals by forests to undermine the incentive to reduce emissions at their source. In the near term, this is expected to result in the NZ ETS driving extensive afforestation but only limited gross emissions reductions.

i. There are also small exceptions in other sectors. For example, in the waste sector, emissions from non-municipal landfills, farm fills, and wastewater treatment are not covered.

In addition, over the longer term (mid-2030s onwards), the NZ ETS will not provide the durable incentives for planting the forests needed to reach net zero long-lived greenhouse gases by 2050.

Our advice in this chapter presents our independent analysis of the options for amending the NZ ETS, and the risks and opportunities involved. We also highlight issues related to expanding the scope of the NZ ETS and reforming the 'industrial free allocation' aspect of the scheme.

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice.

As with all climate policies, the Government must honour Te Tiriti o Waitangi/The Treaty of Waitangi. There are particular complexities regarding the NZ ETS which require great care in developing and appropriately reflecting the Crown-Māori relationship.

Changes from the draft version of this chapter

Since the publication of our draft advice, the Government has announced and/or launched several initiatives related to the NZ ETS and our advice in this chapter. We revised our chapter to reflect these updates, including adding text commenting on the Government's NZ ETS review and the opportunities it presents to strengthen the emissions reduction potential of the scheme.

We also added discussion of the Government's decision to develop a Carbon Removals Strategy, intended to become part of the second emissions reduction plan, and of the recently passed amendments to legislation that enable updates to aspects of industrial free allocation. In response to feedback where submitters expressed differing opinions about the implications of our advice, we went through the chapter and identified opportunities to add information and/or clarify our meaning.

In particular, we received significant feedback from individuals and entities involved in forestry disputing our case for amending NZ ETS incentives. This was mainly on the basis that the Government's NZ ETS review had undermined confidence to invest in afforestation, and so concern about high afforestation rates undermining gross emissions was misplaced.

We clarified in our advice that these recent events have altered the status quo described in our draft advice and take Aotearoa New Zealand off the potential future emissions pathway described there. They do not, however, invalidate the identified issues related to the economics of afforestation compared with reducing gross emissions. These issues mean the current structure of the NZ ETS is not fit for driving either the gross emissions reductions or the removals by forests needed to meet emissions budgets and the 2050 target in an equitable and sustainable way.

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 4 now includes further specificity regarding partnership with iwi/Māori as emissions pricing incentives are redesigned.

In response to the mixed feedback on our industrial allocation advice, we included more discussion of emissions leakage risk and highlighted what some other jurisdictions are doing to evolve their industrial allocation policies. Given the high interest in a carbon border adjustment mechanism as a way to address emissions leakage, we included more information on what the Government has already committed to in terms of investigating this option as part of its first emissions reduction plan.

We did not substantively change the advice in response to submissions questioning the need for emissions pricing at all or advocating to replace the NZ ETS entirely with alternative policies. We continue to stand behind the conclusions we set out in our advice on the first emissions reduction plan, *Ināia tonu nei*. These include that emissions pricing policies are a key pillar of an effective and comprehensive climate policy package (see chapter 11, page 213), and that dismantling the NZ ETS would likely delay much needed action to reduce emissions (see chapter 13, pages 239–240).

NZ ETS incentives

It is important that NZ ETS incentives support an equitable and sustainable transition to low emissions

The NZ ETS is a tool, not a strategy

The NZ ETS is a government-created market with the purpose of assisting Aotearoa New Zealand to meet its emissions budgets, the 2050 target, and Nationally Determined Contributions (NDCs) under the Paris Agreement. It is the Government's role to design and operate the NZ ETS to support desired outcomes for the transition. This step is necessary to enable the NZ ETS to then "*let the market decide*" how those outcomes are delivered.

The Government's first emissions reduction plan set out intentions that the transition to a low emissions economy be equitable, enhance resilience, benefit all, and incorporate and reinforce the principles of Te Tiriti/The Treaty. As a key tool for the climate response, the NZ ETS needs to be run in a way that aligns with these intentions.

Chapter 4: A path to net zero outlines that gross emissions reductions and carbon dioxide removals by forests are not equivalent across a range of considerations. It recommends that the Government commit to specific levels of gross greenhouse gas emissions in the second and third budgets. It sets out that providing clarity on these levels will lead to better policy, manage risks related to using forests as a primary means of meeting emissions budgets, and put Aotearoa New Zealand on track to achieve net zero long-lived greenhouse gas emissions by 2050 in a way that can be sustained over the long term.

To help achieve its desired levels of gross emissions, it will be important for the Government to develop a clear view on the NZ ETS's role in delivering emissions reductions. Communicating this role clearly to participants – and operating the scheme in a manner consistent with that role – will be key to building the confidence in the market needed to drive investment in emissions reductions. Failing to do so will undermine the effectiveness of the NZ ETS and hinder implementation of clear and stable climate change policies in line with the purpose of the Climate Change Response Act 2002 (the Act).

The NZ ETS is not currently structured to drive gross emissions reductions

The NZ ETS currently treats gross emissions reductions and carbon dioxide removals by forests as fully equivalent. Every New Zealand Unit (NZU) generated from a forest and sold into the NZ ETS allows a further tonne of emissions. Establishing and growing a *Pinus radiata* forest delivers removals at relatively low cost ($25-$50 per tonne of CO_2e), while many opportunities to reduce gross long-lived greenhouse gas emissions cost upwards of $100 per tonne of CO_2e.[1]

The current structure of the NZ ETS, combined with these economics, will likely result in extensive afforestation, allowing gross emissions to continue largely unabated. This does not align with our advice outlined in *Chapter 4: A path to net zero* that the approach to meeting emissions budgets and the 2050 target should drive down gross emissions.

The purpose of the NZ ETS needs to shift from focusing only on net emissions to ensuring gross emissions also reduce. This requires decoupling the incentives for gross emissions reductions and afforestation, so the amount of gross reductions driven by the NZ ETS is no longer dependent on the amount of removals achieved by forests.

In the longer term, the NZ ETS will not provide necessary incentives for carbon dioxide removals by forests

Alongside decarbonisation, forests have an essential role to play in the low emissions transition. Aotearoa New Zealand's emissions pricing policies also need to get the incentives right for forests.

A second, longer term issue for the NZ ETS is that by the mid-2030s, it will lose the ability to incentivise carbon dioxide removals. There will not be enough demand from covered sectors to drive the further afforestation needed to reach net zero long-lived greenhouse gas emissions across the economy by 2050.

This is because a significant amount of long-lived and hard-to-abate emissions, like agricultural nitrous oxide, are expected to stay outside the NZ ETS. These emissions will still need to be offset, but current policy approaches do not include a mechanism to enable this.

To reach net zero long-lived greenhouse gas emissions by 2050, it will be necessary for the Government to ensure continued incentives for afforestation over the second and third emissions budgets, and to start considering now how incentives for removals will be maintained over the longer term.

Amending incentives must be considered via a process that upholds Te Tiriti o Waitangi/The Treaty of Waitangi

Aligning emissions pricing incentives with goals for gross emissions and driving afforestation over the long term will require carefully thought through amendments to the NZ ETS. As part of this, the potential impacts on groups affected by the NZ ETS, including those who have already made investment decisions, need to be understood and considered.

In particular, some Māori landowners hold significant interests in land and an important stake in the NZ ETS. In consultation, we heard from iwi/Māori about the importance of upholding Te Tiriti/The Treaty in amending the NZ ETS. Submissions also emphasised the need to acknowledge the impacts of colonisation and past injustices in a manner which supports Māori leadership in mātauranga Māori, and the rights of iwi/Māori to develop their lands for the benefit of their people. It is critical that Government decisions about the NZ ETS recognise the guarantee of rangatiratanga and kaitiakitanga for iwi/Māori.

Recommendation

This recommendation seeks to address the issues with NZ ETS incentives described above and to help enable Aotearoa New Zealand to meet the second emissions budget and its longer-term emissions reduction targets.

Recommendation 4

We recommend that in its second emissions reduction plan, the Government:

4. Align the emissions pricing system with delivering the desired levels of gross emissions for the second and third emissions budgets, and with the 2050 net zero target, by:
   a. amending the NZ ETS to separate the incentives for gross emissions reductions from those applying to forests
   b. providing durable incentives for net carbon dioxide removals by forests through to, and beyond, 2050.

   The redesign of emissions pricing incentives must take into account the unique characteristics and historical circumstances of land owned by Māori and options must be developed in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

It builds on the recommendation we made in *Ināia tonu nei* that the NZ ETS should be amended to strengthen the incentive for gross emissions reductions and to manage the amount of exotic forest planting it drives. The Government responded with an action in the first emissions reduction plan to do further policy analysis to assess whether change was needed. In June 2023, the Government launched a consultation as part of a review of the NZ ETS, to follow up on this action (see **Box 5.2** for more information on the NZ ETS review).

Although the NZ ETS review is now underway, it is still at the beginning of the process. We therefore are expanding on this issue to more clearly outline why altering the NZ ETS incentives should be a key element of the Government's second emissions reduction plan.

The following sections explain the reasoning for this recommendation in more detail.

The current state of the NZ ETS

The Kyoto Protocol set key features of NZ ETS design

The NZ ETS was established in 2008. Its design was strongly influenced by the Kyoto Protocol, the international agreement that at the time set Aotearoa New Zealand's target to reduce emissions.

Several features of the Kyoto Protocol were embedded into the NZ ETS. These included no domestic cap on emissions and a short-term lens, focused on achieving targets looking out only over the next few years. It also resulted in the NZ ETS being the only emissions trading scheme in the world that fully incorporates the forestry sector, for both carbon dioxide removals and emissions, and that treats all types of emissions reductions and removals as equivalent.

Since then, the Paris Agreement and the passing of the Climate Change Response (Zero Carbon) Amendment Act have prompted significant reforms to the NZ ETS. It now has features taking it closer to having a cap on emissions, with a rolling five-year system for managing unit limits and price control settings in line with emissions budgets, the 2050 target, and the NDC. There remain no constraints on the ability of forestry to supply units into the scheme.

Reforms have strengthened NZ ETS incentives, but some view it as inequitable

In recent years the emissions price has increased, with the spot price more than tripling from around $25 in 2019 to a peak of almost $90 in November 2022.[2] It is too early to tell what impact this price may be having on gross emissions.

It is, however, known to be strongly driving afforestation. Evidence indicates over 60,000 ha of new exotic forests were planted in 2022, a significant increase on previous years.[3] The 2022 Afforestation and Deforestation Survey found that exotic afforestation of up to 88,000 ha was intended for 2023, with 70% (61,200 ha) confirmed by late 2022.[4]

We acknowledge that events since then, such as Cyclone Gabrielle and the NZ ETS review consultation, are highly likely to reduce planting from that intended level. The survey finding nevertheless shows the strong forestry response to the emissions price, although the NZ ETS is not the only driver of afforestation, particularly in relation to native species.

This rapid afforestation is raising social licence issues for the forestry sector, particularly in terms of its effects on the environment and on rural communities. In addition, a theme from feedback to our consultation as well as earlier engagement was concern that the NZ ETS's focus on emissions objectives in isolation and lack of recognition of the multiple benefits of a range of forest types are driving perverse outcomes.

In our initial engagement to inform the development of this advice as well as for other Commission work, we heard from some iwi/Māori entities that the NZ ETS in its current form is inequitable and does not support their aspirations. For example, we heard from some representatives that the NZ ETS was not established in a way that properly considered Te Tiriti o Waitangi/The Treaty of Waitangi, and that Māori landowners were not sufficiently resourced or informed to participate when the NZ ETS was introduced, putting them at a disadvantage. We also heard from other iwi/Māori entities with limited land and other resources that they do not benefit from opportunities for revenue created by the NZ ETS and are not included in discussions about the design of the scheme, which contrasts with the treatment of interests in and benefits from fisheries rights.

In other examples shared with us, some Māori landowners own land or will take ownership of land in future but they do not always own the forests on that land. This restricts their decision-making about that land, a challenge which is compounded when those forests have NZ ETS liabilities.

The NZ ETS is expected to play a key role in meeting emissions budgets, but how is unclear

The first emissions reduction plan indicates that the Government expects the NZ ETS to be central to emissions reduction efforts, although it recognises that other policies are also needed.

According to Government modelling presented in the first emissions reduction plan, the NZ ETS was estimated to contribute between 0.9 – 3.5 $MtCO_2e$ net emissions reductions in the first emissions budget, 8.2 – 12.4 $MtCO_2e$ in the second, and 13.0 – 19.8 $MtCO_2e$ in the third.[5] Most of this contribution comes from the energy and industry sector, with a moderate amount from transport.[6] These estimated NZ ETS contributions were included in the overall emissions reductions estimated for each sector in the Government's first emissions reduction plan, as outlined in *Chapter 3: The task for the second emissions budget*.

The first emissions reduction plan also states that it is important that gross emissions reduce. However, in practice the Government has given mixed signals about the outcomes it wants on gross emissions and the role it sees the NZ ETS playing in driving them. In the current NZ ETS review, the Government has recognised that the scheme's current structure, focusing on net emissions, may not deliver desirable outcomes on gross emissions.

The current NZ ETS structure has risks and implications for Aotearoa New Zealand's climate goals

The uncertainty about the Government's objectives for the NZ ETS is likely to undermine the scheme's effectiveness. It makes investments to reduce emissions that rely on the emissions price riskier, increasing costs and likely delaying action.

If the Government does not resolve this uncertainty, it will become increasingly problematic for market participants – emitters, foresters, intermediaries, and consultants – whose businesses and decarbonisation efforts depend on the NZ ETS. It will be difficult for them to proceed with investments when it is not clear whether they are consistent with the path the Government intends to follow to reduce emissions.

In the absence of clear signals and incentives to decarbonise, the least risky approach will be to plant more trees. This then has flow-on implications for those affected by land-use change, particularly rural communities that thrive on a diversity of land uses.

If the NZ ETS is to operate effectively and in line with a sustainable and equitable transition over the second and third emissions budget periods, this uncertainty will need to be resolved in the second emissions reduction plan. The forest planting driven by the NZ ETS in the second emissions budget will be critical for the emissions trajectory in the 2030s and 2040s, as forests planted between 2026–2030 will only start to capture and store significant amounts of emissions in the third emissions budget period, due to the lag between planting and tree growth.

It is therefore timely to revisit the fundamental design of NZ ETS incentives.

Afforestation driven by the NZ ETS is likely to displace gross emissions reductions

The NZ ETS creates strong economic drivers for afforestation, and Aotearoa New Zealand's area of land that is potentially suitable for conversion to forest is relatively large compared to most other developed countries. Te Uru Rākau estimated in 2019 that up to 3.3 million hectares of non-forest land (typically low-producing pasture) could be suitable for afforestation.[7] A study by the Ministry for the Environment estimated that around 5 million hectares could be economic to convert to forest at $50 per tonne of CO_2e or less.[8] Planting just a small proportion of that land would be enough to displace gross reductions and lead to emissions prices that are insufficient to drive most decarbonisation opportunities. This is illustrated by the "unconstrained removals" scenario described in **Figure 4.1** of *Chapter 4: A path to net zero*.

This issue relates to all planting of fast-growing tree species, irrespective of whether it is for production or permanent forestry purposes.

In recent years increased emissions prices have driven an uptick in forest planting, with over 60,000 ha of new exotic planting in 2022.[9] This is well above the 2022–2030 projected average of 32,000 ha per year used by the Government when it set emissions budgets and assumed in the Commission's updated demonstration path. **Figure 5.1** shows the history of NZU prices, deforestation and afforestation over time, and **Figure 5.2** illustrates the scale at which gross emissions reductions could be displaced, if a planting rate of 60,000 ha per year continues.

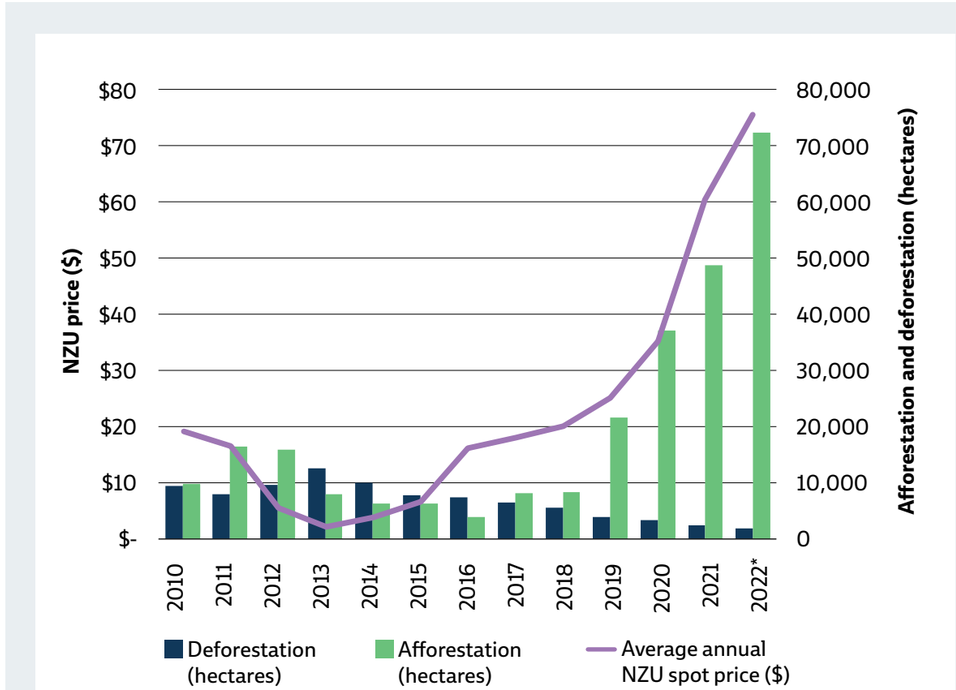

Figure 5.1 Historical NZU price, deforestation, and afforestation

Source: Adapted from figure 1 in Ministry for Primary Industries (2022),[10] updated with 2010–2021 afforestation and deforestation sourced from the 2023 Greenhouse Gas Inventory,[11] 2022 afforestation from the 2022 Afforestation and Deforestation Survey (ADS),[12] and deforestation sourced from the 2022 ADS[13] and extrapolation of the most recent Greenhouse Gas Inventory native deforestation estimates.[14]

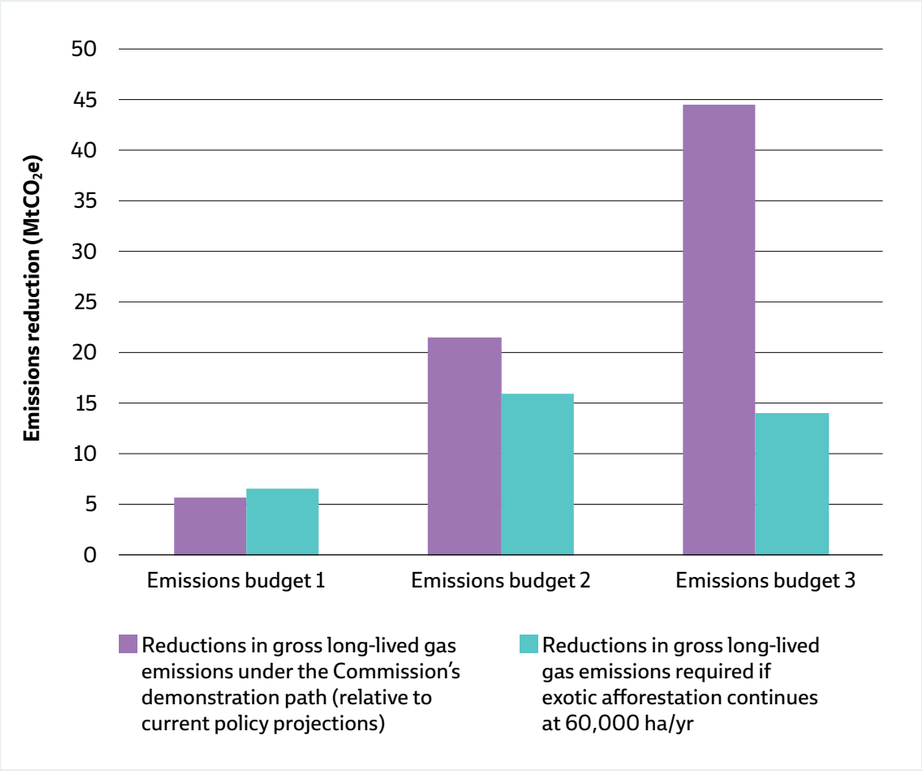

Figure 5.2 Illustrative example of how continued high afforestation rates could undermine gross emissions reductions

Source: Commission analysis

If similar planting rates continue, a large number of forestry units would enter the NZ ETS in the 2030s. While there is uncertainty about when foresters might sell these units to others in the market, the large volume risks depressing NZU prices. The NZ ETS would be unlikely to generate the steadily increasing emissions price needed to drive gross emissions reductions.

While we heard views in consultation that these high planting rates would not be sustained in future, the main reason for this cited in submissions was that the NZ ETS review has undermined confidence to invest.

The paragraphs above describe the status quo before the NZ ETS review outlined potential fundamental changes to the scheme's treatment of forestry.

The change in circumstances means this status quo no longer exists but does not invalidate the issues raised. No submissions identified compelling reasons as to why high planting rates could not be sustained over time, if incentives were sufficiently secure and economically favourable – although we acknowledge that due to the NZ ETS review these conditions are not currently present.

As noted above, the area suitable for conversion to forestry is large so land availability is unlikely to act as a constraint. For example, planting 60,000 hectares every year from 2022 to 2035 would use 840,000 hectares cumulatively, only a quarter of the 3.3 million hectares estimated as suitable for afforestation by Te Uru Rākau.

Stock change accounting exacerbates risk that gross emissions reductions will be displaced

From this year (2023), there will also be two accounting systems in the NZ ETS for emissions and carbon dioxide removals by production forests planted after 1989. Averaging is being introduced, a new approach which reflects how Aotearoa New Zealand will account for forests in its emissions budgets, 2050 target, and NDC under the Paris Agreement. Stock change accounting, the previous approach used under the Kyoto Protocol, will still be used by many forests registered in the NZ ETS before 2023. No decisions have been made about whether – and if so, how – stock change accounting will be phased out of the NZ ETS.

Box 5.1: Stock change and averaging accounting for forests in the NZ ETS

Under stock change accounting, a production forest planted after 1989 (post-1989) and registered in the NZ ETS earns units as it grows. A substantial number of units must be paid back when the forest is harvested, although more units can be earned if the forest is replanted. Over multiple rotations, this gives the saw-tooth pattern in the graph below.

Under averaging accounting, in the NZ ETS a post-1989 forest only earns units up to the amount of carbon it is expected to store long term, averaged over many rotations. Units are earned for the first rotation only, and there is no requirement to repay units on harvest as long as the forest is replanted. There is still a requirement to repay units if the land is deforested.

Note that the averaging accounting used for post-1989 forests in the NZ ETS does not fully align with how emissions and removals by these forests are accounted for in the National Greenhouse Gas Inventory or in emissions budgets, the 2050 target or the NDC. One aspect of this is described in **Box 3.3** in *Chapter 3: The task for the second emissions budget*. Stock change accounting is no longer used in Aotearoa's target accounting.

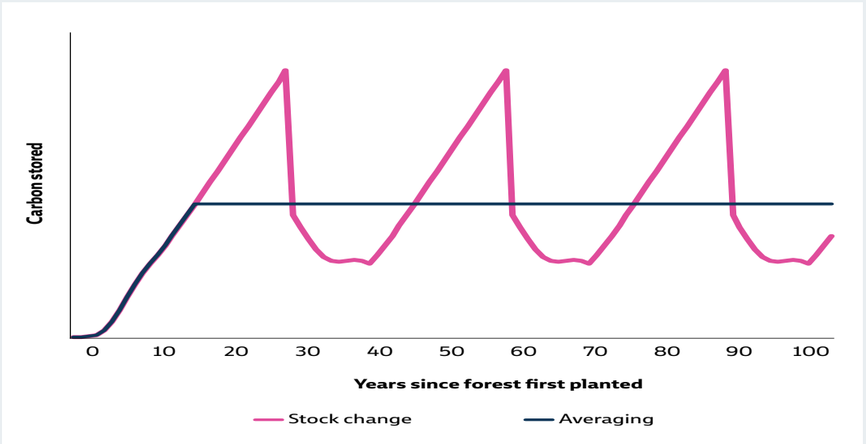

Figure 5.3 Schematic illustrating how units are allocated to NZ ETS-registered post-1989 production forests under NZ ETS stock change and averaging accounting over multiple rotations.

Source: Commission analysis.

Stock change accounting does not match the accounting used for emissions budgets, the 2050 target, or the NDC. Under stock change accounting in the NZ ETS a forest earns units up to its maximum carbon stock over more than one rotation, whereas under the averaging approach used for target accounting, removals by forests are credited up to the long-term average carbon stock, for the first rotation only (see **Box 5.1** and **Figure 5.3**).

Forests registered in the NZ ETS on stock change accounting will therefore be allocated units that do not correspond to removals that can be counted towards emissions reduction targets. This is not a problem if these units are retained by foresters and surrendered when the forests are harvested. But if they are sold to and used by emitters, they risk increasing emissions overall because these units may not represent genuine carbon dioxide removals occurring within the relevant time period that can be counted towards emissions budgets or the NDC.

Recent analysis indicates that at prices of around $70-80 per NZU, not harvesting forests on stock change accounting is more profitable than production forestry for most forests.[15]

If not harvested, *Pinus radiata* and other exotic softwood forests under stock change accounting and current NZ ETS rules can earn units above the peak shown in the saw-tooth line in **Figure 5.3**, until they reach 50 years of age.[16] If foresters decide not to harvest these forests, significant additional units would become available to the market. It is very uncertain to what extent this option might be taken up. Our engagement with forestry stakeholders indicates that the option to not harvest some areas of NZ ETS-registered post-1989 forests on stock change accounting is being considered.

Not harvesting forests originally intended to be production forests has potential to cause other problems too. While actively and appropriately managed exotic forests can transition to native forests over time, exotic forests planted for production purposes may not be suitable for this. Through consultation, we heard concerns about the negative environmental impacts that could occur if these forests are not managed well. There is very little evidence currently about the magnitude of this risk. Further research on harvest intentions could provide more information about the scale of this issue.

The current situation creates risks for foresters too

The NZ ETS structure risks generating a boom, and then a bust, for both the emissions price and forestry. This is partly due to the time lags between planting and tree growth. Recent NZU prices have incentivised increased forest planting, but it will be several years before the growth rate of these forests accelerates and they earn significant amounts of NZUs. This increased planting will eventually feedback through to increases in NZU supply, putting downward pressure on emissions prices.

In addition to putting decarbonisation at risk, the potential effects on price would also be bad for the forestry sector. It could drive a large amount of afforestation for several years, followed by a drastic decline in planting rates.

As a result, foresters may also not get the return on NZUs that they were anticipating when they planted their trees. Foresters who bought land to plant may be particularly negatively impacted, because of the way price expectations for NZUs feed into land prices. For example, the Real Estate Institute of New Zealand reported that median forestry farm prices increased 45% over 2018–19 (from $6,487 per ha to $9,394), linked with the increase in incentives for forestry.[17]

The current increase in planting comes on top of an existing peak this decade due to the harvest and replanting of forests established in the 1990s. In the future this could cause bottle necks for the sector and related industries when large areas of forest are due for harvest and then replanting at the same time. Slower but steady planting over time would likely be preferable for the sector as well as for managing social impacts of land-use change to forests and for meeting emissions reductions targets.

The NZ ETS is unable to incentivise the carbon dioxide removals needed to reach net zero

The effectiveness of the NZ ETS beyond the mid-2030s is at risk, as there will not be enough demand from NZ ETS-covered sectors to drive the carbon dioxide removals by forests needed to reach the net zero component of the 2050 target. This is because not all gases included in that target are covered by the scheme, notably agricultural nitrous oxide.

In other words, the NZ ETS will reach net zero in supply and demand terms before net zero long-lived greenhouse gas emissions is reached in the economy. At that point, the NZ ETS will lose its ability to drive further decarbonisation. It will also be unable to incentivise the further afforestation and removals needed to offset residual long-lived greenhouse gas emissions that sit outside of the scheme.

Under the Commission's demonstration path, which is currently used to set the NZ ETS cap trajectory consistent with meeting emissions budgets, this point would be reached around 2037, illustrated by **Figure 5.4** below. Meeting the net zero 2050 target would require covered sectors to go net negative, which is extremely challenging for an emissions trading scheme to achieve.

This absence of a long-term price signal for afforestation could contribute to a possible decline in planting rates as it becomes understood by market participants. The Government needs to start the process to work out how to address it now, because of the long-term investment horizon of the forestry sector and the forward-looking nature of the NZ ETS market.

Solutions could involve changes to the NZ ETS or the development of separate policies to incentivise removals by forests. It may even be possible to design an approach or package that addresses this issue at the same time as separating the emissions price incentives for forestry from gross emissions reductions.

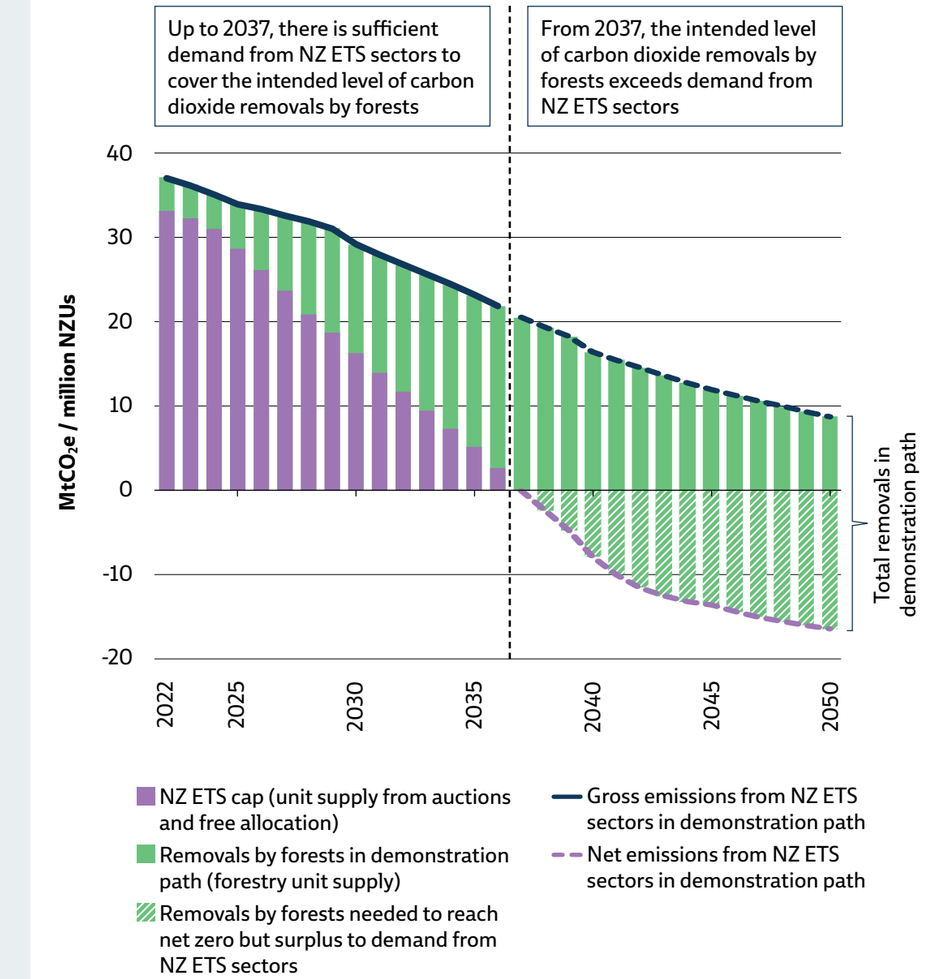

Figure 5.4 The NZ ETS cap reaches zero in 2037 but further removals are needed to reach the 2050 net zero target

Source: Commission analysis of NZ ETS unit limit settings[18]

Most alternatives to amending NZ ETS incentives would not be effective

Amending NZ ETS incentives would be a big change. The process of considering how the NZ ETS could be altered and then implementing changes could create uncertainty and disruption for NZ ETS participants. Emissions reductions could even be delayed if uncertainty causes investments to be put off until Government decisions are made, communicated, and understood.

Despite these drawbacks, we conclude that there is little alternative to this course of action. We have considered whether there are other ways that the risks and potential outcomes outlined above could be avoided. Below, we briefly outline alternatives raised since we first made this recommendation in *Ināia tonu nei*.

Based on current information, strengthening complementary policies appears to be the only other viable option to give increased certainty about the achievement of gross emissions reductions.

Driving gross emissions reductions primarily through complementary policies

The Government could accept that the NZ ETS will not significantly reduce gross emissions, and instead drive most decarbonisation through a much stronger package of complementary policies. In this case, the purpose of the NZ ETS could be clearly redefined as a mechanism for afforestation.

Similar approaches have been used elsewhere. For example, in the United States, California has an emissions trading scheme, but its strong complementary policies are expected to do most of the work to reduce emissions. Its emissions trading scheme is regarded as a "backstop" to reduce remaining emissions after other regulations have had effect.

There would be challenges with applying this approach in Aotearoa New Zealand. Policy-makers and the business community have traditionally preferred market-based policies. If the mix of policies chosen are not sufficiently complementary or are poorly designed, the NZ ETS could shift away from 'polluter pays' to an approach where taxpayers bear a larger cost burden. The cost of reducing gross emissions might still be as high or higher, just not as visible as in an explicit NZU price.

The Government would need to be clear – as California is – that it is choosing this route. This would give clarity about expectations for the NZ ETS and enable participants to factor it in to their expectations of the NZU price. Using a strong package of complementary policies to drive emissions reductions would, over time, cause the NZ ETS emissions price to be lower than it would be with a more pricing-driven approach, all other things held equal.

Other options do not address the core problem

Several other options or reasons against amending NZ ETS incentives have been put forward since we made the recommendation to decouple incentives in *Ināia tonu nei*. They mostly focus on restricting forestry or introducing new sources of demand for forestry units in the hope that this will support the NZU price. Our assessment is that these options do not provide improved certainty about sufficiently strong incentives for decarbonisation or a sustainable pace of afforestation.

These ideas have included:

- **Restrictions on land use under the Resource Management Act 1991**. The potential for land-use change to forestry in Aotearoa New Zealand is large. For example, there are around 8 million hectares of land used for sheep and beef farming,[19] and at current NZU prices most sheep and beef land would be more profitable in forestry.[20] Land-use restrictions would have to be widespread and stringent to counterbalance the NZ ETS incentive effectively.
- **Restricting the NZ ETS permanent forestry category**. Limiting the incentives for permanent forests could reduce the area of permanent forest planted, but it would not prevent further planting of production forests from displacing gross emissions reductions.
- **Demand from agriculture**. The agricultural emissions pricing scheme being developed does not incorporate any requirements to use NZUs for compliance purposes. This means that significant agricultural demand for NZUs is unlikely to materialise.
- **Reducing the NZ ETS cap faster than is required by emissions budgets**. Reducing NZUs allocated to the market through auctions and/or free allocation would not guarantee strong incentives for decarbonisation, as it could simply drive more forest planting or more decisions by foresters not to harvest existing forests. It would also not address the social impacts of rapid afforestation or the intergenerational impacts from locking land up and delaying decarbonisation.
- **Purchase of forestry NZUs by other countries or by the voluntary marke**t. Again, this could drive more forestry rather than stronger incentives for decarbonisation. These approaches may not even be feasible. It is not clear that forestry NZUs would comply with Paris Agreement rules for international trading[ii] or with voluntary carbon market standards' requirements about additionality and sustainable development. Article 6 is also subject to detailed commentary by the UN Local Communities and Indigenous Peoples Platform regarding the risks of trading on the homelands of indigenous peoples utilised for forestry credits without free prior and informed consent.

ii. Article 6 of the Paris Agreement and its rulebook set out that emissions trading between countries is a mechanism to drive higher ambition, to promote sustainable development and environmental integrity. Environmental integrity includes the concept of additionality.

In the context of carbon markets, additionality generally means that an emissions reduction or removal traded should be above and beyond what would happen under current policy and business-as-usual conditions.[iii] Forestry is one of Aotearoa New Zealand's lowest cost mitigation options. It is already incentivised by government policy (the NZ ETS) without the need for international finance, making it unclear that it would fulfil additionality requirements.

Social licence issues arising around both production and permanent forestry, particularly concerns expressed by a range of stakeholders and rural communities about the social, economic, and intergenerational impacts of rapid and extensive afforestation, also raise questions about whether forestry NZUs would satisfy sustainable development conditions aimed at ensuring that projects producing offsets avoid contributing to social and environmental harms.

- **Purchase of forestry NZUs by the Government to help meet the NDC and reduce reliance on offshore mitigation**. It is too late for forest planting to help much with the 2030 NDC, due to the time trees need to start significantly sequestering carbon, although planting forests now would help with meeting future NDCs. Like other options focused on forestry, this would not increase the incentives for decarbonisation and may drive socially unacceptable afforestation rates.

Note that a key reason why offshore mitigation is needed for meeting the current NDC is that Aotearoa New Zealand made little progress in reducing gross emissions to meet its previous emissions reduction targets (over 2008–12 and 2013–2020). Ensuring climate policies drive gross emissions down will help avoid a repeat of this situation.

iii. Note this differs from the definition of additionality used in national accounting for forest emissions and carbon dioxide removals under the Kyoto Protocol and in Aotearoa New Zealand's target accounting, where removals by any forest planted after 1989 are deemed to be additional.

Box 5.2: The Government's NZ ETS Review

The NZ ETS review process

Between the April 2023 release of the Commission's draft advice and the publication of this final advice, the Government ran a public consultation on the role of forestry in the NZ ETS as part of a review of the scheme.[21]

This review is an important step towards developing a new structure for the NZ ETS so it can better support Aotearoa New Zealand to reduce gross emissions in addition to growing forests to remove carbon dioxide from the atmosphere, which the Commission first recommended be progressed as part of *Ināia tonu nei*.

The consultation also starts to implement a key action of the first emissions reduction plan set by the Government in May 2022, *Action 5.2.1: Adjust the NZ ETS to drive a balance of gross and net emissions reductions*.[22]

The consultation document states the aim of the review is to assess the desired role of the NZ ETS in driving gross emissions reductions, while continuing to support removals. It will consider the benefits, trade-offs, and risks of changing the NZ ETS.

The consultation closed on 11 August 2023 and is the first step in a longer process. The Ministry for the Environment has stated that any changes to the NZ ETS would be subject to further public consultation on the detailed design of the proposals.

No decisions resulting from this first consultation have yet been announced.

Clarifying the objectives for reducing gross and net emissions remains essential

The NZ ETS review consultation document did not address the levels of gross emissions reductions and carbon dioxide removals by forests that the Government is seeking to achieve.

The Commission made recommendations on this in *Ināia tonu nei* in 2021[23] and has again in this advice (see Recommendations 2 and 3).

It now appears that the Government's objectives in this regard may be resolved to some extent through the process of developing a Carbon Removals Strategy, with consultation planned for early 2024 (see *Expanding NZ ETS scope* section below for more information).

Meaningful analysis of the options for amending the NZ ETS is dependent on clarifying these objectives as quickly as possible.

A basic principle of policy analysis is that options are assessed against the objectives the policy is seeking to achieve. The NZ ETS is only a tool, and without defined objectives it will be difficult for those consulted – iwi/Māori, emitters, foresters, and any other affected or interested parties – to understand impacts and what options mean for them. These objectives are also essential information for the NZ ETS market as it exists now, so participants can form a view about future NZU prices.

The Parliamentary Commissioner for the Environment's recent advice reviewing the development of the first emissions reduction plan also recommended that the key framing question about the balance between gross and net emissions reductions be answered at the early stage of developing the second emissions reduction plan.[24]

Considering a full range of feasible options is necessary

The consultation document outlined four high level options for change to the NZ ETS, which overlap with some of the options canvassed in this document.

Two options that we identified as potentially feasible were not covered. Described in the following section, these are:

- limiting the area of new forest land that can register into the NZ ETS each year
- introducing a minimum price for emitters via an additional levy or fee.

It is not clear whether these options have been considered or not, and if they have, why they may have been discarded.

We set out these options to inform discussion about the NZ ETS, and to emphasise the importance of examining all potentially feasible options.

Transparent examination of transitional issues is needed in the next stage of the review

A crucial element the review needs to look at is whether and what transitional arrangements should apply to existing forestry participants and forestry NZUs already circulating in the scheme.

While feedback from consultation on our draft advice shows that this is a top priority for NZ ETS market participants, the NZ ETS review discussion document contained very little information on it. The next stage of the review presents a critical opportunity to identify and analyse the options and impacts of potential transitional arrangements, to enable informed discussion and meaningful consultation with affected parties.

Property rights to NZUs in the current NZ ETS are not a guarantee of the value of those NZUs, and asset values can go both up and down for a range of reasons. Emissions trading schemes by their nature involve uncertainty, as the market only exists due to government regulation and government policies inevitably change over time.

As discussed in the above section *The current NZ ETS structure has risks and implications for Aotearoa New Zealand's climate goals*, if left unchanged the current NZ ETS structure comes with a high risk of NZU prices slipping to relatively low levels, reflecting the marginal cost of forestry.

However, to ensure confidence and participation in the review and in the NZ ETS itself are not unnecessarily eroded, current participants (including investors and those who have registered forests under existing rules) will need assurance that their investments will not lose their value as a result of amendments to the scheme.

Emitters who hold or have contracted to purchase forestry NZUs, sometimes for several years forward, will also need to be certain that those units will still be able to be used for compliance.

A fair transition for existing forestry participants and forestry NZUs does not necessarily mean that all forestry units and post-1989 forests already in the scheme must be fully carried over into a revised NZ ETS while remaining subject to the old ruleset (grandparented). This is especially the case if the revised scheme has been designed to generate higher prices than those likely to arise under the previous rules.

As a market established to achieve policy objectives, the Government's conduct when making changes to the NZ ETS will have implications for confidence in the scheme. For participants to maintain confidence and willingness to invest, it will be important for the Government to ensure that any changes – particularly where they affect the returns of past investment decisions which cannot be undone – are:

- necessary
- well-signalled and clearly articulated
- in line with the objectives of the policy
- pursued through a proper process with adequate consultation.

Progression of the NZ ETS review is urgent

While the NZ ETS review is necessary, it will be a disruptive process for the market. Prolonged uncertainty about the future of the NZ ETS will limit its ability to drive investments in reducing emissions, which is central to Aotearoa New Zealand's approach to achieving emissions budgets.

The NZ ETS review will need to be resourced appropriately and undertaken with urgency so that the scheme can drive the needed investments in reducing emissions.

There are several options for amending NZ ETS incentives

In *Ināia tonu nei*, we recommended that the Government amend the NZ ETS to strengthen the incentives for gross emissions reductions and manage the amount of exotic forest planting driven by the scheme. Since making that recommendation, we have been asked several times by stakeholders about how the NZ ETS could be changed to separate the incentives for decarbonisation and forestry. This indicates a desire for more information about how this recommendation could be implemented.

Our role is to provide independent advice on policy direction. Policy development and implementation is the role of government ministries, which are better placed to do the collaborative and detailed work required. Engagement and consultation will be crucial, as will co-design and partnership with iwi/Māori so impacts for Māori landowners, iwi/Māori foresters and other interested iwi/Māori groups, including those who may not be directly participating in the NZ ETS or forestry activities, are understood and reflected in policy decisions.

Below, we have described some possible options for amending NZ ETS incentives. This is intended to give a sense of available approaches, international experience of them, and how they might differ in their effects, to inform the debate. It is not an exhaustive list, and there may be other options available as well as variations or hybrids of the options we discuss. It is also not intended to indicate that the Commission favours these approaches.

Limit the proportion of forestry units that emitters can surrender

This approach has been used internationally in several other emissions trading schemes. For example, in California's cap-and-trade scheme, participants can meet only up to 4% of their surrender obligations with offset units (prior to 2021, the limit was 8%).

Such a limit would reduce demand and therefore price for forestry NZUs, relative to the price of other NZUs in the scheme. Emitters would be subject to an incentive that is a mix of the two prices, with that incentive strengthening with the stringency of the limit on forestry NZUs.

With this option, it may be difficult to determine the appropriate limit to implement. It would not give direct control over the amount of afforestation driven by the NZ ETS and would add complexity with participants needing to consider two different types of units and prices.

Careful consideration would need to be given to how this might apply to forestry NZUs already in the market or that will be generated from forests already registered in the NZ ETS. It may be seen as unfair to impose this limit on all forestry units, given investment decisions and plans for managing surrender obligations, such as offtake agreements, will have already been made based on the previous rules.

An opportunity with this option would be to differentiate the price of units from native forests. For example, if the limit only applied to units generated by fast-growing exotic species, units generated from native or slower growing forests would trade at a premium to those units.

Introduce a minimum emissions price for emitters via an additional levy or fee

This has been used in the United Kingdom. Since 2013, UK power generators have had to pay Carbon Price Support on top of their unit surrenders to the UK ETS (or previously, to the EU ETS).[25] This is an extra charge per tonne that changes over time and is based on government calculations of the price that is needed on top of the ETS price to drive low carbon investment. It has been assessed as contributing to significant falls in coal electricity generation.[26]

In this approach, the price of forestry NZUs would remain undifferentiated from other units, but the fee would subject emitters to a higher incentive, even if NZU prices dropped.

A challenge with this approach is that it may be difficult for the Government to determine the appropriate level at which to set the additional fee. An opportunity is that it would raise revenue, which could be reinvested into the climate response.

Limit the area of new forest land that can register into the NZ ETS each year

This option would offer more direct control over how much forest planting the NZ ETS would drive each year. This would be useful if maintaining a steady, measured pace of afforestation is valued.

An overall quota would be set to limit the forest area that could be registered into the NZ ETS each year. Registered forests would still receive one NZU for each tonne of carbon dioxide sequestered. There would be no differentiation of the prices applying to different types of NZUs, as the quota would provide the brake that prevents excessive afforestation and downward pressure on the NZU price.

How the quota is allocated would have to be considered. A first come, first served system might be viewed as unfair. Another option would be to auction the rights to entry each year. This would create a new source of revenue for the Government but could also create unfair barriers to participation. For example, many iwi/Māori entities have limited access to financial resources, and any upfront cost could further disadvantage them in their ability to participate in the NZ ETS.

Move forestry into a separate project-based mechanism

A separate mechanism could be created to incentivise afforestation, leaving the NZ ETS to focus on driving gross emissions reductions. An example is the Australian Carbon Credit Unit (ACCU) Scheme (formerly known as the Emissions Reduction Fund), a voluntary scheme which operates via a reverse auction mechanism.[27]

The Australian government regularly holds auctions for achieving a set level of emissions reduction. Entities wishing to participate bid at auction to achieve part of this reduction via emissions reduction projects, with the lowest cost projects winning. This ensures efficiency, with the most cost-effective projects taken up. These projects then can earn units when emissions reductions are achieved.

In Aotearoa New Zealand, such a scheme could focus on forestry only, although it could also be expanded to other activities not covered by the NZ ETS, such as peatland restoration. It could use the systems and processes already developed for forestry in the NZ ETS for carbon measurement and reporting.

This approach would enable direct control over the rate of afforestation incentivised. It would also likely make it easier to specify criteria, such as environmental benchmarks, to be met by participating projects. These features could support a design that makes the mechanism more compatible with the voluntary carbon market than the current approach to forestry in the NZ ETS.

Decisions would be needed on whether projects winning the auctions could sell their emissions reductions or removals only to the Government, or also to voluntary carbon market buyers and into the NZ ETS. This would affect the extent to which the NZ ETS incentive for decarbonisation is separated from forestry.

Introduce an exchange rate between forestry and other NZUs or reduce the quantity of NZUs allocated for carbon sequestration by forests

These are two variations which would have a similar effect of dampening the incentive for forests by reducing the return on carbon sequestration.

The exchange rate option would specify that a certain number of forestry NZUs are equivalent to only one tonne of gross emissions, for example that two forestry NZUs must be surrendered for one tonne of gross emissions. Other units would remain one-for-one. This would halve the value of forestry NZUs and the incentive for forests.

The other approach would reduce the allocation of NZUs by applying a discount to sequestration by forests – for example a 10% discount would mean that a forest would have to remove 1.1 tonne of CO_2e to earn one NZU.

The exchange rate or the discount could be varied over time, depending on progress made to reduce gross emissions or to meet emissions reduction targets.

A disadvantage is that these options undermine the basic carbon market principle that a tonne is a tonne. The multipliers or discounts would make it complex for both market participants and the Government to understand how unit supply matches up to emissions budgets and the NDC, as in target accounting each tonne of carbon dioxide removed would still be counted as such. Settling on an appropriate exchange rate or discount would likely be challenging.

Reduce the ability to bank forestry NZUs by applying an expiry date ('vintaging')

This option would put a time limit on forestry NZUs, so after a certain date they would not be valid for surrender. This would reduce the usefulness of forestry NZUs to emitters, thereby reducing demand and their price relative to other units.

This issue has been looked at before, when the NZ ETS was established and in previous NZ ETS reviews. It was rejected previously partly because under stock change accounting, forestry participants need to hold units for decades as part of planning for future harvest liabilities. From this year, averaging accounting will be compulsory in the NZ ETS for newly registered forests, making this reasoning less compelling.

In addition to reducing the incentive for forests relative to that for decarbonisation, this option could help manage risks associated with units being carried over in the NZ ETS across NDC periods, as the Paris Agreement does not allow countries to bank overachievement to count towards future NDCs.

A downside of this option is that it would add complexity. It might also change how market participants approach obtaining units for hedging and surrender obligations, using some units earlier or later. This could affect market dynamics and potentially cause undesired outcomes.

Redesigning incentives presents opportunities

As outlined in *Chapter 4: A path to net zero*, how emissions budgets and the 2050 target are achieved matters – for the climate, for our economy, and for an equitable transition.

