He Pou a Rangi
Climate Change Commission

Monitoring report: Emissions reduction

Assessing progress towards meeting Aotearoa New Zealand's emissions budgets and the 2050 target

July 2024

2024 ANNUAL MONITORING REPORT

Haere mai – Welcome

This report is required under sections 5J, 5ZJ and 5ZK of the Climate Change Response Act 2002.

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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. The Commission operates under its Interests Policy, which is derived from the Crown Entities Act 2004. 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.

Te Whakamahuki | Contents

Te karere a te Tumu

Nōu e whai ana i tētahi whāinga hou – pēnei i te ako pūkenga hou, te whai rānei ki te whakatutuki oma taumano, te penapena rānei ki tētahi mea hirahira – he waiwai tō ine i ō kokenga i runga i tō haere.

Mā te aroturuki koe e āwhina kia mōhio ai mehemea kei te ara tika koe e haere ana. Ki te kore – e kore koe e mōhio, ā, ki te tōmuri tō mōhio kei te ara hē koe e haere ana, he uaua ake te hoki ki te ara tika.

Koinei te hua o tā mātou pūrongo aroturuki ā-tau tuatahi. E whakaatu ana i te hekenga o ngā tukunga waro peke i ngā tau tata nei. He karere pai tēnā, ā, e tohu ana kei te ū a ngāi Aotearoa ki te wero.

Heoi anō, e whakaatu ana hoki te pūrongo he mahi tonu hei mahi e tutuki ai ngā whāinga āhuarangi o te motu me ngā takohanga ā-ao, ko ēnei mea e rua kua whakamanahia e ngā Kāwanatanga hou i runga i te tautoko whānui.

Ahakoa e ai ki ngā kitenga, kei te ara tika te motu ki te whakatutuki i te tahua tukunga waro tuatahi, he nui tonu ngā herenga.

Ko tētahi ko te wero aromatawai i tēnei tau, arā, kua tepea ngā raraunga me ngā pārongo e wātea ana mō ngā whakakoretanga o te waro nā ngā ngahere (arā, te nui o te hauhā ka tutua e ngā rākau).

I runga i ngā pārongo hou i tae mai i muri i te whakaōkawatanga o ā mātou kitenga, tērā te tūraru kāore ngā whakapae o mua i āta kapo i te nui o te whakarake. Mehemea e pērā ana, ko te āhua nei kāore e whakatutukihia te tahua tukunga waro tuatahi. Ka mōhiotia ētahi kōrero anō i roto i te tau, ā te whakaputanga o ngā whakapae hou me ngā whakapae ōkawa o ngā "kautetanga whāinga'.

Ahakoa he aha, e hura ana tēnei i ngā mea huhua. E whakanui ana i te matea ki ngā raraunga tūtahi pai kia mōhiotia ai te kokenga o ngā mahi, kia taea ai hoki ngā whakatau mātau te whakaputa.

E hura ana hoki i taua āhua rangirua – ka pērā haere ake nei – i te wāhi ki te whakapae i ngā whakaputanga o nāianei, o āpōpō anō hoki. Me tūoho ngā kaiwhakatau ki tēnei āhua, waihoki me whakauru ki ngā mahere whakatutuki i ngā tahua me ngā whāinga tukunga.

Waihoki, ka āwhina ki te whakaatu i te ara pai katoa ki te whakatutuki me te pupuri ki te "kore more", arā, mā te whakaheke i ngā tukunga peke – te whakakore i ngā haurehu para āhuarangi i te ōrokohanga (hei tauira mā te panoni i te āhua o te ahumahi me tā tātou tūnuku rawa, tāngata anō hoki).

Mā te whakatō rākau – taketake, rāwaho anō hoki – e tawhiti kē atu te haere a Aotearoa i ngā whāinga āhuarangi pae tawhiti. Ā-motu nei, e waimarie ana tātou i tēnei kōwhiringa utu-pai – engari kāore ōna āwhina i te wāhi ki ngā whāinga pae tata, nā te mea me wā roa e tū ai, e tipu ai anō hoki ngā ngahere. Me āta whakahaere anō hoki e arohia ai ngā pānga tōraro ka hua ake pea ki ngā rohe me ngā hapori, me ngā pānga o ngā huarere taikaha.