As a key tool for reducing emissions, NZ ETS incentives need to be consistent with the outcomes sought. A redesign of the incentives would also present opportunities for broader improvement.

The way climate policy treats forestry could be reconsidered, in terms of whether there is a more holistic way to incentivise forests, so they contribute to our climate, economic, and wider environmental objectives. The NZ ETS by its nature focuses on carbon only, but forests offer many benefits beyond a means to absorb and store carbon.

In particular, we heard in engagement and consultation that there are many barriers to participation and challenges understanding the complexity of the NZ ETS for small landowners, and especially for owners of small blocks of whenua Māori. It would be worthwhile to explore simpler options, such as grant schemes, that may provide small landowners more opportunities to undertake and benefit from afforestation.

How the redesign of NZ ETS incentives is undertaken and implemented also matters. By working closely with Māori landowners, the Crown can better understand their existing barriers and aspirations for land use, and what these contexts mean for policy approaches under consideration.

The unique characteristics and historical circumstances of the varied and nuanced contexts across land owned by Māori collectives must be taken into account, and effect must be given to the Treaty principles of partnership, active protection, participation, and equity while also recognising the guarantee of rangatiratanga and kaitiakitanga.

The redesign we recommend also presents a key opportunity to undertake a full, collaborative, up to date Te Tiriti/The Treaty analysis of the current NZ ETS incentives for post-1989 forestry and of any options for change that may alter how those incentives operate and seek to co-design addressing the specific effects on iwi/Māori, consistent with Treaty principles.

Expanding NZ ETS scope

There is growing interest in expanding the NZ ETS scope to include other activities that store carbon

In recent years, some groups have called for the NZ ETS to be extended to activities which are already counted in Aotearoa New Zealand's emissions reduction target, such as the storage of carbon in harvested wood products or improved management of pre-1990 forests. There is also enthusiasm among some stakeholders for using the NZ ETS to incentivise carbon dioxide removals or better management of carbon stocks where these are not yet included in target accounting – for example in relation to soils, vegetation, wetlands, or the marine environment ('blue carbon').

Investigating these opportunities is important. For some, further research is needed to quantify their sequestration potential as well as the costs and practicalities of interventions to enhance carbon storage. Others, such as harvested wood products, are better understood but raise questions about what policy approach should be used to encourage them.

In *Ināia tonu nei*, we recommended that methods be developed for tracking emissions and removals by sources and sinks not yet included in target accounting, prioritising carbon in organic soils (such as peat) and biomass (such as small lots of trees and regenerating vegetation). We also recommended that the Government maintain and increase carbon stocks in pre-1990 forests, encourage carbon dioxide removals by new and additional small blocks of trees and vegetation, and prevent further loss of carbon from organic soils due to the degradation of drained peatlands and the destruction of wetlands.

We note the Government's decision in June 2023 to develop a Carbon Removals Strategy as part of the second emissions reduction plan includes work to address questions about the scale, mix, and prioritisation of removals needed and how new removal activities can be rewarded, as well as how biodiversity, climate resilience, and broader co-benefits can be realised.[28] We also discuss the plans for a Carbon Removals Strategy in *Chapter 14: Forests and other carbon stock*.

Cabinet documents indicate that this Strategy will also include work on providing a more enabling regulatory environment and clearer pathway to market for new carbon removal activities. The aim is to develop processes to set clear criteria and expectations for research and evidence required for market entry, and to test and verify that evidence, as well as to better encourage improvements to the evidence and monitoring methods needed for deployment. Options will be looked at for including a broader range of carbon dioxide removal activities in the NZ ETS or other incentive mechanisms.

A draft Strategy is expected to be submitted to Cabinet by the end of 2023, with a view to undertaking public consultation in 2024. In this next section, we highlight some important issues to consider in this work.

Any expansion of the NZ ETS needs careful consideration

When looking to encourage new types of carbon dioxide removals, using the NZ ETS tends to be at front of mind, given its status a central tool in Aotearoa New Zealand's climate policy response. However, the NZ ETS may not be the best suited policy tool for all emissions reduction and removal activities.

Nature-based solutions often have multiple benefits and may be better pursued using more holistic approaches. The NZ ETS by its nature focuses on greenhouse gases only and could result in unintended consequences if emissions outcomes are narrowly pursued at the expense of other issues.

It will be important for the Government to determine the outcome of the NZ ETS review before making any decisions about expanding the coverage of the NZ ETS to include these new activities or land uses, as their inclusion could further erode the scheme's ability to drive gross emissions reductions. The Government's approach to developing a Carbon Removals Strategy appears to recognise this.

The Government has signalled that it intends to develop criteria to identify the policy mechanisms most suited to supporting removal activities with different characteristics and at different stages of development. Undertaking thorough policy analysis before decisions are made to include new categories or activities in the NZ ETS would help avoid unintended, negative outcomes. Questions to consider include:

- Are these carbon stocks or sinks accounted for in Aotearoa New Zealand's emissions reduction targets? If not, what is the process for incorporating them into target accounting and how will any policy to incentivise them be made consistent with meeting targets? Before detailed policies are developed, it is important to clarify at least at a high level what the target accounting approach will be as this can affect policy design.
- What is the role for these carbon dioxide removals in Aotearoa New Zealand's low emissions transition pathway?
- What is the full scope of diverse iwi/Māori rights and interests and Te Tiriti/The Treaty considerations? Is including these activities in the NZ ETS consistent with those?
- Is emissions pricing the appropriate policy tool taking into account the emissions reduction opportunity and actors involved, for example large businesses or small landowners? What other policy options exist (e.g., resource management tools, grants), and are they more suitable?
- If emissions pricing is appropriate, what type should be used – for example the NZ ETS or a separate scheme? If incorporation into the NZ ETS is preferred, how should this happen, for example through project crediting or through full coverage of both emissions and removals?
- How will the additionality[iv] and permanence (durability) of the removals be assured as well as responsibility for emissions be dealt by the design of the NZ ETS or any other policies used to incentivise these removal activities?

It is important that any decisions to extend target accounting or NZ ETS coverage to include additional carbon dioxide removal opportunities such as vegetation and peatlands do not weaken Aotearoa New Zealand's efforts to address climate change.

In *Ināia tonu nei*, we advised that if accounting was expanded beyond the scope used to set emissions reduction targets, this should trigger a review of the targets to ensure their integrity. This is important to prevent undermining the ambition of Aotearoa New Zealand's climate commitments, so we reiterate it here to stress its importance, and as another reason to follow a proper process before NZ ETS scope is widened.

iv. The concept, in policy and greenhouse gas emissions accounting, that recognition or reward is only given for outcomes above and beyond what would happen under current policy and business-as-usual conditions.

Industrial free allocation

Under current NZ ETS rules, some companies receive free allocations of NZUs if they are judged to be both emissions intensive and trade exposed (EITE). This protects these firms from a portion of the costs of their greenhouse gas emissions. The purpose of this is to reduce the risk of emissions leakage, which is when costs from climate change policies – like NZ ETS costs – cause production to shift offshore in a way that increases global emissions. This would be a perverse outcome, contrary to the goals of a policy to reduce emissions such as the NZ ETS.

As countries increasingly take action on emissions, the need for industrial free allocation is expected to reduce. Industrial free allocation is therefore a temporary measure, and a significant number of consultation respondents strongly advocated for it to be eliminated or rapidly phased out. The NZ ETS legislation contains provisions to phase it out over time as well as a process for the Commission to give advice, when requested by the Minister of Climate Change, on increasing or decreasing the phase out rate.

Current industrial free allocation policy is not fit for the long term or proportionate to emissions leakage risk

Current industrial free allocation settings are inconsistent with the NZ ETS incentivising net zero long-lived greenhouse gas emissions by 2050. In combination with other elements of NZ ETS design, industrial free allocation contributes to the lack of incentives for forestry in the 2030s described earlier in this chapter. Based on projections of current settings, it brings forward the point where NZ ETS demand will be insufficient to drive further carbon dioxide removals by a year, to 2036 (see **Figure 5.5** below).

In addition, under the legislated phase-out rates, industrial free allocation volumes will still be above zero in 2050. To achieve net zero long-lived greenhouse gas emissions in this case, cost would shift onto the taxpayer as the Government would have to fund removals outside the NZ ETS to compensate for the ongoing free units provided to EITE activities.

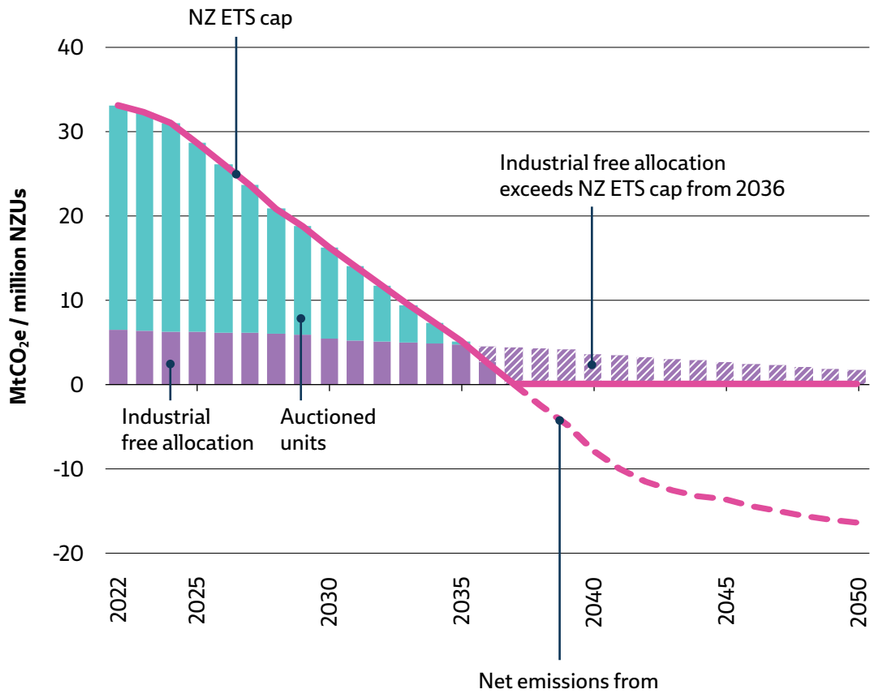

Figure 5.5: Under current settings industrial free allocation exceeds the NZ ETS cap from 2036 onwards

Source: Commission analysis of NZ ETS unit limit settings[29]

The Government recently passed a Climate Change Response (Late Payment Penalties and Industrial Allocation) Amendment Bill to allow updates to the allocative baselines and electricity allocation factor used to calculate the volume of units provided to EITE firms each year.[30] This aims to correct over-allocation, where firms are receiving more units than they need, and resulted from a review which found evidence that industrial free allocation rates are higher than intended.

The Government will now collect data to enable allocative baselines to be updated in 2024, which will likely result in reduced volumes of industrial free allocation in future.

This development is expected to improve, to some extent, the scenario shown in **Figure 5.5**. It is too early to forecast with any confidence the scale of the changes, so it has not been possible to incorporate the impact of the planned updates into the chart. It is unlikely, however, that the updates will reduce volumes sufficiently to avoid industrial free allocation being above zero in 2050.

Figure 5.5 highlights that further change to industrial free allocation over time will be needed, if shifting cost onto the taxpayer is to be avoided. The Government should continue to look at ways that industrial free allocation can be kept proportional to emissions leakage risk, leading up to and throughout the second emissions budget period.

Appropriately designing policy to address emissions leakage risk

Emissions leakage risk is important to consider in the design of climate policies, but mechanisms to address it such as industrial free allocation should be proportional to the risk.

The risk posed by emissions leakage to climate change and to the economy of Aotearoa New Zealand substantially differs from 2009 when NZ ETS industrial free allocation policy was designed.

The world has moved from the Kyoto Protocol to the Paris Agreement. Now both developed and developing countries are obliged to act on climate change and set NDCs under the Paris Agreement. An increasing number are also adopting targets for net zero emissions by 2050. Greater action and targets by multi-national corporations and sub-national actors such as state or provincial governments further limit the probability that increased efforts to reduce emissions in Aotearoa New Zealand would result in an increase in emissions elsewhere.

Further policy development on industrial free allocation should consider how this changed landscape affects emissions leakage risk. Thoroughly assessing emissions leakage risk is a complex task. Countries around the world are increasingly implementing carbon pricing policies as well as a wider range of other policies to drive decarbonisation and manage environmental impacts. This means that understanding leakage risk is not a simple matter of assessing carbon pricing coverage and levels on an activity across jurisdictions.

Thoroughly understanding the risk of leakage would include assessing where production could be increased if emissions pricing caused production to decrease in Aotearoa New Zealand. Then, a holistic assessment would be needed of the overall effect of all relevant climate or other policies and factors (such as the emissions intensity of production) that could limit a rise in emissions in those locations. Emissions leakage risk is likely to vary across different activities, so uniform policy approaches may not be appropriate.

It is also important to evaluate the costs and trade-offs of continuing to provide support through industrial free allocation. Industrial free allocation is a cost to taxpayers, which raises questions about whether it is the best use of public resources, how accountable recipients of it should be, and whether in some cases it may be better to redirect these resources towards reducing emissions.

Internationally, more jurisdictions are putting additional conditions around industrial free allocation. For example, the European Union is seeking to require that industrial firms undertake efficiency measures and establish a climate neutrality plan out to 2050, in order to receive a portion of their free allocation.[31] From 2024, the Canadian province of Quebec will also implement new rules that tie the free allocation policy and related funding to firms' complying with certain criteria set by the government.[32]

It would be worthwhile for the Government to explore other policies to address emissions leakage. It may need to work more actively with the sectors that receive industrial free allocation – some of which are industrial sites with hard-to-abate emissions and production processes unique to this country – to identify transition pathways and transformation strategies (also see *Chapter 13: Energy and industry*). There may be opportunities to replace industrial allocation with other forms of assistance, including potentially those that more directly drive decarbonisation.

Feedback received from consultation showed high interest among submitters in the potential for implementing a carbon border adjustment mechanism (CBAM) – a carbon tariff on imports of carbon intensive products – as an alternative to industrial free allocation. This is a policy approach that the European Union has recently legislated for, with its CBAM entering its transitional phase in October 2023.[33] Considering a CBAM is already on Aotearoa New Zealand's climate policy agenda, as Action 5.4.2 in the first emissions reduction plan is to investigate long-term options to address emissions leakage.

The cement sector is being examined as a test case to determine the feasibility of implementing an alternative policy to industrial free allocation, including looking at the option of a CBAM. The Commission encourages the continuation of this work and looks forward to seeing its outputs in due course.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[34]

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

kaitiakitanga
guardianship, stewardship, trusteeship

whenua Māori
Māori land

Tuaono: Chapter 6

Te rere kapa me te puna moni
Investment and finance

Introduction

Our analysis shows the emissions reductions required to meet Aotearoa New Zealand's climate change goals are within reach and can be funded if the right settings are created. Investing in a shift to a low emissions economy makes good economic sense.[1]

There are key Government actions required to facilitate investment and finance at the pace and scale required to achieve emissions budgets and ensure economic return.

Improving the operating environment for public, private, and institutional investors is an urgent matter as the country approaches the second emissions budget period (2026–2030), when the level of expected emissions reductions will steepen, along with the required investment.

The advice in this chapter builds on the demonstration path developed as part of our advice on the first three emissions budgets (published in *Ināia tonu nei*), and the 2022 update of the demonstration path in our advice on the New Zealand Emissions Trading Scheme (NZ ETS) settings.

Our analysis shows access to finance and investment capital is fundamental to emissions reductions in every sector; further evidence gathered in Aotearoa New Zealand and internationally emphasises that investment needs to be in the right places, and to be made at pace.[2]

In *Ināia tonu nei*, we estimated the additional capital investment, beyond business as usual, that would be required between 2022 and 2050 was around $38 billion (in 2021 dollars). This was to achieve the proposed emissions reductions across key sectors, with requirements increasing across successive emissions budget periods.[3]

Our advice in this report focuses on how the Government can build on early action to support investment (including structures such as the Climate Emergency Response Fund, public sector debt financing, and New Zealand Green Investment Finance), and in particular to facilitate additional investment from the private sector.

These actions would help actualise the growing private and institutional interest in providing finance to low emissions alternatives.[4] The immediate focus needs to be on addressing regulatory, institutional, and ownership barriers.

The evidence shows there is a role for diverse sources of finance – central and local governments, banks, insurers, and institutional investors – in mobilising investment to support emissions reductions, including by:

- the Government setting measurable financial commitments of capital expenditure and setting expectations for private financial institutions
- aligning all public investments with Aotearoa New Zealand's climate goals
- developing a coherent Government investment approach – to support climate-aligned investment decision-making within government and to outline areas of private sector-led investment
- encouraging and enabling private investors to urgently shift to sustainable finance.

To achieve a fair, inclusive, and equitable transition, it is critical that the Government's investment and finance decisions are Te Tiriti o Waitangi/The Treaty of Waitangi-based and informed by tikanga. As discussed in *Chapter 8: Whāia ngā tapuwae*, we recommend that the Government introduce ways to directly allocate resources to iwi/Māori and to augment funding to Māori landowners. This will help to create an enabling environment where iwi/Māori can accelerate their emissions reductions while participating in decision-making and fully exercising their rangatiratanga and kaitiakitanga.

Changes from the draft version of this chapter

In response to feedback that our advice should offer more urgency and greater clarity on what action is needed, we revised the chapter to more clearly identify the existing barriers to public and private investment in the transition to low emissions. We also added more direct discussion of the opportunities available to the Government to address those barriers.

In light of the evidence, as well as strong views we received through consultation, we re-evaluated whether our draft advice appropriately reflected our policy and prioritisation frameworks. As a result, we added a new recommendation focused on addressing the current barriers to mobilising public and private investment to meet emissions budgets.

We added new text discussing our estimate from *Ināia tonu nei* on additional capital investment required to meet the 2050 target. We provided further context and analysis on this estimate, finding there is need for capital to be directed into priority climate investments across both emissions reduction and adaptation to improve resilience.

We also updated the name of the chapter to better reflect its content, and adjusted its position within the report structure to ensure that investment and finance is understood to be a fundamental element of success across all sectors.

The context for action

Private investment is integral to achieve budgets and targets

In *Ināia tonu nei*, we discussed the importance of mobilising private investment, and the need to identify and address the barriers to private capital investment in emissions reduction. Since then, the emphasis on the role of private investment has intensified, in both international and domestic contexts.

However, that interest and awareness of the need for investing for low emissions outcomes is not yet reflected in the global flows of finance. Global investments remain below levels of need in all sectors and regions, despite there being sufficient capital and liquidity.[5]

A 2021 report from the UNFCCC's Race to Zero campaign found that from 2026, a global investment of USD $4.5 trillion in decarbonisation per year is needed to reach net zero by 2050, with private actors accounting for up to 70% of those investments.[6] This expected level of private sector activity highlights the importance of getting policy signals right so the capital can flow.

In *Ināia tonu nei*, we estimated both the size of the investment needed as part of Aotearoa New Zealand's transition, and the economic implications of those investments. Overall, we found that an economy that runs on cleaner fuels and meets emissions budgets and the 2050 target is within reach, and is worth getting right.

Our analysis showed it would cost the country less over time to invest in emissions reductions, than it would to stay dependent on fossil fuels (and pay higher fuel costs later as fuel prices rise with inflation). This 'future avoided expenditure' was shown to be significantly greater than the additional capital costs and expenditure on electricity and biofuels across three key areas of road transport, space and water heating, and food processing.

We found that timely investment that enabled switching to lower emissions fuels would save Aotearoa New Zealand around $2 billion each year by the 2040s. This estimate considers only fuel-switching measures, and excludes the effects of energy efficiency improvements, mode shift and reduced travel demand, which would deliver significant further economic benefits in the long term. A complete picture would need to consider wider implications such as transport infrastructure investment.

The additional capital investment required to meet the 2050 target was estimated in the Commission's demonstration path in *Ināia tonu nei* at around $38 billion over the period 2022–2050.[7] This was the additional capital investment required to reduce emissions from electricity generation, food processing, the built environment, road transport, and native afforestation, over and above investment already planned by the Government – in policies in place before the first emissions reduction plan was implemented.[i,8] That total additional investment spans the years 2022 to 2050, with roughly half ($18 billion) of the additional investment needed across the second and third emissions budget periods to ensure future targets are within reach.

To put the $38 billion of additional capital required in context, the Reserve Bank of New Zealand's measure of capital outlays on durable fixed assets other than residential buildings was a little over $57 billion in 2022.[9]

Our analysis also shows there is need for capital to be directed into priority climate investments across both emissions reduction and adaptation to improve resilience – this is explored more at the end of this chapter, see *A centralised climate finance approach*.

Public funding has multiple important roles to play

The way the Government invests public funds to lower emissions matters. In addition to the direct effect of public investment in individual projects or policies, Government decisions send a message about priorities at government level and across society – showing what is important to New Zealanders and demonstrating what change is possible at a large scale.

Public investment in low emissions initiatives can support an equitable transition that the market cannot deliver alone. This chapter sets out our advice in general on facilitating financial investment in a low emissions economy. The particular areas of government actions that result in investment, either public or private, are covered in the separate chapters on different sectors, or on cross-cutting issues.

To meet the second emissions budget and beyond the Government will need to ensure the full suite of its investments align with Aotearoa New Zealand's climate goals. Nearly every funding decision the Government makes with respect to infrastructure and economic policy, will have an impact – positive or negative – on emissions and resilience to respond to climate change. If fiscal decisions do not carefully and consistently consider the potential impact on both emissions reduction and adaptation, they are likely to create unintended roadblocks to the achievement of the Government's climate-related goals.

i. This figure represents the difference between the demonstration path and the current policy reference baseline in our advice in *Ināia tonu nei*. It is only intended to provide an overall sense of potential investment needs rather than the full picture, as it did not include sectors such as agriculture nor assess different financing costs. Actual figures will also vary based on decisions made about the transition.

Opportunities to mobilise public and private investment

There are several barriers preventing the mobilisation of investment at the pace and scale required to meet emissions budgets and support climate resilience goals. The Government can act to remove those barriers, and to create other opportunities to encourage investment.

Reducing regulatory barriers and improving policy signals

Transition pathways and policy signals help incentivise investments

Investment in a low emissions economy requires strong policy signals and an enabling environment from the Government. However, there are several regulatory and policy signalling barriers – related to a lack of policy consistency and alignment – that create uncertainty and are limiting the flow of capital.

Some notable policy barriers investors are faced with today include a lack of clarity on the future of energy and climate policy, how the costs of climate adaptation will be shared, and the treatment of agricultural emissions.

When policy decisions are delayed, or an approach is not well-defined, investment uncertainty increases. While delays can occur as the result of a robust process (for instance, taking time to explore the feasibility of various options, or ensuring environmental issues are managed), they still impact timely investment decisions. For a case study on the higher emissions that can result from renewable electricity build delays,see *Chapter 13: Energy and industry*.

An example of the value of clarity for influencing investment behaviour is shown in *Chapter 5: Emissions pricing*, which discusses the need for the NZ ETS to have well-defined and well-communicated goals and to provide a clear signal for gross emissions reductions distinct from, and in addition to, a signal for carbon removals. There are several potential complementary pricing mechanisms, including the proposed agriculture pricing system, that can together create stronger incentives for low emissions investment in alternatives.

To support the transition to a low emissions economy, incentives need to be designed to overcome near-term capital constraints to businesses shifting their existing assets and processes to low emissions alternatives. To support this, the Government could explore amending components of the tax system (for example, adjusting depreciation schedules and rates for eligible projects), or ensuring rules around capital adequacy requirements are climate-aligned (for instance, in agriculture, tying these to farm profitability, rather than specific products).

Options for integrated Government action to enable investment in emissions reduction are explored more later in this chapter, see *A centralised climate finance approach*.

Exploring all financing tools to support the transition, including debt financing

Aotearoa New Zealand needs a comprehensive approach to drive investment in gross emissions reductions.

One option that could be further explored is governmental debt financing, which is when a government organisation borrows money to fund a project and then pays the lender back with interest. An important first step has been taken with the establishment of the New Zealand Sovereign Green Bond Framework in 2022. While debt financing faces structural and social licence issues, it allows the benefits from climate investments to be accrued across multiple generations and unlocks wider co-benefits – including improved health, energy saving, and reduced inequity – over the lifetime of the investment. This can help achieve quicker emissions reductions and overall cost savings, even if the public investment return may be realised across a longer period than what private sectors investors may be interested in.

Limiting public investment approaches to a 'pay-as-you-go' model based on tax revenue decreases the potential scale and impact of public investment. Under this approach, private debt would be required to fill a larger portion of the investment gap, which is likely to result in different debt repayment terms, and a schedule of realised investment.

The Treasury's 2021 Statement on the Long-term Fiscal Position (which looks out at least 40 years to examine the potential effects on the economy of long-term, economy-wide trends) recognised that "*pursuing more ambitious reductions earlier on may have larger economic and fiscal cost in the short term, particularly if it means investing before cheaper policy levers or technologies become available. However, starting earlier is likely to reduce total transition costs by requiring less dramatic reductions later, smoothing economic adjustment*."[10]

The New Zealand Green Investment Finance (NZGIF), a green investment bank mandated to consider specific climate criteria, has already explored debt financing.[ii] Both the NZGIF and Green Sovereign Bonds highlight the case for further expanding headroom for the Government to borrow, and enable others to, as a tool to finance the transition.

Revenue gathering as an additional option to increase investment is discussed in *A centralised climate finance approach*.

ii. A recent example of the NZGIF using a debt facility is $25m to Eastland Generation to fund the construction of connection assets for the new ~50MW TOPP2 geothermal plant. For more information see: https://nzgif.co.nz/news-and-events/nzgif-supports-eastland-generation-with-up-to-25m-in-long-term-lending/.

Enabling conditions for private finance

There are opportunities for the Government to support private investment in emissions reduction by sharing and reducing the risks of investment.

In 2019, prior to the 2050 target being set, the Productivity Commission concluded there did not appear to be any major barriers to New Zealand institutional investors finding adequate low emissions investments.[11] However, we heard through engagement with institutional investors that large-scale investment opportunities are not being developed at pace, partially due to perceived risk that climate-aligned investments will not provide sufficient returns. These perceptions have real costs, since those investors able to withstand higher short-term costs can expect low emissions technology investments to yield higher long-term returns.[12] By 2030, 70–80% of decarbonisation technology investments could be better value than previous, more emissions-intensive alternatives.[13]

By sharing and reducing investment risks with private investors, the Government can attract more investment for low emissions projects. The NZGIF already has a role to scale up green investments by demonstrating what is possible and attracting private capital to join in.

Further exploration of partnerships between the public and private sectors, with appropriate safeguards, could enable support for more innovative, entrepreneurial, or leading-edge projects that otherwise might be considered too high-risk by private or public investors alone. Private–public financing models could take many different forms, for instance (but not limited to):

- direct equity investment by the public sector to improve project creditworthiness
- "city-deals" between local government and the private sector to help leverage private capital investment in urban infrastructure, which can support emissions reductions through increasing mode shift into active transport and lower emissions buildings
- "Contract-for-Difference" (CfD)[iii] mechanisms between the Government and the private sector to encourage private capital to unlock further investments in large-scale renewable energy,[iv] while helping protect consumers from price increases.[14]

iii. CfDs are being explored in other countries, such as Germany, as contract instruments between the Government and private electricity providers; these help hedge electricity producers against low electricity prices and protect consumers by supporting stability in the long-term electricity price.

iv. The Guardians of the New Zealand Superannuation Fund, in its submission on the Government's first ERP, identified an opportunity to capitalise on New Zealand's natural wind resource by overbuilding large-scale renewable energy, but that this would require the Government to play a part in unlocking investment as it is suppressed by a number of barriers including: the spot market power prices uncertainty, the lack of a long-term power purchase agreement market, and ineffective regulatory settings for resource consents.

Reducing institutional barriers

There are gaps in implementing transition planning to address climate-related financial risks

As part of our early engagements to inform the draft version of this advice, we heard about inconsistencies in the quality of mandatory reporting under the climate-related financial disclosures regime.[v] These inconsistencies include the quality of transition planning for different future scenarios, including ones that align with the goal of limiting warming to 1.5°C above pre-industrial levels.

Stronger understanding of future climate scenarios and the resulting physical and transition risks would better enable those reporting entities to prepare and respond to risks to their assets or access to capital.[15]

The Government can support this by facilitating increasing climate knowledge in the finance sector and greater coordination and guidance for public and private reporting entities. There are common challenges across multiple sectors that present risk of delayed or misaligned investments, and the Government's support to develop signposts for the desired timing of investment would be helpful. Coordination efforts will need to support partnership and also balance protecting competition while ensuring market transparency.

Data and information collection about finance flows

Investors who are providers of capital – such as pension funds, banks, insurers, and philanthropists – make determinations about how they will prioritise and allocate investments. The Reserve Bank of New Zealand also makes assessments about Aotearoa New Zealand's financial stability.

These assessments will continue to improve with more information, for example how much capital has been deployed from public and private sources to invest in the initiatives needed to reduce emissions and meet emissions budgets. This will increase the information available to investors choosing between activities with higher or lower emissions, or with adaptation-related risks.

A survey conducted in 2022 by the Aotearoa New Zealand Investor Coalition for Net Zero,[vi] identified a lack of tools, data, and definitions as one of the main barriers to investment in low-emissions, climate-resilient activity.[16]

The Government has a role to develop data collection, classification (or 'taxonomy'), and verification systems for climate friendly investment in Aotearoa New Zealand.

Market frameworks featuring agreed standards, definitions, and performance indicators can support potential public and private investors to make strategic low emissions investments and provide the basis for verifying and reporting on climate goals and outcomes in a consistent manner.[17]

Climate finance providers and recipients could use the measures to improve the tracking, reporting, and dissemination of best practices, and to ease concerns about 'greenwashing' amongst private investors.[18] For local government, these frameworks could form the basis of robust decision-making guides to provide support as they navigate competing priorities.

v. A new law passed in 2021 requires around 200 large financial institutions, such as banks, insurers, and asset owners covered by the FMC Act, to start making climate-related disclosures of their physical risks and risks related to the transition to a low emissions economy, in accordance with climate standards published by the External Reporting Board (XRB).

vi. Survey respondents represented around 50 investors, covering in aggregate $331 billion in assets, and capturing over 80% of the fund management market.

vii. This principal-agent problem arises where the person or entity ("the agent") making the decision on behalf of another person or entity ("the principal") possesses resources such as time, information and expertise that the principal lacks, but at the same time, the principal does not have entire control over the agent's ability to act in their best interests.

Reducing ownership-related barriers

Some of the positive impacts from low emissions investments are suppressed by ownership structures. A conflict of interest and priority in making low emissions investments can arise when one person or entity takes actions on behalf of another.[vii]

In some instances, issues relating to iwi/Māori rights and interests must be resolved before investment can occur. These resolution processes are vital and necessary to honour Te Tiriti/The Treaty. However, the time needed to address these issues can be at odds with the pace needed to meet emissions budgets.

Chapter 8: Whāia ngā tapuwae discusses the critical importance of resourcing directly to iwi/Māori and increasing funding to Māori landowners to create an enabling environment where they can fully exercise their rangatiratanga, participate in decision-making, and protect their taonga.

Chapter 11: Built environment discusses the situation where property owners and tenants have different incentives to make low emissions investments in rentals, as owners are accountable for the costs of cleaner equipment, and the tenants benefit from the lower operational costs of a shift away from fossil-based home heating.

These ownership-related barriers, that arise when multiple different people or groups interact, raise several cross-cutting issues, including:

- how partnership with iwi/Māori and consideration of te ao Māori approaches to investment and emissions reduction are enacted and reflected
- how targeted Government support can help those people least placed to change behaviours in response to emissions prices
- how investment risk can be reduced through public-private partnerships.

These are areas where the Government will need to act at a system level to address the challenges.

Recommendation

This recommendation seeks to address the barriers to mobilising public and private investments to enable Aotearoa New Zealand to meet its climate goals, as described above.

Recommendation 5

We recommend that in its second emissions reduction plan, the Government:

5. Reduce the barriers – including regulatory, institutional, and ownership barriers – to mobilising the public and private investment required to meet emissions budgets.

This recommendation builds on the recommendation we made in *Ināia tonu nei* around mobilising public and private finance. Without investment, we will not achieve sector transitions, which will put the meeting of emissions budgets at risk.

The Government has a role to address the barriers to public and private investment required for an equitable transition to a low emissions economy. There are a range of cross-cutting and specific tools and mechanisms that could be deployed to achieve this, including setting an investment target based on an assessment of current finance flows and future needs, and building mechanisms to:

- reduce investment risk
- verify private investment claims
- ensure government signals, incentives, and financing instruments continue to encourage investments
- direct support and partnership where there is a case for the Government to help encourage new markets.

viii. In the weeks following Cyclone Gabrielle, a statement from the Finance Minister based on Treasury calculations estimated that recovery costs from the extreme weather event could reach NZ$13 billion.

A centralised climate finance approach

An integrated and centralised Government investment approach would help to guide Aotearoa New Zealand's transition and ensure a clear, consistent, joined up approach to maximise impact, minimise delays, and better enable individuals, businesses, agencies, and communities to play an active role. This would be a strong step forward in addressing regulatory and institutional barriers that may exist between different levels of government or state actors.

Currently, the Government's approach to financing climate mitigation and adaptation is articulated across several plans and strategies, including in its emissions reduction plan, international climate finance strategy, and national adaptation plan, and is expressed annually in the Budget. There are several sub-strategies as part of these plans, such as the Equitable Transitions Strategy.

As highlighted by Toitū Tahua: Centre for Sustainable Finance, a centralised climate finance approach like the UK Government's Green Finance Strategy can position a country as a leader in sustainable finance, accelerating the establishment of shared priorities across government, clarifying roles and responsibilities, embedding a long-term approach, and supporting the development of robust and consistent market frameworks.[19]

Investments in emissions reduction initiatives will require careful consideration alongside the rapidly growing costs of adaptation and disaster management.[viii] Investment in lowering emissions cannot be delayed due to the emergence of climate-related costs. Emissions reduced or avoided now will impact the scale of adaptation needed later.[20] Every tonne matters, and every fraction of a degree of avoided warming matters.

A centralised approach will require collaboration and coordination between government agencies, with a clear division of responsibilities and ownership.[21]

Box 6.3: Putting people at the centre of investment and learning from te ao Māori

He aha te mea nui o te ao? He tāngata, he tāngata, he tāngata.

The negative impacts of climate change are being felt now and they are being felt disproportionately, with Māori, Pacific people, those living in rural settings, and lower income households amongst those most at risk from harm. More broadly, large economic shocks like the COVID-19 pandemic and other global events affecting the cost of living are known to worsen inequalities.

Community voice is therefore vitally important to funding and finance decisions. Direct public and private funding of community initiatives designed to tackle locally experienced inequities is crucial, as are place-based investments which honour the uniqueness of different rōpū across Aotearoa New Zealand and the wider Pacific region.

In many ways, Māori businesses are leading the way when it comes to integrated investment, frequently incorporating social, cultural, and environmental goals – often through an intergenerational lens – into their business analysis. In addition, Māori businesses tend to place at their centre outcomes that are increasingly attractive to investors, such as sustainability, accessing and building people skills, community development, ethical production, and social impact.[22]

By learning from communities and mātauranga Māori, the Government can develop strategies for navigating the rising costs of mitigating and adapting to climate change with goals, outcomes, and measures appropriate for a carbon neutral Aotearoa New Zealand.

Thoughtful decisions about the revenue from emissions pricing systems are needed

Multiple Government-initiated targeted revenue streams are required for public finance for the transition to a low emissions economy. This helps ensure there are fit-for-purpose and enduring avenues to meet needs for initial capital and ongoing operating expenditure.

The New Zealand Emissions Trading Scheme (NZ ETS) provides revenue for the Climate Emergency Response Fund but is subject to market variability. Relying too heavily on the NZ ETS as the source of funding for the transition may therefore expose emissions reduction initiatives to risk.

Dedicated compliance instruments that price emissions, in general, are likely to be inadequate as the only revenue streams for the transition.

It remains to be seen whether an agricultural emissions pricing system can generate adequate revenue to fund the achievement of emissions budgets, and biogenic methane targets. There is significant seed funding in place today, but time will tell what investment is required as various technology trials either succeed or fail.

Our analysis shows that combined sources of revenue will be required to finance the transition. Changes in financing for emissions reductions will require active Government communication, including clear information about the use of NZ ETS revenue, and whether additional revenue streams are required for the level of investment needed.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[23]

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

kaitiakitanga
guardianship, stewardship, trusteeship

taonga
treasure, anything prized – applied to anything considered to be of value including socially or culturally valuable objects, resources, phenomena, ideas, and techniques

He aha te mea nui o te ao?
He tāngata, he tāngata, he tāngata.
A whakatauākī (a proverb or significant saying with a known author) often translated as "what is the most important thing in the world? It is people, it is people, it is people."

rōpū
groups, organisations, collectives

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices

Tuawhitu: Chapter 7

Rangahau, pūtaiao, auahatanga, me te hangarau
Research, science, innovation,and technology

Introduction

Meeting emissions budgets and transitioning to a resilient and prosperous low emissions economy depends on accelerated transformation of Aotearoa New Zealand's research, science, innovation, and technology (RSI&T) system.

The Government has a significant role to play in enabling and driving this innovation and system transformation, and its options to do so as it sets the second emissions reduction plan go beyond providing direct financial support. This chapter provides advice about the choices the Government has to act in this critical area, including enabling the private sector, while *Chapter 6: Investment and finance* explores options to mobilise the investment needed.

The RSI&T system creates pathways to a low emissions future by providing knowledge and ideas to create new and better methods of reducing emissions. It also increases the accessibility of options to reduce emissions by adapting, absorbing, and extending the reach of existing technologies and knowledge. These activities, occurring across public and private sectors, include inventing new fuels and new ways of generating energy, and developing more efficient processes or technologies to reduce emissions from agriculture.

Our advice is based on our earlier analysis on policy direction for the first emissions reduction plan, in *Ināia tonu nei*, and our review of current government initiatives, including the Environment and Climate Research Strategy and the multi-year reform programme *Te Ara Paerangi – Future Pathways*.

Our analysis has reinforced the importance of increasing access to and uptake of new knowledge and technologies, including those grounded in mātauranga Māori. Stable financial support and well-designed policies enable researchers, industry, and businesses to develop, adapt, and deploy innovative technologies.

To ensure that the climate change science capacity and capability developed over the last decade is maintained, continuity in funding and programmes will be key, as will targeted investment in climate change within the RSI&T system. A clear set of priorities for climate change science and research will help guide investment towards the matters of greatest importance and impact.

Freely available climate change data and information is essential for the transition, and while several policies support open government and the release of data and information, significant roadblocks and gaps remain.

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice. This included endorsement for a strong RSI&T system as fundamental to expanding gross emissions reductions and removal options, and a need for improved coordination across the RSI&T system. The desire for transformation was echoed in the Government's own consultation on *Te Ara Paerangi – Future Pathways*.[1,2]

Changes from the draft version of this chapter:

In light of the evidence and strong views we received through consultation, we re-evaluated whether our draft advice sufficiently reflected the risks to achieving emissions budgets if adequate investment in RSI&T is not made at pace. We looked at the current gaps in the system using our policy and prioritisation frameworks, and as a result added a new recommendation focused on addressing those gaps.

As with the other chapters related to ensuring an enabling environment, we adjusted the position of this chapter within the report structure to better reflect that a robust RSI&T system is a fundamental element of success across all sectors.

We also more clearly identified how investment in the RSI&T system can be prioritised, and added discussion of the tools (like technology roadmaps) available to guide decision-making in this area.

The role of a strong research, science, innovation, and technology system

A strong RSI&T system enables the growth of new sectors, market opportunities, and high-value jobs. It expands low emissions options, creates new technologies, and provides critical information and technology support to climate adaptation efforts – all necessary to drive the transformation to a low emissions economy that is prosperous, equitable, and resilient.

The Government has a significant role to play in enabling and driving innovation and system transformation, and its options to do so go beyond providing direct financial support. Through regulations, procurement, trade agreements, workforce development, resource and development infrastructure, intelligence, foresight, and standards-setting, the Government can facilitate and create change. Exercising these options can help support the development, demonstration, and deployment of innovation, and shift behaviour away from emissions-intensive practices towards low emissions activities.

However, government actions cannot be the sole driver of enabling innovation and system transformation. The private sector will also need to play a significant role in accelerating the transition by embracing the need for transformation across the economy. *Chapter 6: Investment and finance* further explores options to reduce barriers to mobilise public and private investment required to meet emissions budgets.

Continuity of people, infrastructure, technology, and information will ensure the right resources are available at the right time

As the multi-year reform of the research, science and innovation system, *Te Ara Paerangi – Future Pathways*, is implemented, it will be critical to retain the human, infrastructure, technology, and information capacity developed over the last decade through programmes like the National Science Challenges. The second emissions reduction plan will need to include plans to quickly assess and address funding gaps, and to ensure no additional gaps emerge.

A recent study revealed that Aotearoa New Zealand's research workforce has been growing since 2010, with an average annual rate of increase of 4.3%.[3] The report noted a three-fold increase in the number of PhD research graduates between 2003 and 2020, many of whom were foreign students. However, the proportion of Māori PhD research graduates decreased from 6.4% in 2004 to 3.8% in 2019,[4] indicating representation of Māori in graduate training is falling, and that focused efforts may be needed to address this. The *Te Ara Paerangi – Future Pathways* white paper identified the benefits of increasing Māori and Pacific people's involvement in the RSI&T system, both to grow and innovate Māori and Pacific economies, and support the aspirations and wellbeing of Māori and Pacific communities.[5]

We heard from the research community through pre-drafting engagement that recruitment has been difficult and there is a need to ensure that workforce planning is prioritised as part of *Te Ara Paerangi – Future Pathways*. While the number of research graduates has risen, retention in the research workforce is declining because graduates and established researchers are leaving research.[6] Reasons include limited numbers of positions, a high proportion of short or casual contracts, and limited opportunities to move between different parts of the RSI&T system.[7] A focus on growing capabilities to address these issues within research institutions across the country would help, as would ensuring that immigration policies support the recruitment of foreign skilled workers to fill gaps where necessary.

Resourcing of the RSI&T system goes beyond people, and a range of investments is needed. *Kitmap – A Stocktake of research infrastructure in Aotearoa New Zealand's Government Research Organisations* noted that not all research infrastructure can be accessed by external users and, in some cases, there is a fee for external users.[8] Increasing access to tax payer-funded public good information across the RSI&T system will improve the capacity for collaboration.

It is currently unclear how the Government intends to address the funding gap expected by the conclusion of the National Science Challenges in June 2024. To ensure the country has the right resources at the right time, continuity in funding and programmes will be key.

Enabling innovation and systems transformation

Targeted and prioritised investment in climate change within the research, science, innovation, and technology system is required

Targeted investment in climate change within the RSI&T system is required to ensure availability of the knowledge and technologies needed to meet emissions budgets. A clear set of priorities for climate change science and research will help guide investment towards the matters of greatest importance and impact.

The Government's *Environment and Climate Research Strategy* (ECRS) is expected to deliver direction setting for climate change research,[9] aiming to connect research across disciplines and meet the needs identified in the first national climate change risk assessment, the national adaptation plan, and the first emissions reduction plan.

To be effective, the ECRS must enable a strategic and coordinated approach to investing that can inform the wider setting of National Research Priorities, which are part of *Te Ara Paerangi – Future Pathways*. However, as the ECRS is primarily focused on the physical effects and impacts of climate change on the environment, it will not identify the full range of investments required to tackle the social, economic, and cultural climate change challenges facing Aotearoa New Zealand. Therefore, it will be necessary for the setting of National Research Priorities to consider how climate change intersects with the many facets of the RSI&T system.

Currently, investment in climate change within the RSI&T system is difficult to measure. The New Zealand Research Information System under development by the Ministry of Business, Innovation and Employment is expected to provide information on climate change projects underway, including how they are funded and what resources are being used and by whom.[10] This system could act as the foundation to measure targeted investment in climate change in the RSI&T system.

Robust research and innovation take time, and therefore sufficient forward planning is required. Technology roadmaps[11] were suggested during consultation on the draft version of this advice as a tool that can guide development and investment in the RSI&T ecosystem. We also heard that there is a need for a clear pathway to de-risk innovative technology and solutions. Technology roadmaps could also help satisfy this need. While clear direction is an immediate gap, investment by both government and the private sector needs to accelerate to drive the transformation the transition requires.

Consultation submissions called for a significant increase in Aotearoa New Zealand's research and development ambition, which sits below the OECD average. In line with the Government's stated commitment,[12] the *Te Ara Paerangi – Future Pathways* White Paper has proposed increasing research and development expenditure to 2% of gross domestic product (GDP) by 2030.[13] This increase is an improvement, but would still not meet the OECD average expenditure of 2.5% of GDP.[14]

From Maui.Tech case study participants, we heard about the importance of Māori-led research regarding mātauranga Māori (noting that protections must be in place to safeguard mātauranga Māori against risks of appropriation) and called on the Crown to enable Māori-led innovation (for more on the Maui.Tech project, see *Chapter 2: What we heard*).[15]

Another common theme from consultation was that investment in RSI&T needs to be linked to science-policy objectives and outcomes. We heard that the current system heavily favours novelty, which risks more disjointed outcomes and insufficient investment in important proposals that could more directly support climate objectives. These respondents argued that continuing with this approach will not enable the emissions reductions and removals solutions needed to achieve emissions budgets and the 2050 target.

Freely available climate change data and information is essential for the transition

Long-term environmental observations are public good information. They are needed to make informed decisions about everything from resource consents, to event planning, to insurance. Environmental data including weather, water, ocean, air quality, and greenhouse gas monitoring all contribute to understanding how Aotearoa New Zealand's climate is changing.

Monetisation of climate change data and information can hinder its use for the public good by creating inequitable access to information. While there are several policies that support open government[16] and the release of data and information, significant roadblocks remain, resulting in insufficient sharing of and access to climate change data and information.

The revenue model of Crown-owned entities, such as Crown Research Institutes (CRIs) and MetService, appears to be a driver of limited access in many cases. In 2018, MBIE commissioned a review of open access to weather data. The review looked at the viability of releasing government-held data (beyond what is currently released) to the public to encourage innovation and drive economic growth.[17]

The review found that the existing state-owned enterprise and CRI models under which MetService and NIWA operate have led to more restricted access to observational weather data in Aotearoa New Zealand compared with other countries.[18] This is primarily due to the need to earn commercial revenue to support data collection and to cover operating costs of these organisations.

The review noted that making more data openly accessible to the public would require significant changes to MetService and NIWA legal and operating models.[19] To address this and similar issues across the RSI&T system, institutional reforms such as those indicated in the White Paper from *Te Ara Paerangi – Future Pathways* are necessary.

In our early engagements, we heard there are limitations for sharing data across government organisations and CRIs. During consultation, a broad range of submissions – including those from councils, businesses, and research organisations – expressed that free and accessible data is crucial to transforming Aotearoa New Zealand. There were numerous examples of the current barriers to accessing data and public good information, including the presence of fees.

Some Maui.Tech participants discussed the importance of enabling research and information-sharing, including through kura and schools, to support iwi and hapū to develop climate change response strategies based on their unique intergenerational knowledge and local observational methods.[20]

The European Commission's strategy for data considers open data to be "an essential resource for economic growth, job creation and societal progress".[21,22] Failure to enable widespread sharing of environmental, weather, and climate data and information will result in poor outcomes for the transition.

Recommendation

This recommendation seeks to address the need for a clearer and more coherent climate change research strategy to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction goals.

Recommendation 6

We recommend that in its second emissions reduction plan, the Government:

6. Provide adequate targeted investment and increased coordination, and facilitate widespread sharing of freely available climate change data and information to enable a research, science, innovation, and technology system that supports achieving emissions budgets and the 2050 target.

To ensure Aotearoa New Zealand is able to meet the second emissions budget and is on a path to success for meeting the 2050 target, a clear and focused climate change research strategy with adequate funding, increased coordination, and free access to climate change data and information at its core is required.

Through consultation on our draft advice, we heard from a broad range of submitters who agreed with our assessment that the current levels of RSI&T system investment and ambition are insufficient and need to be increased during the second emissions budget period.

The forthcoming National Research Priorities and the ECRS may cover some elements of what is required, but efforts will remain piecemeal if the current path continues. A research strategy centred on the most critical areas to enable accelerated emissions reductions – technology, enablers, and behaviour change – will enable effective action to be taken where it is needed most.

Addressing the impending continuity gap will also be important to building and sustaining an RSI&T system fit for achieving the second emissions budget and beyond. The ending of the National Science Challenges poses a challenge for maintaining the capacity and capability built within the science system over the last decade, and no transition plan has been announced to address this. New multi-year challenges open to a wide variety of researchers across institutions could lead to opportunities for increased coordination.

Implementing this recommendation may also require changes to the legal and operating structures of Crown entities like CRIs and MetService, and potentially restructuring or reconfiguring the research system as described in the White Paper from *Te Ara Paerangi – Future Pathways*. Increased coordination across Ministries will strengthen the Government's ability to clearly identify policy needs, commission research more efficiently, and reduce duplication.

Creating the conditions for transformational change

Aotearoa New Zealand's regulatory environment needs to both enable and incentivise early adoption to drive innovation

A 2021 study into frontier firms by the Productivity Commission found that Aotearoa New Zealand's innovation ecosystem requires reform to enable firms to innovate and export at scale.[23]

Early adoption of new technologies can be risky, and regulatory uncertainty can further exacerbate those risks. If regulations are not updated to reflect new technologies, those technologies, and the emissions reduction potential they represent cannot be brought into the market domestically. Honouring Te Tiriti o Waitangi/The Treaty of Waitangi and the Treaty principles within regulatory settings further advances an appropriate enabling environment.

To avoid stalling the progression and adoption of new technologies, regulatory reform and public investment need to be aligned. Creating incentives for early adopters and strengthening tax incentives will likely drive domestic investment from the private sector (see *Chapter 6: Investment and finance* for further discussion).

Developing a strong digital economy will be necessary to support digitalisation across sectors and improve resiliency across the economy

The economic transformation required for the transition will be strongly dependent on digitalisation across most, if not all, sectors. New low emissions sectors will emerge and create opportunities that, in some cases, will change components of existing sectors.

There are many aspects of the digital economy that have the potential to support a significant transformation over short timeframes, including resource efficiency, energy transition, remote work and services, and data-driven decision-making. To develop a strong digital economy, it will be necessary for the Government to support innovation and digitalisation across sectors. Honouring Māori data sovereignty principles is critical to this process.

According to the Ministry of Business, Innovation and Employment's *Building a Digital Nation* report, Aotearoa New Zealand's digital technology sector is performing well, but is a relatively small component of the economy.[24]

The report emphasises the need to accelerate the digital transformation. To achieve this, there is a need to grow the digital skills of New Zealanders, enhance domestic and international connectivity, balance security, privacy, and innovation, and support digital technological innovation through regulation.

Tuawaru : Chapter 8

Whāia ngā tapuwae

Introduction

Our advice in this chapter reflects the importance of close regard for the Crown–Māori relationship in setting the second emissions reduction plan. It sets out options the Government has to achieve a fair, inclusive, and equitable transition to a low emissions future – one that supports iwi/Māori to realise their aspirations and strengthens collective climate resilience.

It stresses the important role of iwi/Māori in reducing emissions and meeting emissions budgets and the 2050 target while exercising rangatiratanga under Te Tiriti o Waitangi/The Treaty of Waitangi principles.

In accordance with the Climate Change Response Act 2002 (the Act), the Commission must consider the Crown-Māori relationship, te ao Māori, and specific effects on iwi/Māori in providing independent and expert advice to the Government. The effectiveness of the Crown-Māori relationship is critical for an equitable transition, for the benefit of all people of Aotearoa New Zealand. Partnership with mandated iwi representatives supporting Māori to navigate climate change upholds Te Tiriti/The Treaty and facilitates kaitiakitanga.

Assessing the Crown-Māori relationship involves consideration of sufficient resourcing to mandated iwi representatives and Māori landowners. Assessing te ao Māori includes consideration of tikanga and mātauranga Māori responses to climate change. Both of these approaches support the assessment of specific effects on iwi/Māori.

Through partnership, the Government and iwi/Māori can accelerate the transition to low emissions and collectively build climate-resilient communities.

Through partnership, the Government and iwi/Māori can accelerate the transition to low emissions and collectively build climate-resilient communities.

For Aotearoa New Zealand to achieve a fair, inclusive, and equitable transition to a low emissions future, iwi/Māori need to be able to:

- actively exercise rangatiratanga and mana motuhake
- access resources and information to achieve emissions reductions within their takiwā
- ensure their communities are resilient and are able to adapt to the effects of climate change while maintaining intergenerational economic, environmental, social, and cultural wellbeing.

To achieve this, it will be important for the Government to consider the role of iwi/Māori in the country's approach to reducing emissions as well as their specific, localised needs. This includes ensuring iwi/Māori are resourced and enabled to accelerate emissions reduction in accordance with tikanga and mātauranga Māori and while realising the aspirations of their people and communities.

From Maui.Tech case study participants, we heard about the strong commitment many iwi and other Māori landowners have to climate action, and about the significant assets they hold that can contribute to a scalable low emissions transition (for more on the Maui.Tech project, see *Chapter 2: What we heard*).[1] We heard about the range of skills, capabilities, and knowledge that iwi/Māori can mobilise quickly in response to climate emergencies, supported by shared tikanga, values, and an increasing number of Māori affiliated to iwi and other collectives.

Direct investment in iwi, hapū, and Māori landowners will help accelerate iwi/Māori action to reduce emissions and increase preparedness to adapt to the effects of climate change. It will also facilitate deepened understanding of mātauranga Māori across society and enable collaboration with local iwi and hapū to apply mātauranga Māori to local government climate responses. This would help Aotearoa New Zealand design and implement more enduring, locally relevant solutions, thereby strengthening collective climate resilience.

The advice in this chapter builds on the Commission's previous work in *Ināia tonu nei*. While progress has been made regarding the mechanism for developing enduring partnerships, there is considerable work to be done to co-design a strategy for an equitable transition and build emissions profiles within respective takiwā. In our previous advice, we emphasised the importance of equitable access to resources, services, and funding.[2]

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice including on recognition of iwi/Māori climate leadership, protection of the knowledge held by iwi and hapū, and the effectiveness of direct resourcing.

Changes from the draft version of this chapter

We updated this chapter to reflect some of the key messages we heard from iwi/Māori in our consultation and through Maui.Tech case studies, including that the leadership of iwi/Māori is crucial to Aotearoa New Zealand's climate change response, and investing directly in iwi/Māori will help Aotearoa New Zealand accelerate emissions reductions and enhance preparedness for climate change adaptation.

In response to feedback that Recommendation 7 was too narrow, we re-evaluated our analysis and as a result broadened our recommended means of allocating resource. We also expanded the focus to be on all Māori landowners (not just Te Ture Whenua Māori entities) and clarified that the manner of iwi/Māori emissions reductions and removals should be set by iwi/Māori and driven by their assessments and priorities.

We added text about the importance of protecting mātauranga ā-iwi and ā-hapu in implementing Recommendation 8. We revised Recommendation 8 to remove the word 'integration' following feedback that it could be misinterpreted – the recommendation now discusses the "weaving of mātauranga Māori". We also clarified that providing resources is *part* of the action needed by the Government, not the entirety.

Indigenous action on climate change

Through engagement, consultation, and Maui.Tech case studies, we heard about the diverse ways many iwi and Māori collectives are responding to climate change as tangata whenua, rangatira, and kaitiaki. We heard about iwi/Māori climate leadership expressed through intergenerational taiao strategies and grounded in tikanga and mātauranga Māori. The climatic events experienced so far in 2023 have highlighted the way iwi/Māori take action to help restore their communities by mobilising local and national networks, infrastructure, skills, and assets to meet people's needs in devastating circumstances.

Iwi/Māori are also addressing climate change through low emissions investments. With an asset base estimated to be worth $70 billion and a projected growth rate of 5% per annum, iwi and Māori landowners hold significant investment potential and will continue to play a leading role in the economy.[3]

However, through consultation we also heard concerns from iwi/Māori that the Crown has not done enough to acknowledge the role iwi/Māori are playing in addressing climate change. Recognising mandated iwi representatives as partners under Te Tiriti/The Treaty and facilitating partnerships in Aotearoa New Zealand's national climate action strategy could help fast track iwi/Māori local climate action and initiatives to reduce emissions and accelerate preparedness to adapt. Consequently, communities across the motu would be better resourced with the skills, assets, networks, and infrastructure necessary to reduce emissions and respond to climate change events.

This approach is also in keeping with Aotearoa New Zealand's international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the affiliated Local Communities and Indigenous Peoples Platform, which upholds indigenous leadership in formulating climate solutions.[4]

International research around nature-based solutions to climate change has increasingly recognised that policies are most effective when led by indigenous peoples and informed by their lived experience of guardianship of the natural environment.[5] Uplifting iwi/Māori climate change leadership is also critical to implementing the United Nations Declaration on the Rights of Indigenous Peoples.

Through Māui.Tech case studies, we have seen examples of iwi and Māori landowners applying tikanga and mātauranga Māori to reduce emissions and increase climate resiliency, including working to protect interconnected taonga species (such as kuaka bird and tohorā whale) from climate change,[6] and developing biomaterials and biochemicals based on the mauri of the trees.[7] Consistent with other indigenous peoples, case study participants recognised that human wellbeing is dependent on the wellbeing of te taiao/te ira atua.[9]

We also saw examples of how iwi and Māori landowners' design strategies measured success by their outputs, outcomes, and impacts across economic, social, cultural, and environmental goals.[10] Learning from these approaches and applying them more widely could help support Aotearoa New Zealand's equitable transition to a low emissions future.

Direct investment in iwi/Māori

Iwi/Māori want to see a greater recognition from the Government of their leadership in emissions reduction

Iwi/Māori have a crucial role in Aotearoa New Zealand's climate change response, and investing directly in iwi/Māori will help Aotearoa New Zealand accelerate emissions reductions and enhance preparedness for climate change adaptation.

Iwi/Māori have an established history of nurturing economic and social prosperity while protecting te taiao through kaitiakitanga and practices such as tūrāhui, and rāhui for conservation of taonga and taonga species. Through Maui.Tech we have seen examples of iwi/Māori continuing to take deliberate action on climate change despite the challenges and complexities often experienced by Māori landowners.[11]

Current funding allocation often goes to government initiatives designed and administered by central government, which can create barriers for iwi/Māori. When iwi/Māori have access to appropriate tools and mechanisms, they can decide what approach to climate change and emissions reductions is best for the protection of their taonga in a manner consistent with their aspirations and tikanga.

Through engagements as well as consultation on the draft version of this advice, we heard that while there are some instances where the Government has been proactive in responding to inequity in the Treaty Partnership, the current level of funding to support iwi/Māori is not sufficient to achieve an equitable transition. For example, the loss of land and lack of resourcing slows many iwi and Māori landowners from reducing emissions and effectively building climate resilience.

Under the current approach, the Crown still holds the balance of decision-making and resource allocation functions. These Crown-held functions determine the mechanisms for distributing and administering resources, which in turn largely determines co-design and co-governance arrangements.

Whakapapa, tikanga, kawa, tribal kōrero, tribal structures, and tribal assets are unique for every iwi and hapū, as are the continuing impacts of colonisation and settlement redress. Iwi, hapū, marae, urban Māori entities and other Māori landowners are resourced differently, and they manage different emissions profiles and face different climate risks.

To be most effective, the current mechanisms need to be realigned and made relevant to the way iwi and Māori landowners organise themselves economically, socially, and culturally. A co-design process would help ensure iwi/Māori can fully exercise their rangatiratanga, participate in decision-making, and protect their taonga through initiatives such as:

- development of land-use transition strategies
- development of native afforestation and transitional forest strategies
- restoration of wetlands and the associated whakapapa and mātauranga
- exploration of blue carbon and other low emissions and environmentally sustainable economic prospects
- progression of food security and food sovereignty strategies
- progression of parakore and sustainable waste management and waste minimisation initiatives
- increase of planning along coastlines and waterways
- the relocation of urupā and other culturally significant taonga.

By acting quickly to improve equity in the Treaty Partnership, the Government can help ensure that Aotearoa New Zealand achieves its climate targets through an equitable transition. Allocating funding directly to mandated iwi and hapū entities, as well as specific funding to Māori landowners would uplift equity under the Treaty Partnership, create an enabling environment for iwi/Māori that upholds Treaty principles, and mitigate against compounding historic grievances or creating ongoing disadvantages for iwi/Māori.

Recommendation

This recommendation seeks to address the need for iwi/Māori to have appropriate access to resources and mechanisms to reduce emissions and to help enable Aotearoa New Zealand to meet the second emissions budget and its longer-term emissions reduction targets.

Recommendation 7

We recommend that in its second emissions reduction plan, the Government:

7. Introduce ways to directly allocate resources to iwi/Māori and augment funding to Māori landowners to enable them to accelerate emissions reductions and removals in accordance with their assessments and priorities.

There are already settings wherein resources are directly allocated to Māori. For example, the Māori Fisheries Act 2004 provides a framework for the allocation and management of settlement assets to iwi entities individually and collectively, and the Public Finance Act sets out a framework for the use of public financial resources through an appropriation or legislative provision.

Creating a legislative environment where mandated iwi representatives (hapū and marae) could be directly allocated an appropriation in their own mana (in connection with their respective hapū and marae) as whānau under Te Tiriti/The Treaty, specifically to accelerate their emissions reduction and climate adaptation initiatives, would be an optimal expression of equity in the Treaty Partnership. However, a phased approach with interim mechanisms should be explored given the urgency to achieve Aotearoa New Zealand's climate change targets.

This specific appropriation mechanism would need to take into account the differing contexts for Māori landowners, both through Te Ture Whenua entities and through Māori freehold land. As such, an assessment process which is consistent with current direct funding models will need to be created.

In our *Progress towards agricultural emissions pricing* report, we outlined some of the complexities, constraints, and challenges Māori landowners face in comparison to general title land ownership, including the limited land-use and economic opportunities available.[12]

With respect to Te Ture Whenua entities and other Māori land holdings, there are currently approximately 1.4 million hectares of ancestral lands held under such mechanisms which were originally within the mana whenua of hapū.[13] However, over time, government interventions have led to the fragmentation of ancestral land and the ownership base. What remains today is vested in various trusts and incorporation constructs under Te Ture Whenua Māori Act 1993. The original intent of Te Ture Whenua Māori Act 1993 is to promote the retention, use, development, and control of Māori ancestral land as taonga tuku iho by Māori landowners. Upholding this intent is a necessary consideration in the context of a directly allocated appropriation.

However, the Whenua Māori Fund provides a current example of funding allocated for Te Ture Whenua entities. This could be extended to support Māori landowners to accelerate their emissions reduction and climate adaptation initiatives. Other options could include exploring ways to offer specific support for Te Ture Whenua entities through the New Zealand Green Investment Finance (NZGIF), New Zealand Green Bonds, and the Climate Emergency Response Fund.

Allocating funding directly to mandated iwi representatives and other Māori landowners would elevate the mana of both partners under Te Tiriti/The Treaty and acknowledge iwi/Māori in their mana as rangatira, kaitiaki, and indigenous climate change leaders.

Recognising mātauranga Māori

Accelerating a general understanding of mātauranga Māori through collaboration with local iwi and hapū will build more locally relevant and enduring climate change solutions.

Mātauranga Māori forms a core aspect of Māori identity and wellbeing. It encompasses a wealth of localised knowledge, history, and indicators useful for understanding the nature and rate of change in the natural environment and determining localised solutions to the impacts of climate change. The benefits of these approaches apply to all New Zealanders across Aotearoa New Zealand.

Through Maui.Tech case studies, we heard about a range of hapū-led climate change projects aimed at applying mātauranga Māori, and initiatives which build on existing networks and knowledge to boost iwi and hapū climate resilience.[14] We heard that nationally there is still a significant gap in resourcing and prioritisation of mātauranga Māori that imposes constraints on the speed at which iwi/Māori can progress climate change initiatives.[15]

We also heard concerns regarding an imbalance in the prioritisation of western science over mātauranga Māori in Aotearoa New Zealand's climate change responses.[16] This has particular impacts for iwi/Māori-led initiatives, especially in settings where the essential supporting infrastructure (like policy and legislative frameworks and local council bylaws) is not supportive of an ao Māori-led approach to climate solutions.

If policy is developed devoid of ao Māori framing or mātauranga Māori methodologies, it will constrain opportunities to assess the specific impacts of climate change for iwi/Māori and subsequently restrict Māori from effectively executing climate action in a timely manner. It is therefore necessary to implement systems which value mātauranga Māori-based frameworks, data collection consistent with Māori data sovereignty, and kaupapa Māori research methodologies.

Designing and implementing enduring and locally relevant solutions to climate change will require a general understanding of mātauranga Māori across the motu. The Government can facilitate this through collaboration with Māori leadership, including developing a means for local governments to deepen collaboration with local iwi and hapū.

In *Ināia tonu nei* we recommended that the Government fund Māori-led research and development of mātauranga Māori to support the development of policy, strategy, technology, and innovation that is informed from an equitable knowledge base (i.e., both western science and mātauranga Māori).

To ensure responses are tailored to regionalised needs and local knowledge systems, iwi/Māori will need to lead the research and development process, as well as the implementation of mātauranga Māori solutions. Current incorporation of mātauranga systems in central government are not led directly by iwi/Māori in a way that is specific to regions, iwi, hapū, and their tikanga, which also risks limiting the potential benefits of these approaches.

During consultation on the draft version of this advice, we heard that it is important for the Crown to acknowledge that mātauranga Māori is taonga tuku iho to each individual iwi and hapū, highly sensitive, and greatly important to identity and wellbeing. Respondents expressed a strong desire for the Crown to put measures in place to ensure iwi and hapū have full discretion over the use of their mātauranga to prevent extractive approaches and misuse.

Recommendation

This recommendation seeks to address the need for iwi/Māori to take the leadership and decision-making role around weaving mātauranga Māori into Aotearoa New Zealand's strategy to meet the second emissions budget and its longer-term emissions reduction targets.

Iwi and hapū are positioned to understand the place of mātauranga in localised emissions reduction policies, and by leading this process, iwi and hapū can introduce mātauranga as they deem appropriate. It is important that the Crown allows for mechanisms for iwi and hapū to retain full kaitiakitanga, mana, and intellectual property ownership over their mātauranga, and that the Crown takes a localised approach to ensure mātauranga is not homogenised.

Accelerating the collation, understanding, dissemination, and application of mātauranga Māori across central and local government responses to climate change will lead to outcomes that uphold the principles of Te Tiriti/The Treaty, and create more inclusive and enduring climate solutions relevant to iwi/Māori locally.

Recommendation 8

We recommend that in its second emissions reduction plan, the Government:

8. Ensure iwi/Māori are empowered to lead the weaving of mātauranga Māori into policy design, development, and implementation at central and local government levels. This includes providing sufficient resources to iwi and hapū.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

whāia ngā tapuwae
following the footsteps

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[17]

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices.

kaitiakitanga
guardianship, stewardship, trusteeship

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

mana motuhake
mana through self-government and self-determination, control over one's own destiny

takiwā
districts, regions, often interchangeable with *rohe*, can be a subsection of a *rohe*

rohe
boundary, district, region, territory, area, often interchangeable with *takiwā*, can be made up of multiple *takiwā*

te taiao
the world, Earth, the natural world, the environment

mauri
life principle, life force, vital essence - the essential quality and vitality of a being or entity. Can also be used for a physical object, individual, ecosystem, or social group in which this essence is located

te ira atua
supernatural life, *ira* meaning "life principle or gene", *atua* meaning "ancestor with continuing influence, supernatural being, deity"

tūrāhui
to put in place a temporary ritual prohibition, closed season, ban, reserve

rāhui
a temporary ritual prohibition, closed season, ban, a device for separating people from sacred things

parakore
pure, uncontaminated

urupā
burial ground, cemetery, graveyard

kawa
marae protocol – customs of the marae and wharenui

taonga tuku iho
a treasure that is handed down, cultural heritage

Tuaiwa: Chapter 9

Te whakawhitianga tautika
An equitable transition

Introduction

For Aotearoa New Zealand's transition to a low emissions economy to be both ambitious and achievable, the Government will need to act at pace and in a way that sets the transition up to last. A fair, inclusive, and equitable transition will endure, because it will be based on considering how decisions will affect different groups of people around the country.

Government decisions in the second emissions reduction plan related to an equitable transition come at a time when previously set policies are beginning to take effect. The Government has options about how it manages the impacts of actions to reduce emissions and how it maximises the benefits and opportunities that come with climate action. To increase effectiveness and avoid unintended consequences, these options will need to be considered alongside the Government's response to the intensifying impacts of climate change itself, as felt through Cyclone Gabrielle.[1]

Our advice around an equitable transition is built on the approach recommended in *Ināia tonu nei*. Additional analysis, and feedback we received on the draft version of this advice, have emphasised the importance of climate policies and stategies that consider the wellbeing of people together with the environment, now and into the future.

The 2023 synthesis report of the Intergovernmental Panel on Climate Change (IPCC) reinforces this approach, showing that prioritising equity is important for producing effective policies that enable adaptation and ambitious mitigation actions as well as climate-resilient development.[2]

This chapter focuses on new evidence to take into account when considering equity issues (such as health benefits, and workforce and consumer impacts of the transition to low emissions), and the relative effectiveness of different options for Government response to manage impacts. It also highlights where we have identified need for urgent action, in particular the development and implementation of an Equitable Transitions Strategy to take full advantage of opportunities and minimise disruption and inequities.

There are links through to other sections of the report, including *Chapter 8: Whāia ngā tapuwae*, which sets out the options the Government has to achieve a fair, inclusive, and equitable transition in a way that supports iwi/Māori to realise the aspirations of their people and communities. This recognises the Government's responsibility to give effect to the principles of Te Tiriti o Waitangi/The Treaty of Waitangi.

Other cross references show that considerations of equity are central to the integrated approach needed for effective climate action as the Government sets its second emissions reduction plan.

Changes from the draft version of this chapter

Our changes to this chapter focused primarily on clarifying our thinking. We restructured much of the chapter to more clearly lay out the challenges and opportunities presented by the second emissions budget period in relation to an equitable transition. We moved a section on recycling NZ ETS proceeds into *Chapter 6: Investment and finance*.

We added more detail into the sections about education and training, and the health co-benefits impacts associated with taking climate action. We also added a new section about community involvement.

We updated the chapter title and made minor edits to our recommendations to better reflect our analysis and conclusions.

Recognising the health benefits of acting to reduce emissions

In *Ināia tonu nei*, we identified the key elements of a fair, inclusive, and equitable transition to a low emissions economy. This demonstrated the importance of encouraging the positive benefits of emissions reduction, as well as managing potential negative impacts of the policies and other Government action involved.

This included considering economic growth, iwi/Māori priorities, future generations, benefits to health, cost of living, employment and skills, and rural communities.

The transition can provide mental health benefits to young people

The importance of considering intergenerational equity in policy-making for emissions reduction is emphasised by the higher risks young people have of being negatively impacted by climate change through their lifetime – as demonstrated by the IPCC in its 2023 synthesis report (**Figure 9.1**).

Climate change anxiety is a growing concern globally, and children and young people are particularly vulnerable.[3] In our early engagement to support the development of this advice, we heard that this concern is shared by many in Aotearoa New Zealand. Consultation submissions pointed to the potential mental health impacts of climate change, with heightened anxiety related to climate change – particularly among young people – as an emerging area of significant concern.

For rangatahi Māori, sea level rise poses a threat to cultural taonga such as marae, urupā, wāhi tapu, and archaeological sites, as they are frequently located near coasts and rivers at risk of flooding.[4]

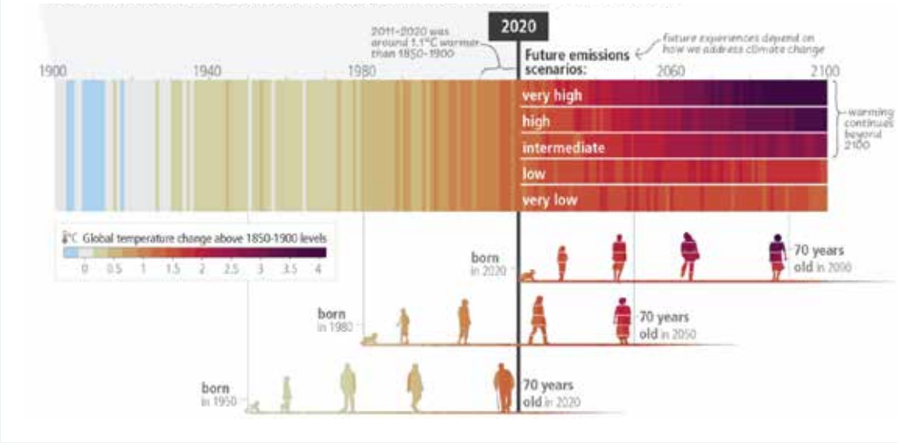

Figure 9.1 The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near term

Source: IPCC[5]

In consultation, some representatives from iwi/Māori shared whakaaro regarding the interdependent relationship between wellbeing and supporting Māori in continuing positive relationships with whenua and taonga species in the face of change climatic conditions, including through enhancing biodiversity. We also heard calls for the Crown to provide more funding and land to enable iwi/Māori to adapt proactively and on their terms – see *Chapter 8: Whāia ngā tapuwae*.

Enabling rangatahi, particularly rangatahi Māori, to participate in the transition to a low emissions Aotearoa New Zealand can have a positive impact on mental health through increasing a sense of control, hopefulness, and resilience.[6]

Physical health can be improved by reducing exposure to air pollutants

Air pollution can cause serious physical health impacts and is associated with respiratory and cardiovascular illnesses. Research suggests the total costs to society related to air pollution health impacts in Aotearoa New Zealand is $15.6 billion per year.[7]

There is a significant opportunity to improve air quality through decarbonising transport – see *Chapter 15: Transport*.

Access to active types of transport such as walking and cycling can also improve individuals' health, and public transport can improve mental health by connecting individuals, families, and communities.

In a similar way, improving the energy efficiency of buildings and adopting clean heating choices can also contribute to improved health and wellbeing while reducing emissions – see *Chapter 11: Built environment*, and *Chapter 13: Energy and industry*. Insulated housing, when combined with heating, increases indoor temperatures, and helps to prevent outdoor pollutants and allergens from entering a home. Proper insulation reduces exposure to mould and allergens, as well as the risk of respiratory issues and lung cancer.

The use of fossil gas cooking appliances, especially without an exhaust hood or if not well maintained, can also contribute to lower indoor air quality. The combustion of fossil gas for cooking emits nitrogen dioxide, carbon monoxide and formaldehyde, which can exacerbate respiratory symptoms and other health issues.[8] A recent Motu Research study into health and wellbeing benefits of installing heat pumps concluded using heat pumps in homes results in warmer and drier living areas through winter, and household savings on electricity bills.[9]

Managing transition impacts for employment

Our advice in *Ināia tonu nei* on achieving an equitable transition to a low emissions economy noted that the transition needed to be well paced, well planned, well signalled and co-designed with affected groups of people. Transparent and inclusive processes involving active social dialogue are key for a transition that is accepted by all parts of society and will be enduring as a result.

For iwi/Māori, partnership and appropriate resource allocation is crucial for a successful transition, as highlighted in *Chapter 8: Whāia ngā tapuwae*. Literature in this area reinforces the importance of implementing collaborative, co-designed policies where Māori are a part of the policy processes each step of the way, and frameworks that incorporate mātauranga Māori alongside western science.[10]

Transition to a low emissions economy will affect economic activity and employment patterns differently across sectors

Some industries, regions and communities will be more affected than others by action to reduce emissions. It is important that the speed and nature of the transition is well signalled to allow time for businesses and communities to manage the change. This will be particularly important in regions that host industries facing major change to reduce emissions, such as steel, aluminium, or chemical production – see *Chapter 13: Energy and industry*.

Labour market changes need coordinated consideration. Sectors like renewable energy (such as offshore wind, solar, and geothermal) are likely to experience increased demand for workers, including for roles requiring specialist engineering and technical skills. At the same time, sectors associated with higher emissions, such as fossil fuel extraction, may see a decrease in the need for workers.

Overall, the workforce demand is expected to stay fairly constant, although there will be a move between sectors. Energy Resources Aotearoa's *Building Energy's Talent Pipeline; An Industry Skills Action Plan* shows that 90% of existing roles are estimated as being able to be transferred into new emerging renewable energy projects.[11] There is also evidence from international studies that emissions-reducing sectors tend to create more job opportunities than are lost in fossil fuel sectors.[12]

The workforce changes in higher emitting sectors are expected to occur gradually, as some workers will continue to be needed to manage existing infrastructure and to safely decommission it once it has been phased out.[13] We have heard in our engagement that perceptions of sudden reduction in jobs present challenges. For example, gas fitters are struggling to attract young people to what is perceived to be a sunset industry, while there is ongoing need for workers.

Managing transition impacts for workforce training

Workers will need continued education and training

In its report on *Technological Change and the Future of Work*, the Productivity Commission noted that Aotearoa New Zealand has a flexible labour market that has historically adapted well to economic change.[14]

That adaptation, however, requires attention to workforce training, as well as support for individuals and communities. Multiple consultation submissions strongly advocated for education and training initiatives aimed at supporting individuals, the public, and communities to effectively navigate challenges and uncertainties associated with the transition.

The Productivity Commission highlighted several challenges to be overcome to improve New Zealanders' ability to adapt to and benefit from technological change. Its recommendations are also applicable to the specifics of a transition to a low emissions economy. It called for the training system to be made more accessible and flexible, as there are currently barriers making it hard for some people to gain new skills or upgrade existing skills. The report stated that adults should be able to borrow through the Student Loan Scheme for short-course tuition fees, and that rules that require adults to enrol in full qualifications before they qualify for public funding should be removed. The quality and reach of careers advice and guidance could also be improved.[15]

Our analysis also shows that policy responses will be more effective if they focus on addressing the skill needs of those facing the most difficulties in gaining new employment. For example, research shows that workers with few or no qualifications are most at risk of being displaced and are more likely to remain unemployed for extended periods of time.[16] Older workers over the age of 50 are also particularly vulnerable to displacement, and the likelihood of finding a new job after being displaced decreases with age.[17]

As part of our analysis for *Ināia tonu nei* we identified that other measures to assist with managing the workforce as Aotearoa New Zealand moves to a low emissions society could include:

- approaches to make the education system more flexible, and able to support the needs of mid-career professionals who face the need to re-skill or re-train
- addressing barriers that restrict all New Zealanders from participating in education and training – including iwi/Māori, Pacific people, and low-income groups
- supporting education and training by Māori, for Māori, including enabling iwi/Māori to train/re-train for the skilled jobs that will be needed in the transition to a low emissions economy, and investments in schools, kura, and wānanga to ensure they have the necessary resources and technology to prepare rangatahi for jobs of the future.

An equitable transitions strategy the country needs

In *Ināia tonu nei*, we identified the need for a strategy to ensure the impacts on people were thought about during planning, programme and policy development, and recommended that the Government prioritise and fund an equitable transitions strategy. That strategy should enable genuine partnership with iwi/Māori to give effect to the principles of Te Tiriti/The Treaty, proactive planning, an education system developing skills needed for a low emissions economy, support for workers to re-train or move, and a robust assessment of impacts. We proposed a timeframe aiming for implementation in 2024.[18]

Work to support an equitable transition is underway in some regions and industries

The Government is progressing coordinated planning at a regional and industry level. The Ministry of Business, Innovation and Employment (MBIE) and the Ministry of Social Development (MSD) have worked with local communities to develop Just Transition plans for Taranaki[19] and Southland,[20] laying the groundwork for the development and funding of similar plans for all regions.

These plans present the opportunity to address location-specific challenges like those facing some rural communities, where the transition could result in fewer available jobs in certain areas. Co-designing these Just Transition plans with communities and mana whenua will help ensure they are relevant, pragmatic, and impactful.

An equitable transitions strategy which considers adaptation and mitigation together is urgently needed to plan for a changing climate

The Government's Equitable Transitions Strategy is in development. There is urgent need for this to be completed and implemented, for it to have effect in the second emissions budget period. Consultation submissions expressed a strong sense of urgency and concern regarding how and when the Equitable Transitions Strategy will be developed and implemented.

The Government's first emissions reduction plan indicates the Equitable Transitions Strategy will consider only impacts related to emissions reduction policies.[21] The Government separately outlined principles for an equitable adaptation transition in its national adaptation plan.

The Intergovernmental Panel on Climate Change (IPCC) has demonstrated that strategies which link emissions reduction action to adaptation planning have advantages. The IPCC's 2023 synthesis report outlines that significant synergies exist between adaptation and emissions reduction, and responses that integrate adaptation and mitigation can reduce trade-offs. Solutions that are integrated across multiple sectors to address social inequities and increase the feasibility and effectiveness of adaptation can also be effective at reducing emissions. For example, in the agricultural sector, on-farm water management and storage, soil moisture conservation, irrigation, community-based adaptation, farm and landscape diversification provide multiple benefits and reduce climate risk.[22] Similarly, approaches such as urban greening and restoration of wetlands reduce a range of climate change risks including flood risk and provide multiple co-benefits.[23]

Failing to consider emissions reduction and adaptation together can lead to decisions to prioritise one over the other, rather than making decisions that meet both goals. This was evident in the wake of Cyclone Gabrielle, with the Government revising its *Government Policy Statement on land transport* to focus less on reducing emissions and more on reconstructing or relocating damaged infrastructure and building greater resilience into the land transport system.[24]

Recommendation

This recommendation seeks to address the need for an equitable transitions strategy that encompasses Aotearoa New Zealand's plans to both minimise and adapt to the impacts of climate change.

Recommendation 9

We recommend that in its second emissions reduction plan, the Government:

9. Expand the scope of the Equitable Transitions Strategy to also include the impacts of climate change and adaptation as well as mitigation.

Taking fair, inclusive, and equitable action on climate change

Barriers are making it harder for some to lower their emissions

In *Ināia tonu nei*, we highlighted the importance of a transition that is well paced, well planned, well signalled, and co-designed to ensure equitable and sustainable outcomes. In many cases, good policy design and implementation can reduce the risks of inequitable impacts.

However, some important and well-designed climate policies may still present a risk of inequitable impacts, and there are barriers preventing some households and small-to-medium businesses from taking up options to reduce their emissions and realise cost savings. This effect is likely to intensify as energy costs rise, increasing inequities.

Many emissions-reducing technologies offer lower running costs but require higher upfront investment. As a result, those with lower incomes or inadequate access to capital may find it challenging to adopt these technologies, even though they would likely lead to long-term cost savings. For example, insulating a home incurs initial costs, but it can lead to significant energy savings over time, along with other non-financial benefits such as improved health.

Split incentives – where the person or entity who could make a change is different from the beneficiary of that change – are another reason for delayed action. Returning to the example of home insulation, a landlord or rental company may not be as motivated to install new insulation in a rental home as they would if they were living in that property (see also *Chapter 6: Investment and finance* and *Chapter 11: Built environment*).

Many households and small-to-medium businesses also lack the time and resources they need to assess climate change risks and decide how to adapt. According to Stats NZ, a lack of information to support decision-making and uncertainty around future policy direction are the main reasons businesses do not invest in climate measures.[25]

The risk of inequitable impacts of emissions pricing needs to be managed

An example of the need to manage policy settings to consider impacts on different groups is available from our separate advice on settings for the New Zealand Emissions Trading Scheme (NZ ETS). With support from the Treasury, the Commission analysed the impacts of the emissions price on household costs as part of its 2023 NZ ETS settings advice.[26] **Table 9.1** shows what the effects would be, based on an assumption that the households do not respond to NZ ETS pricing at all. It is not intended as a projection,[i] but instead provides a snapshot of *relative* potential impacts across a range of emissions prices under the NZ ETS. This helps to identify what groups might be exposed in the short term by a change in emissions price.

Table 9.1: Modelled median change in household expenditure on food and fuel for a $50/tonne increase in NZU price in dollars per week and as a percentage of household disposable income assuming no behavioural or technological change

Emissions price ($/tCO$_2$e)	Quintile 1 (low-income households)	Quintile 2	Quintile 3 (middle-income households)	Quintile 4	Quintile 5 (high-income households)
For a $50 change in NZ ETS price					
$/week	$3.30	$5.00	$5.90	$6.40	$7.30
% of disposable income	0.56%	0.42%	0.35%	0.29%	0.18%

Source: CCC[27]

i. This modelling is not a projection of impacts, as it assumes that consumer behaviour does not change in response to price, no low emissions alternatives are taken up, or no additional measures are introduced to manage the impacts, and that the economy remains the same.

In plain terms, the analysis shows lower income households would pay a larger share of their disposable income than higher income households would. For lower income households, our analysis estimates that a $50 increase in the price of a New Zealand Unit[ii] (NZU) could result in a median change in absolute weekly household spending on food and fuels by around $3.30/week. This is 0.56% of their disposable income. For higher income households, a similar increase in the NZU price could result in a median change in absolute weekly household spending on food and fuels by around $7.30/week. This is 0.18% of disposable income.[28]

To ensure an equitable transition, the risk of inequitable impacts of climate policies – in this instance, emissions pricing – needs to be managed.

The Commission has previously recommended the Government use complementary policies to address equity issues and distributional impacts rather than suppressing the emissions price.[29] As emissions pricing is a key part of the Government's emissions reduction plan, reducing its effect for emissions reduction would mean that more reductions would need to come from other policies, which could in turn create additional unintended inequitable impacts.

Targeted policies can improve equity while reducing emissions

The Government's upcoming Equitable Transitions Strategy can provide a comprehensive response to manage equity during the transition to a low emissions economy.

While the strategy remains in development, there is opportunity to use existing targeted policies to promote equity while reducing emissions. By directing support to the households and small-to-medium businesses least able to transition, the Government can assist those in most need in a resource-efficient manner.

These targeted policies can ensure all New Zealanders are empowered to lower their emissions and promote a fairer society. Examples include the Energy Efficiency and Conservation Authority's Warmer Kiwi Homes programme, which provides subsidies for household insulation and clean heating, and proposed initiatives like social leasing or low-cost loans for emissions-reducing technologies.[30]

The Government also has the option to provide increased income support to low-income households using the existing welfare system, as identified in the first emissions reduction plan.[31] In its *Low Emissions Economy* report, the Productivity Commission highlighted that a well-designed and properly functioning social safety network should support people disproportionately affected by the shift to a low emissions economy. It recommended a combination of adjustments to existing benefits and tax credits as the lowest-cost option for assisting affected households.[32]

The IPCC has also highlighted that the impacts of policies required to reduce emissions can be moderated by fiscal, financial, institutional, and regulatory reforms and by integrating climate actions with macroeconomic policies through economy-wide packages and climate-resilient safety nets.[33]

ii. It is difficult to assess how the NZ ETS flows through to household costs with accuracy. In order to isolate the impact, the Treasury's Tax and Welfare Analysis Model assumes a 100% flow-through of emissions prices to consumers. This means that, for example, there is no technology or behaviour change response assumed to respond to price. This table should therefore not be taken as our assessment of actual household flow-through costs.

This approach would more quickly address current issues and act as a bridge to a longer-term strategy to address these effects. Recent initiatives like the COVID-19 support payments and half-price public transport show the Government can act fast to counter cost of living impacts.

Non-targeted complementary policies that address wider barriers can also help address inequity. For example, policies to improve cycling and public transport infrastructure and services, while not primarily driven by equity considerations, offer more people lower-cost transport options.

Using existing tools and resources rather than delaying action is crucial. Weakening action on climate policy during times of adverse economic conditions – which climate change is only likely to exacerbate – is not sustainable and will greatly compromise Aotearoa New Zealand's ability to meet emissions budgets and the 2050 target as set in the Act.

Community involvement in decision-making

Some communities will need targeted support through the transition to ensure existing social or economic inequalities are not exacerbated. This includes support which enables them to take advantage of opportunities to reduce emissions and associated costs.

Without targeted assistance some communities, including low-income households, iwi/Māori, Pacific people, people with disabilities, LGBTIQA+ community members, and women – would likely be unfairly disadvantaged from the climate transition.

Consultation submissions discussed the importance of effectively including specific groups – including youth (particularly rangatahi Māori and Pacific youth), as well as immigrants, those living in rural areas, the LGBTQIA+ community, people living in lower socio-economic circumstances, and disabled people – in the design and implementation of climate change policies and strategies.

The greatest effect will be achieved when the kind and mix of assistance is aligned to the specific community affected, and when the focus is on the communities whose livelihoods are most impacted. This includes households with the least ability to absorb costs, or workers who are least able to find new employment.

Research also demonstrates the importance of active inclusion of specific groups, including recognition of their potential as agents of the change needed. For example, a study focused on how people with disabilities are involved in climate change response found that ensuring people with disabilities are included in decision-making processes is integral to a just transition.[34] People with disabilities may have specific vulnerabilities to climate change due to ableist infrastructure, policies, and disaster management practices. Equally, making sure the voices of people with disabilities are heard was essential for integrating their knowledge, experience, and solutions into inclusive policy-making that builds resilience.[35]

A guide to just transitions for communities in Aotearoa New Zealand was commissioned by MBIE and developed by Motu Economic and Public Policy Research in 2023.[36] It contains practical ideas, methods, and tools enabling communities to come together and solve problems. The resources include guides for developing a leadership group, questions for getting started, questions to consider when choosing a collaborator group, overcoming resistance to change, and designing transition processes.

As noted in the Motu guidance, while locally led change is a key element in equitable transition, the Government also has a role to play in establishing laws and policies, and ensuring community involvement receives funding to enable equitable transition processes.[37]

Recommendation

This recommendation seeks to address the need for immediate action to both minimise the impacts of climate change and manage the risks of inequitable impacts.

Recommendation 10

We recommend that in its second emissions reduction plan, the Government:

10. Manage the impacts of climate policies using existing policy levers until the Equitable Transitions Strategy is implemented, rather than delaying climate action.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

urupā
burial ground, cemetery, graveyard

wāhi tapu
sacred place, sacred site such as a burial ground, a battle site, or a place where sacred objects have been placed

rangatahi
young people, youth

wānanga
university, place of higher learning, tertiary institution designed to meet the learning needs of Māori

whakaaro
thought, opinion, idea, understanding

whenua
land

taonga species
treasured species, often refers to species that were present in Aotearoa New Zealand prior to the first European contact with Māori in 1642

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices

mana whenua
the mana and rights held by those with historic and territorial rights over land in a particular area, authority derived through whakapapa links to that area

3: Kōwhiringa tukuwaro iti mā ngā rāngai me ngā whakahaere

Part 3
Low emissions options for sectors and systems

Ahuwhenua
Agriculture

Introduction

Reductions in greenhouse gas emissions from agriculture are central to meeting Aotearoa New Zealand's emissions reduction targets. Agriculture accounts for 91% of the country's biogenic methane emissions and 94% of nitrous oxide emissions,[1] which together represent approximately 49%[i] of gross greenhouse gas emissions.

Through the second emissions reduction plan, the Government can build on the sector's progress in reducing emissions. Our analysis shows there are clear options to achieve the further shifts needed to meet the biogenic methane components of the 2050 target.[2]

With an effective emissions pricing system for agriculture, new technologies, some land-use diversification, and on-farm efficiency increases, the sector could make the changes needed to meet Aotearoa New Zealand's emissions reduction targets while limiting impacts on agricultural production.[3]

This advice builds on our analysis of options for the first emissions reduction plan (as outlined in *Ināia tonu nei*) and our 2022 report *Progress towards agricultural emissions pricing*, and considers recent changes in the operating environment, including in policy settings. Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice.

The implementation and rapid advancement of an agricultural emissions pricing tool will be one of the key tools for achieving the biogenic methane components of the target.

Supporting this with effective advisory and extension services will support farmers to lift the pace of on-farm change and maximise their opportunities to reduce emissions. Equally, the enabling of new technologies, including streamlining the review and approval process, would help achieve biogenic methane targets while limiting impacts on production.

i. When compared using the GWP_{100} metrics.

Our advice reflects that the Government also has priority considerations around maintaining safe food standards and animal welfare, as well as the environmental conditions that underlie Aotearoa New Zealand's agricultural export markets and wider issues of wellbeing.

In line with the Government's partnership under Te Tiriti o Waitangi/The Treaty of Waitangi, the policy settings for the second emissions reduction plan need to reflect the significant part agriculture plays in the Māori economy, the unique characteristics of land owned by Māori, and the relationship Māori have as tangata whenua to te taiao.

Sufficient resourcing allocated to further support iwi/Māori advisors would improve the response to any new policies relating to agriculture. This approach must uphold Treaty principles, including partnership, active protection, participation, and equity, while also recognising the guarantee of rangatiratanga and kaitiakitanga. Refer to *Chapter 8: Whāia ngā tapuwae* for additional discussion on appropriately resourcing iwi/Māori.

There is opportunity in setting the agriculture settings in the second emissions reduction plan to support adaptation and resilience to climate change, and to maximise the co-benefits for other Government outcomes such as water quality improvements.

As in the previous chapter, our analysis shows that policy to drive emissions reductions is more effective when it also recognises and manages the impacts on people. An equitable transition will depend on consideration of the effects of policy change to reduce agricultural emissions on different groups, including rural communities and mana whenua, and in different regions.

Changes from the draft version of this chapter

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 12 now includes further specificity regarding partnership with iwi/Māori as services to farmers are enhanced.

Recommendation 12 also reflects feedback we received about the importance of collaboration with industry to ensure services add meaningful value and are not unnecessarily duplicated between government and industry good organisations.

We more clearly emphasised the importance of an equitable transition in our advice about working with regional councils and in partnership with iwi/Māori when developing land-use approaches.

Some submitters wanted to see a more detailed policy recommendation specific to land-use change from agriculture to horticulture. However, as our role is to provide advice on the direction of policy, rather than give detailed policy recommendations, we did not amend our recommendation.

Instead, we strengthened areas of our advice related to this feedback. Our final advice discusses the importance of the Government working in partnership with iwi/Māori and in collaboration with food and fibre producers and industries to identify and support options for land-use diversification. We then discuss the benefits (biological emissions reduction) and challenges (lack of infrastructure, access to water, or labour) related to changing land from agriculture to horticulture.

We updated our advice to reflect the Government's announcement on its plan for an agricultural emissions pricing system, which confirmed a split-gas approach with pricing to commence from Oct 2025 (rather than Jan 2025). We also added content to discuss environmental safety regulation alongside food safety.

As a result of mixed feedback regarding our advice and recommendation on advancing an agricultural emissions pricing system, we reviewed the available evidence and re-examined Recommendation 11 to ensure it builds on what we learned through *Ināia tonu nei* and our advice on *Progress towards agricultural emissions pricing*, and *Agricultural Assistance*.

We found that the implementation and rapid advancement of agricultural emissions pricing will provide a necessary tool to incentivise the emissions reductions required by 2050 and beyond.

While existing policies, mainly related to freshwater quality, will achieve part of the near-term methane reductions required by 2030, the effect of those policies is uncertain and there is little evidence that they will be sufficient. An effective pricing mechanism would provide the Government with a key additional tool to ensure that the 2030 biogenic methane component of the 2050 target will be met, and that agriculture mitigation contributes to meeting the second emissions budget.

Advancing to a more detailed pricing system within the second emissions budget period would recognise and reward more emissions reduction actions, allowing farmers to reduce emissions while limiting impacts on production. It would also provide more choice about how to respond to price signals, enabling farmers to make decisions that best align with the wellbeing of their businesses.

Financial assistance could provide a means to limiting disruptive change to the agricultural sector. The Government could also choose to give targeted assistance based on certain criteria to manage more specific impacts.

Under the Act, the Commission is due to provide the Government with advice regarding its review of the 2050 target In December 2024. This review, which includes the biogenic methane components of the target, will consider all relevant evidence and will involve consultation with the public.

Pricing agricultural emissions

In 2019, the Climate Change Response (Zero Carbon) Amendment Act put into law a new 2050 emissions reduction target. The 2050 target is made up of three components:

- net zero of all domestic sources of greenhouse gases except biogenic methane by 2050
- a reduction of biogenic methane to 10% below 2017 levels by 2030
- a 24-47% reduction of biogenic methane below 2017 levels by and beyond 2050.[4]

Reducing agricultural emissions will be crucial in meeting all three components, and the implementation and rapid advancement of an agricultural emissions pricing tool will be key to achieving the biogenic methane components of the target.

In *Ināia tonu nei*, we recommended the Government commit to a pricing mechanism to incentivise on-farm emissions reductions.

In 2022, the Government released its proposal for an agricultural emissions pricing system.[5] The proposal was based on the farm-level split-gas levy designed by He Waka Eke Noa, the Primary Sector Climate Action Partnership. In August 2023, the Government announced a final plan confirming the farm-level split-gas approach with pricing to commence from October 2025, instead of January 2025.[6]

Emissions from agricultural activities are currently legislated to be priced from 1 January 2027 through a farm-level New Zealand Emissions Trading Scheme (NZ ETS) backstop option, unless an alternative, simplified, basic farm-level levy system is legislated and implemented prior to this date.[7]

It is critical that the Government quickly implement this alternative and rapidly advance it in the second emissions budget period to a more detailed pricing system to create more long-term incentives to reduce emissions.

Box 10.1 Agricultural emissions pricing

The 'Pricing of Agricultural Emissions' report was prepared by the Minister of Climate Change and Minister of Agriculture in late December 2022 to meet the requirements of Section 215 of the Climate Change Response Act 2002 ('the Act').[8] The report outlined a system to put a price on emissions from agricultural activities as an alternative to the NZ ETS.

The Government proposed a farm-level split-gas levy for agricultural emissions that would price emissions from biogenic methane and nitrous oxide (including from fertiliser) separately. The legal point of responsibility would be with the business owner and reporting could be done via a collective.

Payments would be available as incentives to reward the uptake of technologies and eligible removal and storage of carbon. The NZ ETS would be reformed and parties incentivised to conduct science and research to include new categories of sequestration.

In August 2023, the Government announced their final plan for pricing agricultural emissions through a farm-level split gas levy.[9] Under this plan, emissions pricing is set to commence in quarter four of 2025, with mandatory reporting of on-farm emissions to begin in quarter four of 2024.

The processor-level NZ ETS backstop will remain in place as set out in the Act until an alternative system has been implemented.

Advancing towards a more detailed pricing system will be a key tool that can contribute to meeting the second emissions budget and ensure the 2030 biogenic methane component of the 2050 target will be achieved

In our 2022 report *Progress towards agricultural emissions pricing*, the Commission supported a farm-level pricing system for methane (as opposed to having the point of obligation at the processor level) as the best approach to pricing agricultural emissions in the long term.[10] We also found that the system needs to have enough detail to recognise and incentivise the full range of mitigation options for farmers.

A detailed pricing system would recognise more inputs through on-farm emissions calculations, including fertiliser application methods used and grazing dates for different feed types, allowing the calculator to reflect more on-farm actions. Advancing the system to include more inputs would mean that the impacts of new emissions reduction technologies could be measured as they come online.

We heard through both engagement and consultation on the draft version of this advice that farmers want more emissions reduction actions to be recognised under the pricing system. A detailed system would recognise and reward more emissions reduction actions, allowing farmers to reduce emissions while limiting impacts on production. It would also provide more choice about how to respond to price signals, enabling farmers to make decisions that best align with the wellbeing of their businesses.

Effective agricultural emissions pricing will be a key tool to ensure Aotearoa New Zealand will meet its climate targets. A review of publicly available modelling suggests that existing policies alone, including freshwater and other non-climate policies, would not result in adequate biogenic methane reductions to meet the 2030 target. We have not been presented with any modelling or analytical evidence through engagement or consultation that suggests otherwise.

A basic farm-level system can provide a path towards a more detailed and effective system, but it is important that this basic system is implemented without delay and then advanced as soon as possible over the second emissions budget period.

Financial assistance could provide a means to limiting disruptive change to the agricultural sector. As previously stated in the Commission's *Agricultural Assistance* advice, our view is that the Government should provide assistance to all farmers as the sector transitions to low emissions, if it expects material financial hardship to be widespread. The Government could also choose to give targeted assistance based on certain criteria to manage more specific impacts.[11]

Recommendation

This recommendation seeks to help ensure the development of a timely and fit-for-purpose agricultural emissions pricing system which helps to enable Aotearoa New Zealand to meet the second emissions budget and its longer-term emissions reduction targets.

Recommendation 11

We recommend that in its second emissions reduction plan, the Government:

11. Advance the agricultural emissions pricing system to:
    a. continuously broaden the range of recognised low emissions practices and technologies
    b. incentivise gross biogenic methane emissions reductions in a manner consistent with achieving the 2030 biogenic methane component of the 2050 target, and putting the country on a trajectory to achieve the 2050 target in full.

Technologies for reducing on-farm emissions

Removing barriers to the deployment of emerging technologies that reduce agricultural emissions

Farm management changes such as adjusting stocking rates and managing supplementary feed and nitrogen inputs will be important for meeting targets, especially as they can be implemented now. However, the development of new technologies could result in significantly greater and faster emissions reductions.

The development of new technologies and practices which reduce on-farm emissions would give the agriculture sector greater flexibility in meeting both the 2030 and 2050 biogenic methane components of the 2050 target. If new technologies are successfully developed and widely adopted, it could allow Aotearoa New Zealand to achieve these targets while limiting impacts on agricultural production.

There are several emissions reduction technologies currently under development. Some, such as urease inhibitors, are already commercially available and widely used in Aotearoa New Zealand. Others, such as methane inhibitors, are yet to be formulated for pastoral use.[12]

In Budget 2022, Parliament allocated $338.7 million over the next four years towards accelerating the research and development of new agricultural emissions reduction technologies to get these into the hands of farmers sooner.[13] A new Centre for Climate Action on Agricultural Emissions has been established with a Government-industry joint venture that has made its first investment in developing a slow-release methane-inhibiting bolus.[14] The Government also committed to supporting clear and effective regulatory paths for agricultural emissions reduction technologies, which included adding inhibitors as "*agricultural compounds*" under the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act).[15]

While these technologies could have significant benefits, it is crucial that they do not negatively impact the environment, or human and animal health. Aotearoa New Zealand's food safety system will need to ensure agricultural products are safe and trusted, while minimising barriers to the regulatory approval of new technologies.

Environmental and food safety regulation

It is critical that new technologies are safe, but getting approval can take time

The food safety system in Aotearoa New Zealand includes the ACVM Act,[16] under which agricultural compounds are authorised for sale, and the Codex Alimentarius,[17] which sets international health and trade standards for food.

The environmental regulatory system includes the Hazardous Substances and New Organisms Act (1996) under which chemicals are approved for use, and the Natural and Built Environment Act 2023, which places conditions on discharges to the environment.

Regulatory tools play a crucial role in protecting the environment, and ensuring agricultural products from Aotearoa New Zealand are safe and trusted in overseas markets. However, the current system means that it takes time to get new technologies approved for widespread use.[18] Streamlining the approval process to ensure new emissions reduction technologies can be approved faster will help achieve the second emissions budget and longer-term emissions reduction targets.

Legislation could also be reviewed to ensure the removal of any barriers to the introduction of new emissions reduction technologies. Genetic modification, for example, is currently primarily regulated under the Hazardous Substances and New Organisms Act. Current restrictions on genetically modified organisms could restrict the development and testing of emerging mitigation technologies.

Opportunities

Streamlining the process for introducing new technologies is key to enabling adoption by farmers

Biogenic methane emissions are largely a function of the amount of feed an animal eats, so it can be challenging to reduce emissions without reducing production. Technologies such as methane vaccines or inhibitors would allow the sector to significantly reduce emissions while limiting impacts on production.

We heard in consultation that streamlining the regulatory process for approving new technologies is critical for getting emissions reduction technologies into the hands of farmers. These actions would enable the sector to move faster in reducing gross emissions and give Aotearoa New Zealand the best chance of achieving its climate targets.

In *Ināia tonu nei*, our Tailwinds scenario found that developing and widely adopting new technologies like methane inhibitors, methane vaccines, and low emissions breeding could enable Aotearoa New Zealand to exceed the 2030 component of the 2050 target and meet the more ambitious end of the range for the 2050 biogenic methane component.[19]

The Headwinds scenario assumed that slower changes in technology and behaviour change make it challenging to meet the 2030 and 2050 biogenic methane components of the 2050 target. Without new technologies, meeting the 2050 component would likely require significantly lower agricultural production from livestock and more land-use change.[20]

Under the current legislation, agricultural emissions are set to be priced from 2025, and we heard through consultation that the rollout of new technologies would allow farmers more options to respond to an emissions price. If the pricing system can recognise a range of emissions reduction technologies, farmers will be able to respond according to the characteristics of their farm and minimise financial impacts.

Some emissions reduction technologies like nitrification inhibitors could have environmental co-benefits, such as supporting water quality and biodiversity. These technologies could also align with the principles of Te Taiao and Tiakitanga under the He Ara Waiora framework.[21]

It is important that support is continued for Māori-led mātauranga Māori approaches for reducing emissions

Through Maui.Tech case study participants, we heard about the importance of tino rangatiratanga in fulfilling the ancestral relationships of kaitiakitanga, and of tikanga-led practices within agricultural contexts (for more on the Maui.Tech project, see *Chapter 2: What we heard)*.[22]

Māori-led mātauranga Māori approaches can inform reductions in biogenic methane and nitrous oxide emissions over and above what is already in development. Bringing emphasis to these approaches could accelerate the transition for all farmers and lower costs.

Approaches led by iwi/Māori will support all levels of Māori participation in the agriculture sector. Examples of these programmes can be seen at organisations like AgResearch, where a Māori Research & Partnerships Group has been established.

Building resilience in the agriculture sector

Diversifying land use can reduce emissions and provide other benefits

Diversifying agricultural land use has the potential to provide several benefits – particularly for rural communities – including reducing emissions, diversifying income, building climate resilience, and enhancing environmental outcomes.[23]

Many farmers have already reduced emissions by converting some areas of pasture into cropland, allowing native bush to regenerate, planting trees on steep pockets of land, and planting vegetation along waterways in response to freshwater policy. These actions, forming mosaic land uses, have several co-benefits such as increasing biodiversity, water quality, soil health, and carbon sequestration.[24]

In some places, land-use change from agriculture to forestry could offer higher profit per hectare while producing lower biological emissions.[25] However, there are multiple barriers and risks associated with whole farm conversions to forestry, including not achieving significant gross emissions reductions (this is addressed in *Chapter 14: Forests and other carbon stocks*). These concerns reinforce the need for the right tree to be planted in the right place for the right purpose.

An integrated land-use approach with councils and iwi/Māori is important for enabling an equitable transition

To enable an equitable transition, an integrated approach to land use, bringing together central government, regional councils, and iwi/Māori, is needed.

It is important for the Government to work in partnership with iwi/Māori, and in collaboration with food and fibre producers and industries across supply and value chains, to identify and enable land-use diversification options. Water allocation and consenting regulations that are supportive of land-use change and land-use diversification will also be needed.

Beyond forestry, other land-use changes from agriculture to horticulture may reduce biological emissions.[26] However, barriers such as lack of infrastructure, markets, access to water, skills, or labour, as well as unsuitable growing conditions limit the potential for this. Therefore, to enable different production types and land-use diversification, gaps within supply and value chains need to be identified and addressed.

Investment in science will be required to identify suitable options for land-use diversification within individual landholdings on a regional basis. Suitable research areas include evaluations of a range of parameters such as commercial viability, water availability, soil properties, growing conditions, and potential climate risks.

The agriculture sector is likely to experience impacts from extreme weather events and gradual changes in the climate

The National Climate Change Risk Assessment for New Zealand[27] stated that climate change will directly impact many industries including horticulture, viticulture, agriculture, and forestry through changes in climate variables, pests, and diseases.

Therefore, as landowners consider changing land use it will be important for them to have access to and consider regional climate change impacts and potential adverse outcomes. For example, widespread conversion from agricultural land use to forestry in some areas may result in increased risks including fires, destruction from debris during floods, and pest or insect predation. Opportunities will depend on shifts in labour markets, skills, and availability of resources.

Supporting producers to make changes

A trusted and skilled farm advisory service would help individual farmers make the changes that best suit their land and business. Collaborating with farmers and industry in the design of advisory services will be important to ensure services are relevant, pragmatic, and accessible. The Government could coordinate pan-sector advisory and extension services to enhance collaboration and avoid duplication, and focus on opportunities for adding value and aligning with wider environmental outcomes like freshwater management.

To be in the best position to seize opportunities associated with transitioning the agriculture sector, farmers will require adequate support to reduce emissions.[28] Advisory and extension services provided through industry groups[29] provide farmers with knowledge and skills to identify possible changes to achieve improved economic, social, and environmental outcomes.[30]

Advisory services will be essential for enabling farmers to access information on low emissions practices and technologies, and to better understand which options would be most effective and appropriate for their specific business. As new technologies become available, it will be critical to support and enable uptake at farmer and grower level, translating research and science into on-farm action.

Aotearoa New Zealand's agriculture sector has a diverse range of farm types, geography, climate, and farmers. Therefore, multiple methods of advisory services and training will be required to support decision-making and changes at the farm level.[31] There are a range of advisory approaches and ways farmers get information, including through rural professionals, sector bodies, demonstration farms, rural media, catchment groups, and formal and informal networks.[32]

Research shows farmers respond to peer-to-peer learning and farmer or regionally-led groups, using them to understand what other farmers are doing and talk about the benefits, challenges, and technical details of lowering their emissions.[33] In addition, utilising demonstration hubs and farms to display science and research on-farm has been shown to increase confidence in low emissions strategies and emissions reduction technologies. Demonstrations enable farmers to access strong evidence of success before making a change themselves.[34]

Environmental legislation designed cohesively will minimise the administrative burden on farmers

Through our engagement and consultation we also heard that upcoming environmental legislation may place a large administrative burden on farmers. Reporting and planning requirements for agricultural emissions pricing and freshwater farm planning will both be introduced over the next few years. While it is important that there are enough skilled farm advisors available to help with these requirements, environmental legislation designed cohesively will minimise the administrative burden.

Services co-designed with iwi/Māori will be necessary to ensure an equitable transition

Māori land ownership faces unique constraints and challenges compared to general freehold title land ownership and management structures.[35]

There is evidence that the mainstream models of agricultural education, training, and advisory services are not fit-for-purpose for iwi/Māori needs.[36] In consultation, we heard about the need for action (and therefore funding) at multiple levels, with whānau, hapū, iwi, and individual Māori driving agricultural change along with post-settlement governance entities. Therefore, sufficient investment in programmes and advisory services that focus on the specific perspectives, needs, and aspirations of iwi/Māori will be necessary to ensure an equitable transition which avoids disproportionate impacts.

Investment in training and upskilling the workforce will be crucial to enabling land-use change and diversification in the transition to a low emissions sector

The impacts of climate change are already being felt across the agriculture sector, with the frequency and intensity of extreme weather events such as flooding and drought likely to increase in different regions.[37] As the agriculture sector is directly exposed to the changing climate, it is important to upskill regional advisory services to inform farmers of climate risks and adaptation options. These advisory services will also be key to helping farmers to identify different land-use and diversification options.

Future advisory services can build on the services and networks that already exist to avoid duplication. This will improve integration with other advice and training farmers are receiving on outcomes like productivity, water quality, biodiversity, and soil health.

Existing education, training, and advisory programmes will also need to be scaled up to meet the growing demand for these services, which will be critical for supporting farmers to transition to low emissions.[38]

Experienced farm advisors are currently in short supply, and difficulties in attracting and retaining employees mean that the industry is struggling to grow.[39] Therefore, investment in upskilling rural professionals and extension and advisory services is equally important to enabling farmers to reduce agricultural emissions.

Impacts on rural communities

There are multiple pressures contributing to land-use changes, particularly the shifts away from sheep and beef farming. We have heard through our engagement and consultation that in areas where sheep and beef farming generates jobs, land-use change may have wider impacts on communities, including mana whenua.

Identifying the impacts on rural communities and other flow-on effects will help support an equitable transition towards a lower emissions agriculture sector. Land-use change has many drivers, including:

- economic factors such as profit, commodity prices, capital, interest rates and markets, and availability of labour
- biophysical factors such as soil type, topography, climate
- regulation and technology
- the objectives of the land manager.[40]

Over recent years, the relative profitability of forestry compared to extensively farmed sheep and beef has increased. This is caused by both product prices and climate incentives for forestry. Where livestock is farmed more extensively, there may be fewer management practices and technologies available to reduce emissions without reducing production. This means agricultural emissions pricing may accelerate the move away from sheep and beef farming.

Land-use change to forestry has uneven impacts on regions and communities

The Commission has heard through engagement and consultation that rural communities in some farming regions will experience flow-on effects of land-use change to forestry. Land-use change may impact the availability of sheep and beef farming work, and permanent carbon forestry may not generate enough permanent local jobs to replace it.

A decrease in employment opportunities could in turn impact the population of rural communities and reduce expenditure in other businesses. The viability of institutions such as schools could also be impacted if there are not enough pupils.

Land-use change could also disproportionately impact iwi/Māori. Around 24% of land owned by Māori is farmed in sheep and beef.[41] It is more likely to be steeper and less versatile, and is often less agriculturally productive per hectare, making it more likely to be bought out by forestry interests.[42]

Land-use change from sheep and beef farming into forestry is unevenly distributed across the country and will impact different regions in different ways. To ensure an equitable transition, it is important to understand where the impacts will occur, and how the rural communities in these areas could be affected. The Equitable Transitions Strategy, co-led by the Ministry of Business, Innovation and Employment and the Ministry of Social Development, will be a key vehicle for ensuring an equitable transition.[43]

Recommendation

This recommendation seeks to address the need for farmers to have the necessary support to take actions that will help enable Aotearoa New Zealand to meet the second emissions budget and its longer-term emissions reduction targets.

Recommendation 12

We recommend that in its second emissions reduction plan, the Government:

12. Enhance advisory and extension services to farmers to accelerate land-use diversification and uptake of the technology and practices required to reduce gross emissions in line with emissions budgets and the 2050 target.

    These services must be co-designed, coordinated, and implemented in partnership with iwi/Māori, and should be developed in collaboration with industry.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

te taiao
the world, Earth, the natural world, the environment

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[44]

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

kaitiakitanga
guardianship, stewardship, trusteeship

tangata whenua
local people, indigenous people – people born of the whenua, of the placenta and of the land where the people's ancestors have lived and where their placenta are buried

mana whenua
the mana and rights held by those with historic and territorial rights over land in a particular area, authority derived through whakapapa links to that area

tino rangatiratanga
self-determination, sovereignty, autonomy, self-government

Mā tahi: Chapter 11

Te hanga a te tangata
Built environment

Introduction

There are opportunities for long-lasting emissions reductions achieved through an integrated approach to urban form, infrastructure, and buildings. Equally, there is time pressure for action, as policy changes in this sector often have long lead-times before they deliver emissions reductions.

The Government has significant investment choices to make for the built environment. Settings in the second emissions reduction plan that influence how and where the country builds will matter for reducing greenhouse gas emissions and for reducing Aotearoa New Zealand's vulnerability to climate change impacts and natural hazards.

The way cities, towns, and communities are designed affects emissions from land use, transport, buildings, energy, and waste. Emissions are generated throughout the lifecycle of infrastructure and buildings. The built environment also has a secondary effect on emissions and the transition. For example, the type of transport infrastructure people can access will impact their ability to reduce their emissions.

The advice in this chapter is based on our analysis for the first emissions reduction plan (as outlined in *Ināia tonu nei*) and takes into account new information, such as the 30-year infrastructure strategy released by Te Waihanga Infrastructure Commission in 2022.[1] Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice.

We have identified where well-integrated policy, planning, and funding decisions related to the built environment can help to meet the second emissions budget and enable Aotearoa New Zealand to achieve its longer-term climate targets.

This includes Māori-led approaches to weaving mātauranga Māori into decision-making. Increasing opportunities for co-design can help improve understanding of the impacts of urban form and infrastructure development for iwi/Māori communities as well as taonga tuku iho, whenua, awa, and all of te taiao. Refer to *Chapter 8: Whāia ngā tapuwae* for additional discussion on appropriately resourcing iwi/Māori.

The strategy published by Te Waihanga Infrastructure Commission sets out sustained actions that can meaningfully reduce emissions. It specifically highlights enabling net zero carbon emissions – through a combination of increased clean energy generation capacity, reducing emissions from the infrastructure sector, and building attractive and inclusive cities in ways which build enduring partnerships with and opportunities for Māori.

While this advice has a focus on emissions reductions required to achieve emissions budgets and the 2050 target, it also necessarily points to intersections with decisions around climate change adaptation and resilience. Aotearoa New Zealand has a high exposure to natural hazard risks and much of its built environment is in vulnerable coastal and lowland locations, as demonstrated in the extreme weather events of early 2023 in Auckland and across the path of Cyclone Gabrielle.

Not only will decisions across urban form, infrastructure, and buildings impact emissions, they can also reduce risk to coastal infrastructure, buildings, and land, and strengthen the resilience of core systems such as electricity and communication networks.

Changes to policy settings also offer the chance to deliver sustainable transport modes and lower energy consumption, as well as to support greater social equity.[2] See *Chapter 9: An equitable transition* for our analysis showing policy to drive emissions reductions is more effective when it also recognises and manages the impacts of policy change on people and communities.

Changes from the draft version of this chapter

To reflect what we heard from consultation, we included additional discussion on embodied carbon, and how education, training, and behaviour change can support emissions reduction. We also added evidence about the key role of electrification in reducing emissions from building heating.

We strenghtened our advice on policy cohesion, pointing to the need to address current unresolved conflicts and support policy alignment through clear central government direction.

Recommendations 13 and 14 received broad support, and we made only minor changes to improve their clarity.

An integrated planning system that results in 'density done well' provides the opportunity to ensure that future generations across all income levels inherit a high quality, low emissions urban environment. Rather than seeking regulation which would impact building costs and housing affordability, Recommendation 13 seeks to address the misalignment between existing urban form and Aotearoa New Zealand's emissions reduction targets.

Retrofitting existing buildings can be complex. There are currently limited incentives to retrofit given the upfront costs associated with equipment and installation, potential space requirements, and disruptions during construction. Recommendation 14 reflects our analysis findings that incentives to retrofit are preferable to regulation.

Recommendation 14 is intentionally broader than the existing Warmer Kiwi Homes programme. Installing insulation, upgrading windows, improving weathertightness, and switching away from fossil fuel heating and cooking can improve health outcomes, reduce exposure to a rising carbon and fuel prices, increase resilience to extreme weather events, and lower overall running costs. However, these come with upfront purchase and installation costs, which is what the recommendation seeks to help overcome.

Recommendation 15 got a more mixed reception, and we used our policy and prioritisation frameworks to evaluate whether any changes were needed. Our analysis showed that the investment required to continuously expand fossil gas infrastructure would be recovered from consumers, some of whom may not have a choice in what fuel they use or have the ability to change energy use patterns. This could effectively lock in their exposure to a rising carbon price and fossil fuel costs.

Some respondents felt that fossil fuel use in buildings should be phased out entirely. While our recommendation is aimed at limiting the installation of new fossil gas connections, encouraging and incentivising the installation of electric and induction technologies will lead to both short and long-term emissions reductions. As a result of this analysis and in response to feedback, we revised the recommendation to be more outcomes focused.

Urban form

Urban form has numerous links to emissions, but the most significant links are through buildings, infrastructure, and transport

Consumption-based emissions accounting is not used in Aotearoa New Zealand's Greenhouse Gas Inventory or its emissions budgets. Accounting for international and domestic greenhouse gas emissions reporting is done using a production-based accounting system, in line with international practice.

However, when decisions are made in the design and build of infrastructure, considering the whole-of-life of that piece of infrastructure can reduce system-wide emissions and contribute to a more circular economy. For more discussion on the circular economy, refer to *Chapter 12: Circular economy and bioeconomy*.

Box 11.1: Emissions in the built environment

Operational emissions occur during the usage of a building. They stem mainly from the energy required to heat and cool a building, heat water, cook, and power devices plugged in at the wall.

Embodied emissions stem from the materials and products the building or infrastructure is made from, the construction process itself, construction waste disposal, maintenance and refurbishment throughout the infrastructure's life, and final disposal of the infrastructure at the end of its life.

Upfront emissions refer to the embodied emissions up to the point of practical completion, but exclude maintenance, refurbishment, and building end-of-life.

Table 11.1: Examples of emissions sources linked to urban form

Emissions source	Example
Transport energy	Petrol and diesel use in vehicles
Infrastructure embodied carbon	Transport and utilities infrastructure materials, and construction energy use
Building energy	Fossil gas cooking and heating, electricity
Building embodied carbon	Concrete, steel, timber

The way cities and towns are shaped impacts emissions across land use, transport, buildings, energy, and waste

Urban form refers to the physical characteristics that make up urban areas, including the shape, size, density, activities, and configuration of settlements. Making changes to how Aotearoa New Zealand approaches and shapes urban form can reduce emissions and strengthen climate change resilience. The rate of change will likely vary across different sized urban areas, influencing the pace and scale of emissions reductions that can be achieved.

Two of the main aspects that shape urban form are transport and development needs. Transport investments can drive urban development, and urban development can influence transport investments in response. What results is an urban form that can be classified as people-oriented (dense and well-connected) or car-dependent (low density and vehicle-dependent).[3] Spatially planning urban developments in a way that helps reduce emissions can support meeting emissions budgets. The Spatial Planning Act provides a way for this alignment to be realised. Well-planned and designed urban spaces can also result in greater social equity, improved health outcomes, and lower energy consumption.

Transport investments that reduce emissions can also reduce total vehicle-kilometres-travelled (VKT). The Government has set a goal of reducing light fleet VKT by 20% relative to the projected baseline by 2035 through improved urban form and providing better travel options, particularly in large urban areas.[4] These changes can help incentivise people to walk and cycle as well as use micro-mobility options (e.g. e-scooters) and/or public transport (e.g. buses, trains) more often, meaning they travel less in cars.

Transport investments such as road and highway improvements can also lead to higher emissions, both from development itself and the choices it incentivises people to make.[5] The Government has announced multiple such transport projects that will increase emissions and make it more difficult to meet emissions budgets. Refer to *Chapter 15: Transport* for additional discussion.

Urban development and expansion have resulted in significant demographic, social and cultural change for Māori

While physical evidence of mana whenua occupation varies across current urban areas, reminders of such connections can inform decision-making and planning for urban form and green spaces.[6] Several Maui.Tech case study participants referred to the alienation of iwi/Māori from their whenua as a result of Crown actions, and the emerging context of land loss from climate change (for more on the Maui.Tech project, see *Chapter 2: What we heard*).[7] In addition to involuntary land acquisitions and seizures, some rural iwi/Māori environments became subsumed within an expanded urban boundary as settlements and towns evolved into cities.

The Māori population currently represents a significant proportion of the urban population. Between the 1960s and 2010s, the percentage of Māori living in urban areas increased by more than 20%, driven by manufacturing booms and higher wages in cities, population pressures on sparse rural resources, and targeted government relocation programmes.[8]

Urbanisation can result in cultural dislocation, with impacts on important aspects of te ao Māori including kaitiakitanga, whakapapa, and whanaungatanga. It will be important for urban planning and design to fulfil obligations under Te Tiriti o Waitangi/The Treaty of Waitangi. This includes Māori-led approaches regarding appropriate and respectful uplifting of mātauranga Māori into decision-making frameworks. Increasing opportunities for co-design can help improve understanding of the impacts of urban form and infrastructure development for iwi/Māori communities and taonga tuku iho, whenua, awa and all of te taiao. Maui.Tech participants also highlighted the importance of ensuring Māori built environments, such as marae and papakāinga, are resilient in the face of climate change.[9]

Existing urban form in Aotearoa New Zealand is not compatible with climate challenges

Post-colonial urban planning in Aotearoa New Zealand has followed a model to suit what is described as the "quarter-acre dream". This emphasised standalone homes with sections as the main residential development type, creating sparsely populated residential areas that continue to expand urban boundaries, even in the largest centres.[10]

When measuring urban form, the '7Ds' can be used to understand system outcomes. They are design, distance, density, diversity, destination accessibility, demand management, and demographics.[11] These seven factors drive emissions reductions when used for effective street and infrastructure design.

For example, design can enable shorter distance to transit, higher density, higher destination accessibility, and complementary demand management measures, informed by an understanding of demographic needs and behaviours. Greater land-use diversity and mixing uses[i] can also support greater density when developing urban areas. Building urban areas upwards may reduce pressure on productive soils close to the urban fringe.

Together the 7Ds can result in "density done well", which emerged in consultation as a key priority for many respondents, who called for a strong focus on navigating the risk of increased vulnerability to climate change as a result of densification, and on the role of green spaces and biodiversity in dense urban areas.

Combined with other knowledge, like the Parliamentary Commissioner for the Environment's report *Are we building harder, hotter cities? The vital importance of urban green spaces* and lessons from international case studies, policy direction can be set which enables emissions reduction, climate risk reduction, and co-benefits.[12]

International studies have demonstrated that denser urban forms result in significantly fewer overall emissions – including embodied, enabled, and operational emissions.[13]

These studies show that greenhouse gas emissions per person in high density areas measured less than half of those in low density areas.[14] Operational emissions from energy use – for either transport or buildings – are much more significant than embodied emissions, though embodied emissions are not insignificant.[15]

High density urban development reduces emissions from urban form, but density needs to be in the right places. It is important that density does not occur in vulnerable coastal or lowland locations, or areas exposed to climate-related hazards that increase the adaptation burden. For example, increasing density in areas prone to flooding and sea level rise increases the risk that those communities will suffer loss and incur more costs in the future.

Ongoing urban intensification also comes with risks for the amount, functionality and pressures on urban green spaces such as public parks and reserves. Green space is vital for good mental and physical health and provides a variety of environmental services such as air quality, temperature regulation, stormwater management, and habitat provision.[16]

Transport and urban development in Aotearoa New Zealand are not well linked, as the funding and planning systems are siloed and disjointed

When undertaking a land transport project, planning responsibility is determined by the type of transportation being developed. While much of the planning occurs at the local government level, state highways sit at a central government level, public transport sits at a regional council level, and other land transport modes rest with local councils.

The majority of urban development, however, is planned and undertaken by the private sector working with local government as a regulator, either at the regional or local council level. This fragmentation does not lend itself to whole-of-system outcomes like emissions reduction.

i. Mixed use development combines multiple uses within a building, site or block, for example, combining residential and commercial or other types of use into a development.

Additionally, Aotearoa New Zealand's transport and development markets both operate primarily on a one-off basis. In Auckland, for example, there are separate entities for the City Rail Link (the country's largest ever infrastructure project) and Auckland Light Rail.

To improve emissions reduction potential, transport and development projects for an urban area could be implemented on an integrated, consistent, and coordinated network basis – as opposed to standalone corridors. An effective land transport system is an integral part of the form and function of urban centres, as well as the connection between those centres.

Greater collaboration between different types of infrastructure providers – for example, between electricity lines companies and regional councils in the development of regional spatial strategies – can also better support whole-of-system outcomes.

Current financing structures are not well integrated, which overwhelms the capacity to pay for transport and urban form improvements

Financing of infrastructure is a significant challenge. Consistently, local government consultation submissions called for central government to provide greater support. They cited clarity of their roles, responsibilities, decision pathways, appropriate funding, and access to finance and legislative tools as key enablers for effective local government action.

The political economy of assessing rates for the level of funding required is difficult. Rates have been historically low compared to many international jurisdictions[17] and Aotearoa New Zealand has not fully explored options such as land-value capture to fund infrastructure, which has been used effectively in places like London, the Gold Coast, and Curitiba, Brazil.[18]

To deliver a denser, more mixed urban form through transport and urban development would require planning and delivery integration, as well as sustained access to all four key types of funding: existing central government funding mechanisms, existing local government funding mechanisms, existing private funding mechanisms, and novel Government funding.

Restrictive land-use policies can add cost, time and complexity to projects and prevent climate-resilient design

Urban form and developments are influenced by local government policies, including zoning and land use, building regulations or ordinances, covenants, and procurement policies. Design decisions would in turn determine construction methods and materials (embodied emissions) and thermal performance (operational emissions), with potential flow-on effects to end users or occupants.

The Government could ensure that local and national land-use policies, as well as other land-use instruments, do not impede or conflict with emissions reduction and climate change adaptation activities.

Recommendation

This recommendation seeks to address the misalignment between existing urban form and Aotearoa New Zealand's emissions reduction targets.

Recommendation 13

We recommend that in its second emissions reduction plan, the Government:

13. Ensure planning systems are integrated and support building urban areas upwards and mixing uses in order to reduce emissions, while decreasing susceptibility to climate-related risks.

Infrastructure

Infrastructure is part of the solution when reducing emissions, but it also produces and enables emissions

Infrastructure lays the foundation for Aotearoa New Zealand to thrive and is a critical part of the solution to reducing emissions and adapting to climate change.

A growing and more urban population affects the need for new or strengthened infrastructure, against a historical infrastructure deficit. Meeting the 2050 target will require a transformation of the energy and transport systems enabled by significant investment in new infrastructure.

However, it can be difficult to predict exactly when new infrastructure will be needed in the future. An investment system that can better account for uncertainty can support the future infrastructure development needed to enable decarbonisation.[19]

It will be important to deliver on the commitment to integrate climate mitigation and adaptation into government decisions on infrastructure by reviewing central government frameworks, guidelines, tools, and by factoring climate outcomes into decision-making on infrastructure investment. Opportunities to reflect this commitment include when delivering on the National Resilience Plan, the Infrastructure Action Plan, and through projects facilitated by Rau Paenga.

Infrastructure can also be a significant cause of emissions. The emissions are associated with the materials required to build it (such as concrete and steel), how it is built, and how it is maintained or decommissioned. Infrastructure design therefore affects the emissions it enables or saves. For example, building more roads results in more cars on the road,[20] which (if petrol or diesel-fuelled) increases emissions.

Making better use of existing infrastructure and making it more resilient to the effects of climate change reduces the pressure on resources.[ii]

Demand on the consenting system out to 2050 may exceed the ability of the system to respond in the short term

In He Pou a Rangi Climate Change Commission's (the Commission) demonstration path, by 2035 annual energy and transport emissions reduce by over 12 $MtCO_2e$ relative to 2021 levels. Most of these emissions reductions will come from projects that have not yet been consented.

Gross electricity demand is projected to increase 26% by 2035 and 65% by 2050, compared to 2021, as electricity is used to decarbonise the transport and industrial sectors.[21] There will be distribution and transmission lines additions and upgrades, and renewable energy developments. In addition, around 40% of current renewable generation capacity will need to be reconsented during the second emissions budget period.[22]

When new infrastructure is necessary, its development relies on the resource consenting system to run effectively and efficiently. Demand on the consenting system out to 2050 will be high, given the amount of infrastructure that needs to be either built or reconsented. Acute events (e.g., earthquakes, fire) and long-term threats (e.g., severe storms), which are likely to increase in frequency and severity due to climate change, may exacerbate this demand further.

Addressing resourcing constraints and the complexity of project approvals will reduce the demand each consent has on the system. Aotearoa New Zealand does not have unlimited personnel to manage the anticipated increase in consent applications. Under the current consenting system, where resources are constrained, between 29 and 34% of emissions targets could be in jeopardy by 2050.[23]

For additional discussion, refer to *Chapter 13: Energy and industry* and *Chapter 15: Transport*.

ii. Resources referred to here include but are not limited to workforce, aggregates, steel, cement/concrete, and timber.

Simplifying consenting for low emissions infrastructure, especially renewable energy and transport assets, will be necessary to achieve the 2050 target

While the need for a more efficient consenting system is well understood, its link to the importance of electrification, low emissions transport, and low emissions process heat for meeting our emissions reduction goals should not be underemphasised.

Infrastructure is essential to the transition and, because of its long-lived nature, essential to the intergenerational impacts the Commission is required to consider under the Climate Change Response Act 2002. Currently, it can take several years to gain consent, with costs and other required resources increasing significantly. While this is especially true for large infrastructure, it is also disproportionately onerous on smaller or local infrastructure projects.[24]

Align objectives for low emissions infrastructure across relevant Acts and policy instruments

The largest legislative reform of the resource management system in 30 years is currently underway. This reform seeks to balance development with environmental and social outcomes, while honouring Te Tiriti o Waitangi/ The Treaty of Waitangi.

The transition to the new resource management system is expected to take 10 years, extending across the second and third emissions budget periods. Any further delay, or ineffective reform, could make it unnecessarily difficult for Aotearoa New Zealand to consent the infrastructure needed to support its climate change goals.

In consultation, we heard from a range of respondents calling for greater policy coordination to address potential conflicting system outcomes, seeking a consistent national approach to delivering low emissions infrastructure.

Competing rather than complementary direction across policy domains and multiple interactions between different pieces of legislation can add complexity and time to projects. For example, there are clear barriers to developing renewable generation under the existing resource management legislation, needing urgent resolution. These include the unresolved conflicts between the National Policy Statement for Renewable Electricity Generation (NPS-REG) and the National Policy Statement for Freshwater Management (NPS-FM).

Aotearoa New Zealand's two largest hydropower generation schemes will require renewal of water permits within the next 15 years. They are likely to have to compete for water use, but the incomplete regulatory framework means the outcomes for the electricity system are uncertain.

During the second emissions budget period, the National Planning Framework, regional spatial strategies, natural and built environment plans, and other national policy instruments will be introduced or amended. Appropriate and clear direction will need to be reflected across all relevant Acts and policy instruments to support the transition to a low emissions society.

Box 11.2: Progress on the reforms of the Resource Management Act

The Resource Management Act (RMA) 1991 is currently undergoing a process of reform. This splits the RMA into three pieces of legislation – the Natural and Built Environments Act (NBA), the Spatial Planning Act (SPA), and the Climate Adaptation Act (CAA). The reform provides consistency, streamlining current planning and consenting processes, and moving to an outcomes-based approach rather than an effects-based system. It also requires decision-makers to 'give effect to' rather than 'take into account' the principles of Te Tiriti/The Treaty.

The SPA and NBA were passed into law in August 2023. The NBA provides a fast-track consenting process for certain infrastructure and housing activities. However, many parts of the RMA are still in force for now. The CAA, which was scheduled to be introduced to Parliament in 2023, will be looked at separately.

Recommendations from a Parliamentary Select Committee Inquiry on community-led retreat and adaptation funding may inform the development of a proposed Climate Change Adaptation Bill.

The Commission made a submission on the Bill for the NBA. In the submission it was noted that some of the climate change outcomes may come into conflict with other outcomes.

For example:

- renewable electricity will play a key role decarbonising the wider energy system. New generation will need to be built rapidly to meet an increase in electricity demand. However, building new renewable generation, such as hydropower, wind and geothermal, can be at odds with other outcomes, such as the protection and restoration of waterways and iwi/Māori rights and interests
- how urban expansion takes place, where and what gets built, and how it is built can lock in emissions and increase exposure to climate impacts, creating further path dependencies for development. Building urban areas upwards, rather than out, can allow residents to meet most of their needs within a short walk or bicycle ride from their homes. The outcome of making "ample supply of land for development" may encourage more building out, rather than upwards.

In our submission, we recommended the Government provide clear direction and approaches for balancing and resolving the conflicts between system outcomes.[25]

Buildings

How buildings are designed, built, used, and located will impact emissions and our ability to adapt to climate change for generations

Buildings include all private or public dwellings, homes, and commercial spaces including iwi/Māori structures such as papakāinga, marae, wharenui, whare, and all other Māori-defined dwellings and built structures. Buildings are long lived, setting emissions patterns for the future, and driving emissions in other sectors through demand for materials and fuels.

While emissions from the operational energy use of buildings account for about 4% of long-lived greenhouse emissions, they are estimated to account for about 20% of total greenhouse gas emissions through a consumption-based accounting lens.[26]

The Government's Building for Climate Change programme has started the process of addressing operational and embodied emissions from new builds. It is essential to deliver on this commitment to high quality new builds. However, much work remains to achieve the same with the existing building stock.

Buildings are also exposed to inland flooding, sea-level rise (and associated groundwater rise), coastal flooding, extreme weather events, wildfires, and drought. The magnitude of loss from storms in Aotearoa New Zealand has increased over the past decade.[27] New buildings and settlements can be designed and built with a much higher level of adaptive capacity, to be tolerant to a wider range of climate and weather extremes.

Greater incentives are required to encourage uptake of low emissions options

Some of the technology required to make homes and businesses more energy efficient can be costly, and this is often a barrier to adoption – particularly for those on low incomes.

Installing insulation, upgrading windows, improving weathertightness, and switching away from fossil fuel heating and cooking can improve health outcomes, reduce exposure to a rising carbon and fuel prices, increase resilience to extreme weather events, and lower overall running costs, but come with upfront purchase and installation costs.

Lack of easily understood and relevant information for consumers, conflicting incentives between tenants and building owners, poor transparency of credible energy performance data, and limited awareness, skills, and capabilities of the sector can also prevent uptake of low emissions alternatives.

Initiatives to inform and educate consumers on how to identify energy efficient options and use and/or enforcement of minimum energy performance standards and mandatory energy performance labelling can address some of these barriers. Delivering on the commitment to introduce mandatory energy performance certificates for certain building types, and ensuring compliance with and enforcement of the Healthy Homes Standard, also remain important.

Targeted support may be required to address barriers for lower income households and small businesses with limited financial resources and information, as well as for renters, who have less autonomy. With initiatives underway to develop options to provide specialist advice, grants to support households, and options to expand eligibility under the Warmer Kiwi Homes programme, it may be possible to implement support by the start of the second emissions budget period or earlier.

Targeted support could include expanded co-funding for small-to-medium sized businesses through the Energy Efficiency and Conservation Authority, or potential financial incentives for building owners to undertake building retrofits where practical. Other options include expanding upfront, transitional finance in the form of low or no interest loans or equity stakes, voluntary targeted rates, tax settings, or energy efficient equipment rebates.

Retrofitting existing buildings can be complex

The condition and performance of existing buildings is highly variable across Aotearoa New Zealand, making them more complex to address than new buildings. There are currently limited incentives to retrofit given the upfront costs associated with equipment and installation, potential space requirements, and disruptions during construction. The potential emissions trade-off between a deep retrofit of an existing building versus building a new, high performance, and low carbon building may also need to be considered.

Data from the mandatory energy performance programmes for existing commercial and public buildings could support the design of options. A pilot programme for residential building retrofits could also inform design of a durable, long-term programme that meets the needs of New Zealanders.[28]

Existing buildings also have an inherently low levels of adaptive capacity, as buildings are generally designed to be long-standing, permanent structures and are served by complex infrastructure systems. Enhancing adaptive capacity will therefore require strong government leadership, governance, funding mechanisms, and community engagement.[29]

Relevant training can support a behavioural, social, and cultural shift towards low emissions buildings

A recent national survey of 308 construction industry participants found that over half had no experience or knowledge about calculating greenhouse gas emissions, planning for retrofits, or determining the carbon footprint of a design. Nearly half were also somewhat or extremely dissatisfied with current education and training for zero carbon and sustainable construction.[30]

Recruitment and large-scale upskilling across the industry can accelerate the shift towards low emissions construction in a way that reduces embodied and operational emissions, improves climate resilience, minimises waste, and supports the circular and bioeconomy.

Giving effect to resource management reforms, Building Code updates, the Building for Climate Change programme, and housing and urban development regulations will require more robust guidance from the Government from both regulatory and educational lenses.

Greater market awareness and demand for high performing, low emissions buildings can also help drive the shift.

Electrification is essential for reducing emissions from building heating

Heat pumps have rapidly reduced in cost, a trend which is projected to continue.[31] Over their lifetime, heat pumps can save consumers money as they are more energy efficient than gas heaters.[32] Coupling heat pump installation with better insulation, improved weathertightness, and adequate ventilation will immediately reduce the amount of energy required to heat or cool a home to the same temperature.

Better thermal performance may result in a rebound or take-back effect, where any savings through energy efficiency get cancelled out by an increase in energy use. This take-back effect likely results from raising the indoor temperature to a more comfortable, healthier, and warmer level along with other co-benefits.

However, a recent evaluation of the Warmer Kiwi Homes (WKH) programme found that electricity usage through winter falls in a house fitted with a heat pump by an estimated 16% relative to a house without a heat pump installed, despite indoor temperature gains during peak periods. This evaluation found no significant increase in electricity consumption over summer for houses that used the heat pump as an air conditioner, but cooling demand will vary across the country and may change over time due to climate change.[33]

The evaluation found that the overall WKH programme resulted in a benefit cost ratio of 1.89 using conventional health and energy metrics. When looking at just the heat pump component, the benefit cost ratio increases to 2.15. Additionally, when using metrics which place a value on living in a warm home, the benefit cost ratio for heat pumps is estimated at 7.49.[34] There are other benefits associated with improved heating and insulation, including hospital admissions avoided, pharmaceutical prescriptions avoided, reduced visits to the doctor, and reduced days away from work or school.[35]

Reducing electricity demand through building thermal performance improvements can also reduce the pressure to build new generation assets and network infrastructure. Transpower estimates peak demand could increase from 7.3 GW in 2020 to 8.9 GW by 2035 and 10 GW by 2050.[36] Network planning, innovative pricing approaches, and demand-side measures could further help to minimise peak demand growth. For additional discussion, refer to *Chapter 13: Energy and industry*.

Continued fossil gas use and asset expansion will add additional cost to consumers as well as raise equity issues for future generations

Many households, businesses, marae, and community centres use fossil gas for heating, cooking, and hot water, and the number of new connections to the fossil gas network continues to grow.

To meet the 2050 target, the use of fossil gas needs to decrease.

Fossil gas assets installed during the second emissions budget period could endure to 2050 and beyond, despite affordable and technically viable low emissions alternatives being available now. Applying the He Ara Waiora Framework, continued expansion of the fossil gas asset base may be incompatible with sustainable, intergenerational prosperity (mana whanake) if it locks tangata whenua and other households, communities, and businesses into this path.[37] Electricity is a more efficient and lower emissions source of energy for heating homes and businesses than fossil gas.

Low emissions gases such as biogas or green hydrogen are currently more expensive than fossil gas. In the short-term, blending biomethane[iii] into the existing network could lower the emissions intensity of fossil gas used in buildings and smooth the rate of change (and associated impacts on the electricity network).

iii. Biomethane is produced by "upgrading" biogas in a process that removes any CO_2 and other contaminants present in the biogas.

Gas network reinforcements or replacements may be required for blending hydrogen into the network, or in response to demand growth and new customer connections. The costs to do so would need to be recovered through users' bills as the gas network is a regulated asset base.

While large industrial gas users such as Methanex incentivise gas producers to continue production to supply all users, residential and small commercial users contribute a comparatively greater proportion of gas pipeline businesses' revenue. Gas distribution businesses recover most of their costs from residential and small commercial customers, as industrial customers tend to be connected closer to the gas transmission system. Residential and small commercial customers contribute around 65% of the total revenue of gas pipeline businesses despite only consuming around 20% of the volume.[38] Historically, gas transmission and distribution charges have made up approximately 40–45% of the average consumer gas bill.[39]

Households are not best placed to manage the risk of economic stranding of gas pipeline businesses' assets or to support continued gas use by large industrial users. There are few levers for households to manage this risk and there are limits to absorbing any price increases, especially during periods of high inflation. For example, vulnerable groups like the elderly, medically vulnerable, or those with disabilities may be less able to change their energy demands or use patterns to manage costs.

Increasing flexibility in the energy system and managing the pace of fossil gas demand change alongside growing pressure on the electricity network will be critical in the transition. The Government's Gas Transition Plan and National Energy Strategy and the Commerce Commission's regulated investment framework should provide clear strategic direction on the future of fossil gas, as well as options for regulated cost recovery models for gas pipeline businesses which are equitable, give consumers time to transition, and support industries with hard-to-abate emissions.

Targeted support for retrofitting residential and non-residential properties that have existing fossil gas infrastructure may be required

Replacing fossil gas infrastructure will be expensive for some households and businesses. Wealthier households and businesses may be more able to convert to electricity in response to emissions pricing or other factors, and have the time, resources, and capacity to access support.

As with broader retrofits, targeted support may be required to address barriers for lower income households and small businesses with limited financial resources and information, and renters, who have less autonomy.

The Government could help drive this shift and underpin market demand by leveraging its procurement power through mechanisms like Kāinga Ora or the Carbon Neutral Government Programme. Refer to the section above on *Incentives to encourage uptake of low emissions options* for additional discussion.

Recommendations

These recommendations seek to address the need for stronger low emissions incentives and to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 14

We recommend that in its second emissions reduction plan, the Government:

14. Accelerate comprehensive retrofits to deliver healthy, resilient, low emissions buildings.

Recommendation 15

We recommend that in its second emissions reduction plan, the Government:

15. Prevent the installation of fossil gas infrastructure and connections in buildings except where there are no technically viable low emissions alternatives.

Within this recommendation, restrictions on the new installation of fossil gas is intended to include:

- infrastructure in new buildings, whether in new subdivisions or in existing centres where gas is piped
- gas pipeline network infrastructure
- delivered LPG bottles.

It is not intended to include:

- connecting new gas appliances, even where they have reached end of life and need to be replaced
- industrial connections
- LPG barbeques
- camping gas canisters.

There is a need to exercise pragmatic judgment. Isolated properties or marae may need bottled gas for heating and cooking. Restaurants and hotels may not currently have economically viable alternatives; however, alternatives are increasingly feasible. For example, Mānawa Bay at Auckland Airport is set to launch Aotearoa New Zealand's first fully electric food court in late 2024.[40]

Electric and induction technologies should be encouraged and incentivised.

Optimising building design through improved data access, standardised methodologies, and upgraded regulations and guidelines will assist with achieving low emissions construction

Through deliberate optimisation and better design, low carbon and low cost or cost-neutral building construction can be achieved. Credible and accessible data, standardised approaches, and easy-to-use tools will be critical to ensuring the sector can deliver on key outcomes.[41]

Government leadership through its Carbon Neutral Government Programme, Construction Sector Accord, the Building for Climate Change programme, and procurement policies will be important in setting a clear and ambitious pathway. Appropriate training, capability building, and apprenticeships to ensure the sector has the knowledge and skills to deliver optimised building designs is critical.

Box 11.3: Distributed energy resources and buildings

Distributed energy resources (DER) are controllable energy resources located in the distribution network or within consumer premises. They include battery storage, electric vehicles (EVs) with smart charging capabilities, demand response/demand side participation, and distributed generation like solar photovoltaics and small-scale hydropower generation.

Some types of DER can operate quickly and flexibly, which could help manage the electricity system by offsetting the need for grid supply, network capacity, or new generation. While different DER have different capabilities, together they can support grid resilience by providing back-up power, reducing demand during peak periods, and improving system flexibility.

For distributed generation to support community resilience during extreme weather events, the systems must be designed to withstand storm conditions. For example, high winds and flooding could damage solar photovoltaic (PV) system conduits, inverters and electrical cabinets through high pressure loads and water ingress. Adequately designed and constructed systems can be reasonably expected to provide a full 25-year service life.

Having a back-up power system (e.g. solar PV plus battery storage) on community buildings such as marae, recreation centres, community halls or schools can reduce the buildings' energy demand, lower energy bills, support energy awareness and education, and provide services during power outages or emergency situations. Refer to *Chapter 13: Energy and industry* for additional discussion.

Other DER like EVs with bi-directional charging capabilities (vehicle-to-grid or V2G) can also provide back-up power support for households in emergencies or help to manage peak demand. Updated regulations and standards to enable integration into buildings may be required. Refer to *Chapter 15: Transport* for additional discussion.

Embodied carbon can increasingly be addressed

Embodied carbon will increasingly need to be measured, reported, and addressed during the second emissions budget period. The Ministry of Business, Innovation and Employment's Building for Climate Change programme has proposed whole-of-life embodied carbon reporting requirements for new buildings from 2025. Embodied carbon caps in new buildings will be phased down from 2026. Emissions reduction policy measures for embodied carbon emissions in existing buildings are set to be developed in 2030.[42]

Increasing use of timber products in buildings can reduce embodied emissions

Engineered wood products (EWPs) such as laminated veneer lumber, glulam, and cross-laminated timber can displace some steel and concrete used in building construction. Increasing use of EWPs may require a corresponding increase in domestic consumption of logs. This could be an opportunity to diversify the forestry and wood processing sector as part of an emerging bioeconomy. Refer to *Chapter 12: Circular economy and bioeconomy* for additional discussion.

A clear regulatory pathway for using EWPs and an understanding of how to develop Building Code-compliant designs that would be accepted by consenting authorities would be beneficial. This includes knowledge and education for the designers as well as the consenting officials and territorial authorities.[43]

Papakāinga development can support iwi/Māori aspirations and connection to whenua

Some whānau are collaborating in papakāinga housing developments, for example through the Parihaka Papakāinga Trust or Kōkōhīnau Papakāinga Trust. The Kōkōhīnau Papakāinga Trust's mixed housing community development near Edgecumbe will be made up of 34 houses with shared facilities, wraparound services, and connections with the marae next door. Each house will be fitted with a heat pump and a solar PV plus battery system.[44]

Government support through the Māori and Public Housing Renewable Energy Fund and the Energy Efficiency and Conservation Authority can further help Māori landowners develop papakāinga and renewable energy projects to offset energy bills and support community cohesion. Other initiatives that consider circumstances specific to hapori Māori – such as the Whai Kāinga Whai Oranga fund through Te Puni Kōkiri and the Kāinga Whenua Loan Scheme through Kāinga Ora and Kiwibank – are also beneficial.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

taonga tuku iho
a treasure that is handed down, cultural heritage

whenua
land

awa
river, stream, creek

te taiao
the world, Earth, the natural world, the environment

kaitiakitanga
guardianship, stewardship, trusteeship

whanaungatanga
relationship, kinship, sense of family connection – a relationship through shared experiences and working together which provides people with a sense of belonging

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[45]

papakāinga
original home, communal Māori land, development on ancestral land

wharenui
main building of a marae where guests are accommodated, meeting house

hapori Māori
Māori communities

Mā rua: Chapter 12

Ōhanga taketake me te ōhanga toiora
Circular economy and bioeconomy

Introduction

Coordinated efforts to shift patterns of resource and energy use could deliver greenhouse gas emissions reductions across the economy, but this depends on Government leadership to develop strategy and drive its implementation.

Aotearoa New Zealand's resource use largely follows a linear pattern: extract-make-use-dispose. In contrast, a circular economy – encouraging reuse, repair, regeneration, and recycling – optimises energy and resource use.

This advice builds on our identification in *Ināia tonu nei* of the opportunities and challenges presented by a shift to a circular economy for Aotearoa New Zealand, including for the parts of the economy that use renewable biological resources to produce food, products, and energy ('the bioeconomy').[1]

Our analysis and international evidence demonstrate the emissions reductions possible through circular economy approaches. Studies show that efficient and more circular use of materials in just four key industrial materials (cement, steel, plastics, and aluminium) could help reduce global greenhouse emissions by 40% by 2050.[2] Similarly, using circular approaches within the food system could reduce global emissions by nearly half.[3]

The aim of 'a circular economy with a thriving bioeconomy by 2050' was set as one of the goals for a productive, sustainable, inclusive economy in the first emissions reduction plan. This recognised the role of a circular economy to support social, economic, and environmental objectives, develop more resilient supply chains, and support a low carbon future for Aotearoa New Zealand.

The first emissions reduction plan also stated Government intention to create a circular economy and bioeconomy strategy, including options for increasing supply and uptake of bioenergy.[4]

Our analysis shows there is work to do to achieve the full emissions reductions made possible by moving to a circular economy and bioeconomy. This would require:

- committing to developing and implementing a comprehensive circular economy strategy, in partnership with iwi/Māori, within the second emissions budget period
- addressing consumption-based emissions through product stewardship and right to repair legislation
- reducing construction and demolition waste through actions to reduce wood waste to landfill
- committing to a strategic use assessment and strategy for biomass
- addressing the bioeconomy information gap through research, education, government procurement, and standards.

Our analysis and recommendations reflect what we heard in consultation on the draft version of this advice. A key theme from local government was to focus on the opportunities there are to avoid generation of construction and demolition waste and to reduce waste volumes sent to landfills.

Changes from the draft version of this chapter

We revised the structure of this chapter for clarity, adjusted its position within the report structure, and included new content to better explain the concept of a circular bioeconomy and its role in climate change mitigation.

In light of evidence and strong feedback provided through consultation, we re-examined our draft advice in this chapter to determine whether it appropriately reflected our policy and prioritisation frameworks, and our assessment of the risks to emissions budgets caused by gaps in action.

As a result, we added two new recommendations related to the circular economy – one focused on strengthening product stewardship and the other on reducing emissions from construction and demolition waste.

We also added a new recommendation focused on the guidance and regulation needed to advance a circular bioeconomy, reflecting evidence and feedback that there is currently a lack of clarity, direction, and momentum required to realise the benefits of a sustainable bioeconomy.

Circular approaches required to achieve emissions budgets

This section sets out what is meant by the circular economy and the bioeconomy, with a focus on achieving the emissions reductions needed for the second emissions budget.

The next sections outline the choices the Government has to apply circular approaches to optimise resource use and reduce waste emissions, as well as the emissions reductions possible through applying a coordinated strategic approach across the natural resource sectors that make up the bioeconomy.

Circular economy

The 'circular economy' refers to an economic system based on designing out waste and pollution and reusing products and materials.[5]

The circular economy seeks to:

- keep materials circulating and in use as long as possible
- extract the maximum value of resources while in use
- recover and regenerate products at the end of useful life.[6]

There is an important distinction between renewable and finite materials (**Figure 12.1**), and a key point that recycling of manufactured products is the last resort in a circular system. The most effective way of retaining the value of products with a limited life is to maintain and reuse them. Breaking them down to recycle their constituent materials is the last option, for when parts cannot be reused or remanufactured.

Recycling remains a necessary process, for circulation of resources and waste reduction. Metals recycling from commercial construction and electronic waste provides an example of this.

A 2021 study for the Heavy Engineering Research Association found that approximately 74% of steel in Aotearoa New Zealand is collected for recovery or further processing.[7] This recycling is less carbon-intensive than newly produced steel, with around 1000 kilograms of avoided emissions of CO_2e per tonne of steel recycled. The study found that increasing recycling rates would lower emissions further.[8]

Options for the use of more circular practices to reduce emissions are detailed in *Circular economy opportunities within the second emissions budget period*.

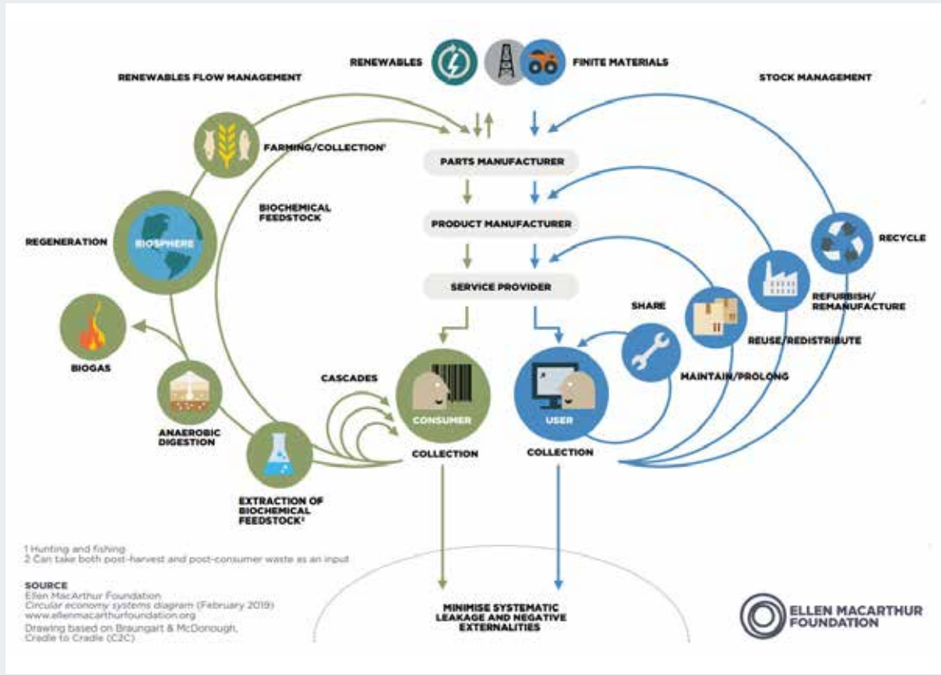

Figure 12.1: Circular economy systems

Sustainable bioeconomy

The 'bioeconomy' refers to the parts of the economy that use renewable biological resources to produce food, products, and energy.[9] This includes using biomass waste (residue) from forestry, fisheries, agriculture, and households as raw materials for other products.

Aotearoa New Zealand's current bioeconomy is centred on primary agricultural and forestry industries producing food and fibre, prioritising export commodities. New approaches would make more use of sustainable natural resources for new processes and products, reducing waste and pollution, and transitioning away from fossil fuel dependence – all in support of economic and social outcomes.[10, 11]

International research emphasises the potential for circular processes within the bioeconomy to strengthen the economy, with the value of the global circular bioeconomy estimated to reach US $7.7 trillion by 2030.[12]

In consultation, we heard support from iwi/Māori who view the transition towards a circular bioeconomy as a means of generating opportunities. Several Maui.Tech case study participants emphasised the potential for Māori landowners and commercial entities to lead bioproduct innovation in the bioeconomy (for more on the Maui.Tech project, see *Chapter 2: What we heard*).[13]

The second emissions budget period presents important opportunities to reduce emissions and increase climate resilience by advancing a sustainable bioeconomy – see *The role of the bioeconomy in reducing emissions* below.

This requires development of an overarching, coherent bioeconomy framework that:

- takes a systems approach to environmental, social, and economic considerations
- ensures coherence across the industrial and primary production sectors
- integrates land management, waste, and nature conservation.

It could also support other climate change mitigation and adaptation opportunities, including:

- ecosystem restoration
- biodiversity conservation and sustainable use
- supporting indigenous and local livelihoods based on biological products and services
- building the conditions for more sustainably managed forests and fisheries
- efficient and resilient new value chains flexible to uncertain climate events and potential market disruptions.[14]

A more circular economy offers a range of benefits

We identified the first steps needed to shift to a circular economy that delivers emissions reductions in *Ināia tonu nei*. This requires a clear plan and vision supported by robust data and governance structures.[15]

A fully developed and implemented circular economy strategy would contribute to emissions reductions by:

- eliminating waste and pollution to reduce greenhouse gas emissions across the value chain
- circulating products and materials to retain their embodied energy
- regenerating nature to sequester carbon in soil and products.[16]

Developing circular approaches alongside a long-term waste infrastructure plan will support emissions reduction throughout a product's life cycle, including its design, production, distribution, use, and end of life reclamation and reuse.

The wider economic benefits of early adoption of circular principles, in the context of global pressure to reduce the use of non-renewable resources and fossil fuels, include the potential to promote more self-sufficient businesses, reduce economic risk, and reduce reliance on imported goods and materials.[17]

Circular economy opportunities within the second emissions budget period

This section sets out four ways that the use of more circular practices can reduce emissions:

- recognising Māori-led collaborations regarding mātauranga Māori as a rich knowledge source including with respect to circular economy policy design
- enhancing data and transparency around the embodied emissions of materials
- using product stewardship and right to repair legislation as tools to reduce emissions
- accelerating action to reduce emissions from construction and demolition waste.

The technical terms used in this list are explained in each of the following sections.

Developing a unique circular economy informed by mātauranga Māori

Mātauranga Māori reflects the holistic and interconnected relationship between iwi/Māori and the natural world.[18] Māori-led consideration of mātauranga Māori within circular economy policy design would enable wider Aotearoa New Zealand to learn from and apply many of the sustainable practices which sit at the heart of tikanga Māori.

Through active partnership under Te Tiriti/The Treaty, the Government can ensure mātauranga Māori is appropriately woven into policy design, and that iwi/Māori are able to equitably participate in business opportunities and initiatives within the circular economy.

Box 12.1: Para kore (zero waste) and the circular economy[i]

He tirohanga Māori i te para me te mahi hangarua (Māori views on waste and recycling) emphasise whakapapa connections between humans and the natural world.

The respect for natural resources and the materials made from them is demonstrated by maintaining their value for as long as possible before they reach the end of their life, at which point they are disposed of in a way that causes the least harm to Papatūānuku. In this way, he tirohanga Māori i te para precedes the concept of a circular economy (ōhanga āmiomio) but similarly acknowledges the mauri of natural resources.[19]

Building awareness and increasing transparency around the opportunities for more sustainable, low emissions supply chains and businesses may also be beneficial for iwi and Māori-owned businesses, as well as other existing and emerging businesses within the circular economy. As such, the transition to a more circular economy can generate intergenerational benefits.

Embodied emissions accounting within a circular economy

The emissions that are 'embodied' in a good or service are all the greenhouse gas emissions created from beginning of production, across the global supply chain – including the emissions involved in imported materials. This is used for consumption-based emissions accounting, which assumes that those who consume or use a good, product, or service should take responsibility for the emissions generated in the process of creation.

This contrasts with the accounting approach used in the National Greenhouse Gas Inventory, which is this country's official source of emissions and removals data. In line with UNFCCC and IPCC guidelines, the GHG Inventory applies a production-based accounting approach, which measures emissions created by the production of goods and services within Aotearoa New Zealand's geographic zone.

In our previous advice to the Government, we presented the option of advancing the use of consumption-based emissions estimates as a complement to the GHG Inventory. While Stats NZ reports on embodied emissions for households, government, non-profits, and physical asset investments, this reporting does not currently provide emissions detail at the material or product level.

The first emissions reduction plan includes several actions centred on realising opportunities to reduce embodied emissions. These predominantly apply to the building and construction sector.[20] By targeting embodied emissions more broadly, Aotearoa New Zealand can reduce emissions throughout the supply chain of materials, products, and services.

Improving the understanding of the emissions embodied in different materials would support the country's shift to a more circular economy in the second emissions budget period. An example of how this could be applied is shown in **Box 12.2** below.

Increased data and transparency on consumption-based emissions will enable more consumers, businesses, and industry and government organisations to consider the embodied emissions of the products, goods, and services they use.

i. Sourced from the WasteMINZ Report – Recommendations for standardisation of kerbside collections in Aotearoa: Prepared for the Ministry for the Environment.

Box 12.2: Making sense of corporate emissions

The GHG Protocol Corporate Accounting and Reporting Standard[ii] provides a framework for measuring greenhouse gas emissions across private and public sector operations, value chains, and associated mitigation actions.

The standard covers the accounting and reporting of seven greenhouse gases covered by the Kyoto Protocol – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PCFs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). For corporate greenhouse gas accounting and reporting purposes, three scopes (scope 1, scope 2, and scope 3) are defined. These scopes address direct and indirect emissions created through company operations.

Scope 1 emissions include direct greenhouse gas emissions, which occur from sources that are owned or controlled by the company (for example, emissions from combustion in owned or controlled boilers, furnaces, and vehicles).

Scope 2 emissions include the indirect emissions from the generation of purchased electricity (including steam and heating/cooling) consumed by the company.

Scope 3 emissions includes other indirect emissions that are a consequence of company activities, but which occur from sources not owned or controlled by the company (for example, the use of sold products and services, or emissions from inputs into manufacturing processes).

Scope 3 reporting therefore addresses the consumption-based emissions that are generated throughout the supply chain. Targeting these emissions can present significant opportunities for emissions reductions within companies.

Source: World Business Council for Sustainable Development and World Resource Institute

Product stewardship and right to repair legislation are important tools in a circular economy

Regulated product stewardship and right to repair legislation are important tools for avoiding waste, minimising negative environmental impacts from product disposal, and achieving more effective forms of emissions reduction.

- Regulated product stewardship involves the producers and importers of products taking responsibility for the waste and negative environmental impacts generated throughout a product's lifecycle and taking action to minimise these impacts.
- Right to repair legislation establishes a legislative right for a consumer to repair their products, often through access to repair information, the provision of diagnostic tools, and the supply of appropriate parts.

In consultation, we heard strong support for advancing product stewardship, which submitters viewed as a key opportunity to reduce supply chain emissions. Further developing these tools will help normalise behaviour change within society and support the transition towards a circular economy.

To create a regulated product stewardship programme, a product must first be identified as a "priority product" in accordance with the Waste Minimisation Act 2008. In 2020, the Government identified the following products as 'priority products':

- tyres
- e-waste (including large batteries, such as those used in electric vehicles)
- plastic packaging
- agrichemicals and their containers
- refrigerants (including synthetic greenhouse gases)
- farm plastics.

Priority products must have product stewardship schemes developed and accredited. Sale of these products is prohibited unless in accordance with that accredited scheme.[21]

The second emissions reduction plan presents an opportunity to strengthen regulated product stewardship processes to ensure that emerging schemes are robust, have integrity, and are effective in realising opportunities for emissions reductions.

This includes ensuring that regulated product stewardship is established with the oversight of government, avoids industry capture of regulators, and is directly informed by the principles of the waste hierarchy (**Figure 12.2**).

If regulated product stewardship schemes are to be effective in reducing emissions, they will need to consider, address, and minimise both the embodied emissions generated during the production and use of the product, and the potential biogenic methane emissions generated on disposal. Independent monitoring of schemes, with findings actively applied to improve effectiveness, will help to realise the potential of regulated product stewardship in Aotearoa New Zealand.

The establishment of right to repair legislation could also be advanced as an opportunity for emissions reductions, particularly relating to electronic waste (or e-waste). E-waste typically refers to electrical and electronic equipment that has been discarded as waste without the intent of reuse. E-waste is now recognised as being one of the fastest-growing global waste streams. OECD estimates suggest that New Zealanders generated 19.2 kg of e-waste per capita in 2019.[22]

Right to repair legislation is now becoming increasingly common internationally, with various forms of legislation having been established in America and Europe under the goal of providing cost savings for consumers and a means to facilitate the transition to a circular economy.[23]

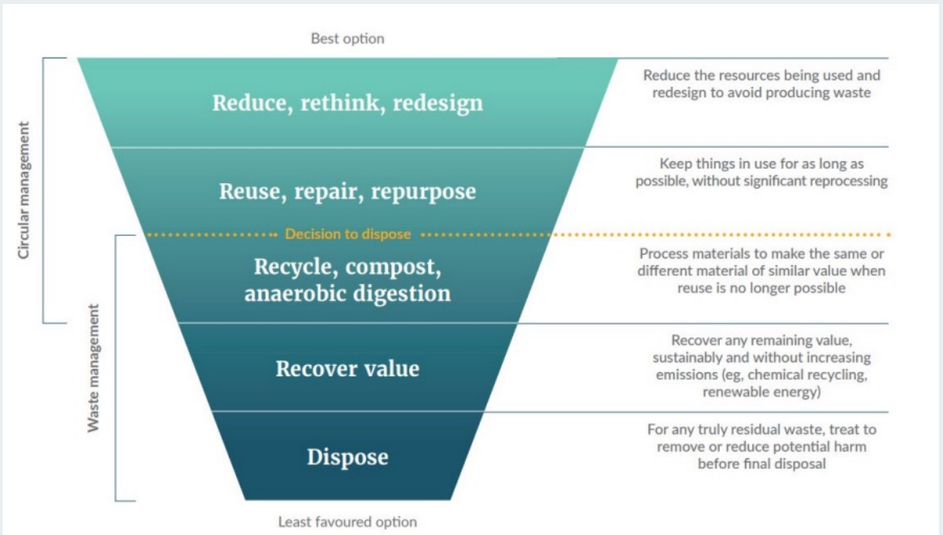

Figure 12.2: The waste hierarchy

Source: Ministry for the Environment

ii. The GHG Protocol establishes comprehensive global standardised frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions. The first edition of the GHG Protocol Corporate Accounting and Reporting Standard was published in September 2001.The 2011 Scope 3 Standard complements and builds upon the Corporate Standard to promote additional completeness and consistency in the way companies account for and report on indirect emissions from value chain activities. Although used by many companies and businesses, these frameworks are guidance, and their application is not mandatory in Aotearoa New Zealand.

The waste hierarchy (**Figure 12.2**) is a framework for supporting the delivery of circular economy outcomes related to waste. It is also a useful tool for decision-making regarding waste management and minimisation, as it prioritises waste minimisation in the form of prevention and reuse while discouraging waste disposal.

The waste hierarchy is also referenced in *Chapter 16: Waste and F-gases*, which covers options for reducing direct emissions from waste, including by reducing waste overall. That chapter includes discussion of the need to coordinate policy development in this area with proposed new waste management legislation.

Accelerating action to reduce emissions from construction and demolition waste

Estimates suggest that construction and demolition waste may represent up to 50% of all waste generated in Aotearoa New Zealand, with approximately 20% going to landfill and 80% going to cleanfill sites.[24]

Construction and demolition waste includes a wide range of material streams, with the most common waste types being concrete and rubble, timber (treated and untreated), plasterboard, and mixed waste.

In addition to the embodied emissions in construction waste materials and products, wood waste generates methane when disposed to landfill. The benefits of diverting reusable wood away from landfill would include improved resource efficiency and reduced emissions.

The first emissions reduction plan identified a range of actions and initiatives relating to construction and demolition waste, including the need to separate construction and demolition materials – such as treated and non-treated timber products – to enable waste diversion.[25]

The specific issue of waste timber's frequent contamination with the heavy metal preservative copper-chrome-arsenic (CCA) was identified in consultation submissions as a challenge to reducing the volume of timber sent to landfill. The current lack of commercial-scale differentiation between treated and untreated timber as well as barriers limiting reuse present ongoing difficulties.

Robust and regulated forms of product stewardship provide an opportunity for the development of whole-of-life solutions for complex product challenges like construction wood waste disposal. Given the scale of the construction and demolition waste issue, the challenges related to timber disposal and reuse, and the importance of reducing the disposal of organics at landfill, actions and initiatives to reduce the wood waste to landfill should be accelerated.

This can be achieved by declaring construction material wood waste as a 'priority product' under the Waste Minimisation Act, and establishing an accredited product stewardship scheme for it.

Recommendations

These recommendations seek to address the current limitations of product stewardship to achieve emissions reduction, and to accelerate action to reduce the emissions from construction and demolition wood waste disposal.

Recommendations 16 and 17

We recommend that in its second emissions reduction plan, the Government:

16. Strengthen product stewardship and expand coverage across products and packaging to help avoid emissions associated with waste.
17. Declare construction material wood waste as a priority product to help reduce emissions from construction and demolition waste.

The role of the bioeconomy in reducing emissions

Emissions-intensive goods and services can be displaced through the bioeconomy

Ināia tonu nei proposed ways the bioeconomy could reduce emissions across sectors, including:

- decarbonising energy and transport (for example using wood fuel for process heat, as set out below)
- replacing fossil-fuel derived materials in supply chains (see **Box 12.3**)
- increasing the carbon stored in long-lived products (see *Chapter 11: Built environment* for discussion of use of engineered wood products like cross-laminated timber instead of concrete in construction)
- reducing emissions from waste (see *Chapter 16: Waste and F-gases* for more about landfill gas capture).

The bioeconomy can contribute to emissions reductions in the short and long term by displacing higher emissions energy alternatives. For example, in the Commission's demonstration path, the use of biofuel avoided significant fossil fuel emissions. Forestry residue and pulp logs were used for process heat in place of fossil gas and coal, and liquid biofuels were used instead of petrol and diesel for on- and off-road vehicles. Avoided emissions from the use of this bioenergy over the first three budget periods were estimated at 1.5 $MtCO_2e$ in the first emissions budget period, 4.8 $MtCO_2e$ in the second emissions budget period, and 8.1 $MtCO_2e$ in the third emissions budget period.

The Energy Efficiency and Conservation Authority (EECA) 2022 summary of the Government Investment in Decarbonising Industry (GIDI) fund demonstrates the gains possible from bioeconomic initiatives.[26]

An example of the opportunities, and barriers, to replacing fossil-based goods with renewable biomass is in the forestry industry, which contributes around 1.6% of gross domestic product.[27] There are options to transform forestry residue to forms of fuel and higher value wood-based construction products that contribute to emissions reductions. Wood processing plants already recognise this by recovering costs using their on-site residue as fuel.[28]

However, the benefits diminish with the distance to transport feedstock to processors, as noted in the Forestry and Wood Processing Industry Transformation Plan, which provides a joint sector/government vision of harvested wood products developed as substitutes for fossil fuels, plastic packaging, concrete, and steel.[29]

Box 12.3: Agricultural circular bioeconomy opportunities

The primary sector in Aotearoa New Zealand has increased its reliance on synthetic fertilisers and imported feed, enabling productivity gains while also leading to higher on-farm costs, waste, emissions, and environmental degradation.[30]

These issues could be at least partially addressed by applying circular bioeconomy principles that aim to utilise materials across the economy, increase nutrient use efficiency, keep resources in use for as long as possible, and regenerate natural cycles.[31]

For the horticulture and agriculture sectors, using organic waste by-products for composting or fertiliser can increase soil health while reducing costs and embodied emissions associated with procuring synthetic fertiliser.

One major development in this area is the Ecogas Reporoa Organics Processing Facility, which opened in 2022. It is estimated to produce and distribute 200 tonnes of nitrogen in the form of bio-fertiliser per year from the anaerobic digestion of 75,000 tonnes of organic waste from Auckland.[32] Additionally, the plant is estimated to produce 185TJ of biogas energy per year, displacing fossil gas in the energy sector.[33]

Waste from the horticulture sector, crop residues, and human food production can provide high-value feed[34] for livestock, reducing costs and embodied emissions from importing feed. The circular flow of materials keeps organic waste out of landfills, reducing biogenic methane emissions and other environmental risks.

This illustrates how implementing circular practices in one sector has the potential to produce a cascading effect across the economy.

Need for a strategic approach to the bioeconomy

Strategic planning and implementation pathways are important elements of an overarching bioeconomy framework and plan.

This was reflected in our advice in *Ināia tonu nei*, which highlighted the importance of an integrated, cross-government approach to realise opportunities to reduce emissions across supply chains by decarbonising energy sources, replacing fossil-fuel derived materials, increasing carbon stored in long lived products, and reducing waste.[35] We also emphasised the need for partnership and collaboration under governance structures that supported consideration of system issues such as data availability and enabling research and innovation.[36]

The Government has a governance role to provide direction, prioritisation, and support (through incentives, investment, and collaborations) for the strategic use of resources in the bioeconomy, aligning policies to ensure desired outcomes – including emissions reduction – are achieved.[37]

In its first emission reduction plan, the Government committed to developing a circular economy and bioeconomy strategy (Action 9.1).[38]

As the Government develops its second emissions reduction plan, it has opportunity to accelerate work on this overarching strategic approach.

It can demonstrate its commitment in this area by focusing on the most emissions-efficient use of biomass resources that can be produced and managed sustainably. There are a range of opportunities, and both public and private investors will likely require guidance to identify options with the greatest verified emissions reduction potential.

In consultation, respondents expressed support for a biomass strategic use assessment, as sector projections suggest that the demand to replace fossil fuels is likely to quickly exceed Aotearoa New Zealand's capacity to produce biomass fuels.

The Government can also provide a systems view, clarifying how components of the bioeconomy interact with each other and the wider economy.

The Government must ensure its strategy honours Te Tiriti o Waitangi/The Treaty of Waitangi and that the principles of Te Tiriti/The Treaty are upheld, including active partnership with iwi/Māori.

The importance of co-design with iwi/Māori is emphasised by the contribution to the current bioeconomy from iwi/Māori. As discussed in *Chapter 14: Forests and other carbon stocks*, the Māori forestry asset base has been estimated to make up 48% of production forest land, with an estimated value of $4.3 billion (as of 2018). See *Chapter 8: Whāia ngā tapuwae* for discussion of the sustained effort needed from the Government to ensure appropriate land ownership and access to financial resources.

Whāia ngā tapuwae also sets out a statement from the NZ Bio Forestry Director that the bioeconomy offers an avenue for Māori in forestry communities to apply their mātauranga to build sustainable and renewable alternatives to fossil and petrochemical products, generating significant cultural, social, and economic benefits.

Robust data, information, and standards are essential

Through consultation, we heard from numerous submitters identifying the need for better data, economic modelling, and analysis as part of the overall strategic leadership sought from the Government.

Realising the potential of emissions reductions from a sustainable circular bioeconomy depends on robust data and information. Market participants need to know that a bio-based product will perform at the same level as the equivalent carbon-intensive product. Aligning industry standards with bioproducts would allow industry professionals to recognise bioproducts that meet state-of-the-art requirements and present a credible alternative to higher emissions solutions. Bioproduct standards would also complement emerging regulations such as net zero energy codes.[39]

Robust data systems with accessible, transparent information are also needed to support the development of a bioeconomy. This could include tracking opportunities and development of bioenergy – as is done in the European Union – and publishing potential bioeconomy platforms.

Urgent focus required for the second emissions budget period

The work required across sectors to bring together a circular economy and bioeconomy strategy will take time. It requires urgent Government action now if it is to support the achievement of the second emissions budget.

In our consultation on the draft version of this advice, we heard that regulatory barriers, siloed governance, and a lack of effective incentives pose challenges that need to be addressed to realise opportunities in a sustainable and low emissions bioeconomy. The dominance of the current siloed primary production sector creates inertia in the system, making it difficult to transition to a 'new' bioeconomy.[40]

Given this context, the competition for land (for example, fuel biomass displacing food crops on finite available land) and related issues pose a challenge that may intensify as the emphasis on biomaterials increases.

To avoid unintended consequences and poor environmental and social outcomes, development of a sustainable, circular bioeconomy needs to take a system-wide view and use coherent frameworks to prioritise emissions reduction and environmental sustainability.

Government procurement can be used to create demand by providing a secure pipeline of work and reducing costs. An example in the construction sector is the innovation programme run by Kāinga Ora, where teams collaborate to introduce new technology, including bioproducts, to improve the quality of new homes.

A focus on industry training will increase general awareness of bioproducts and their benefits. Effectively incorporating this knowledge in training institutes will help current and future workforces to increase their knowledge and uptake of bioproducts.

Recommendation

This recommendation seeks to ensure the bioeconomy strategy is implemented to support coherent delivery across sectors and contribute the emissions reductions necessary to achieve the second emissions budget and Aotearoa New Zealand's longer-term targets.

Recommendation 18

We recommend that in its second emissions reduction plan, the Government:

18. Provide overarching guidance and an enabling regulatory framework to advance a circular bioeconomy that reduces emissions and increases resilience to climate change, ensuring cross-sector coherence.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[41]

mātauranga Māori
Māori knowledge, the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori creativity and cultural practices

Papatūānuku
Earth, Earth mother and wife of Rangi-nui – all living things originate from them

mauri
life principle, life force, vital essence - the essential quality and vitality of a being or entity. Can also be used for a physical object, individual, ecosystem, or social group in which this essence is located

Mā toru: Chapter 13

Matapūngao me tōna rāngai
Energy and industry

Introduction

Changing energy supply and industrial processes can lead to significant emissions reductions within the second emissions budget period, with projections totalling 17.4 $MtCO_2e$, or 40% of the total reductions needed to meet the budget.

Our analysis shows that realising those potential reductions depends on Government action to accelerate renewable electricity generation and to remove barriers to change in the production of process heat in industry.

This advice builds on our previous advice on the policy direction for the first emissions reduction plan (published in *Ināia tonu nei*), and our analysis of recent developments. It also reflects what we heard in consultation on the draft version of this advice.

This chapter shows that reducing emissions from energy supply and industry in line with the next emissions budget and the 2050 target will require intervention to speed up investment in and construction of renewable electricity generation. There are options for the Government to provide stronger direction to streamline consenting processes and also to improve resilience of the country's electricity grid.

Decarbonising process heat in industry in the second emissions budget period (estimated at 2 $MtCO_2e$) will also require action to remove a range of barriers. These would address areas outside the price incentives already provided by the New Zealand Emissions Trading Scheme (NZ ETS), such as workforce and engineering shortfalls.

Both energy supply operations and industrial processes can invoke mana whenua and mana moana interests under Te Tiriti o Waitangi/ The Treaty of Waitangi given the extent of the infrastructure involved and associated environmental impacts on te taiao. Changes in this area must be progressed in partnership with iwi/Māori.

Our analysis shows that making these changes, to phase down fossil fuel use in energy supply and industry, in ways that focus on people and communities can deliver positive outcomes across many dimensions – energy affordability and accessibility, community resilience, health, and socio-economic opportunities.

Changes from the draft version of this chapter

Feedback highlighting the need for an equitable transition that honours Te Tiriti/The Treaty led us to re-examine our proposed recommendations with a particular focus on the Crown-Māori relationship and Te Tiriti/The Treaty. Recommendation 19 now includes further specificity regarding partnership with iwi/Māori as renewable electricity generation build is accelerated, and electricity networks are strengthened and upgraded.

Several submitters suggested we extend our proposed recommendation about renewable electricity generation and electricity distribution networks to encompass the transmission network. We amended Recommendation 19 by removing the word 'distribution' to ensure it applies to transmission and distribution networks. In the body of our advice, we added text emphasising that transmission infrastructure investments have long lead times and are often inconsistent in level and frequency.

Some respondents expressed a desire for the proposed recommendation to address the whole energy system rather than focusing on aspects of the electricity system. As this was covered in our advice in *Ināia tonu nei*, this advice instead highlights electricity supply, which is critical to meeting emissions budgets but has associated barriers which need to be addressed during the second emissions budget period. We do note in our report that the electricity system is highly interlinked with other sectors such as gas and industry.

We heard from local government about the importance of energy security and equity, and the potential role for community-level distributed generation to improve resilience. In our advice we acknowledge community-scale and local renewable energy generation projects and their potential benefits, and that a careful and managed transformation of the energy system is needed to maintain energy security, affordability and reduce emissions.

Several industry submitters suggested a new recommendation urging the Government to support the development of new low emissions gases including through policy and coordination. However, our analysis finds there is insufficient evidence around the possible future availability of biogas – including its accessibility, economic viability, and cost to consumers – to warrant continued expansion of the gas network. While we did not include this suggestion in our final advice, we do note a that considered assessment by the Government of the future role and cost of these gases is needed.

Our changes to the text also include adding a cross-reference to *Chapter 12: Circular economy and bioeconomy* to address the suggestion from some submitters that a new recommendation on low emissions gases be developed. We added clarifying discussion of fossil gas as well as on carbon capture and storage (CCS), carbon capture and utilisation (CCU), and carbon dioxide removal (CDR).

Context

Energy supply and industrial emissions are considerable and need to significantly reduce in the second emissions budget

Energy supply emissions are from the generation of electricity and from the production and distribution of fossil fuels. In 2021, the combustion of coal, fossil gas, and diesel in thermal electricity generation contributed 4.4 $MtCO_2e$, and fugitive emissions from geothermal plants[i] contributed 0.6 $MtCO_2e$.[1] Producing and distributing fossil gas caused 0.8 $MtCO_2e$ of emissions through fugitive methane leaks from pipes, the carbon dioxide vented and flared from wells, and from own use for energy. Additionally, refining oil into petrol and diesel fuel released 0.7 $MtCO_2e$ of emissions in 2021, but the country's sole refinery converted to an import-only terminal in April 2022.[2]

Industrial emissions come from the combustion of fossil fuels for energy and the chemical reactions which occur in industrial processes. Fossil gas and coal are combusted in boilers, burners, and ovens for process heat in sectors such as food processing and wood, pulp, and paper production. These low temperature applications released 3.9 $MtCO_2e$ of emissions in 2021.[3]

Higher temperature process heat applications, such as the production of chemicals, released 1.5 $MtCO_2e$.[4] Petrol and diesel use in off-road vehicles and machinery for motive power in the agriculture, mining, construction, and other industrial sectors caused 2.4 $MtCO_2e$.[5] Industrial process emissions come primarily from the production of cement, steel, and aluminium, which contributed 3.1 $MtCO_2e$ in 2021.[6]

Energy supply and industrial emissions totalled 17.4 $MtCO_2e$ in 2021.[7] Energy supply operations and industrial processes, such as building new electricity generation, can invoke mana whenua and mana moana interests under Te Tiriti/The Treaty in contexts where such processes incur impacts on te taiao. Building new onshore or offshore wind farms, for example, can have impacts on the environment that merit consideration through a Tiriti/Treaty lens.

The Government set a sector sub-target for energy and industry emissions which averages at 14.6 $MtCO_2e$ per year for the second emissions budget,[ii] based on the Commission's demonstration path. An updated version of this (**Figure 13.1** below) is used here to show the action required to meet the first, second, and third emissions budgets.[iii]

i. Dissolved CO_2 and CH_4 gases in the geothermal fluid are released along with steam during electricity production.

ii. The Government includes emissions from residential and commercial sectors in its energy and industry sub-sector target, whereas in this report they are included as building emissions and are discussed in *Chapter 11: Built environment*.

iii. The update to the demonstration path was made for our NZ ETS settings advice in 2022. Amongst other changes, it assumes that the aluminium smelter at Tiwai Point continues to operate beyond 2024 and reflects the conversion to an import terminal of the oil refinery at Marsden Point.

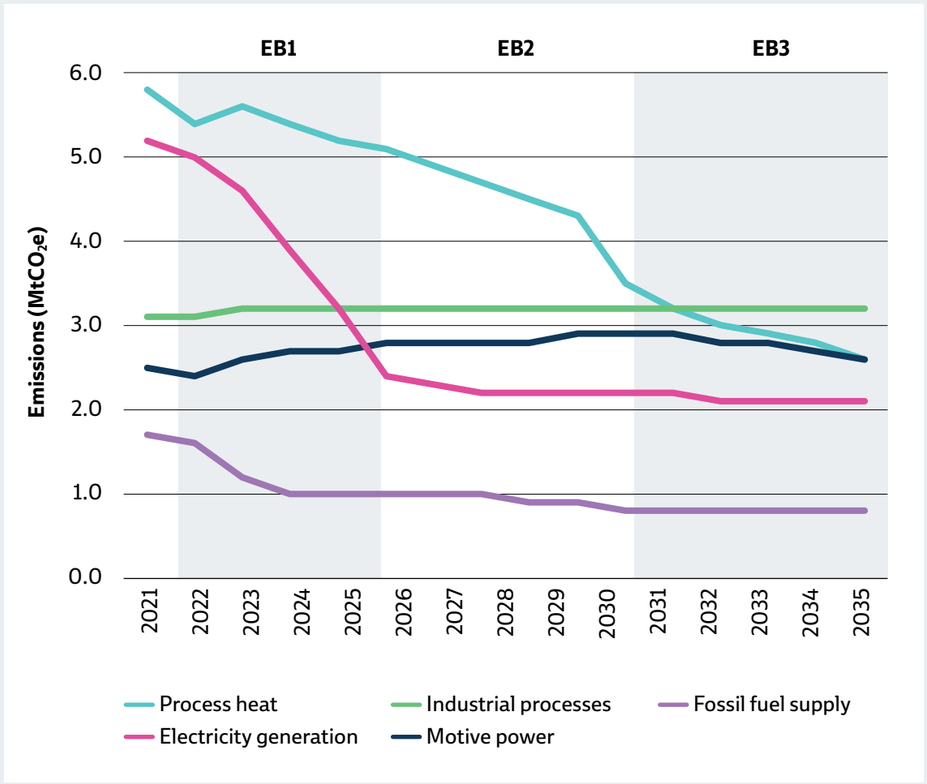

Figure 13.1: Demonstration path emissions projections of energy supply and industrial emissions
Source: Commission analysis

Note:
1. Projections are from the 2022 update to demonstration pathway published with our NZ ETS settings advice.[8]
2. Values for 2021 have been updated with the 2023 National Greenhouse Gas Inventory.

Building renewable generation can cut electricity emissions in the first emissions budget, and maintaining build during the second and third budgets will keep the system low emissions

During the first emissions budget period, emissions from electricity generation need to be reduced dramatically by eliminating the use of fossil gas and coal for baseload electricity generation – generation which operates most of the time. Geothermal and hydro generation can provide this sort of steady supply at lower cost and with less emissions.

Increasing wind and solar generation can reduce the amount of time that fossil generation is required, and flexible gas and hydro generation can provide support during periods of intermittency.

There are several large renewable generation projects currently being built. The Tauhara geothermal power plant and the Harapaki and Turitea wind farms will displace around 2.2 TWh of fossil gas or coal generation per year, avoiding over 0.9 $MtCO_2e$ of emissions per year.[iv] In our demonstration path, new generation which contributes a further 2.0 TWh per year is completed by the end of the first emissions budget period.

The build of renewable generation needs to continue into the second and third emissions budgets to minimise the use of fossil gas generation and to meet new demand from transport electrification, heating, and industrial load. In our demonstration path, during the second emissions budget period new renewable generation is completed, which contributes around 5.0 TWh per year. This is more than twice the rate that generation is currently being built, indicating that a ramp up of generation build needs to take place between now and the end of the second emissions budget.

If policy uncertainty and barriers within the consenting system are not addressed, it may be difficult to meet emissions budgets because renewable generation build will be delayed, and electrification could be more expensive than it otherwise would be.

Significant decarbonisation can occur in low-to-medium temperature process heat during the first and second emissions budget periods

For the coal used in industrial boilers, our demonstration path showed a 28% reduction by 2025 and 60% by 2030 relative to 2021 levels. The use of coal as a boiler fuel is concentrated at several large industrial sites, and the 2030 outcome could be achieved if all 17 dairy product manufacturing sites in the South Island converted to biomass or electricity.[v]

Fossil gas used in low-to-medium temperature process heat also needs to reduce during the first two budget periods. Our demonstration path showed a 9% reduction in fossil gas consumption by 2025 and 24% by 2030, relative to 2021 levels. Some reductions can be achieved by improving energy efficiency, but some fuel switching to biomass or electricity will also be required.

Emissions reductions might be achievable in other sectors as well

Our demonstration path assumes limited availability of technology and high costs for decarbonising other industrial sectors. No technology breakthroughs were assumed to reduce emissions in industrial processes or high temperature heat. However, there are emerging opportunities for reducing emissions from industrial processes, such as the planned adoption of an electric arc furnace at Aotearoa New Zealand's only integrated steel mill.[9]

Aotearoa New Zealand's energy transition is taking shape

There is a wave of energy policy development currently underway. The first emissions reduction plan commits to the development of an energy strategy to provide long-term direction for an energy system transition. This is due to be completed by the end of 2024. The strategy will bring together and be informed by a range of projects including the Gas Transition Plan, the Hydrogen Roadmap, and work underway to address the challenges to expanding and decarbonising the electricity system, such as the NZ Battery Project. Maintaining continuity of actions currently in progress as part of the first emissions reduction plan is important to ensure we can meet future emissions budgets.

The New Zealand Emissions Trading Scheme (NZ ETS) can drive much of the decarbonisation of the energy system. However, as set out in the policy framework section in *Chapter 1: Introduction*, complementary policies are needed to guide the transition, ensure it is equitable, and to address non-price barriers. Although all fossil fuel consumers pay the cost of emissions, the relative impact of the carbon price across different groups and their ability to reduce emissions in line with the changing price vary considerably.

iv. Commission analysis based on Energy Link wholesale electricity market modelling.

v. There are many other industrial sites using coal in boilers, including in the North Island, and the exact sequencing of switching from coal is not critical.

Energy supply

Electrification is key for decarbonisation, and the system must be able to deliver secure, affordable, and low emissions electricity

Aotearoa New Zealand has one of the lowest emitting electricity systems in the world, reaching 87% renewables share in 2022.[10] The use of electricity as a low emissions fuel can therefore be maximised.

More renewable generation will need to be built to further reduce electricity system emissions. It will enable emissions reductions across the economy through increased electrification – of transport, space and water heating, and industry. This would best be accompanied by expansion of transmission and distribution infrastructure and increased system flexibility through demand response, energy storage, and potentially more flexible generation.

Electrifying transport and heat are some of the greatest opportunities to reduce emissions and will contribute substantially to demand growth. Gross electricity demand has been relatively stable over the past two decades but is projected to increase 26% by 2035 and 65% by 2050, compared to 2021.[11]

Policy settings and other factors could delay renewable generation build

Aotearoa New Zealand will rely heavily on renewable electricity to replace fossil fuels. Each year from 2025, generation that can supply over 1 TWh per year will need to be built to meet anticipated demand.[vi] For scale, this is equivalent to around two very large wind farms being completed every year (although we expect a mixture of renewable generation types, including geothermal and solar).

There is ample generation that can be developed, with over 30 GW of potential generation interest and significant potential for offshore wind.[12] However, much of this potential interest is still at early stages, and barriers related to consenting and investment certainty must be removed for this generation potential to be realised. Build delays will both directly and indirectly impact emissions.

We expect that the market can deliver this new generation. However, there are factors that may delay investment decisions and construction schedules. For example, any new electricity supply contract for New Zealand's Aluminium Smelter (NZAS) will be a high-profile factor which developers will likely consider when considering new generation.

Other factors such as global supply chain constraints, labour shortages, and consenting times could also delay construction build. Moreover, developers control the timing of their generation investment, meaning they may look to secure purchase agreements and consider the broader impact across their portfolio before committing to build.

Some policy settings are introducing investment uncertainty

Government policy uncertainty may also be delaying the build of new generation. For example, the Government has set a target of reaching 100% renewable electricity by 2030, but under the Commission's demonstration path, the electricity system is projected to reach only 96% renewable by 2030. To achieve 100% renewable electricity generation by 2030, some market intervention will likely be required. This introduces investment uncertainty for developers of new generation. The Government has committed to reviewing this target in 2024.

Although a 100% renewable electricity system is technically feasible, it may come at significant cost and could increase economy-wide emissions if it led to higher electricity prices. The NZ Battery Project is investigating pumped hydro storage and a portfolio approach to resolve the country's dry year problem[vii] and to achieve 100% renewable electricity supply. Any dry year solution should be implemented in a manner which honours Te Tiriti/The Treaty and is consistent with Te Tiriti/The Treaty principles.

vi. Commission analysis.

vii. A 'dry year' occurs when hydro inflows are lower than usual, meaning that less energy is stored in the form of water, for weeks to months at any given period of time. This is a particular challenge for the Aotearoa New Zealand electricity system due to its reliance on hydropower, which supplies about 60% of the country's electricity on average.

Renewable generation build delays can directly increase emissions

We estimate that if renewable generation build is six months behind the Commission's updated demonstration path,[13] emissions would increase by 0.9 $MtCO_2e$. A 12-month delay would increase emissions by 1.9 $MtCO_2e$ across the second emissions budget period (**Figure 13.2** below).[viii] This is because fossil gas generation will need to operate more to meet projected demand. Continued uncertainty and build delays could make it challenging to meet emissions budgets.

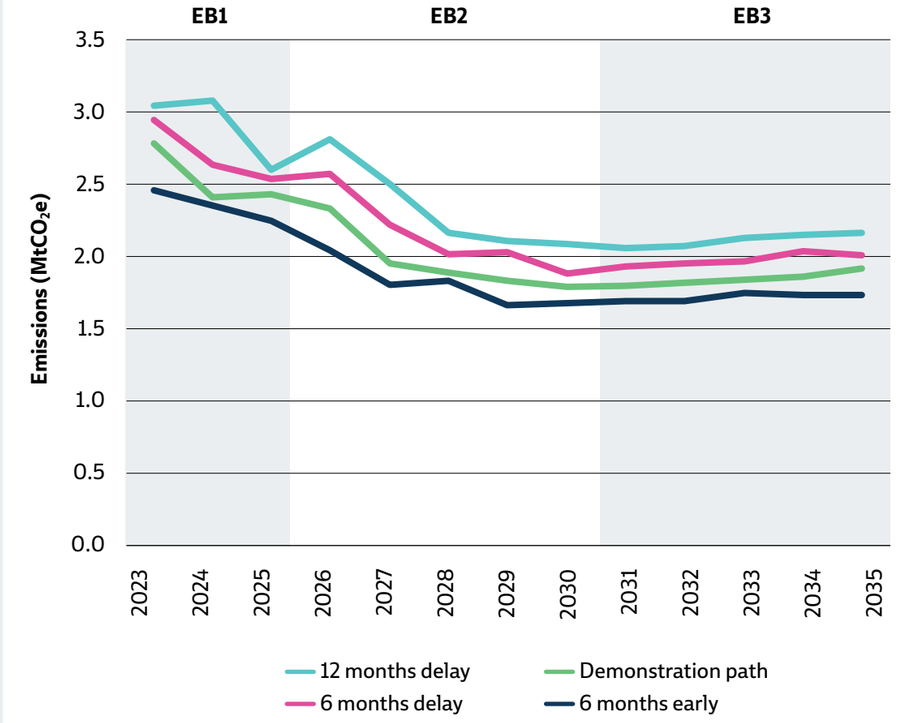

Figure 13.2 Projected electricity generation emissions with varied build timing. Note that emissions are averaged across simulated weather years and include co-generation.

Source: Energy Link modelling

viii. Commission analysis based on Energy Link delayed build electricity market modelling.

Box 13.1: Case study on build delays

As an illustration of how market uncertainty can impact emissions, the Commission has considered how the New Zealand Aluminium Smelter's (NZAS) contract termination and renegotiation in 2020/2021 may have affected renewable build timing and emissions. NZAS consumes around 13% of the country's electricity, and so whether it continues to operate has a significant impact on the balance of generation capacity and demand. The uncertainty around NZAS's contract status caused significant uncertainty in the wholesale electricity market.

The power supply contract renegotiation took six months and during this time investment development for the Tauhara and Harapaki renewable generation projects went on hold.[14] Final investment decisions for these projects coincided with the new power supply agreement for the smelter, when this specific uncertainty had been resolved.[ix]

These renewable generation projects are now under construction and scheduled to be completed in 2023. Supply chains and workforce capacity may have also delayed construction build.[15]

If this renewable generation was operating six months earlier, around 0.3 $MtCO_2e$ of emissions from fossil gas generation could have been avoided in 2023.[x] While this is the duration of the contract renegotiations, many factors could have impacted the timing of this generation build.

The example demonstrates the potential consequences of the timing of early investment decisions on emissions. Developers need to commit to significant generation build and delays will increase electricity generation emissions.

Delayed build impacts wholesale electricity prices and can indirectly increase emissions

A slower renewable generation build also impacts wholesale electricity prices, as more expensive fossil gas and coal generation will continue to be required to meet baseload demand. This indirectly influences emissions, as the higher electricity prices will hinder the electrification of process heat and transport.

We estimate that during the second emissions budget period, a six-month delay in build would increase wholesale electricity prices by $14/MWh and a 12-month delay by $30/MWh, corresponding to a 14-30% increase over modelled wholesale electricity prices under the updated demonstration path.[xi]

The consenting system can enable a fast-paced and sustained build of renewable generation, but stronger direction is needed to remove barriers to building new renewable generation or reconsenting existing generation

Resource management system reform is underway, but existing processes will remain in place across the second and third emissions budget periods as the system transitions. The lengthy transition period, uncertainty around currently unspecified environmental limits, and the potential provision of exemptions could create additional uncertainty that delays renewable generation build.

ix. Meridian Energy's Harapaki windfarm and Contact Energy's Tauhara geothermal plant were put on hold when NZAS terminated their main electricity supply contract. These projects restarted after the new NZAS contract was announced. Contact's Tauhara geothermal project was delayed by 3-6 months.

x. Commission analysis based on Energy Link delayed build electricity market modelling.

xi. Note that these prices are time-weighted-average-prices across simulated weather years for the Haywards grid exit point.

A simplified or streamlined consenting process that makes renewable build easier and quicker is needed by the start of the second emissions budget period, if not earlier.

The current system lacks joined up thinking across energy, water, infrastructure, housing supply, and climate change outcomes, is no longer fit to help respond to emerging issues and does not adequately uphold the principles of Te Tiriti/The Treaty. This adds complexity, cost, and delay to generation projects. Consultation submissions identified the consenting system as a significant barrier to the energy transition.

Some of these issues may be addressed through the Natural and Built Environment Act (NBA) and National Planning Framework (NPF). However, the first iteration of the NPF will not be published until 2025,[16] and consultation submissions raised concerns that the Bill will not more effectively address climate change than the current Resource Management Act.

Local government submissions called for transitional plans and clear guidance, and expressed interest in being more involved in developing the national energy strategy. As stated in the Commission's submission on the NBE Bill, transitional measures need to be put in place to support local government to take proactive climate mitigation and adaptation steps prior to reforms being implemented.

To ensure a fast-paced and sustained build of renewable generation and network infrastructure, the Government could also provide clear direction and approaches for balancing and resolving conflicts between system outcomes. It would be particularly beneficial if the Government provided stronger directive language within existing policy instruments to remove barriers to building new renewable generation or reconsenting existing generation in the interim.[17]

Implementation of transitional measures are an opportunity to explore how to quickly respond to changing market conditions and system requirements, with lessons incorporated into the new resource management system. This could increase investment certainty as the system transitions.

It would be beneficial if the consenting system recognised the national importance of renewable energy and could adapt to ongoing technological innovations that provide system flexibility and more efficient generation of electricity – for example, energy storage technologies and modern, advanced wind turbine technology. Slow resource consenting times can impact the attractiveness of projects to investors, increase the risk of project abandonment, and increase overall project costs.

Refer to *Chapter 11: Built environment* for further discussion on consenting.

Genuine public collaboration and consultation, especially co-design with iwi/Māori, is important for the development of renewable electricity generation

Prioritising and accelerating the development of renewable electricity generation is best done through genuine public collaboration and engagement, in partnership with mana whenua and mandated iwi representatives and Māori landowners.

Having regard to the reasonable concerns of affected parties in the development of projects can support community awareness and acceptance of local energy infrastructure.

It is critically important to consider the natural resources located within the rohe of Māori landowners to uphold mana motuhake and to restore/maintain the mauri of that which is being developed. The prioritisation and acceleration of renewable electricity generation should be done in a manner that gives effect to the principles of Te Tiriti/The Treaty and upholds Te Tiriti/The Treaty settlement legislation. This includes related legislation such as the Marine and Coastal Area (Takutai Moana) Act wherein the Crown-Māori relationship is in the process of addressing the scope of mana whenua and mana moana legal interests regarding areas currently under consideration for offshore wind development. Emphasis on rangatiratanga and a genuine partnership is essential to ensuring future energy developments take a kaitiaki approach to resource management within the takiwā of iwi/Māori.

Weaving Māori-led mātauranga Māori approaches into decisions on renewable electricity generation can help ensure solutions are appropriate within te ao Māori and reflect the full range of knowledge systems available in Aotearoa New Zealand. It is important to consider the potential impacts of using natural resources as an energy source through a te ao Māori lens.

Proactively managing demand growth through efficient, forward-looking investments will be useful for critical electricity infrastructure providers

Electrifying transport and heat are some of the greatest opportunities to reduce emissions and will contribute substantially to electricity demand growth. Electricity distribution businesses (or lines companies) will need to evolve and innovate to accommodate rising electricity demand, as well as emerging technologies or services that allow greater consumer participation in how, when, and where electricity is generated, used, and compensated.

Lines companies have a critical role in managing peak demand and delivering services for the long-term benefit of consumers. The regulatory system needs to provide appropriate incentives for lines companies to manage peak demand through existing tools, and to invest in other ways to manage demand (for example, through batteries, distributed energy resources, other non-network alternatives, or network reinforcement).

Uncertainty about future requirements and potential solutions has increased. The existing regulated investment framework for transmission and distribution infrastructure needs to be future proofed by looking to meet outcomes related to emissions reduction, system security and reliability, and affordability. Approaches to setting total revenue and estimating future spending for lines companies, the national grid owner, and other critical infrastructure providers need to be able to support the accelerated pace of investment in generation and electrification that is required. Physical grid capacity must keep pace with generation build.

Control and operation of the grid also needs to evolve as generation becomes more distributed and digitalisation increases. Improving electricity network information disclosure and facilitating data sharing and coordination between electricity sector participants could better enable low emissions investment.

Realising the vision of an electrified economy could require an investment of an estimated total $42 billion by 2030 across generation, transmission, and distribution infrastructure providers to address historical under-investment, meet future needs, and strengthen grid resilience.[18]

Improving grid resilience has become increasingly urgent

Transmission and distribution infrastructure is exposed to climate risks such as coastal and inland flooding and slips, and has less ability to make the changes to adapt than electricity generation assets.

Distribution networks likely have even less ability to adapt than the transmission network.[19] Varying size and capabilities of lines companies, and differences in the kinds of climate impacts experienced around the country, may result in different levels of network vulnerability across regions as the climate changes. Heavy reliance on a single source of energy across the economy can impact Aotearoa New Zealand's resilience.

Investment decisions need to support future-proofing network infrastructure, particularly in areas with historic under-investment or at high risk of climate hazards. Guidance from regulators on how to treat investments to increase resilience under the economic regulatory framework could be considered across electricity generation, transmission, and distribution. For transmission infrastructure in particular investment tends to be lumpy, with long lead times and lifetimes.

Energy efficiency and demand side management can be better leveraged to reduce network costs and support system flexibility

Although Aotearoa New Zealand has a predominantly renewable electricity system, energy efficiency improvements can still have significant emissions reduction benefits. This is particularly the case if it can reduce electricity demand at peak times, when fossil gas or coal fired power generation is used alongside renewables to meet demand.

Reducing peak demand defers the need to build a bigger network and improves utilisation of existing assets. This can extend the life of network infrastructure, reduce the need for upgrades, and reduce costs for consumers.

The recent introduction of real-time pricing and enhancements to dispatchable demand in the wholesale electricity market will provide consumers with a clearer price signal to inform decisions and improve the types of services that can be accessed. A dispatch notification product will better enable distributed energy resources (DER) to participate in the market. DER and demand side management can help manage the variability of supply and demand from an increasingly renewable electricity system and electrified economy.

The electricity industry has made progress in balancing the energy trilemma as the country transitions to a low emissions economy through, for example, phasing out low fixed-charge tariff regulations, making amendments to the Electricity Industry Participation Code, and improving information disclosure.

However, it will be important for the Electricity Authority and other electricity sector entities to continue delivering on initiatives related to pricing reform and cost allocation. This could include actioning options identified under the Electricity Authority's Market Development Advisory Group project, *Price discovery under 100% under renewable electricity supply*, and greater use of innovative pricing structures.

Recommendation

This recommendation seeks to address the need for greater and more reliable access to renewable electricity and to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 19

We recommend that in its second emissions reduction plan, the Government:

19. Prioritise and accelerate renewable electricity generation build and ensure electricity networks can support growth and variability of demand and supply.

    These outcomes must be progressed in partnership with iwi and hapū, particularly considering potential implications for mana whenua and mana moana and their rights and interests.

Fossil gas will begin to transition out of the system, but will remain important for the security of electricity supply and some industrial users through the second emissions budget period and beyond

Fossil gas plays an important role in the energy system. It provides secure energy supply for electricity generation (26% of consumption in 2021), and for users of process heat (21%), as well as feedstock and fuel for chemicals and fertiliser (42%) such as methanol and urea.[20] Many households use fossil gas for cooking, heating, and hot water (5%), and many commercial businesses use it for space heating and cooking (5%).[21]

Fossil gas combustion emissions made up 8% of gross greenhouse gas emissions in Aotearoa New Zealand in 2021 and need to be reduced.[22] In the Commission's demonstration path, fossil gas emissions reduce by 9% by 2025 and 30% by 2030, relative to 2021.

However, this must be done in a measured way that ensures the energy system can deliver an equitable transition to net zero long-lived greenhouse gas emissions. Removing fossil gas too quickly from the system could increase electricity prices and reduce reliability. This may have significant consequences for the electrification of transport and process heat. For further discussion, see *Chapter 11: Built environment* and *Chapter 15: Transport*.

To reduce emissions from electricity generation, fossil gas is better used as support for renewable generation and not as baseload

Fossil gas (and coal) electricity generation currently play a number of roles in the electricity system. In absolute terms, most thermal electricity in Aotearoa New Zealand currently comes from fossil gas. However, coal results in about double the emissions per TWh of electricity produced. In *Ināia tonu nei*, the Commission set out how generating electricity with coal must end and that this would be a key priority for the first emissions budget.

Much of current fossil gas generation operates almost year-round as baseload. Additionally, fossil fuels fill the gap when hydro inflows are low or when renewable supply falls short due to the intermittency of wind and solar. As more renewable generation comes online, fossil gas use for electricity generation will decrease, and its role will change to being about backing up renewable generation.

Historically, Aotearoa New Zealand has been concerned with seasonal dry periods. However, peak electricity demand is growing significantly (with the top ten largest peaks occurring in the last two winters) and will continue to do so into the second emissions budget period.[23] As more homes and businesses use electricity for heating, cooking, and to power their cars, and as additional intermittent renewable generation is built, capacity will be needed to meet daily peaks and for calm, cloudy periods. Currently, this is likely to come from fossil gas generation, and/or from additional demand response.

Managing down the remaining fossil gas should occur in a planned and measured way

Globally, methanol production is dominated by production from coal and fossil gas, but increasingly alternative feedstocks are being used such as biogas, hydrogen, and carbon dioxide. The company Methanex produces methanol from fossil gas and consumes about 40% of the total domestic fossil gas supply.[24] As a large user of gas, Methanex's demand incentivises gas producers to continue production to supply all users. Methanex also has the ability to provide flexibility to producers by reducing its demand and methanol production when there is an interruption to supply or in dry years when hydro lakes are low. For example, Methanex has suspended production from the Waitara Valley plant in response to tight gas market conditions and in recent years has freed up gas for electricity generation in winter.

It would benefit Aotearoa New Zealand to align investment in fossil gas infrastructure and supply with the gradual phasedown of the user base. To do that, the Government could engage with upstream producers and large users of fossil gas (such as Methanex and electricity generators, as well as mandated mana whenua representatives) so the transition away from fossil gas is as smooth as possible and fossil gas is available when and where it is strategically required.

Careful thought is required when considering winding down fossil gas infrastructure in the future, including close partnership with mandated mana whenua representatives. For example, some electricity distribution companies will be under significant additional pressure with the increased uptake of electric vehicles and/or industrial load. Taking residential and commercial users off the gas network may need to be carefully considered alongside this pressure.

Biogas could play a role in replacing fossil gas, but there is currently a limited supply and multiple sectors that could make use of it

Biogas, when transformed into biomethane, is chemically identical to fossil gas. However, over the full value-chain it prevents up to 95% of associated carbon emissions,[25] making it a highly valuable resource. It has been estimated that by using existing and available organic wastes in Aotearoa New Zealand, around 7% (13 PJ) of existing fossil gas use could be met with biomethane by 2050, avoiding 1.5 $MtCO_2e$ of emissions per year.[26] By 2030, the estimated total accessible biomethane resource that could be injected into the network is likely to be in the order of 3-4 PJ.[27]

However, the biogas industry in Aotearoa New Zealand is underdeveloped. Bringing the available quantities of biogas to market at affordable prices will likely require Government support and coordination, and cross-sector collaboration.

Biomethane production costs could be up to $80/GJ for some feedstocks,[28] more than six times the current wholesale fossil gas price. Additionally, transitioning the operation of the gas network to a more distributed user model with regionally located biogas plants is a significant operational departure from the current gas network and distribution model; this needs to be carefully considered.[29]

There is not enough biogas to completely replace fossil gas, so choices will have to be made for where it is used. It could be injected into the pipeline network to partially supplement fossil gas. Biogas could also be very valuable for use in industrial heat and processes, for which alternative decarbonisation solutions may be harder and more expensive.

Co-location of the production of biogas and its consumption have obvious efficiency benefits. More work is required including an assessment under Te Tiriti/The Treaty to ensure best use of this limited resource. Refer to *Chapter 12: Circular economy and bioeconomy* for additional discussion.

There is insufficient evidence around the possible future availability of biogas – including its accessibility, economic viability, and cost to consumers – to warrant continued expansion of the gas network. Fossil gas assets installed during the second emissions budget period would endure to 2050 and beyond, even though affordable low emissions alternatives are available now.

The Commerce Commission's last price path reset for gas pipeline businesses brought forward the expected recovery of capital to mitigate asset stranding risks from declining use of gas networks. Capital expenditure is recovered from users remaining on the network. Electricity is a more efficient and lower emissions source of energy for heating homes and businesses than fossil gas. More information on this can be found in *Chapter 11: Built environment*.

Box 13.2: Hydrogen

Hydrogen is a versatile fuel that could be used to decarbonise many applications that currently use fossil fuel. Some applications will require low emissions hydrogen. However, for most potential uses, there are alternative emissions reduction options which are likely to be more efficient, cheaper, and have less system impact. There are also some applications where there is uncertainty around hydrogen's potential future role as technologies are currently immature and not at scale.

At this stage, we understand that low emissions hydrogen would be required to decarbonise some domestic industrial processes.

- for urea and methanol production, hydrogen is an essential feedstock. The hydrogen production needs to be decarbonised to reduce the emissions from these processes
- green hydrogen looks like a promising way to decarbonise primary steelmaking. Increasing the use of recycled steel is also an alternative or complementary pathway for reducing emissions.

Other potential future uses of hydrogen are cases which direct electrification would struggle to support. Examples include:

- remote vehicles and machinery used in forests and mines, to which it would be very costly to bring charging infrastructure
- some high temperature industrial heating applications, which may be better served by a combustible fuel
- a niche role in heavy freight for trips that are both long and heavy. For these applications, using batteries comes at the expense of carrying payload, and downtime for charging could impact operational efficiency. However, battery electric trucks should be able to support most freight operations in Aotearoa New Zealand, and it is not yet clear for what range and weight hydrogen trucks would be preferable
- aviation and shipping, although a path to decarbonisation is not yet clear. The space and weight required to store hydrogen make it a challenging substitute for existing fuels. Hydrogen ships and aircraft are likely to have limited range or higher fuel costs, which will constrain use cases.

The use of hydrogen for building heating would increase system and consumer costs and add a considerable burden for new renewable generation which adds risk to decarbonisation.[30] This means it is unnecessary to convert the existing fossil gas network over to hydrogen. For example, to convert all existing residential fossil gas users to green hydrogen would require around six large wind farms. If instead their heating was provided by heat pumps, then only one of these wind farms would be required.[xii]

There is also a risk that exporting green hydrogen could impede domestic decarbonisation if the required renewable generation comes at the expense of other builds. Although Aotearoa New Zealand's generation potential is considerable, the capacity to consent and develop projects is currently constrained, and social licence to develop may increasingly become an issue. Particularly close assessment is needed under Te Tiriti/The Treaty, and we note that there is ongoing hapū-led litigation in this space.

Green hydrogen has featured strongly in the country's energy policy development and decarbonisation funding. To enable decarbonisation through hydrogen, but to avoid supporting inefficient uses, the Government could consider:

- prioritising support for applications where hydrogen is likely to play a significant future role. Hydrogen experience and technology can then be developed, which other applications may eventually benefit from
- offering fuel neutral support. Generally, there are competing electric technologies under development and there is uncertainty around which process will ultimately be optimal and adopted at scale
- ensuring the development of hydrogen infrastructure is sized to sensible future demand. A view of sensible demand for hydrogen should consider alternative low emissions fuel options for all potential applications.

There is opportunity to reduce more fugitive emissions from fossil fuels

Fugitive emissions result from production, transmission, and storage of fuels, and from non-productive combustion. In 2021, fugitive emissions from domestic coal mining, oil and fossil gas production contributed 0.6 $MtCO_2e$ – around 0.8% of gross emissions.[31] Examples are emissions from the venting of CO_2 at the Kapuni Gas Treatment Plant, gas flaring at oil production facilities, and methane leaks from the pipeline network. Fugitive emissions also result from geothermal generation.

Generally, it is assumed that fossil fugitive emissions will reduce in line with fossil gas reductions. However, there is considerable variation between production fields. It may be possible to make significant reductions in fossil fugitive emissions by targeting key sources, such as vented and flared production emissions. As a signatory to the Global Methane Pledge, Aotearoa New Zealand has committed to a collective global target to reduce global anthropogenic methane emissions by at least 30% from 2020 levels by 2030.

The NZ ETS should incentivise producers and distributors to minimise fugitive emissions. However, fugitive emissions are not a focus area in the first emissions reduction plan, and the evidence base on sources and opportunities to reduce fossil fugitive emissions could be improved.

xii. Commission analysis

Industrial emissions

Rapidly reducing industrial emissions is crucial to meeting the second emissions budget

There is a large opportunity to reduce industrial emissions, and there are cost-effective options available now. Under the Commission's demonstration path, industrial emissions reduce from 10.9 $MtCO_2e$ in 2021 to 8.9 $MtCO_2e$ in 2030. The current work programme is helping to unlock these reductions; current policy consists primarily of the NZ ETS, the Government Investment in Decarbonising Industry (GIDI) Fund, and national direction under the Resource Management Act (RMA) to prevent the installation of new coal boilers and a backstop on the reconsent of existing ones. Work has also begun on a plan for decarbonising industry.

However, the Commission's assessment is that the Government may have overestimated how quickly emissions reductions from process heat can be achieved. The current policies, outlined in the first emissions reduction plan, have combined policy impact ranging from 12 $MtCO_2e$ to 20 $MtCO_2e$ during the second emissions budget period. For the higher estimate to be achieved, all coal, fossil gas, and diesel industrial boilers will have to be converted to electricity or biomass by 2025. The Commission's assessment is this likely exceeds the sector's capability to deliver decarbonisation in this area in the short term.[32] Refer to *Chapter 3: The task for the second emissions budget* for additional discussion.

This means that some of the tasks to reduce emissions in this sector are likely to move from the first to the second emissions budget period, and that emissions reductions may have to be made elsewhere in the sector.

Wider problems preventing industries reducing emissions will need to be addressed and policy support broadened to include new sectors

The goals for the sector are unlikely to be achieved without expanding the pool of emissions reductions it is targeting and working to overcome more of the problems preventing the industrial sector reducing emissions.

The rate at which industrial emissions will be reduced will be limited by several factors. For example, fuel switching decisions involve long-lived assets and have high upfront capital costs, which is what the GIDI Fund is helping to overcome. Continual assessment and readjustment of the fund and/or alternative policy mechanisms will support emissions reductions in line with budgets.

The NZ ETS will need to maintain an effective carbon price signal into the future

Lower emissions fuels are generally more expensive than fossil fuels and a high emissions price is needed to make these fuels cost competitive. It is important that there is an effective carbon price signal into the future. Refer to *Chapter 5: Emissions pricing* for additional discussion.

Other barriers like engineering, workforce, and supply chain constraints will limit the amount of decarbonisation possible during the second budget period

While to date the Government has focused on addressing capital cost barriers in low-to-medium temperature process heat, there are opportunities for further emissions reductions if further policy support was put in place to address a range of non-price barriers.

A study for the Commission identified some key technical challenges which need to be overcome. These include electricity distribution business (EDB) processes, an underdeveloped biomass market, future uncertainty about pricing and technology, equipment availability, and onerous consenting.[33] Some of this can be resolved through improved information provision, coordination, and procurement planning.

There may also be practical engineering constraints around the integration of new technologies and fuels into established plants, and limits on shut down periods for plant conversions. Upscaling the domestic workforce and supply chains will help support the transition.

Security and cost of electricity and bioenergy supply will be critical in enabling the decarbonisation of process heat

There is uncertainty in the availability of biomass supply and growing competition, so additional coordination will be required. Some biomass suppliers are reluctant to enter long-term contracts, which are important for users to be able to secure continuity of supply and certainty of price.[34] A strategic assessment of the best use of bioenergy, including where the fuel should be used and for what purpose, could be useful. Further discussion on the bioeconomy is found in *Chapter 12: Circular economy and bioeconomy*.

The electricity system must be able to support the additional pressure that will come from industrial conversions to electricity. Decarbonisation projects occur on a much shorter timeline than EDBs are used to, or the regulatory system can easily allow for. There can also be a first mover disadvantage if the project triggers a network upgrade, and the company is required to disproportionately bear the costs. EDB resources and systems vary significantly around the country, and some may be understaffed to facilitate multiple large decarbonisation projects. This can often lead to project delays due to the time taken for network upgrades, or projects not proceeding because the network cost is too great to justify the project.[35]

See the above section on electrification for more information.

Other opportunities could be pursued, such as large industrial users and chemical production

So far, policy support has primarily been targeting low-to-medium temperature process heat, which is mainly boilers which produce steam. This is likely due to the readily available technology and relative achievability of emissions reduction. Policy support to reduce emissions from low-to-medium temperature process heat has increased over time, but support will need to encompass other opportunities outside of low-to-medium temperature process heat to help Aotearoa New Zealand meet its emissions budgets.

Technology for industries with hard-to-abate emissions is still developing

Aotearoa New Zealand has several single company industries with industrial processes unique to this country, such as primary steel production or aluminium smelting. Emissions reductions from these industries is challenging and the scale of investment needed to decarbonise is significantly larger than what the GIDI Fund is designed to provide.

Technologies to reduce emissions for these industries are progressing. For Government support to be effective, bespoke, long-term arrangements may be required. For example, in May 2023, the Government partnered with NZ Steel to deliver Aotearoa New Zealand's largest emissions reduction project to date through a conditional deal with up to $140 million from the GIDI Fund.[36]

In the meantime, incremental emissions reductions should be encouraged. Enabling a sustainable research, science, innovation, and technology system that supports Aotearoa New Zealand's transition to a low emissions economy, and mobilising private finance can also support development of technologies for industries with hard-to-abate emissions. Refer to *Chapter 6: Investment and finance* and *Chapter 7: Research, science, innovation, and technology* for further discussion.

There are some sectors that have received little attention to date, resulting in a lack of information or enabling policies to reduce emissions

Other sectors, such as mining and construction, have not received much attention to date. This includes off-road vehicles and machinery that contribute significant emissions, but often fall between central government agencies' focus. There is a lack of evidence on opportunities to reduce emissions and few enabling policies for these sectors, meaning these opportunities have yet to be unlocked. Refer to *Chapter 15: Transport* for additional discussion.

Recommendation

This recommendation seeks to address the need to rapidly reduce industrial sector emissions to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 20

We recommend that in its second emissions reduction plan, the Government:

20. Accelerate the decarbonisation of process heat and pursue opportunities to reduce emissions across other industrial sectors.

Box 13.3: Carbon capture and storage (CCS), carbon dioxide removal (CDR), and carbon capture and utilisation (CCU)

CCS is a process in which a relatively pure stream of CO_2 from industrial and energy-related sources is separated (captured) at or near a point source, conditioned, compressed, and transported to a permanent storage location for long-term isolation from the atmosphere. Permanent storage is generally geological (underground geologic formations, rocks, minerals).

Under the Climate Change Response Act 2002, CCS is categorised as an 'other removal activity' but the application of CCS is generally as an emissions reduction technology.[37]

CDR are deliberate human activities that draw physical quantities of CO_2 from the atmosphere, and durably store it in geological, terrestrial, or ocean reservoirs. There are two broad removal methods, biological and engineered geochemical/chemical. Engineered technologies, many of which are not yet mature, proven, or economically scalable, include direct air carbon capture and storage (DACCS) and bioenergy with carbon capture and storage (BECCS), the latter of which is CCS technology applied to a bioenergy facility.

CCU is a process in which CO_2 is captured and then stored in a long-lived product. If the CO_2 is stored in a product for a climate-relevant time horizon, this is referred to as CCUS (carbon capture, utilisation, and storage). Only then, and only combined with CO_2 recently removed from the atmosphere, can CCUS lead to carbon dioxide removal.[38]

In 2022, 61 new facilities were added to the global project pipeline, bringing the total to 30 CCS/CCU/CDR projects in operation, 11 under construction, and 153 in development.[39]

Most of these facilities are associated with coal power generation or oil and fossil gas production. Many of these projects have been supported through substantial tax credits and enabling legislation such as the United States' Inflation Reduction Act and the Infrastructure Investment and Jobs Act.

In Aotearoa New Zealand, non-biogenic CDR, CCS, and CCU technologies have not progressed beyond the concept and research stage. This is likely because forests are currently a lower-cost emissions removal option and because low emissions substitutes for fossil fuel combustion for energy are increasingly economic under current policy settings.

Estimated costs for carbon capture are wide-ranging, from USD $25–35/t$CO_2$ for ammonia production to USD $60–120/t$CO_2$ for cement production, and USD $40–100/t$CO_2$ for iron and steelmaking.[40] Future cost estimates for direct air capture are wide-ranging and uncertain, reflecting the early stage of technology development, but are estimated at USD $125–335/t$CO_2$ for a large-scale plant built today.[41]

There are additional costs for transport and storage. The cost of retrofitting CCS technology to existing onshore fossil gas production facilities in Aotearoa New Zealand has recently been estimated to cost $30-110/t$CO_2$.[42]

Aotearoa New Zealand also does not have an enabling legislative framework for CCUS compared with Australia, Canada, or the United States, and existing legislation is not adequate to manage the risks and liability around CCUS.

Specific amendments to laws and policies relating to environmental management, the Exclusive Economic Zone, Crown minerals, marine and coastal areas, and the NZ ETS would be required to address concerns around long-term liability, property rights, and competitive behaviour. However, these specific amendments would be unlikely to address all the issues that have been raised in relation to regulatory comprehensiveness for the protection of public interest, or in terms of investment certainty. Specific legislation may therefore be required.[43]

The Government is developing a Carbon Removals Strategy to inform decisions on the choice and design of policy mechanisms to incentivise carbon removals which will become part of the second emissions reduction plan. CDR, CCS, and CCU are activities within the scope of the Strategy.[44] The Strategy will address questions about the volume of removals needed to complement ambitious gross emissions reductions, what types of removals are prioritised, and how new removal activities can be recognised and rewarded. Refer to *Chapter 5: Emissions pricing* and *Chapter 14: Forests and other carbon stocks* for further discussion.

Until decisions are made on the NZ ETS's role in driving gross emissions reductions and removals, it may be premature to expand the NZ ETS scope to include more removals. It will be important to think carefully and undertake a proper policy development process before making such decisions.

Since the release of *Ināia tonu nei*, stakeholder interest in CCS has increased. For example, Ara Ake released a summary document on CCS and its possible application in meeting climate change targets to renew discussion.[45] A report by Energy Resources Aotearoa, *Fuelling the Energy Transition: A low emissions energy future for New Zealand*, assumes deployment of CCS from 2030 under a preferred technology-led gas transition.[46] The Intergovernmental Panel on Climate Change has found that all modelled pathways limiting global warming to 1.5°C with no or limited overshoot require CDR, both biological and engineered.[47]

There could be a role for CDR, CCS or CCU technologies to play in addressing hard-to-abate residual emissions in the medium term and achieving net negative emissions in the long term. However, an enabling regulatory framework would need to be in place by the end of the second emissions budget period to take advantage of any potential opportunities.

Intergenerational wellbeing and equity

Transformation of the energy system requires a considered approach as part of a broader strategy that supports intergenerational wellbeing

Meeting Aotearoa New Zealand's net zero 2050 target requires a steady transformation of the energy system where fossil fuel use is phased down and the supply and efficient use of renewable energy is maximised. An energy system transformation with people and communities at its centre can deliver positive outcomes across many dimensions – energy affordability and accessibility, community resilience, health, and socio-economic opportunities.

The transformation will require substantial investment in renewable energy across:

- renewable electricity generation, capacity, and storage (such as grid-scale batteries)
- transmission and distribution infrastructure
- demand response and distributed energy resources
- more flexible generation
- new consumer services.

Some of these investments may have flow-on effects to consumers and will vary across regions.

Recent extreme weather events such as Cyclones Hale and Gabrielle have shown that some network infrastructure is not ready to withstand increasingly impactful weather, and that investment that improves grid resilience and energy security is prudent. In consultation, this was an area of particular concern and interest for local government.

Concern for wellbeing is a shared common heritage for many New Zealanders and underscores kaitiakitanga from within te ao Māori. The complexity of intergenerational wellbeing and energy hardship cannot be addressed through an individual policy measure or fuel-specific policies. Proactive and targeted measures as part of a comprehensive policy package could manage potential impacts during the transition to a low emissions society. Refer to *Chapter 9: An equitable transition* for additional discussion.

The energy system transformation may have some flow-on effects to consumers, but average household energy bills will reduce

The costs of network investment, where required to support electrification and new renewable generation, could result in higher costs passed through to consumers. However, delaying investment in network infrastructure may impede renewable generation build, in turn impacting the pace of electrification and directly and indirectly increasing emissions (see **Figure 13.2**).

As households and businesses increasingly shift towards lower emissions choices and fuels, and as buildings, vehicles, and equipment become more efficient, this will lead to lower average household energy bills.[48] New Zealanders' exposure to the cost of carbon on average will also reduce. Analysis shows that New Zealanders who can transition their households to all electric appliances and use an electric vehicle by 2026 stand to save thousands of dollars in the long term.[49]

However, some groups will need assistance to take advantage of these energy savings as the flow-on effects could be experienced inequitably by households across the motu. For example, households with Māori and Pacific people are between two and three times more likely than the general population to experience measures of energy hardship and may be at greater risk of not being able to transition early.[50]

Some households may have little visibility over what they are currently paying for emissions as part of their expenses. If they cannot reduce their consumption or purchase new, low emissions alternatives, they may have few opportunities to avoid rising costs. For example, the upfront cost of electric vehicles remains a barrier to uptake, particularly for lower income households. Continued use of internal combustion engine vehicles prolongs exposure to a rising carbon price and increasingly high petrol costs.

Through consultation on the draft version of this advice, we heard from iwi/Māori representatives that there is a strong desire for more action around sustainable energy, but that barriers are hindering progress. We heard from some that price is a barrier to more sustainable energy use (such as the uptake of electric vehicles), while others noted they were unsure of what leadership in this space might look like.

For households who cannot afford to transition early, the potential impacts could be greater, and it will be important for supportive policies to be put in place to help accelerate their shift. Complementary policies can increase the ability of consumers and businesses to shift their behaviour in response to prices and can address non-price barriers to adoption of lower emissions options. More information about targeted support for retrofitting existing fossil gas infrastructure is discussed in *Chapter 11: Built environment*. Additional discussion on potential household impacts and policy measures is in *Chapter 9: An equitable transition*.

The transition will vary across firms

Small businesses make up 97% of all firms in Aotearoa New Zealand and account for 29% of employment.[51] Many businesses are interested in taking action to reduce their emissions. Larger firms typically have more resources and capability to plan their response to regulatory requirements and are in a better financial position to seek external support.[52]

Smaller firms are more likely than larger firms to report that they lack the time, organisational resources, or technical know-how to identify and implement measures which might make them more resilient to the impacts of climate change.[53] Amongst high inflation rates and labour shortages, climate action may not be a high priority for some businesses.[54] They may also be less likely to have the capital available to invest in low emissions technology.

However, there are many existing opportunities to reduce emissions within the business community that can be shared through peer-to-peer networks. For example, the Climate Leaders Coalition is a CEO-led community leading the response to climate change through collective, transparent, and meaningful action. In the upper South Island, Mission Zero and Businesses for Climate Action help businesses understand their carbon emissions, coach them towards positive climate outcomes, and facilitate projects for the greater business community. The Energy Efficiency and Conservation Authority also provides co-funding and support for businesses; however, additional support for smaller firms may be needed.

Many benefits and opportunities can be realised during the energy system transformation

The transition will generate jobs and economic opportunities

The transition to a low emissions economy requires a robust workforce to undertake the technical and everyday actions needed to both reduce emissions and be resilient to a changing climate. As highlighted in consultation submissions, labour shortages and lack of skills and capabilities have been cited by the energy and industry sector as a barrier to faster action.

Measures to improve the efficiency of urban areas, buildings, industry, and transport systems are labour intensive, providing opportunities for new businesses, services, and jobs. For example, an increase in heat pump uptake will require technicians trained for installation and maintenance, but also in the correct handling, destruction, and substitution of high Global Warming Potential (GWP) refrigerants with lower GWP refrigerants.

Transpower estimates that thousands more highly skilled workers will be needed in the electricity sector by 2035 to meet increasing demand.[55] Part of this will be from increased demand as transport and process heat are electrified. As technology advances, the sector will increasingly need workers with skills in technological and digital innovation, automation, data science and artificial intelligence.[56]

Consultation submissions pointed to the need for the Government to have clear objectives around immigration policies, workforce development, and the education system to ensure Aotearoa New Zealand has the expertise required to reduce emissions in line with emissions budgets.

Community participation and local generation projects have a range of benefits

Community-scale renewable electricity generation projects can provide local and regional benefits, including energy resilience. Transparent and participative decision-making can enhance energy literacy and awareness, and social cohesion, and generate economic opportunities through reinvestment of profits into the community. [57]

It may also be possible for communities and iwi/Māori to invest in renewable generation projects to provide lower cost energy – for example, by establishing a community retailer that receives electricity from a local project via a power purchase agreement.

Through consultation, we heard suggestions from iwi/Māori representatives that solutions could involve storytelling to overcome local resistance and change mindsets, and that appropriate partnership and additional explicit support could better enable iwi and hapū to transition their energy generation and use.

Some Maui.Tech case study participants discussed their involvement in a range of energy initiatives, such as geothermal and bioenergy research and innovation, and shared their aspirations to build independent renewable energy supplies (for more on the Maui.Tech project, see *Chapter 2: What we heard*).[58]

Government support, such as the Māori and Public Housing Renewable Energy Fund by the Ministry of Business, Innovation and Employment, alongside regulatory measures to ensure equal access to network infrastructure and data, may be beneficial in enabling more community energy projects.

Energy efficiency improvements can save money and improve building comfort and safety

More than 130,000 households in Aotearoa New Zealand (or 7.6% of all households) cannot afford to keep their home adequately warm. More than 90,000 households also had a major problem with damp and/or mould, with renters more likely to experience dampness and mould than homeowners.[59]

Coupling heat pump installation with better insulation, improved weathertightness, and adequate ventilation will immediately reduce the amount of energy required to heat or cool a home to the same temperature.[60] Refer to *Chapter 11: Built environment* for additional discussion.

Reducing fossil fuel use can improve health outcomes

Switching to low emissions fuels such as electricity or biomass can result in improved indoor air quality, particularly for households that use portable LPG appliances or unflued gas heating appliances.

The use of fossil gas cooking appliances, especially without an exhaust hood or if not well maintained, can also contribute to lower indoor air quality. The combustion of fossil gas for cooking emits nitrogen dioxide, carbon monoxide and formaldehyde, all of which can exacerbate various respiratory symptoms and other health issues.[61] In the United States, switching to an electric stove reduced patients' need for asthma medication, which resulted in savings of USD $180 per year per person. Indoor air pollution from fossil gas cooking is estimated to cost the EU at least €3.5 billion per year in healthcare costs, lost earnings and productivity, and disability adjusted life years.[62]

Indoor air pollution from using fossil gas for heating or cooking can disproportionately impact people in lower income households, who may not be able to afford to properly maintain fossil gas appliances and are proportionately more likely to rent homes that use older fossil gas appliances.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[63]

te taiao
the world, Earth, the natural world, the environment

mana whenua
the mana and rights held by those with historic and territorial rights over land in a particular area, authority derived through whakapapa links to that area

mana moana
the mana and rights held by those with historic and territorial rights over the sea and lakes. According to Māori custom, land rights extended to adjacent sea or lakes with fixed boundaries for inshore and deep-sea fishing and the gathering of seafood

mauri
life principle, life force, vital essence - the essential quality and vitality of a being or entity. Can also be used for a physical object, individual, ecosystem, or social group in which this essence is located

kaitiaki
guard, custodian, guardian, caregiver, keeper, steward

takiwā
districts, regions, often interchangeable with *rohe*, can be a subsection of a *rohe*

rohe
regions, tribal districts, territories

mana motuhake
mana through self-government and self-determination, control over one's own destiny

kaitiakitanga
guardianship, stewardship, trusteeship

Mā whā: Chapter 14

Te wao me ētahi atu mātāwaro
Forests and other carbon stocks

Introduction

Forests, which remove and store carbon from the atmosphere, are critical to the pathway to achieving the net zero component of the 2050 target. The second emissions reduction plan is an opportunity for the Government to clarify the role of forests and other carbon stocks in achieving Aotearoa New Zealand's emissions reduction goals.

As forests take a long time to establish, grow, and begin having an impact on carbon in the atmosphere, clear policy direction is needed quickly. At the same time, the strong connection between forestry and Māori land ownership, and the relationship Māori have as tangata whenua to te taiao, emphasises the need for policy to be developed in a manner that honours Te Tiriti o Waitangi/The Treaty of Waitangi.

This advice builds on our analysis for the first emissions reduction plan (outlined in *Ināia tonu nei*), where we recommended a comprehensive national programme to establish more native forests.

The first emissions reduction plan identified actions that would contribute to this, including more accurate yield tables in the New Zealand Emissions Trading Scheme (NZ ETS) and research into the reduction of costs associated with native afforestation.

Our analysis shows that further policy direction is needed to clarify the role of forests – including the area and types of forestry – to achieve emissions budgets and the 2050 emissions reduction target.

This chapter highlights some of the particular challenges of using forests to remove carbon, including the costs of establishment, land availability issues and the risks of carbon release from events such as floods and fire. *Chapter 4: A path to net zero* presents the wider questions for Government about reliance on carbon removals compared to reduction of gross emissions, while *Chapter 5: Emissions pricing* presents options relating to settings around forestry in the NZ ETS.

Our analysis and recommendations also reflect what we heard in consultation on the draft version of this advice, including that forests offer multiple benefits and diverse ecosystem services. As it sets policy related to forests in the second emissions reduction plan, the Government has the opportunity to consider economic, social, and cultural outcomes alongside environmental outcomes like increasing biodiversity, water quality, and land-use diversity.

Our analysis here, in *Chapter 9: An equitable transition*, and in chapters focused on natural resource use (*Chapter 10: Agriculture* and *Chapter 12: Circular economy and bioeconomy*) shows that policy approaches based on consideration of cross-cutting issues can contribute to emissions reduction and climate change resilience.

Changes from the draft version of this chapter

For clarity, we updated the title of the chapter to better reflect its content. We restructured and revised the text to include additional information and to acknowledge some of the concerns and questions raised in consultation.

We amended Recommendation 21 to be more specific about moving Aotearoa New Zealand towards landscapes with durable carbon storage and other co-benefits.

Though submissions, we received feedback that our use of the term 'risk' in relation to forests was unclear and inconsistently applied. In response, we clarified that forests are an important source of carbon removal and storage, but also carry a risk of carbon release due to human activities or events such as floods or fire. We also added a new section on the challenges of using forests as a carbon removal strategy, including difficulties relating to the cost of establishing native trees and competition for land, which is expected to increase as extreme weather events become more common.

We added a new section on the multiple benefits forests provide, and how some practices, including clear-fell harvesting, can reduce these benefits and result in negative outcomes.

We also included discussion of the Government's recently announced Carbon Removal Strategy and its potential impact on how carbon removal activities will be recognised and rewarded. This is supported by explanations of the two key characteristics about carbon removal for the purpose of reducing emissions (permanence and additionality) and the factors that affect the contribution forests make to carbon removal and storage (carbon sequestration rates, carbon density, and carbon storage durability).

Context: Forests' contribution to carbon removals

The first section of this chapter sets out core concepts underlying the role forests have in carbon removal, and as part of wider ecological systems. This includes a short summary of the area, types, and history of forestry in Aotearoa New Zealand. This sets the basis for discussion of the Government's choices for policy setting around forestry and other carbon stocks in the second emissions reduction plan.

Characteristics of carbon removal

Two key characteristics about carbon removal for the purpose of mitigating climate change are permanence and additionality.

- *Permanence* indicates how long carbon is expected to be stored; it is also referred to as durability of carbon removal. Carbon capture through land and coastal vegetation, soils, and sediment has storage timescales of decades to centuries. Processes involving marine sediments have timelines of centuries to millennia, and engineering processes involving geological formations and minerals even longer.
- *Additionality* is the concept that an activity only contributes to carbon removal if it is extra to the status quo or business as usual. This is the reason for the setting of baseline years for carbon storage in forests in Aotearoa New Zealand at the 1989/1990 boundary (**Box 10.1**), see also *Chapter 5: Emissions pricing*.

Several factors affect the contribution forests make to carbon removal and storage:

- *carbon sequestration rate* – the amount of carbon accumulated in an area during a specified time, influenced by the growth rate of trees
- *carbon density* – the amount of carbon stored per unit area, dependent on the forest's characteristics such as the species composition and its structure
- *carbon storage durability* – the timescale of the carbon store, depending on land use and management (for example a temporary production forest on a short rotation compared with a continuous canopy cover with selective harvesting or a permanent forest without extraction of timber or forest products).

Forests provide many co-benefits

Carbon sequestration is one of many ecosystem services that forests provide. These environmental, cultural, social, and economic benefits can broadly be classed into four categories: supporting, regulating, provisioning, and cultural. As well as storing carbon, forests also provide the supporting service of habitat to other species, while their regulating services include functions like water quality, air quality, and land stabilisation.

Production forests also provide many of those wider ecosystem services, in addition to the provisioning service of timber production. However, some management practices of production forestry, for example clear-fell harvesting, can reduce these benefits and result in negative outcomes.

Forest area, make-up and use

Currently, 38% of Aotearoa New Zealand's land area – a total of 10.1 million hectares – is forested, of which 8 million hectares are native (or indigenous) forest, 1.7 million hectares are planted production forest, and 0.4 million hectares comprise reserves and areas near water bodies and infrastructure.[1]

Forests are commonly described as 'native' or 'exotic', based on their species composition. Another important distinction is whether they remain intact as long-lived, 'permanent' forests or are intended for harvest as production forests. Exotic does not necessarily mean the forest is managed for production, and native doesn't necessarily equate to permanent forest (**Box 14.1**).

Prior to human settlement, forest ecosystems covered more than 85% of Aotearoa New Zealand's land area.[2] Only a third of that native forest remains, much of which is now considered 'permanent' and is protected and managed by the Department of Conservation, local and regional governments, and private entities.[3] Smaller remnant forests are found throughout the country on both public and private lands under various management regimes, ranging from conservation easement to commercial harvesting.[4]

Aotearoa New Zealand's forests have been used and cleared since humans first arrived.[5] The industry that developed in the nineteenth century after European settlement originally focused on native trees for high-quality hardwood timber and forest products. Following major indigenous forest clearance, the industry shifted to planting faster growing exotic species in production forests, beginning with Government-funded trials in the 1890s.[6]

Currently, 90% of commercial production forests are planted in *Pinus radiata* (Monterey or radiata pine).[7] Commercial production forests are largely managed as monocrops and clear-fell harvested on rotation lengths optimised for economic return – pine, for example, is usually harvested after 26-28 years.

Forestry exports are worth approximately $6.6 billion per year and the sector contributes 1.6% to GDP,[8] ranking forestry as the third-largest goods export behind dairy and meat products. The forestry sector provides between 35,000 to 40,000 jobs,[9] with many other employment opportunities across the wider supply chain.[10]

Evolving practices within the forestry sector include increasing interest in native forest afforestation and regeneration for both conservation and production purposes, and in diversifying landscapes, where small areas of forest are interspersed with other land uses like farms to create mosaic landscapes or practise agroforestry.[11] The industry is also exploring new species, management systems, and harvesting regimes.[12]

Box 14.1: New Zealand forest types are differentiated by species composition, land use, and management[13]

Native forests

Native forests are made up of predominantly indigenous species. They are typically multi-age, multi-species forests that, once established, remove carbon dioxide for centuries. Harvesting is generally prohibited in existing, publicly owned native forests. High-value native trees can be selectively harvested on private land.

Native forests can be established through planting seedlings or reversion (setting up the conditions for land to revert through activities like pest control and fencing). Enrichment planting of additional plants within these existing forests can increase their carbon stock.

Exotic forests

Exotic forests are made up of tree species that are not native to Aotearoa New Zealand. Most exotic forests are conifers, mainly *Pinus radiata*. Other species planted include Douglas fir, redwoods, eucalyptus, oaks, and acacia. Most exotic forests are planted as monocultures, though some self-seed. Conifers self-seeded in undesirable locations are commonly known as wilding pines.

Production forests

Production forests are planted to be harvested. They are generally exotic trees planted as a single species that are, in current practice, usually clear-felled after the trees have reached a desired age.

Permanent forests

Permanent forests include both old-growth forests and newly established ones (either through planting or regeneration) with no intention of clear-fell harvest.

Permanent forests can have different management regimes. Many have no direct human use or are managed for non-extractive uses such as recreation. Some permanent forests are established with the intention of selective harvest of timber or for forest products.

A forest can be registered in the NZ ETS as permanent if it meets certain conditions, such as maintaining canopy cover.

Pre-1990 and post-1989 forests

For accounting and policy purposes, a distinction is made between forests established prior to 1990 (pre-1990 forests) and forests established after 1989 (post-1989 forests).

Iwi/Māori relationship with whenua, forests, and forestry

As tangata whenua, iwi/Māori have cultural and spiritual connections to te taiao and hold an important role in Aotearoa New Zealand's forestry sector.

There is also a strong connection between forestry and Māori land ownership. **Figure 14.1** shows a large proportion of Māori land (as defined for that study) is under native or exotic forestry cover.

Many Māori landowners and other Māori entities participate in the forestry sector as forest owners, forest workers, and kaitiaki. The Māori forestry asset base has been estimated to make up 48% of production forest land,[14] with an estimated value of $4.3 billion (as of 2018).[15] Much of the land that has been returned through Te Tiriti/The Treaty settlements is already established in production forests or has characteristics, such as being steep, landlocked, or erosion-prone, better suited to forests than other uses.

Often, land held by Māori is managed by either the Crown or private forestry companies, which are typically subject to long-term agreements – sometimes up to 99 years or a defined number of rotations. As these agreements end, many Māori landowners are taking on management responsibilities for their forests, meaning they can make more decisions on their own whenua – including whether it is commercially viable to plant permanent forests.

Different policy settings – such as those under Te Ture Whenua Māori Act – have an impact on what Māori landowners can do with their land, which in turn may have wider implications under Te Tiriti/The Treaty. It is necessary to consider the specific effects such policies have on iwi/Māori in relation to forests, in light of Te Tiriti/The Treaty principles and the unique cultural, economic, social, and environmental considerations of tangata whenua.

Policies and objectives need to be co-designed so that the diversity of iwi/Māori rights and interests is understood and recognised appropriately, including the complexity of historical grievances among rohe.

Through Maui.Tech case study participants, we heard about the importance of collective action to:

- protect forest health and taonga species
- cleanse the atmosphere through healthy forestry
- diversify wood products
- manage erosion risks and reduce sediment flow into rivers resulting from deforestation, including through increasing indigenous forestry.[16]

Some Maui.Tech participants have expressed an interest in transitioning existing pine forests to native forests.[17] In addition to income from forestry operations, forests provide sources of food, rongoā, and building materials.

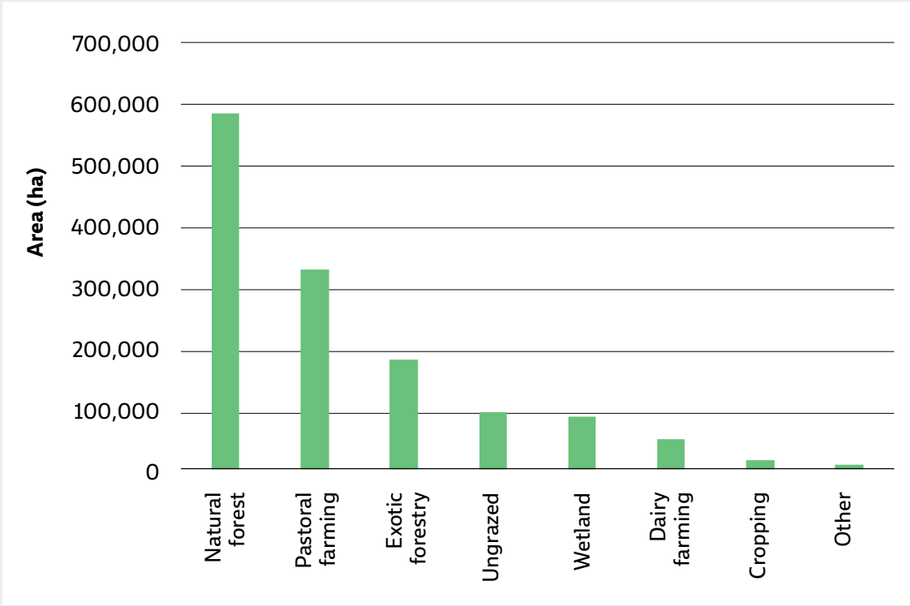

Figure 14.1 Land uses on Māori land

(Source: Maori Land Spatial dataset, LUCAS dataset, Commission analysis).

Note:
This figure looks at Māori land that falls within the Māori Land Spatial Dataset created by the Ministry of Justice and Ministry for Primary Industries on behalf of the Māori Land Court.

Forests play a significant part in reducing emissions

Forests are important for meeting the net zero component of the 2050 target, as they contribute significantly to the removal and storage of carbon dioxide (see *Chapter 4: A path to net zero*).

The second emissions reduction plan presents a critical opportunity for the Government to clarify the role of forests – including the amount and type of forestry – in achieving emissions budgets and the 2050 target, in a manner that complements prioritising gross emissions reduction.

While any plantings during the 2026–2030 period will not significantly contribute to the second emissions budget, they will be important for achieving future emissions budgets and the 2050 target.

This section sets out annual afforestation as updated in our 2022 advice, and then addresses challenges for use of forestry for carbon storage.

The effects of policy settings around forestry for emissions reduction are explored in depth in *Chapter 5: Emissions pricing*, while *Chapter 4: A path to net zero* presents the wider questions for Government about reliance on carbon removals compared to reduction of gross emissions.

Relative growth in native and exotic forest cover

How forests can contribute to meeting emissions budgets and targets needs to take into account species composition, land use and management (**Box 14.1**). In Aotearoa New Zealand, exotic species such as *Pinus radiata* generally establish faster than indigenous ones, especially in early years, meaning they absorb and store more carbon from the atmosphere earlier after planting.

Native trees, however, store carbon over a longer time period, growing larger over a longer lifespan. Pine production forests are considered to reach their long-term average carbon storage level at around 16 years, although they can store more carbon over a longer time period if not harvested. Native forests can continue to store carbon for hundreds of years, providing the opportunity to create longer-term carbon sinks.[18] Permanent forests also tend to be more complex and diverse than production forests, which leads to higher carbon density.

In our July 2022 advice to the Government on the settings for the NZ ETS, we updated the demonstration path set out in *Ināia tonu nei*. Changes included incorporating updated data from the national 2022 Greenhouse Gas Inventory and new afforestation projections from the Ministry for Primary Industries[19] (see **Box 3.1** in *Chapter 3: The task for the second emissions budget*).

In the updated demonstration path (**Figure 14.2**), total exotic afforestation over the period 2021–2035 increased from 380,000 ha to 500,000 ha. On the other hand, total native afforestation decreased in the updated demonstration path from 300,000 ha to 280,000 ha for the same period. The updated demonstration path still assumes that native afforestation rates reach 25,000 ha per year by 2030.

The lower overall figure reflects that native afforestation rates over the past three years were lower than expected in the original demonstration path, with a more rapid increase in afforestation through to 2030. We heard through submissions that this is an ambitious aim compared to current planting rates of native trees.

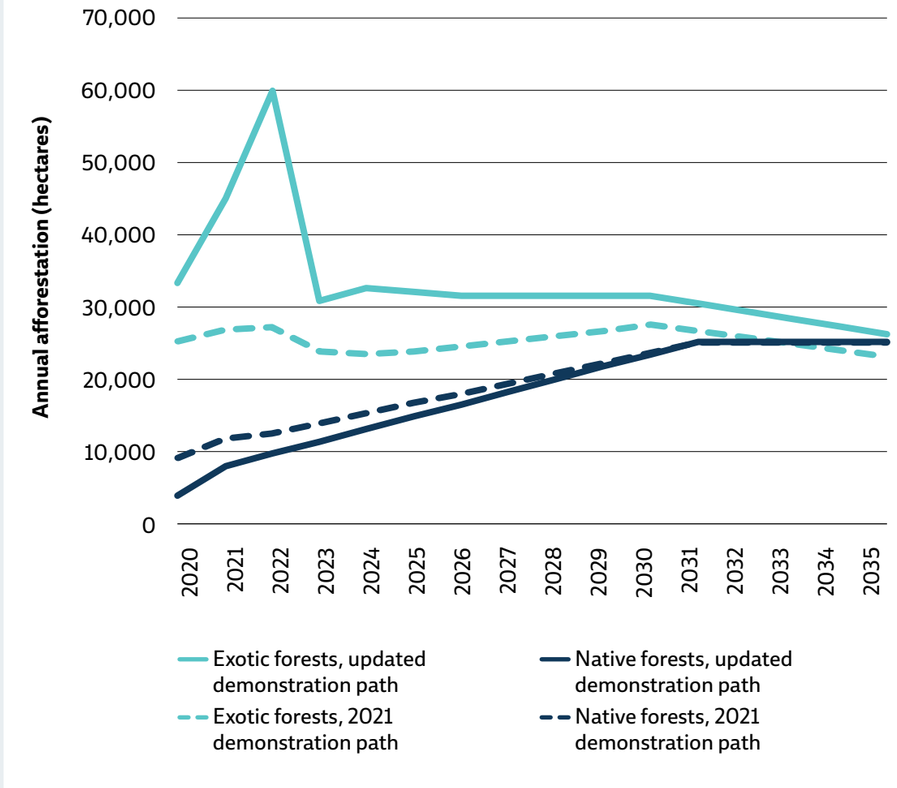

Figure 14.2: Updates to the demonstration path for forests
Source: Commission analysis

Challenges of using forests as a carbon removal strategy

Issues around permanence

While forests store carbon as they grow, they do not do so permanently: carbon will be released as dead trees decompose or after wood products produced from them reach end of life. Under the accounting approach used for forests in Aotearoa New Zealand's emissions reduction targets, carbon storage by a production forest is counted to its long-term average carbon stock (the average amount of carbon stored per hectare estimated over multiple growth and harvest cycles).

Carbon storage in forests does not occur in an increasing linear manner; it depends on life history, forest health, and survival, all of which will be affected by the ongoing impacts of climate change. Although forests are important and durable carbon stores (on a timescale of decades to centuries), they also carry a risk of carbon release due to environmental conditions, natural disturbance, or human activities.

Changing environmental conditions (such as temperature and precipitation regimes) could alter tree growth rates and survival. This may already be occurring – recent scientific studies are finding that carbon uptake in intact tropical forests may have peaked in the 1990s, and measurements in some forests around the world indicate they are releasing more carbon than they are storing.[20]

Natural and human-caused disturbances such as storms, fire, pests, and pathogens can damage forests and lead to decreases in and/or releases of stored carbon.[21] Pests in New Zealand pose a threat to existing native forests, potentially leading to the release of the carbon they store, the loss of their biodiversity, and other ecosystem services.[22] Cyclone Gabrielle felled large tracts of forests across the North Island in early 2023, leading to a loss of carbon, at least in the short term. Decisions about land use and management will determine the durability of carbon stored in these areas. These examples highlight that if large sections of forest land are disturbed and the forest is not (or cannot be) replaced, carbon dioxide will be returned to the atmosphere over the long term.

Issues around forest establishment

In *Ināia tonu nei* we recommended a comprehensive national programme to establish more native forests. Native trees can be expensive and difficult to establish due to factors such as the cost and availability of seedlings and planting rates. These costs and the slow rates of carbon sequestration in early years associated with native forests mean that they lack a clear financial return (although many comprise high quality hardwoods). Whereas some native and exotic species are hardy and relatively easy to establish, other species are more susceptible to pests and diseases and so harder to establish.

Native forests can establish through natural regeneration, but without financial incentives and guidance this will remain limited and small-scale. Through submissions, we heard interest in a range of incentives (not necessarily only through the NZ ETS) and requests for comprehensive policy and mechanisms to facilitate increased native afforestation, reforestation, and regeneration.

Competition for land

Creating more forests to remove more carbon dioxide from the atmosphere requires land being used for other purposes to be converted to forestry. Reliance on carbon removals from forests to meet emission budgets and the net zero component of the 2050 target creates the need for ongoing land conversion. This reduces flexibility in land-use choice and shifts the burden of reducing gross emissions to future generations.

Debate over land-use change and land availability already exist. The Commission heard concerns about sheep and beef farmland conversions to permanent forestry and the potential for wider impacts on communities in rural areas. Land-use change to forestry may change the employment profile in many rural communities. These issues are discussed further in *Chapter 9: An equitable transition* and *Chapter 10: Agriculture*.

As extreme weather events become more common, issues related to appropriate land use are expected to increase. There are examples of forestry debris clogging waterways and damaging or destroying infrastructure, such as in Tairāwhiti following Cyclone Gabrielle.

Government and industry response to such crises will result in changed land-use patterns and practices.[23] Land exposed to erosion and run-off is generally not suitable for harvesting, and as a result permanent exotic forests have been established in these areas. Any limits on new plantings may have Te Tiriti/The Treaty implications around tangata whenua exercising rangatiratanga over their whenua, especially as a large amount of Māori collectively held land is landlocked and lacks viable commercial production options.

Clarity is needed around the role of forests in emissions reduction

Government decisions and communication about forestry's role in emissions reduction relate to overall questions about emphasis on reducing gross emissions compared to carbon removals, and to the settings for policy tools such as the New Zealand Emissions Trading Scheme (NZ ETS).

Policy decisions about forestry also have significant effect for wider considerations about a fair, inclusive and equitable transition to a low emissions economy, and for adaptation to the direct impacts of climate change (see *Chapter 9: An equitable transition*).

As it sets policy related to forests in the second emissions reduction plan, the Government has the opportunity to consider economic, social, and cultural outcomes alongside environmental outcomes like increasing biodiversity, water quality, and land-use diversity.

To give certainty over the outcomes being sought and to guide the design of climate change policies relating to forests, it is essential that there is a clear direction on:

- the quantity of removals committed to in the second and third emissions budgets
- expected planting rates over the second and third emissions budget periods
- the types of forests to be used in different contexts and for different purposes
- the role of forests in the transition to a low emissions economy.

Setting objectives for the role of forests will help clarify what types of forests to plant where, ensuring the right trees are planted in the right place for the right purpose. For example, native planting is more likely to uphold the principles of Te Taiao and Tiakitanga under the framework He Ara Waiora.[24] In general, there are meaningful co-benefits to the regeneration and planting of native forests, including enhancing native biodiversity and improved social and cultural outcomes.

Once the objectives are clearly articulated, broader policies can be introduced that support outcomes for the comprehensive suite of ecosystem services that forests provide, including carbon storage, freshwater, soil retention, land stability, biodiversity, and cultural values. This could include biodiversity credits or grants that make native forestry more financially appealing.

Carbon Removals Strategy

The Government announced the development of a Carbon Removals Strategy in July 2023. This is intended to be included in the second emissions reduction plan. The strategy will consider how a broader portfolio of carbon dioxide removal activities can be used to meet emissions budgets and the Nationally Determined Contribution under the Paris Agreement[25] (see also *Chapter 5: Emissions pricing*).

The second emissions budget period is an important time to conduct analyses on the mechanics and potential of a portfolio of carbon removals for Aotearoa New Zealand.[26]

Beyond policy considerations, carbon dioxide removal activities are important for the contribution they make to climate change mitigation. Internationally, removing carbon, rather than offsetting or avoiding carbon, is considered essential for reducing global carbon emissions to net zero and limiting global temperature increase to the 1.5°C threshold,[27] in parallel to (not as a substitute for) gross emissions reductions.

We have considered the potential impact of the strategy on how carbon removal activities will be recognised and rewarded.

Carbon dioxide removal activities can be categorised in how they capture carbon (biological or engineered) or where they store carbon (ecological carbon storage, conversion to long-lived products, and geological carbon storage).[28] This could help inform the role of New Zealand's forests: native, permanent forests are a type of ecological carbon storage and planted, exotic production forest ultimately store carbon through conversion to long-lived products.

Our advice is it will be important to consider the principles of additionality and permanence (durability) and to include them as criteria for any recognised removal activities, along with other key characteristics including removal capacity, measurability, cost, and acceptability.

In *Ināia tonu nei*, the Commission provided advice about investigating the options for a wider portfolio of carbon dioxide removal activities. This will require robust project assessment based on evidence of quality and durability of carbon capture and storage. Monitoring and evaluation needs to be planned and funded at project initiation for both proof-of-concept pilot projects and ongoing long-term carbon dioxide removal activities.

Consideration of how a carbon removals strategy will support an equitable transition is also important, and its integration with other policies aimed at achieving environmental, social, cultural, and economic outcomes.

Recommendation

This recommendation seeks to clarify the roles of forests in Aotearoa New Zealand's efforts to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 21

We recommend that in its second emissions reduction plan, the Government:

21. Clarify the intended roles of different types of forests in achieving emissions budgets and targets. The effects of different types of forests on ecosystem services, socioeconomic factors, rural communities, and resilience to hazards and climate change must be considered in partnership with iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

Māori landowners
refers to the collective ownership of Māori land (as regulated by Te Ture Whenua Māori Act 1993) and other Māori land entities which serve similar purposes – see our advice about Māori land in *Ināia tonu nei*[29]

te taiao
the world, Earth, the natural world, the environment

tangata whenua
local people, indigenous people – people born of the whenua, of the placenta and of the land where the people's ancestors have lived and where their placenta are buried

kaitiaki
guard, custodian, guardian, caregiver, keeper, steward

taonga species
treasured species, often refers to species that were present in Aotearoa New Zealand prior to the first European contact with Māori in 1642

rongoā
remedy, medicine, often native plant-based

rangatiratanga
right to exercise authority and autonomy, self-determination, self-management

whenua
land

Te paewaka
Transport

Introduction

There are key choices about transport facing the Government as it sets the second emissions reduction plan. Transport emissions, which made up 18% of Aotearoa New Zealand's gross greenhouse gas emissions in 2021,[1] need to reduce rapidly and on a steepening trajectory to achieve the 2050 target.

The transport system connects individuals, whānau, and communities to one another and to places where they learn, work, live, and play. It delivers essential goods and services around the country.

However, the transport system is also a major source of greenhouse gas emissions. More than 90% of those emissions come from road transport. Nearly 70% of road emissions come from light vehicles (those under 3.5 gross tonnes) and about 30% come from heavy vehicles (those over 3.5 gross tonnes). The remaining transport emissions are from domestic aviation (6%), shipping (1.5%) and rail (less than 1%).[2]

The advice in this chapter builds on our analysis for the first emissions reduction plan (outlined in *Ināia tonu nei*). It presents the Government's options to drive the change needed to achieve its budgeted emissions reductions in the transport system – from an annual average of 16.5 $MtCO_2e$ in the first emissions budget to an annual average of 11.4 $MtCO_2e$ in the third emissions budget (for 2031–2035) – including a reduction of 7–8 $MtCO_2e$ between 2026 and 2030.[3]

Our analysis, supported by internationally recognised approaches, shows that emissions can be reduced by avoiding, shifting, and improving transport use. This includes finding ways to reduce unnecessary travel while maintaining or improving accessibility, shifting to low emissions transport modes, and improving the emissions efficiency of the transport fleet. For example, reducing trip distances and changing short trips to active transport (walking and cycling) can help achieve the Government's target of reducing Vehicle Kilometres Travelled (VKT) in the light vehicle fleet by 20%, relative to the baseline projection, by 2035.[4]

The need for decisive Government action is immediate, due to the time it takes to consent and build low carbon infrastructure and the pace at which low emissions technologies can replace high emissions technologies. The potential impacts of transport policy change on people and communities also need to be given due time and consideration, including through partnership under Te Tiriti o Waitangi/The Treaty of Waitangi.

Changes from the draft version of this chapter

Some respondents requested greater detail and specificity in our proposed recommendations, and for them to be expanded to include both incentives and regulation to drive change. However, our role is to provide advice on the direction of policy, rather than to give detailed policy recommendations. The main body of our advice discusses incentives and regulations extensively, including a section on the need for these measures to decarbonise freight, commercial, and offroad vehicles.

Some submissions raised potential equity concerns related to our recommendation about accelerating the uptake of zero emissions commercial vehicles. Our analysis, which included evaluating the evidence and applying our prioritisation and policy frameworks, has led us to keep the recommendation. Our advice emphasises the significant benefits of increasing walking, cycling, and public transport. Recommendations 23 and 24 are focused on enhancing public and active transport options for the public.

In light of evidence and insights provided by submissions, we re-evaluated Recommendations 23 and 24 against our policy and prioritisation framework and as a result, made several revisions. The changes are intended to provide more clarity, address feedback related to funding, and examine whether cycle and rapid transport network deadlines are achievable. We also evaluated the proposed recommendations to ensure they are appropriately outcomes focused.

Recommendation 25 was amended for clarity, and Recommendation 26 was revised to include 'off-road vehicles', as our analysis found they that although they offer opportunities for emissions reduction, they are not currently being given adequate focus by the Government.

We also added and revised chapter content in response to issues raised in consultation. The chapter now discusses more clearly the mental and physical health benefits of changing how people travel, the opportunities of inter-regional passenger rail, the additional regulatory measures required to increase zero emissions vehicle uptake, and the focus needed now to prepare for the aviation sector to decarbonise in future.

The benefits of decarbonising transport

Iwi/Māori

Iwi/Māori representatives shared feedback regarding the importance of maintaining accessible transportation options across a range of settings with particular significance under tikanga. For example, within the natural environment, this includes facilitating accessible transportation options to spaces such as ancestral maunga, awa, roto, ngahere, māra, moana, and wāhi tapu. Within the built environment, this includes spaces such as papakāinga, marae, urupā, and wāhi tapu. Such spaces hold special meaning within concepts of identity and maintaining wellbeing.[5] The transport system provides a means to reach these important places, but often offers limited options for doing so by low emissions means.[6,7]

Historic and systemic socio-economic inequities can also restrict the ability to transition to lower transport emissions. This reduces access to high-value assets such as electric vehicles, while disproportionate obligations may limit options for walking, cycling, and public transport. This, combined with ownership of lower safety rated, often older vehicles, contributes to the higher rates of deaths, serious injuries, and accidents among Māori.[8]

These negative impacts underline that the transport system in Aotearoa New Zealand must be decarbonised in a manner consistent with the Crown's obligations under Te Tiriti/The Treaty.

Improving health, wellbeing, and equity

Social equity needs to be a central consideration when developing action to decarbonise transport. Transport inequity exists within the current system due to two main reasons:

- transport disadvantage resulting from a lack of options
- transport poverty resulting from people paying more for transport than what they can reasonably afford.[9]

While there are different pathways to decarbonise transport, prioritising those that alleviate transport inequities will build stronger communities and better meet the needs of current and future New Zealanders.

For example, emissions can be reduced by ensuring there are more transport options for all New Zealanders, and by centring the needs of people with disabilities, the young, and the elderly so that they can travel safely and affordably.[10] Making changes to urban form and safely opening streets to increase instances of walking, cycling, and public transport use are effective ways to lower emissions and enhance wellbeing and equity.[11]

Decarbonising transport can realise significant health and wellbeing co-benefits at all levels of the 'Avoid, Shift, Improve' hierarchy.

- Changes to urban form that reduce vehicle kilometres travelled will reduce harm and road deaths. Motor vehicle deaths are also one of the leading causes of premature mortality in Aotearoa New Zealand, especially for Māori.[12, 13]
- Changes that improve walking, cycling, and public transport contribute to a healthier population.[14, 15, 16]
- Changes that replace fossil-fuelled vehicles with low carbon alternatives will significantly improve air quality.

While there are some challenges in quantifying these health co-benefits, the latest Health and Air Pollution in New Zealand study found that air pollution in New Zealand contributed to approximately 3,300 premature deaths per year and social costs of $15.6 billion per year,[17] as illustrated in **Figure 15.1**. This is primarily attributed to ICE vehicles.

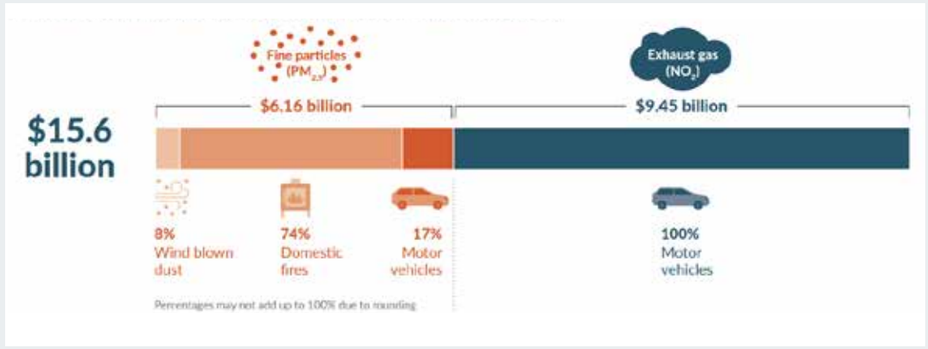

Figure 15.1: Social costs of health impacts from human-made air pollution
Source: Health and Air Pollution in New Zealand 2016 (HAPINZ 3.0): Findings and Implications[18]

Changing when, why, and how transport is used

Achieving this scale of decarbonisation requires pursuing many opportunities in parallel. As in *Ināia tonu nei*, our approach to considering options to decarbonise transport has been informed by the internationally recognised 'Avoid, Shift, Improve' hierarchy.[19] This hierarchy prioritises actions with the greatest cumulative impact and which maximise co-benefits.

- **Avoid** measures reduce the need to travel and the time and distance travelled while improving or maintaining accessibility through, for example, changes to urban form[20,21]
- **Shift** measures change how people move, enabling greater use of public transport, cycling, and walking
- **Improve** measure increase the emissions efficiency of transport, for example through electrifying vehicles to eliminate tailpipe emissions.

Increasing walking, cycling, and public transport

Transport infrastructure supporting safe walking, cycling, and public transport would provide New Zealanders with low emissions options to connect

Walking, cycling, and public transport can provide zero or low emissions forms of transport and contribute to reducing emissions. International evidence indicates that when comparing cities with and without walking, cycling, and public transport networks, those with such networks can reduce emissions and pollution substantially.[22] These reductions are enhanced when paired with changes to urban form, as we discuss in *Chapter 11: Built environment*.

International research from the Institute for Transport and Development Policy has shown that biking networks and smart public transport upgrades yield high rates of decarbonisation on a per-dollar-expended basis, by supporting a shift to these lower emissions modes (as illustrated in **Figure 15.2)**. This is compared to highway spend that induces demand for private vehicle use and creates higher emissions.[23] Providing more options for New Zealanders increases the opportunities to for co-benefits to health, economies, and wellbeing.[24]

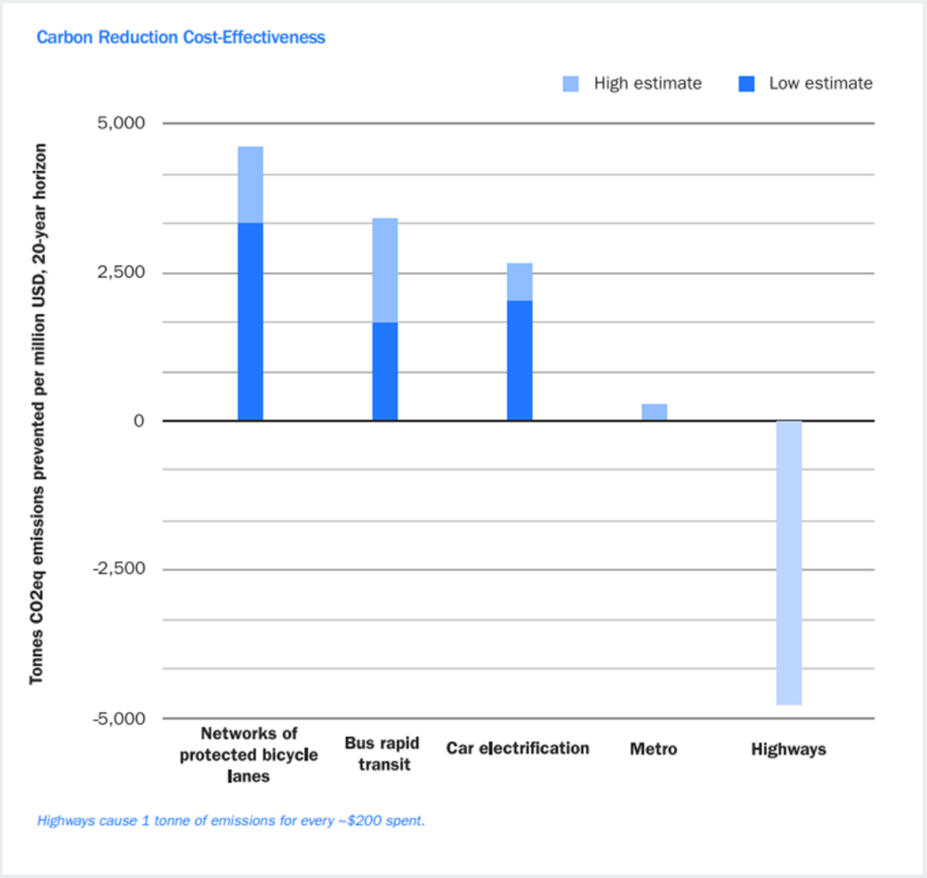

Figure 15.2: Carbon reduction efficiency per dollar spent (USD)
Source: Institute for Transport and Development Policy[25]

Currently, active and public transport levels are low in Aotearoa New Zealand. In the most recent household transport survey, from 2019 to 2022, only 5% of person-kilometres-travelled (PKT) were by active or public transport.[26]

Although categorisation differs slightly around the world, this level lags behind many countries including those in the European Union, which for 2019 reported 17.6% of its PKT occurring on non-car modes, Ireland, which has reported 18.2%, and the United Kingdom, with 12.6%. [27]

In our demonstration path, the percentage of PKT by active or public transport grows to 11% by the end of the second emissions budget. The growth in these activities directly reduces emissions and contributes towards meeting the second and third emissions budgets.

Transport is impacted by emissions pricing from the New Zealand Emissions Trading Scheme (NZ ETS), but this is insufficient on its own to substantially grow rates of walking, cycling, and public transport.

The impact at current NZ ETS prices is relatively low compared to other impacts on the price of liquid fuels. In 2022, consumers paid an extra 21 cents per litre of petrol (including GST) because of the NZ ETS.[28] The price signal is also currently insufficient to overcome safety and convenience-related barriers to using low emissions transport.[29,30]

For walking, cycling, and public transport to make a substantial contribution to reducing emissions, these barriers need to be overcome through safe and dedicated infrastructure. This will require changes to the funding and planning system.

Transport infrastructure has been underfunded, especially that which supports safe walking, cycling, and public transport

Aotearoa New Zealand's transport infrastructure has been chronically underfunded. This message was reiterated through consultation submissions, through which we heard that transport infrastructure and services need significantly more funding to achieve decarbonisation.

Te Waihanga Infrastructure Commission estimates the current day infrastructure deficit to be approximately $100 billion across all types of infrastructure (that is, not just transport), and $100 billion in the future.[31]

In addition, transport funding has generally privileged high emissions vehicle infrastructure. In recent National Land Transport Programme allocations, capital expenditure has been significantly weighted away from public and active transport.[32] With limited other options, Aotearoa New Zealand has one of the highest car ownership rates in the world on a per capita basis, embedding a high emissions transport system.[33]

Delivering a low emissions transport system in Aotearoa New Zealand will require significant investment to overcome the existing infrastructure deficit, and a reorientation of this funding to prioritise infrastructure that enables low emissions forms of transport. This combination of solutions would provide New Zealanders with more low emissions choices.

Local governments are responsible for a large portion of the funding for transport infrastructure and make many of the funding decisions that shape cities. Ensuring adequate funding to achieve needed emissions reductions will require stronger coordination between central, regional, and city/district entities.

In our consultation on the draft version of this advice, we heard from local government councils that as well as appropriate resourcing, they require greater clarity on their role in delivering low emissions transport.

Simplifying the planning and increasing investment in integrated transport networks is needed to deliver transport infrastructure at the pace required

Meeting the target to reduce VKT by 20% relative to the projected baseline by 2035 will require a significant decrease in VKT per capita compared to the last two decades, and therefore will need dedicated investment in infrastructure to deliver rapid change.

The current planning and consenting processes, however, contain significant complexities, and major projects are funded inconsistently between central and local government. Both contexts create additional barriers to delivering transport infrastructure at the pace required.

Public investment in transport infrastructure can be supplemented by leveraging private funding. As discussed in *Chapter 6: Investment and finance*, these barriers to mobilising public and private investments will need to be addressed at a systems level.

Pressure is building on the consenting system, with demand projected to increase 40% by 2050.[34] That increase, combined with compounding delays in the consenting system, threatens 29–34% of the emissions reductions required to meet targets across the energy and transport sectors.[35]

The planning and funding system for transport is slow and fragmented, carried out one project at a time instead of at a network level. This is changing in Auckland,[36] and delivering the same change to each of our largest city centres will be essential.

As *Let's Get Wellington Moving*, which originated in 2016, and *Auckland Light Rail*, which originated in 2018 – both of which are yet to commence building public transit – show, the process to deliver infrastructure takes too long.

Creating a consistent approach to how major projects are funded would give greater certainty to local government in developing projects in their areas. Simplifying the planning process to optimise public and active transport would enable these projects to be consented faster, and consequently, begin development earlier.

Infrastructure for walking, cycling, and public transport can be delivered faster than changes in urban form.[37] Given the pace at which transport needs to decarbonise, the balance of investment directed at achieving different outcomes is important to consider.[38]

Some of these planning and investment barriers may become addressed through the Natural and Built Environment Act (NBA). However, as stated in our submission on this Bill, transitional measures will need to be put in place to support local government to take proactive climate mitigation and adaptation steps prior to the NBA being implemented.

These transitional measures could include clear direction on what existing levers and tools local government should use to avoid further development in areas at risk from climate change, or development that locks in high emissions.[39]

The greatest opportunities to reduce emissions by increasing uptake of walking, cycling, and public transport are in major population centres. Auckland, Wellington, and Christchurch account for over a third of the national light vehicle VKT. This increases to 65% of national light vehicle VKT when all the Tier 1 areas are included (see **Box 15.1**).[40] An additional 13% of VKT are in Tier 2 cities and the remainder are in Tier 3 or rural areas.[41]

Focusing safe infrastructure for walking, cycling, and public transport in major population areas is therefore critical to reducing transport emissions.

Box 15.1 What do we mean by 'major population centres'?

In Aotearoa New Zealand, major population centres are defined in several different ways across regulations and policy frameworks.

For this advice, we consider 'major population centres' to be the Tier 1 urban environments as defined in the *National Policy Statement on Urban Development 2020*, which also specifies the corresponding Tier 1 local authorities. These are Auckland, Christchurch, Wellington, Tauranga, and Hamilton.

Aligning the focus of transport infrastructure with urban form will allow for greater synergies and emissions reductions.

Recommendations

These recommendations seek to address the transport infrastructure challenges described above and to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 22

We recommend that in its second emissions reduction plan, the Government:

22. Simplify planning and and increase investment in integrated transport infrastructure and services that optimise public and active transport.

Recommendation 23

We recommend that in its second emissions reduction plan, the Government:

23. Provide dedicated long-term funding for the construction of integrated cycle and rapid transport networks in major population centres.

Inter-regional passenger rail can create low emissions choices to connect major urban centres and, especially when integrated with new urban development, contribute to reduced transport emissions

Aotearoa New Zealand has very limited options for low emissions travel between major urban centres, and the smaller towns in between. Through consultation, we heard enthusiasm for the opportunity to restore existing rail lines to reintroduce passenger services, providing New Zealanders with low emissions options. This is especially relevant between major centres in the upper North Island (Auckland, Hamilton, and Tauranga).

These three regions collectively account for 50% of New Zealand's population and are expected to be the major population growth areas.[42] The Auckland-Hamilton commuter line *Te Huia* is the pilot example of this intervention. Despite COVID-19 disruptions, *Te Huia* has carried over 100,000 passengers over the last two years.[43] The full potential of such inter-regional passenger rail to displace longer trips in private vehicles, however, will only be realised with dedicated, long-term funding. This will enable new developments and densification around transit corridors.[44]

Policies to reintroduce regular passenger rail between these three cities will begin the process of developing this network. Ongoing support for infrastructure development, rolling stock, and driver training will be needed.

Shared and enhanced transport modes are transformative investments which should be funded to support connection

Walking, cycling, and public transport can be supported by greater use of shared transport, such as car share services, and enhanced modes such as e-bikes and, to a lesser extent, e-scooters.

Car sharing services, which enable people to hire a vehicle on demand for only the time needed, are one of the only transport investments that enables reduced car ownership – clearing roads of vehicles that sit empty much of the time.[45] Studies indicate that each car share vehicle added reduces the need for approximately 11 vehicles,[46] allowing more road space to be devoted to connecting New Zealanders through active and public transport.

Similarly, private and shared e-bikes allow people to travel farther than normal bikes[47] while emitting less than cars,[48] and often reducing travel time for those using motor vehicles[49] by decongesting vehicle lanes. To be effective and safe, shared bikes, e-bikes, and e-scooters need to be supported with separated cycle lanes and docking infrastructure.

The Low Emissions Transport Fund, administered by the Energy Efficiency and Conservation Authority, has supported demonstration projects that expand car sharing services and grow vehicle charging infrastructure. However, after demonstration projects, the market is left to deliver these essential (for example, charging infrastructure) and valuable (for example, car sharing) services in a competitive market with numerous barriers.

These barriers include a lack of access to road or parking space, cost, information gaps, and suboptimal operating models because of challenges imposed by other entities (for example, local government or electricity lines distribution companies). Where initiatives do proceed, lower socio-economic neighbourhoods and rural communities are often the last to receive these services, contributing to transport inequity.

The gap between initiative demonstration and maturity would benefit from funding and policies to address barriers – in partnership with local government.[50] One solution would be for the Government to bring car sharing and e-bikes into the funding framework, with incentives intended to reduce overall costs, as a means of expanding access to quality transport options. These could be particularly useful for pā/papakāinga and marae-based partnerships.

Decarbonising the light vehicle fleet

Transitioning to zero emissions battery electric vehicles is needed quickly

Alongside increasing walking, cycling, and public transport, transitioning ICE vehicles to zero or low emissions technologies will play a critical role in decarbonising transport.

Outside of urban centres, private vehicles are often the only available practical mode of transport for medium or long-distance trips. In the absence of safe, reliable alternatives, they provide mobility for New Zealanders, and for many people with disabilities, they will remain critical.

Decarbonising the light vehicle fleet in Aotearoa New Zealand requires EVs to quickly increase as a share of vehicles new to the country, and for this increasingly high share to be sustained.

From 2025 to 2030, our demonstration path sees annual light EV registrations climb from 11% to 67% of the market and reach 100% percent by 2035. This means 100% of cars entering the Aotearoa New Zealand fleet, whether new or new second-hand imports, would be electric in 2035.

As older vehicles – predominantly ICE vehicles – are retired, the EV percentage of the entire fleet will rise. By the end of the second emissions budget, the demonstration path sees EVs comprising 14% of the total light fleet – almost 700,000 vehicles.

Shifting from ICE to EV has several benefits. Including both operation-related emissions and emissions from production, new battery-powered EVs reduce emissions by 60% when compared with a new ICE vehicle.[51] Coupled with appropriate product stewardship that ensures battery reuse and recycling, EVs can minimise overall environmental impact.

While EVs are already cheaper to operate than ICE vehicles, the Commission's modelling projects new EVs will also be on average cheaper on a total-cost-of-ownership basis by 2026.[52] The shift to EVs also has health co-benefits from reducing the harmful effects of air pollution.

The rapidly climbing share of EVs in vehicles new to Aotearoa New Zealand needs to continue throughout the second emissions budget, with sustained support

Progress has been made under policies introduced in the first emissions budget period to address the upfront cost barrier to uptake of EVs.

Figure 15.3 illustrates the Commission's demonstration path modelling for the share of EVs entering the fleet (in green) and the share of EVs in the total light fleet (red). The actual share of EVs entering the fleet each month is shown in orange. In 2022, the EV share of light vehicle registrations was 11%. This is nearly twice that of the Commission's demonstration path, and significantly exceeds Te Manatū Waka Ministry of Transport's modelled policy impact.

While the number of EV registrations may change in response to policy and other factors, in the long-term we expect it to follow an S-shaped curve, which is typical for the adoption of new technologies.

At the end of 2022, there were 65,000 registered electric vehicles.[53] This is 1.5% of the entire vehicle fleet in Aotearoa New Zealand. While this is progress, significant work remains to transition the entire fleet to low emissions vehicles. Continued policy support is essential to encourage the purchase of new EVs at the pace needed to achieve the second and third emissions budgets. Supports to address the upfront cost barrier are especially important.

Another option is to consider setting a phase-out date of ICE vehicles. While the *Clean Car Standard* sets increasingly stringent carbon dioxide emissions targets for imported vehicles out to 2027, and allows subsequent years to be set by regulation, it falls short of announcing a complete phase-out of ICE vehicles.

Setting a phase-out date would align Aotearoa New Zealand with the European Union, the United Kingdom, and other countries which have announced similar policy. This would also provide certainty for industry and send a clear signal to vehicle manufacturers about the direction of policy requirements in Aotearoa New Zealand.

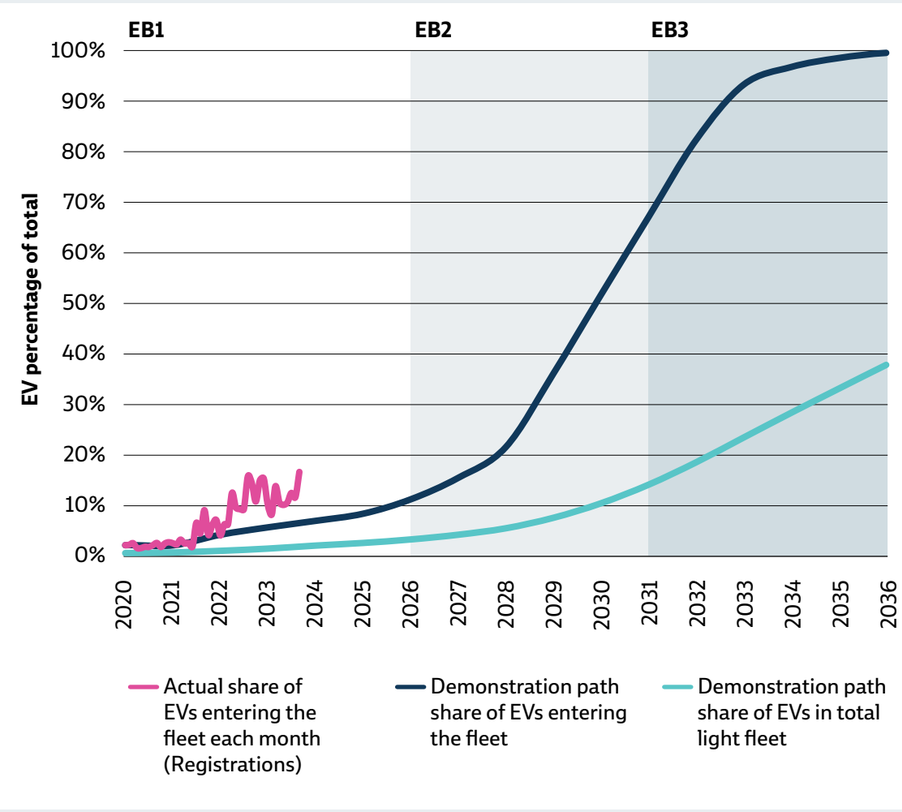

Figure 15.3: EV adoption mapped against the demonstration path 2020–2036

Source: Commission analysis[54]

Targeted support for low income and disadvantaged groups is needed to ensure an equitable transition to a zero emissions vehicle fleet

Through consultation, we heard that while accelerating the uptake of zero emissions vehicles is important, they are less accessible for some groups of people, with cost being a significant barrier.

The second emissions budget presents opportunities for the Government to ensure more equitable access to EVs. Second-hand vehicles have been a major portion of imported vehicles, accounting for approximately 40% of light vehicles registered.[55] For many, these vehicles are more affordable than new vehicles and have provided a critical means of transport.

During the second emissions budget, supply of second-hand EVs may be constrained. In our demonstration path modelling, 70,000 used electric cars and SUVs are imported in 2030.

Japan is a key current supplier, and vehicles entering the Japanese fleet now will only just start being available during the second emissions budget. However, Japan is not adopting electric vehicles as quickly as Aotearoa New Zealand. In 2022, only 61,000 new battery-powered electric vehicles were registered in Japan.[56] Not all of these EVs will be available for export as second-hand vehicles, and there is an increasing competition from markets like Australia.

Constrained supply from Japan may be alleviated by increasing EV imports from other second-hand markets such as the United Kingdom, but with the pace of the EV transition there may be a limited supply of used vehicles for right-hand drive markets globally.

To address this anticipated shortage, households are likely to need support to reach into the new vehicle market. Targeted support for low income and disadvantaged groups will ensure an equitable transition to a zero emissions vehicle fleet. This could take the form of new ownership models like car sharing, social leasing, low-cost loans, or targeted capital cost subsidies. Targeted policy to enhance fleet turnover may also be required.

Vehicle charging infrastructure is likely to limit electric vehicle uptake unless existing barriers are removed

Charging infrastructure, both public and private, is crucial to the success of the EV transition. If the network rollout leads EV uptake, it has the potential to support consumer demand. If it lags, it has the potential to dampen EV uptake.[57]

During the Commission's initial engagement to inform the development of this advice, many stakeholders said that the main constraint on EV uptake during the second emissions budget period would be sufficient vehicle charging infrastructure – not access to low emissions vehicles. The Government has also identified the importance of charging infrastructure, and in March 2023 released a draft EV charging strategy for consultation.

There are currently several barriers to increasing both public and private vehicle charging infrastructure which will need to be overcome to support EV uptake.

At present, Aotearoa New Zealand lags behind similar countries in terms of public chargers.[58] A high-quality public charging network which enables longer journeys will help relieve range anxiety and incentivise EV uptake.[59]

The capacity of electricity distribution lines presents a major constraint for the public charging network and for vehicle charging depots for private companies. This can create a first-mover disadvantage on some distribution networks, as the first to fund installation of vehicle charging infrastructure may also need to contribute to the upgrade of the supporting distribution lines.[60] This barrier is shared with electrifying process heat, as discussed in *Chapter 13: Energy and industry*.

Currently, 82% of EV owners do most of their charging at home. This has multiple benefits, including the ability to charge at off-peak times, which lowers the operating costs.[61] However, increasing numbers of electric vehicles will raise residential electricity demand significantly.

The best way to manage this is to require smart charging, which can be used to maximise benefits for both consumers and electricity works. Consideration of what functionalities can be included in smart charging requirements will be important.

In the near term, simple measures like default off-peak charging (ordinarily overnight) can be adopted to reduce the burden on the grid, allow cost-effective investments in infrastructure, and reduce costs for homeowners.[62]

There are also barriers to scaling up vehicle charging infrastructure at home. One third of Aotearoa New Zealand's population are renters,[63] which creates conflicting incentives between tenants and building owners to install vehicle charging infrastructure.

Using another metric, around 15% of households lack a dedicated car park.[64] While this can support increased urban density, such households will likely need to use a public facility to charge an electric vehicle. There are policy options that could incentivise local authorities, landlords, pā, and marae to provide charging facilities, in recognition that these facilities are an asset to both the properties themselves and their local communities.

Without focused policy intervention, these and other barriers to scaling up both a nation-wide public charging network and sufficient private charging capacity are likely to constrain EV uptake in the second emissions budget period. This will limit the contribution of EVs to meeting the second emissions budget period and beyond.

Recommendation

This recommendation seeks to address the current challenges related to EV charging infrastructure and to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 24

We propose that in its second emissions reduction plan, the Government:

24. Rapidly upscale vehicle charging infrastructure, including removing existing barriers.

Decarbonising freight, commercial, and offroad vehicles

While the freight network is essential for a thriving economy and enables exports, it creates a quarter of transport emissions

The freight network is essential to Aotearoa New Zealand's economy, both for moving goods around the country and for connection to export markets, a fact that was underlined by the COVID-19 pandemic.

Freight is predominantly delivered by road (around 75% on a tonne-kilometres basis).[65] Heavy vehicles – those over 3.5 gross tonnes and frequently involved in delivering freight – make up only around 4% of the vehicle fleet but generated nearly a third of road transport emissions in 2021.

The freight network is also supported by light commercial vehicles, such as vans and utes, which are under 3.5 gross tonnes. These vehicles play a critical role in 'last mile' freight delivery and for many small and medium businesses, and make up around 16% of all vehicles. Collectively, light commercial vehicles and trucks constitute only 19% of all vehicles but contribute 49% of road transport emissions.[66]

Coastal shipping, rail, and aviation provide the remaining 25% of freight on a tonnes-kilometre basis, each playing a different role depending on cargo characteristics and delivery needs.[67]

There are different challenges to decarbonising the different forms of freight. The Commission's demonstration path sees total emissions from freight (medium and heavy trucks, rail, and marine emissions) reduce from 3.9 Mt in 2021 to 3.5 Mt by the end of the second emissions budget period. However, with freight volumes anticipated to increase by 18% by 2030 relative to 2019,[68] decarbonising freight will be critical in achieving transport emissions reductions in the second emissions budget period.

Policy support, regulatory measures, and incentives are needed to decarbonise freight, commercial, and offroad vehicles

Transitioning ICE trucks to zero or low emissions alternatives presents significant emissions reductions potential. There is a commercial imperative for these vehicles to be in use on the road, which means that on a per-vehicle basis they generate significantly more emissions than private, light passenger vehicles, which spend significantly more time unused. This is also true, although to a lesser extent, for the vans and utes in commercial use.

The Government has signalled support for decarbonising this segment of the transport sector by committing to the Global Memorandum of Understanding to enable 30% of new truck and bus sales to be zero emissions by 2030, and 100% to be zero emissions by 2040.[69]

Uptake of such vehicles is currently slow due to a combination of significantly higher cost, limited supply, and the lack of supporting infrastructure. For small and medium businesses, a commercial vehicle may be their single largest capital asset. Converting this to a less familiar low emissions commercial vehicle may create perceived or real risks that slow uptake.

By the second emissions budget period, however, around 300 low emissions medium and heavy vehicle models are anticipated to be available globally.[70,71] To realise the opportunity this presents for the second emissions budget period, clear direction and policy certainty is needed for investing operators.

Sending a demand signal for these vehicles is important for global supply chains. Such a signal could be sent through policy interventions such as an importer mandate – where a minimum portion of heavy vehicles sold are required to be zero emissions – and/or cost interventions, as seen with the light vehicle fleet.

The costs of zero emissions vehicles are currently significantly higher than their diesel alternative – between two and four times more for trucks.[72] Although on a total-cost-of-ownership level this cost is anticipated to decrease, freight operators – particularly small and medium businesses with fewer resources – see this high upfront cost as a significant barrier.

The lack of public charging infrastructure capable of supporting zero emissions road freight is another barrier to uptake. There are currently no public chargers that cater to the capacity needed for battery-powered electric trucks. Rapidly resolving the barriers to scaling up vehicle charging infrastructure would also create an important opportunity to address those barriers related to the freight network.

Outside of core transport sectors, it is estimated that 1.5 billion litres of petrol and diesel are consumed in off-road applications, contributing 3.9 $MtCO_2e$ per year – with a significant portion of this coming from off-road vehicles.[73] Off-road vehicles encompass many types of vehicles, including utes, all-terrain vehicles (ATVs), and tractors, as well as heavy machinery like combine harvesters, diggers, forest machinery, and recreational marine activities.

In some instances, off-road vehicles use the same technology as on-road vehicles, but in an off-road application (for example, utes used in farms, mines, and quarries). In other instances, there may be shared engine technologies between off-road vehicles and heavy transport, such as high-power diesel engines.

Off-road vehicles are often used in remote areas where electricity networks may be weak or unavailable. For the industries and individuals that use these vehicles, this may present a barrier to electrification. In our demonstration pathway, only 4% of these off-road vehicles are electrified by 2030, and low-carbon liquid fuels make up 2% of supply.

To address the emissions from these vehicles, policies incentivising decarbonisation will be required. These could include extending existing policy frameworks to include off-road vehicles, as was done with the Low Emissions Transport Fund.

Recommendation

This recommendation seeks to address the current challenges related to commercial EV uptake and to help enable Aotearoa New Zealand to meet its second emissions budget and longer-term emissions reduction targets.

Recommendation 25

We propose that in its second emissions reduction plan, the Government:

25. Accelerate the uptake of zero emissions commercial vehicles, including vans, utes, trucks and offroad vehicles.

Supporting rail and coastal shipping will provide a resilient, low emissions freight network

Rail and coastal shipping offer lower emissions forms of freight,[74] but can service fewer destinations than road freight. While this constrains the ability to shift freight from road, government support for rail and coastal shipping can support a more resilient freight network.

Cyclone Gabrielle damaged over 400 kilometres of roads, with a significant impact on road freight and other critical services.[75] The storm illustrated the vulnerability of the roading network to the impacts of climate change, underlining the resilience gained from a thriving, multi-modal freight network.

Continued investment in coastal shipping will be needed to upgrade port infrastructure and support increasing freight volumes, larger anticipated vessels, and resilience to increasing risk from extreme weather events and sea-level rise. For domestic carriers to remain competitive and to support a thriving, resilient local shipping industry, the Government needs to ensure regulations do not unduly favour international carriers.

For rail, the $1.3 billion Government investment committed in Budget 2021 for several long-term projects, and as part of implementing the New Zealand Rail Plan, will help upgrade more of the existing network to standard.[76] However, as noted in the Government's freight and supply chain issues paper, rail "needs to aggregate greater volumes of cargo to maximise utilisation on each journey. This leads to challenges in schedules being timely enough to meet market expectations."[77]

In line with the freight and supply chain strategy, it will be important to understand what freight tasks are achievable, but not currently accomplished, with rail. Identifying and addressing the barriers to increasing rail freight will ensure low emissions options are pursued in the network.

Aotearoa New Zealand needs to prepare now to enable future decarbonisation of aviation

As well as delivering high value freight, passenger aviation also connects people across regions faster than road travel. While upgrading aircraft and other efficiencies will contribute to emissions reductions, long-term, sustainable decarbonisation will be achieved through new aircraft types and low carbon fuels.

Within the second emissions budget period, the biggest opportunity for reducing emissions within aviation is likely to come from sustainably produced drop-in biofuels as a component of aviation fuels.[78] Air New Zealand, for example, announced that by 2030 it expects its fleet to be fuelled by 10% aviation biofuels.[79]

The first emissions reduction plan committed to developing an aviation-specific obligation for such biofuels. This would send an important signal to global supply chains and help secure this fuel.

In our modelling for *Ināia tonu nei*, domestically produced biofuels played an important role in addressing hard-to-abate transport emissions, rather than imported biofuels. Sustainably sourced biofuels can provide the most benefit when prioritised for aviation, shipping, and other applications that cannot be easily electrified.

The development of a greater bioeconomy strategy, as discussed in *Chapter 12: Circular economy and bioeconomy*, presents a key opportunity for exploring the domestic production of high value, low emissions aviation fuel alternatives, and considering any impacts on the electricity system, as discussed in *Chapter 13: Energy and industry*.

The introduction of zero or low emissions aircraft – for example, battery electric or hydrogen fuel capable of servicing short or medium haul routes – is anticipated in Aotearoa New Zealand during the third emissions budget.[80] During the second emissions budget period, it will be important to develop regulations to enable this.

Te reo Māori glossary

Kupu/rerenga kupu Māori and English contextual translations:

maunga
mountain

awa
river, stream, creek

roto
lake, wetlands, swamp

ngahere
forest

māra
courtyard – the open area in front of the wharenui, garden

wāhi tapu
sacred place, sacred site such as a burial ground, a battle site, or a place where sacred objects have been placed

urupā
burial ground, cemetery, graveyard

papakāinga
original home, communal Māori land, development on ancestral land

Mā ono: Chapter 16

Ngā Tukupara
Waste and fluorinated gases

Introduction

Reducing waste emissions is a key area for Government action to enable Aotearoa New Zealand to achieve the 2030 biogenic methane component of its 2050 emissions reduction target, as 9.1% of these emissions come from organic waste breaking down in landfills.[1]

Waste management and minimisation can also support decarbonising the economy more generally, including through providing the fundamentals for a developing circular economy (see *Chapter 12: Circular economy and bioeconomy*).

The advice in this chapter builds on our analysis for the first emissions reduction plan (outlined in *Ināia tonu nei*), as well as what we heard in consultation on the draft version of this advice.

It presents options for the Government to accelerate a reduction in methane emissions from landfills by decreasing the volume of organic waste that goes to landfill and improving landfill gas capture systems. This chapter also discusses the need for a long-term waste infrastructure plan to guide the required investment in organic waste processing and resource recovery infrastructure.

At the core of this advice is a focus on options to reduce emissions by avoiding and reducing waste produced. Evidence shows Aotearoa New Zealand is generating nearly 50% more solid waste than other OECD countries, on per capita basis.[2]

The chapter also provides advice on management of fluorinated gases (F-gases), used as alternates to ozone-depleting gases. F-gases are greenhouse gases with high global warming potential (GWP), and so require regulation and monitoring to reduce their prevalence and prevent leakage during recycling and disposal.

Changes from the draft version of this chapter

As a result of consultation feedback, we edited Recommendations 26 and 27 for clarity and to ensure they are appropriately outcomes focused.

Some submitters were of the view that landfills such as modern, Class 1 landfills should be considered an appropriate destination for organic waste where no local alternatives exist. In *Ināia tonu nei*, we recognised the importance of shaping plans in line with the waste hierarchy, which classifies disposal as the least favoured option below waste avoidance or resource recovery. Our current advice builds on this analysis by encouraging the phase out of organic waste disposal to landfill where appropriate diversion facilities exist. In additional to preventing potential methane emissions, alternative methods of organic waste management like composting can have benefits for the environment and for communities.

While submissions generally supported our proposed recommendations, we did receive requests to strengthen our advice. We addressed this feedback through changes to this chapter, and by adding recommendations in *Chapter 12: Circular economy and bioeconomy*.

We revised the chapter text to emphasise the important of avoiding and reducing waste. This message reiterates and builds on our advice from *Ināia tonu nei*, where we recommended that the New Zealand Waste Strategy (Te rautaki para | Waste strategy) use the waste hierarchy of 'reduce, recover, and dispose' as a guiding principle for action to "significantly decrease waste generation and increase resource recovery".

The context for change

In 2021, emissions from waste in Aotearoa New Zealand contributed 3.2 $MtCO_2e$, or 4.2% of gross greenhouse gas emissions.[3] These include emissions generated from solid waste disposal, biological treatment, the incineration and burning of solid waste, and from wastewater.

Approximately 92% of these emissions are biogenic methane, primarily generated by the decomposition of organic waste (for example, food, garden, wood, and paper waste). Other greenhouse gas emissions from waste include nitrous oxide (5.3%) and carbon dioxide (2.8%).[4]

Emissions reductions within the waste sector will contribute to meeting the biogenic methane components of the 2050 target. Of the total biogenic methane produced in Aotearoa New Zealand, 9.1% comes from organic waste breaking down in landfills, and 90.9% comes from ruminant animals in agriculture.[5]

The first emissions budget period (2022–2025) set a waste sub-sector emissions target of 13.7 $MtCO_2e$. The Ministry for the Environment estimates the work programme in the first emissions reduction plan will support the transition to a low emissions economy but will not be enough to achieve the waste sub-sector target,[6] potentially resulting in a shortfall of between 0.1 and 0.3 $MtCO_2e$ in 2025. This highlights the significance of the subsequent actions and initiatives for inclusion in the second emissions reduction plan.

A starting point for reducing emissions from waste

Waste management and minimisation planning in Aotearoa New Zealand is in a state of flux. There is increasing awareness of the importance of diverting organic waste from landfill, enhancing resource efficiency, and promoting more sustainable waste treatment and disposal practices. There is also awareness of the need to transition into a more circular economy – as set out in *Chapter 12: Circular economy and bioeconomy.*

The waste actions in the first emissions reduction plan are largely based on reducing the amount of biodegradable waste sent to landfill and expanding landfill gas capture systems. As detailed in the emissions reduction plan for 2022–2025, key focus areas include:[7]

- enabling households and businesses to reduce organic waste
- increasing the amount of organic waste diverted from landfill
- reducing and diverting construction and demolition waste to beneficial uses
- exploring the use of bans or limits to divert more organic waste from landfill
- increasing the capture of gas from landfill
- improving waste data and prioritising a national waste licensing scheme.

Most of these focus areas seek to reduce greenhouse gases produced by landfills, known as 'landfill gas'.

Landfill gas is a by-product of decomposing organic waste in landfills. It is mainly composed of biogenic methane and carbon dioxide. With appropriate equipment, modern landfills can capture some of the gas and either flare (burn) it or use it to produce energy. The process converts biogenic methane to carbon dioxide, which has a lower global warming potential (GWP). Capturing landfill gas is a valid way to reduce harmful biogenic methane emissions and, in some cases, gain added benefits.[8]

Organic waste avoidance and diversion is critical for emissions reduction. However, where the disposal of organic waste to landfill cannot be avoided, or where organic waste disposal prohibitions will take several years to take effect, highly efficient landfill gas capture systems will enable emissions reduction.

Prioritising waste avoidance and reduction

The focus of this chapter is on reducing direct emissions from waste. Wider waste issues are covered in *Chapter 12: Circular economy and bioeconomy*, including construction and demolition waste, product stewardship, and consideration of the emissions created in the whole life of particular materials (embodied emissions). That chapter also sets out the 'waste hierarchy', an evaluation tool used to inform waste management and minimisation decision-making, which can help identify pathways for maximising resource recovery throughout different waste management stages.

Analysis based on the waste hierarchy sets waste avoidance and reduction as priorities for waste management. As set out in *Ināia tonu nei*, this means focusing first on maximising what waste can be reduced at source, before waste is created. This chapter builds on that initial advice, to define the central objectives for reducing the emissions from waste as:

- reducing the production of waste
- phasing out the landfilling of organic waste
- reducing the embodied emissions from waste
- avoiding and preventing fossil-fuel waste generation
- ensuring highly efficient gas capture at landfills that accept organic waste.

Our advice points to the necessary policy and infrastructural framework needed to enable accelerated action on each of these objectives.

Key opportunities to reduce emissions from waste in 2026–2030

It is critical that waste management and minimisation policies are developed in partnership with iwi/Māori in a manner consistent with Te Tiriti o Waitangi/The Treaty of Waitangi and incorporate mātauranga Māori, to the benefit of all New Zealanders.

Waste hierarchy considerations

Applying the principles of a waste hierarchy can be effective for avoiding and reducing waste, and therefore reducing its direct emissions.

Our earlier advice stated that the waste hierarchy should be used as a guiding principle for action. We also recommended that the revision of the New Zealand Waste Strategy (Te rautaki para | Waste strategy) include the waste hierarchy to:

- significantly decrease waste generation
- increase resource recovery across waste streams
- reduce emissions via specific, time-bound goals
- identify and implement regulatory changes to assist people to take actions to reduce waste emissions.[9]

Recognition of the waste hierarchy will also be important within the new waste management legislation proposed to reform the Waste Minimisation Act (2008) and the Litter Act (1979). The Government has signalled this new legislation will create tools to deliver Te rautaki para | Waste strategy and ensure Aotearoa New Zealand makes good use of funds generated by the expanded Waste Disposal Levy. It is intended to reset the purpose, governance arrangements, and roles and responsibilities in legislation, and strengthen and clarify regulatory and enforcement powers.

This new legislation also presents the opportunity to require the consideration of the waste hierarchy in decision-making at central and local government levels.

The Waste Disposal Levy[i] can be used effectively as a pricing mechanism to promote waste reduction. By increasing the cost of waste disposal, it encourages organisations and individuals to take responsibility for the waste they produce and find more effective and efficient ways to reduce, reuse, recycle, or reprocess waste.

The Government could strategically use Waste Disposal Levy price increases to achieve further waste reduction. Clear long-term price signals with respect to future levy increases would help provide certainty relating to the value of waste reduction for the waste sector and investors.

Addressing organic waste disposal to landfill

The waste-related policies contained in the first emissions reduction plan predominantly focus on reducing biodegradable waste going to landfill. The plan proposes this be achieved through enabling the separation of organic waste and investing in organic waste processing facilities. At the same time, a 2030 ban or a limit applied to disposal of organic waste to landfill is being investigated by the Government.

Currently, a lack of funding is considered by some local councils to be a barrier to reducing the emissions from waste, particularly for councils with a smaller rating base. We have also heard that food waste diversion is not a priority for some councils and there remains uncertainty about who would fund the ongoing costs of related servicing and processing infrastructure.

i. From 1st July 2009 the Waste Disposal Levy came into effect, adding $10 per tonne to the cost of landfill disposal at sites that accept household solid waste. This levy is collected and managed by MfE who distribute half of the revenue collected to territorial authorities on a population basis. The other half is managed by MfE as a central contestable fund for waste minimisation initiatives. The levy for Class 1/Municipal landfills is currently set at $30/tonne, but scheduled to increase to $60/tonne in 2024. Beyond that, future levy increases remain uncertain.

In our previous advice, *Ināia tonu nei*, we recognised that increases in the Waste Disposal Levy and New Zealand Emissions Trading Scheme (NZ ETS) costs impacting municipal landfills could lead to organic waste being diverted to non-municipal landfills that do not have landfill gas capture, resulting in increased emissions.

To prevent such an increase in emissions, we recommended that high performance gas capture systems be mandated for all landfills that accept organic waste. We further recommended that the Government ensure that all landfills (except farm fills) that accept organic waste have effective gas capture systems in place.

While the first emissions reduction plan does not require the installation of landfill gas capture to all landfills accepting organic waste, it does commit to undertaking feasibility studies to determine whether additional landfill gas capture requirements or organic material bans should be implemented.[10] It also requires all municipal (Class 1) landfills to have landfill gas capture systems in place by 31 December 2026.

Notwithstanding these actions, installing high-performance gas capture systems within landfills is an opportunity for further emissions reductions. This matter is discussed in more detail below.

As appropriate waste diversion facilities become available, limits on the amount of organic waste that goes to landfill can be implemented. Investing in organic waste processing and resource recovery infrastructure is also required to support the achievement of the waste sub-sector target in the second emissions budget.

Long-term planning for waste infrastructure in Aotearoa New Zealand

In *Ināia tonu nei*, we recommended the Government accelerate investment in infrastructure for waste collection, processing, and resource recovery.

In 2021, the Ministry for the Environment identified the need to release a long-term waste infrastructure plan to ensure that recently increased Waste Disposal Levy funds are managed in a way that enables coordinated decision-making and investment to support the development of a fit-for-purpose resource recovery system. Release of a long-term waste infrastructure plan remains forthcoming.

Creating a fit-for-purpose resource recovery network remains essential to large-scale resource recovery and waste emissions reduction. The absence of a long-term waste infrastructure plan increases the risk that Aotearoa New Zealand will lack the facilities necessary to significantly divert organic waste away from landfills by 2030. This would undermine the achievement of future waste sub-sector targets.

A long-term waste infrastructure plan is still required. This plan can provide the strategic direction for asset and investment plans and inform the necessary extent of waste and resource recovery infrastructure required across the country.

The plan also presents an opportunity for transparency and promoting confidence for territorial authorities, businesses, and iwi/Māori who may be interested in investing in the resource recovery sector. To be effective, the plan will need to connect into the development of a circular economy and bioeconomy strategy and provide transparency on the emissions reduction potential and climate change mitigation benefits of the infrastructure proposed.

Establishing a national resource recovery network is an opportunity for the Government to promote equitable access to resource recovery services and facilities, which can further support community wellbeing through redistributing goods to help meet household needs.

Through the network, the Government can help ensure reasonable community access to resource recovery services and facilities, irrespective of the size of the rating population base of a district or town. It can also realise opportunities to promote community-level resilience to climate change through the planning and delivery of resource recovery facilities, such as through community-level composting.

The expansion of the resource recovery network could also be a commercial opportunity for partnership with iwi/Māori; however, the Government would first need to address the barriers which limit participation.

Enhance the performance of landfill gas capture

A package of emissions pricing and regulation is currently applied to reduce biogenic methane emissions at landfill. Emissions are priced via the NZ ETS, and the Waste Disposal Levy encourages the reduction of waste going to municipal landfills, which further lowers emissions. Disposal facility operators[ii] are obliged to report their emissions and surrender New Zealand Units under the NZ ETS. Operators of disposal facilities are mandatory NZ ETS participants.[11]

However, through consultation we heard concern that, as the NZ ETS currently only covers active municipal landfills, waste may be diverted to landfills not included in the NZ ETS rather than being reduced. These respondents supported reducing emissions from historic or closed landfill, and for all disposal sites (or as a minimum, those receiving organic materials) to be included in the NZ ETS.

The cost of NZ ETS emissions obligations from landfill is effectively passed from the landfill owner to the person paying gate fees/landfill disposal charges when disposing of their waste.

In addition to pricing instruments, the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 stipulate a maximum level of permitted greenhouse gas emissions at landfill. In effect, this creates a minimum baseline for gas capture efficiency, but does not incentivise the installation of highly effective landfill gas capture technologies.

As the financial impacts of the NZ ETS are passed on to the landfill user, and due to the minimum standard set by the air quality regulations, the current policy package does not efficiently work to incentivise innovation or promote the installation of optimal landfill gas capture systems.

The first emissions reduction plan requires all municipal (Class 1) landfills to have landfill gas capture systems by 31 December 2026 and commits to undertaking feasibility studies to determine whether additional landfill gas capture requirements or organic material bans should be implemented at non-municipal landfills. However, it does not address landfill gas capture performance.

Ensuring the installation of high-performance landfill gas capture at landfills could increase innovation and enhance the efficiency of gas capture infrastructure at landfills that accept or have recently accepted organic waste.

Through early engagements to inform the development of this advice, we heard concerns about the possible implications of the extended landfill gas capture requirements. There was a view that these existing requirements will increasingly result in the closure of smaller territorial authority landfills due to costs, and that such closures could result in a landfill monopoly dominated by the commercial sector, resulting in less control over price. There was also concern expressed over a possible ban of organic waste within Class 1 landfills, and uncertainty about the impact this might have on the efficiency of existing landfill gas capture systems.

ii. A disposal facility is any facility including a landfill which operates as a business to dispose of waste, at which waste is disposed, and the disposed waste includes that from households, which is not entirely from construction, renovation, or demolition of a house.

For the second emissions budget period, there nevertheless remains an opportunity for the Government to incentivise greater gas capture performance and efficiency. To ensure the installation of high-performance gas capture systems, the Government should review the regulatory and policy settings and apply regulatory and policy instruments to achieve the optimal use and effectiveness of landfill gas capture systems and technologies at all landfills. Steps also need to be taken to improve the accuracy and transparency of landfill gas capture data.

Ensuring the optimal use and efficiency of landfill gas capture systems will require consideration of the potential opportunities and incentives available, as well as the expected decline of organic waste inputs to landfill over time. A review also presents the opportunity to assess how gas capture requirements could be applied to all landfill classes, including closed landfills as well as the costs and benefits of action necessary to achieve optimal landfill gas capture.

In light of the current emissions reduction plan requirement for all municipal (Class 1) landfills to establish landfill gas capture systems by 31 December 2026, Government action to improve landfill gas capture performance needs to be progressed with urgency. Improvement measures also present the opportunity to support effective and efficient investment and decision-making associated with landfill gas infrastructure.

As discussed in *Ināia tonu nei*, regular monitoring and auditing of landfills will be necessary to ensure that gas capture systems are high performance.

Broader policy intervention initiatives for consideration

There are a broader range of policy intervention opportunities to reduce the emissions from waste and further support Aotearoa New Zealand's transition to a more circular economy. The following opportunities would benefit from further investigation:

- broadening emissions reduction plan efforts to reduce commercial, industrial, and manufacturing waste
- establishing a proportion of contestable Waste Minimisation Funds for initiatives led by iwi/Māori to address current inequities[iii]
- improving the level and accuracy of available emissions data for farm-based waste disposal sites, potentially through farm waste management planning processes and through regional council regulatory processes
- accelerating action necessary to establish national waste operator licensing, leveraging territory authority progress already established within this area
- identifying opportunities to reduce emissions from wastewater discharge
- applying appropriate policy mechanisms to promote the reduction of fossil fuel waste, including initiatives to reduce the use of virgin plastic used in packaging
- leveraging territorial authority waste-related procurement processes to promote equity – while considering the effect of cost weighting on the competitiveness of community groups and NGOs with the commercial sector
- establishing a more strategic approach to resourcing for the food rescue sector, as well as funding and research, including quantifying the emissions impacts of food waste and food rescue at the national level.

iii. Currently, $120 million of contestable funding is available for projects over the next two years, however, funding requirements neither address issues related to inequities experienced by iwi/Māori, nor the barriers that limit iwi/Māori from competing

Box 16.1: The co-benefits of food rescue

"Food rescue can contribute to social good by nourishing people, including those experiencing food insecurity, and can provide broader social benefits including: contributing to community building and a sense of whanaungatanga or belonging; linking people experiencing food insecurity to wrap around services; and providing an opportunity for volunteerism and the associated benefits. A recent New Zealand-based study estimated that every dollar invested in food rescue provides a social return of $4.50." [12]

Food loss and food waste are a national and global source of greenhouse gas emissions. While the extent of this emissions issue remains unknown for Aotearoa New Zealand, research has found that 13.4% of children live in households experiencing moderate-to-severe food insecurity.[13] Due to the cross-cutting benefits of food rescue, a more strategic approach to funding and research would benefit Aotearoa New Zealand.

Tensions over thermal waste-to-energy for emissions reductions

During our initial engagement to inform the development of this advice, we heard concerns about thermal waste-to-energy operations potentially undermining resource recovery. We have not previously provided advice to the Government on thermal waste-to-energy, and this matter is not addressed in the first emissions reduction plan.

Thermal waste-to-energy technology broadly refers to a family of technologies that process waste material to generate energy. It uses combustion ranging from incineration to more advanced methods such as pyrolysis and gasification. Different technologies use a range of waste materials as feedstock for the processing plant, and each plant might produce energy in the form of heat, electricity, or fuel.[14]

Establishing thermal waste-to-energy facilities can lock in the supply of waste as feedstock. When waste-to-energy facilities compete with the same material as recycling, it has the potential to constrain or undermine national recycling efforts.[15]

In England, the use of waste-to-energy has become more prevalent than recycling, and emissions from incinerators and waste-to-energy facilities have subsequently increased. Both Scotland and Wales have recently established moratoriums on the establishment of new waste-to-energy facilities, subject to varying conditions. More broadly, the United Kingdom recognises that if continued unchecked, growth in waste-to-energy incineration could undermine the waste sector's contribution to the United Kingdom's emissions goals.[16]

Thermal waste-to-energy premised on non-renewable feedstock is less favourable within the waste hierarchy. Such facilities have the potential to undermine future national waste reduction and recycling goals and displace the use and advancement of alternative renewable electricity generation options within Aotearoa New Zealand.

The concerns expressed during our early engagements were reflected in consultation, with some respondents in outright opposition to the technology on the basis that it could inhibit the transition to a circular economy or hamper efforts to develop low impact alternatives.

For the reasons identified above, a precautionary approach could beneficially inform waste-to-energy policy and investment considerations in Aotearoa New Zealand.

To provide clarity for decision-makers, there is a need for comprehensive research to inform the development of a policy framework to guide local government waste-to-energy-related decision-making. This research could consider:

- embodied emissions of waste within different feedstock types
- potential impact of waste-to-energy facilities on the establishment of renewable energy and potential lower impact alternatives
- avoidance and diversion potential of feedstock
- potential opportunities for biogenic waste to energy within the bioeconomy.

The policy framework for waste-to-energy will need to be consistent with the waste and emissions reduction targets in Te rautaki para | Waste strategy and promote the objectives central to reducing the emissions from waste (as discussed above).

The experience of the United Kingdom also illustrates the importance of understanding current and future waste disposal and recycling capacity within Aotearoa New Zealand, as well as the need to ensure that the establishment of any new waste-to-energy facilities do not undermine emissions reduction targets.

For our associated recommendations that recognise the need to reduce energy and industry emissions, see *Chapter 13: Energy and industry*.

Recommendations

These recommendations seek to address the misalignment between current landfill gas capture and Aotearoa New Zealand's emissions reduction targets.

Recommendation 26

We recommend that in its second emissions reduction plan, the Government:

26. Ensure the use of landfill gas capture systems and technologies is widespread and efficient.

Recommendation 27

We recommend that in its second emissions reduction plan, the Government:

27. Improve the accuracy and transparency of landfill gas capture data.

Fluorinated gases

Fluorinated gases (F-gases) are a class of fluorine-containing compounds that are gases at ambient temperatures.

There are three classes of F-gases used in Aotearoa New Zealand: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). These gases are all imported and are used in a range of industrial, commercial, and domestic applications – including refrigeration, air-conditioning and heat pumps, medical inhalers and aerosols, electrical switchgear, fire protection systems, and other specialist applications.[17]

F-gases were commonly introduced to replace harmful ozone-depleting substances. While not ozone-depleting, F-gases are powerful greenhouse gases, with a global warming potential (GWP) that can be many thousand times higher than carbon dioxide.

In 2021, F-gases collectively contributed to 2.0% of gross emissions in Aotearoa New Zealand, equating to 1.55 $MtCO_2e$.[18] These emissions mainly comprise of HFCs (93.4% of all fluorinated gases), which are the most common type of refrigerant.[19]

HFC imports are expected to reduce sharply over time, largely due to the phasedown of these gases in accordance with the Kigali Amendment to the Montreal Protocol. However, due to high levels of existing stock, emissions from HFCs are anticipated to decline at a much slower pace.[20]

A suite of policy intervention measures is necessary to establish a robust F-gas and refrigerant management framework effective in reducing greenhouse gas emissions. These measures need to be developed in line with Te Tiriti/The Treaty.

Context of F-gas policy advice

In *Ināia tonu nei*, we recommended the Government commit to measures to reduce HFCs, including expanding import restrictions where feasible, improving industry practice to reduce leakage, and enabling businesses and consumers to switch to low climate impact alternatives.[21]

The first emissions reduction plan contains a range of measures, including actions to:

- develop training and accreditation for handling alternative gases
- prohibit imports of pre-charged equipment
- investigate prohibiting F-gases with high GWP
- introduce a mandatory product stewardship scheme for refrigerants.[22]

While the existing work programme intersects with the following opportunities to reduce emissions from F-gases, there remain concerns around the illegal venting of gas, and the delivery and implementation of existing actions is essential. We also heard through consultation concerns about the accuracy of F-gas data.

The advice below contains additional actions that will support the establishment of a robust regulatory framework for effective emissions reduction.

Key opportunities to reduce F-gas emissions in 2026–2030

Enabling robust F-gas regulation

Refrigerants and other synthetic gases are one of six priority products under the Waste Minimisation Act 2008. Appropriate F-gas monitoring and the enforcement of F-gas regulation, including requirements for F-gas labelling and traceability, will be an important part of scheme success. Measures that ensure the prevention of F-gas leakage and appropriate degassing prior to recycling or disposal will also be essential.

Uptake of low global warming potential (GWP) alternatives

The transition to low-GWP refrigerants will be critical to lowering F-gas emissions without significantly affecting industries that rely on refrigerants. Measures to promote the uptake and safe use of these more volatile low-GWP gases would also help.

A robust and transparent framework for refrigerant training, management, and tracking that reflects industry best practice and has government oversight could further support the transition.

Import restrictions on pre-charged equipment with high-GWP F-gases

The bulk import of HFCs into Aotearoa New Zealand is currently being phased down. However, the existing phase down requirements do not address the import of pre-charged equipment, like conditioning units in vehicles. Prohibitions that target the import and sale of equipment pre-charged with high-GWP F-gases would prevent the continued use of these gases in areas where a viable pathway exists to shift to alternatives with lower environmental impact. In *Ināia tonu nei*, we provided advice on the benefits of establishing import restrictions where feasible.

Box 16.2: New refrigerant destruction plant proposed for Aotearoa New Zealand

The Trust for the Destruction of Synthetic Refrigerants is commissioning the first refrigerant waste management destruction facility in Kawerau, having acquired from PyroGenesis Canada a system that uses steam technology to destroy high-GWP gases.

To date, the Trust's Cool-Safe voluntary product stewardship scheme has recovered synthetic refrigerants in Aotearoa New Zealand and shipped them to Australia for destruction. However, destroying the refrigerants onshore means a reduced risk of leakage associated with transporting these gases, and provides enhanced tracking transparency associated with their destruction. It also reduces transport emissions. Onshore refrigerant destruction will also be in line with the commitments of the Basel Convention, which seeks to reduce the movement of hazardous waste between nations.

The Cool-Safe programme has a goal of reducing greenhouse gas emissions from the refrigerants industry by 90% by 2035. The destruction facility is proposed to be built by 2024 and will have the capacity to destroy up to 100 tonnes of gases annually.

Policy intervention to promote equity

As steps are taken to reduce emissions from waste and F-gases, communities will continue to look to the Government and to government agencies to lead through their own actions. This will require integration across government agencies, applying the waste hierarchy, and considering equity in central and local government waste planning and decision-making, in partnership with iwi/Māori.

Equity is inherently connected with reducing emissions from waste. For example, coordinated long-term planning and investment into waste and resource recovery infrastructure presents opportunities to promote community wellbeing and equity through the provision of resource recovery services and facilities.

More strategic government support and resourcing to support food rescue could also promote equity and support wellbeing for many people facing food insecurity in Aotearoa New Zealand.

Tāpiritanga

Appendices

Piringa 1: Appendix 1

Te mātātuku matua
Prioritisation framework

In **Table A1.1** below, we discuss how He Pou a Rangi Climate Change Commission's six identified criteria (co-benefits, equity, pace and timing, policy gap, potential, and risk) connect with matters that the Commission is required to consider in developing its advice on emissions reduction plans under the Climate Change Response Act 2002.

Table A1.1: The prioritisation framework used to develop this draft advice

Relevant considerations in the Act	Criteria
Section 5M Matters Commission must consider **In performing its functions and duties and exercising its powers under this Act, the Commission must consider, where relevant,**	
a. current available scientific knowledge; and	Potential, gap, pace and timing, risk, co-benefits
b. existing technology and anticipated technological developments, including the costs and benefits of early adoption of these in New Zealand; and	Potential, pace, and timing
c. the likely economic effects; and	Potential, equity, co-benefits,
d. social, cultural, environmental, and ecological circumstances, including differences between sectors and regions; and	Equity, co-benefits
e. the distribution of benefits, costs, and risks between generations; and	Equity, gap, pace and timing, risk
f. the Crown-Māori relationship, te ao Māori (as defined in section 5H(2)), and specific effects on iwi and Māori; and	Equity, co-benefits
g. responses to climate change taken or planned by parties to the Paris Agreement or to the Convention.	Pace and timing

Relevant considerations in the Act	Criteria
5ZC Matters relevant to advising on, and setting, emissions budgets (2) The Commission and the Minister must—	
(a) have particular regard to how the emissions budget and 2050 target may realistically be met, including consideration of –	
(i) the key opportunities for emissions reductions and removals in New Zealand; and	Potential, gap
(ii) the principal risks and uncertainties associated with emissions reductions and removals; and	Risk
(b) have regard to the following matters:	
(i) the emission and removal of greenhouse gases projected for the emissions budget period:	Potential, gap
(ii) a broad range of domestic and international scientific advice:	Potential, risk, co-benefits
(iii) existing technology and anticipated technological developments, including the costs and benefits of early adoption of these in New Zealand:	Potential, pace and timing, co-benefits
(iv) the need for emissions budgets that are ambitious but likely to be technically and economically achievable:	Pace and timing, risk
(v) the results of public consultation on an emissions budget:	
(vi) the likely impact of actions taken to achieve an emissions budget and the 2050 target, including on the ability to adapt to climate change:	Gap, risk, equity, co-benefits
(vii) the distribution of those impacts across the regions and communities of New Zealand, and from generation to generation:	Equity, co-benefits
(viii) economic circumstances and the likely impact of the Minister's decision on taxation, public spending, and public borrowing:	Equity
(ix) the implications, or potential implications, of land-use change for communities:	Equity, co-benefits
(x) responses to climate change taken or planned by parties to the Paris Agreement or to the Convention:	Pace and timing
(xi) New Zealand's relevant obligations under international agreements.	Pace and timing

Piringa 2: Appendix 2

He kōrero anō e hāngai ana ki ngā ahunga tukuwaro matua a te Kāwanatanga
Further information on the latest government emissions projections

The Government published new emissions projections in December 2022 in *New Zealand's Fifth Biennial Report*[1] and *Eighth National Communication*.[2] These reports are part of Aotearoa New Zealand's reporting obligations under the United Nations Framework Convention on Climate Change (UNFCCC). A summary and dataset are also published on the Ministry for the Environment's website.[3]

In line with UN reporting guidelines, the Government produced emissions projections for three scenarios, which differ in the policies they include and exclude:

- **'With existing measures' (WEM)** – currently implemented and adopted policies and measures
- **'With additional measures' (WAM)** – includes planned policies and measures, in addition to implemented and adopted policies and measures
- **'Without measures' (WOM)** – excludes implemented, adopted, and planned policies and measures (this acts as a reference scenario against which the others can be compared).

The 'With additional measures' scenario effectively provides an updated baseline, reflecting changes in policy and other drivers (such as projected population growth) since the previous projections used in formulating the first emissions reduction plan. The Government also produced 'low emissions' and 'high emissions' variations for this scenario to quantify the potential uncertainty range.

'With existing measures' excludes policies from the first emissions reduction plan yet to be implemented. Unexpectedly, it also excludes existing transport policies (such as the Clean Car Discount policy implemented in 2021) except for the Road User Charge exemption for EVs.[i]

One key change from the previous projections is a higher assumed emissions price path in the New Zealand Emissions Trading Scheme (NZ ETS), reflecting changes to the regulated 'price corridor' in 2021. This leads to significantly lower energy emissions and higher cardon dioxide removals from forestry.[ii] The scenario also assumes that agriculture emissions will be priced via the NZ ETS from 2025 with 95% free allocation.

'With additional measures' includes estimated impacts of further policies in the first emissions reduction plan in the energy, forestry, waste, and F-gases sectors. It does not include any further policies in transport or agriculture. More information on policies included in the scenarios and other assumptions can be found in Aotearoa New Zealand's *Fifth Biennial Report*.

i. The reports state this was due to time and capacity constraints.
ii. The Commission understands from MBIE staff that other energy policies included in the analysis for the emissions reduction plan were indirectly included in the 'With existing measures' scenario and attributed to the NZ ETS. However, this is not mentioned in the reports.

Figure A2.1 presents the projected net emissions (under target accounting) for the scenarios. The emissions budgets are shown as annual average quantities. Note that the aluminium smelter was assumed to close in 2024 in all scenarios.

Biogenic methane emissions in 2030 are projected to be 8.4% and 9.2% below 2017 levels in the 'With existing measures' and 'With additional measures' scenarios respectively, compared with the targeted reduction of at least 10%.

Figure A2.1: Net emissions (under target accounting) in the government's Fifth Biennial Report emissions projections

Source: He pou a Rangi Climate Change Commission's analysis of Government emissions projections[4]

Note:

1. Net CO_2e emissions expressed using GWP_{100} values from the IPCC's *Fifth Assessment Report* (AR5) and the 'target accounting' approach for forestry emissions and removals as described in the glossary.

Table A2.1 shows the further emissions reductions that would be required to meet the second and third emissions budgets under these latest projections. We also show the assessment from the baseline projection used in the first emissions reduction plan, which was shown in earlier figures in this chapter. In all cases we have made an adjustment for the continued operation of the aluminium smelter.

Table A2.1: Further emissions reductions required to meet the second emissions budget under the Government's emissions projections (adjusted for continued operation of the aluminium smelter)

	Further emissions reductions needed to meet budgets ($MtCO_2e$)	
Relative to:	**The second emissions budget (2026–2030)**	**The third emissions budget (2031–2035)**
First emissions reduction plan baseline (March 2022)	43.5	73.6
Fifth Biennial Report 'With existing measures' scenario (December 2022) [Uncertainty range]	20.7 [4.4 to 38.9]	34.6 [5.2 to 66.5]
Fifth Biennial Report 'With additional measures' scenario (December 2022)	14.0	22.9

Source: Commission analysis of Government emissions projections[5]

We note again that these projections did not include implemented or planned policies for the transport sector, other than the Road User Charge exemption for EVs. This suggests projected transport emissions are likely overstated and the gap to meeting the emissions budgets may be smaller. However, we highlight risks around how the NZ ETS is represented in the projections. The projections are driven by an assumed emissions price path in each sector, and it is not clear whether or how agencies have considered supply and demand dynamics in the NZ ETS.

The emissions price is assumed to rise to $140 in 2030 for the energy sector and to $97 in 2030 for forestry. However, the current NZ ETS design delivers a single emissions price across energy and forestry, and ongoing price increases are unlikely to play out due to the strong afforestation response at relatively low emissions prices. We discuss this in greater depth in *Chapter 5: Emissions pricing*.

In summary, the latest Government emissions projections suggest a significant gap remains to meeting the second and third emissions budgets. The discussion above highlights issues and risks for policy to address and areas for improvement in future emissions projections.

Piringa 3: Appendix 3

He iringa kupu
Technical glossary

2050 target	The domestic 2050 emissions reduction target, established in 2019 by the Climate Change Response (Zero Carbon) Amendment Act, requires Aotearoa New Zealand to: • reduce emissions of greenhouse gases, other than biogenic methane, to net zero by 2050 and beyond. This relates to emissions of carbon dioxide, nitrous oxide, non-biogenic methane and F-gases (hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) • reduce biogenic methane emissions by at least 10% by 2030, compared to 2017 levels • reduce biogenic methane emissions by 24-47% by 2050 and beyond, compared to 2017 levels.
Adaptation	Actions that can help people or natural systems adjust to the actual or expected impacts of climate change. Actions can be incremental and temporary in their effect or transformational by changing systems and their functions, depending on the scale and pace of change and what is at stake.
Additionality	A term used to describe what an action or intervention has accomplished, compared to doing nothing. Emissions reductions or removals can be considered additional if they would not have occurred under business-as-usual conditions and without the policy or activity in question. The details of how additionality is evaluated can vary depend on the context. For example, in most carbon markets a project or activity is only judged additional if it would not have occurred without the revenue from earning units in that market. In contrast, in the system used for accounting greenhouse gas emissions against New Zealand's emissions reduction targets, based on the rules established under the Kyoto Protocol, carbon dioxide removals by any forest planted after 1989 are deemed to be additional, irrespective of whether they were driven by a specific policy intervention aiming to enhance sequestration by forests.
Afforestation	The conversion of land from another use, such as pasture for grazing, to forest.
Allocative baseline	An amount of emissions attributed to a unit of product, set at the national sector level, used to calculate the amount of industrial free allocation provided to firms undertaking an eligible activity.
Bioeconomy	Bioeconomy describes the parts of the economy that use renewable biological resources to produce food, products and energy.
Biogenic methane	Methane emissions resulting from biological processes in the agriculture and waste sectors.
Biomass	Material originating from living organisms. Some forms of biomass in the environment store significant amounts of carbon. Solid biomass such as wood chips, wood pellets and briquettes can be used as fuel in residential, commercial and industrial situations.
Carbon capture and storage (CCS)	Refers to a suite of technologies that capture carbon dioxide emissions from an industrial or energy-related point source for permanent storage in a biological or geological reservoir. CCS can be considered as emissions reduction, not removal.
Circular economy	Refers to an economic system based on designing out waste and pollution, reusing products and materials. This system promotes the circularity of resources and energy within production systems by establishing a restorative cycle and regenerating natural systems.
Cleanfill	Refers to landfills limited to the disposal of uncontaminated cleanfill materials, such as clay, gravel, rock and soil.
Climate Change Response Act 2002 (the Act)	The Act that establishes the Climate Change Commission and contains the framework for the 2050 emissions reduction targets and emissions budgets. It also provides a legal framework to enable Aotearoa New Zealand to meet its international obligations under the United Nations framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement; and provides for the implementation of the New Zealand Emissions Trading Scheme (NZ ETS) and the synthetic greenhouse gas levy.

Climate resilience	Climate resilience is the ability to anticipate, prepare for, and respond to the impacts of changing climate, including those that we know about and can anticipate and those that occur as extreme events. This includes planning now for sea level rise and more frequent flooding. It is also about being ready to respond to extreme events like forest fires or extreme floods, and to trends in precipitation and temperature that emerge over time like droughts.
CO_2e	Carbon dioxide equivalent. This is a way to describe different greenhouse gases on a common scale that relates the warming effect of emissions of a gas to that of carbon dioxide. It is calculated by multiplying the quantity of a greenhouse gas by the relevant global warming potential.
CRIs	Crown Research Institutes
Deforestation	The conversion of forest land to another use such as grazing. In greenhouse gas emissions accounting and policy relevant to Aotearoa New Zealand, deforestation is defined as clearing forest and not replanting within four years. It does not include harvesting where a forest is replanted.
Dry year	In Aotearoa New Zealand, hydro lakes only hold enough water for a few weeks of winter energy demand if inflows (rain and snow melt) are very low. When inflows are low for long periods of time, hydro generation is reduced and the system relies on other forms of generation such as natural gas and coal. These periods of time are often colloquially referred to as 'dry years'.
ECRS	Environment and Climate Research Strategy
EECA	Energy Efficiency and Conservation Authority
Electric vehicle (EV)	An electric vehicle has an electric motor that is powered by a battery which is charged by an external source of electricity. There are two main types of EVs: • Battery electric vehicles (BEVs) – these are powered by a battery only. • Plug-in hybrid electric vehicles (PHEVs) – these have two engines – one powered by a battery that is charged externally, the other is fuel powered and generally uses petrol or diesel. Conventional forms of petrol hybrids aren't considered EVs as they aren't charged by 'plugging in'. Their batteries are only charged by re-capturing energy when braking or from electricity generated by the engine.
Embodied emissions	The sum of emissions involved in making a product, sometimes termed the "carbon footprint".

Emissions	Greenhouse gases released into the atmosphere. The Climate Change Response Act 2002 covers the following greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.
Emissions budget (EB)	A quantity of emissions to be emitted within a given period to stay within the boundaries of New Zealand's target. The cumulative amount of greenhouse gases that can be emitted over a certain period. In the Climate Change Response Act 2002, emissions budgets are the total amount of all greenhouse gases (expressed as a net amount of carbon dioxide equivalent) that can be released over a five-year period (or four years in the case of 2022–2025).
Emissions intensive and trade exposed (EITE)	To be eligible to receive industrial allocation in the NZ ETS, an activity must meet two tests in the Climate Change Response Act 2002. These are: • An emissions intensity test, looking at whether the activity produces a large amount of emissions in relation to the revenue it generates. • A trade exposure test, looking at whether there is international trade of the activity's output and if importing or exporting the output is viable.
Emissions leakage	Emissions leakage would occur if efforts to reduce emissions in one location caused an increase in emissions somewhere else so that global emissions overall do not reduce. Emissions leakage risk is created by the uneven implementation of climate policies around the world.
Emissions reduction plan	A plan setting out the policies and strategies for meeting an emissions budget, as required by the Climate Change Response Act 2002.
Equitable Transitions Strategy	Strategy under preparation by the Government to achieve a low emissions Aotearoa New Zealand that is fair and inclusive.
European Union Emissions Trading System (EU ETS)	A cap-and-trade scheme established in 2005 that applies to EU member states and three members of the European Economic Area (Norway, Iceland and Liechtenstein).
Exotic production forests	Forests consisting of non-native species, such as pine, that have been planted for harvesting.
Farm-level, split-gas pricing system	A levy with different rates for short and long-lived greenhouse gas emissions. The point of obligation sits with individual farms or collectives.
F-gases	Fluorinated gases, such as hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Global Warming Potential (GWP)	A factor relating the warming effect of a tonne of emissions of a particular greenhouse gas to those of a tonne of carbon dioxide emissions.

Greenhouse gases	Atmospheric gases that trap heat and contribute to climate change. The gases covered by the Climate Change Response Act 2002 are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
Greenhouse Gas Inventory	New Zealand's Greenhouse Gas Inventory is the official annual report of all anthropogenic (human induced) emissions and removals of greenhouse gases in New Zealand.
GDP	Gross Domestic Product
Gross emissions	Gross emissions include total greenhouse gas emissions from agriculture, energy, industrial processes and product use (IPPU) and waste. Greenhouse gas emissions and removals from land use, land-use change and forestry (LULUCF) are excluded.
Heavy vehicle	A vehicle over 3.5 gross tonnes. These are typically trucks and buses.
Industrial free allocation	The provision of free New Zealand Units (NZUs) to firms undertaking activities considered emissions intensive and trade exposed (EITE). This reduces the cost of the NZ ETS for these firms and is intended to reduce the risk of emissions leakage.
Industry Transformation Plan	Industry-based plans under development by the Government in partnership with business, workers, and Māori for industries that have significant potential to contribute to a high productivity, high wage, lower emissions economy.
Internal combustion engine (ICE)	The engine, typically associated with transport, found in petrol and diesel vehicles.
IPCC	Intergovernmental Panel on Climate Change.
Just Transition Plan	Region-based plans for sharing and coordinating the work of transitioning Aotearoa New Zealand to a low emissions economy.
Kyoto Protocol	An international treaty under the UNFCCC that deals with emissions limitation or reduction commitments for ratifying developed (Annex 1) countries.
Light commercial vehicle	A goods vehicle, including vans, trucks, and utility, weighing up to 3.5 gross tonnes as defined by the Ministry of Transport.
Light vehicle	A vehicle under 3.5 gross tonnes. These are typically cars, SUVs, utes, vans and motorbikes.

Long-lived gases	Greenhouse gases that have a long lifetime in the atmosphere, i.e. they persist in the atmosphere without breaking down for multi-decadal, centennial or millennial timeframes. For ease of presentation, this report refers to all greenhouse gases other than biogenic methane collectively as long-lived gases, although this includes small amounts of other short-lived gas emissions (non-biogenic methane and certain fluorinated gases).
MBIE	Ministry of Business, Innovation and Employment.
Methane inhibitors and vaccines	Chemical compounds that reduce the production of methane in animals' rumen (stomachs). They typically do this by targeting enzymes that play a key role in the generation of methane.
MfE	Ministry for the Environment.
Mitigation	Human actions to reduce emissions by sources or enhance removals by sinks of greenhouse gases. Examples of reducing emissions by sources include walking instead of driving or replacing a coal boiler with a renewable electric powered one. Examples of enhancing removals by sinks include growing new trees to absorb carbon, or industrial carbon capture and storage activities.
MPI	Ministry for Primary Industries.
Mt	Megatonnes (million tonnes).
MSD	Ministry of Social Development.
Nationally Determined Contribution (NDC)	Each country that is party to the Paris Agreement must define its contribution to achieving the long-term temperature goal set out in the Paris Agreement. The first NDC adopted by Aotearoa is a target to reduce greenhouse gas emissions by 30% below 2005 levels by 2030.
Net emissions	Net emissions differ from gross emissions in that they also include emissions from the land use, land use change and forestry (LULUCF) sector as well as removals of carbon dioxide from the atmosphere, for example due to the growth of trees.
New Zealand Unit (NZU)	The unit of trade in the NZ ETS, representing one tonne of CO_2e emissions or removals.
New Zealand Emissions Trading Scheme (NZ ETS)	The NZ ETS is Aotearoa New Zealand's main emissions pricing policy. It creates a market for emissions by requiring certain businesses to acquire and surrender one New Zealand Unit (NZU) for every tonne of carbon dioxide equivalent emitted.

Offshore mitigation	Emissions reductions or removals, or allowances from emissions trading schemes, that originate from outside Aotearoa New Zealand.
Organic waste	Waste containing organic matter that decays to create methane emissions.
Paris Agreement	An international treaty under the UNFCCC to address climate change after 2020.
Petajoule (PJ)	A unit of energy equal to 10^{15} joules.
Permanent forest	Permanent forests are not intended to be clear-fell harvested, although they may be subject to selective or small coupe harvesting. The permanent forestry category in the NZ ETS came into effect from 1 January 2023 and allows owners to earn NZUs from post-1989 forests that are not intended to be clear-fell harvested for at least 50 years after they are registered.
Person-kilometres-travelled (PKT)	The number of kilometres travelled across a number of people. For example, 4 people in one car travelling 1 kilometre is 4 PKT.
Pinus radiata	An introduced tree species used for timber production, which makes up about 90% of Aotearoa New Zealand's plantation forests.
Post-1989 forests	New forest established after 31 December 1989 on land that was not forest at that date.
Pre-1990 forests	Forest land established before 1 January 1990.
Priority product	Refers to priority products as defined under the Waste Minimisation Act (2008), for which a product stewardship scheme for the product must be developed, and accreditation of the scheme must be obtained.
Production forest	Production forests are planted to be harvested. Production forests in Aotearoa New Zealand currently are largely exotic trees planted as a single species which are then usually clear-felled (completely removed) after the trees have reached the desired age.
Removals	The removal of carbon dioxide from the atmosphere, a synonym for sequestration. In Aotearoa New Zealand, this usually refers to absorption of carbon by forests as trees grow.
Rotation (in relation to forests)	The cycle of growth and felling or cutting of trees in production forests.
RSI&T	Research, science, innovation, and technology

Sector sub-targets	A level of emissions for each sector as outlined in the Government's first emissions reduction plan to track progress across sectors towards meeting the emissions budgets.
Sequestration	The removal and storage of carbon dioxide from the atmosphere, for example by vegetation.
Surrender of NZUs	The submission of units to the Crown by an NZ ETS participant to meet an emissions obligation under the NZ ETS.
Target accounting	The accounting system used to measure progress towards Aotearoa New Zealand's emissions reduction targets. Target accounting emissions include all gross emissions, but only a subset of emissions and removals from land use and forestry – namely emissions and removals that are the result of recent and future forestry activities. Target accounting is designed to incentivise emissions reductions and to avoid relying on actions that occurred before 1990 (such as forest planting in the 1970s and 1980s) that continue to result in emissions and removals today. It also applies an averaging approach to production forests to smooth out emissions and removals over harvest cycles.
tCO_2e	Tonnes of carbon dioxide equivalent
Tier 1, 2 and 3 urban environment	Classes of urban environment as defined in the National Policy Statement on Urban Development 2020.
Tonne-kilometres	The number of kilometres a good is moved for freight purposes multiplied by its weight. For example, a truck carrying 10 tonnes of goods 1 kilometre is 10 tonne-kilometres.
United Nations Framework Convention on Climate Change. (UNFCCC)	This is the major foundation global treaty focused on climate change that was signed in 1992 at the Earth Summit in Rio de Janeiro.
Urban form	The design and structure of an area or community. Including what type of development is allowed and where.
Vehicle-Kilometres-Travelled (VKT)	The number of kilometres travelled across a number of vehicles. For example, 4 people in one car travelling 1 kilometre is 1 VKT.
Voluntary carbon market	Markets where emissions units (credits) are purchased, usually by organisations, for voluntary use rather than to comply with legally binding emissions reduction obligations.
Watt-hour (Wh)	A unit of energy usually used for measuring electricity generation and consumption. One Watt-hour is the amount of energy used by a 1 Watt appliance running for 1 hour. 1 kWh = 1,000 Wh and 1 TWh = 10^{12} Wh.
Zero emissions vehicle (ZEV)	A vehicle with zero tailpipe emissions.

Piringa 4: Appendix 4

Rārangi tohutoro
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Chapter 11

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Chapter 12

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Chapter 15

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