He taputapu whai mana anō hoki ngā utu, engari he nui tonu ngā taupā e heke ai tōna whāomoomo, he nui hoki ngā rangiruatanga i te wāhi ki tōna whakahaeretanga. Ko tētahi tauira o tēnei ko te hemihemi rangirua o ngā pāpātanga i te New Zealand Emissions Trading Scheme (NZ ETS). Nā reira he nui ngā rangiruatanga e pā ana ki te nui o ngā pāpātanga ka wātea hei whakamahi mā ngā kaiwhakapuha i roto i ngā tau e tū mai nei. E heke ai te tūraru o tā ēnei rangiruatanga kaupare i tā te NZ ETS whakaheke i ngā puhanga ki te wāhi e tika ana, me whai whakaaro ki ētahi atu āhuatanga e heke ai ngā puhanga peke.

Hui katoa, e piki haere ana te hiranga o ngā mahi āhuarangi e mārama ana, e whānui ana anō hoki. Nō te whakataunga o ngā whāinga āhuarangi o te motu i 2019, kua kitea kāore tonu te ao i te ara tika kia noho ki raro o te 1.5 waeine tohurau, te 2 waeine tohurau rānei. Nā reira me whai ko ngā whakahekenga puhanga toitū.

E puta ana tēnei pūrongo i te wā e whakaahua tonu ana te Kāwanatanga o nāianei i āna kaupapahere āhuarangi, tae ana ki te mahere whakaheke puhanga tuarua i tōna tikanga ka puta i te hiku o tēnei tau.

E whakapono ana he nui te takohatanga o tēnei pūrongo ki aua mahi. Ehara i te kāri pūrongo whai raraunga, aromatawai noa iho. Ka tohu hoki i ētahi ara hei whakaheke i ētahi anō puhanga, te whakahohoro, me te whakapai ake i ngā ao o ngāi Aotearoa – e tino pērā ana mō te hunga e pāngia nuitia ana e te huringa āhuarangi me ōna pānga, e te korenga rānei o ngā mahi turaki i aua pānga.

Waihoki, mā ā mātou aroturukitanga motuhake, whai taunakitanga anō hoki e āwhina ki te tuku māramatanga kia mōhio ai mēnā rānei e whai hua ana ngā mahi o nāianei, ā, mēnā rānei he mahi anō me mahi e tātou. I te korenga o aua momo hōmiromirotanga, ka ara ake te tūraru ka ngahoro te whakapono o te marea me te māia o te ao.

I te mutunga iho, he kōwhiringa ā te Kāwanatanga ki te whakatutuki i ngā whāinga āhuarangi. Engari me hāngai ngā kōwhiringa mahi – arā, ki te whakakorea, ki te whakahekea rānei ngā kaupapahere, me whai i ētahi atu anō kaupapahere, hātepe anō hoki hei whakaū i te hekenga o ngā tukunga waro e noho tonu ai te motu i te ara ki te kore more.

Dr Rod Carr, Chair

Chair's message

When you are on a journey to reach a goal – like learning a new skill, aiming to finish a marathon, or saving up for something important – measuring your progress along the way is crucial.

Monitoring helps you know if you are on track to achieve your goal. Without it, you will not know – and if you do not find out until later that you are off track, it is harder to get back on course.

That is why our first annual monitoring report is useful. It shows gross emissions have declined in recent years. That is good news and indicates New Zealanders are on board with the challenge.

However, the report also shows more work is needed to meet the country's climate goals and international commitments, both of which have been endorsed by successive Governments with broad support.

While our findings suggest the country is likely on track to meet the first emissions budget, this comes with several caveats.

These include that a challenge for this year's assessment has been the limited data and information available on carbon removals by forests (that is, the amount of carbon dioxide soaked up by trees). This has meant we have had to rely on some older data and government projections.

Based on newer information received after our findings were already finalised, there is risk that those older projections might have underestimated how much deforestation has happened. If this is the case, it makes it less likely that the first emissions budget will be met. We will know more later this year when updated projections and official estimates of 'target accounting' emissions are released.

Either way, this highlights several things. It emphasises the need for good, independent data to know how things are tracking, and to be able to make informed decisions.

It also highlights there is – and will always be – a degree of uncertainty around estimating current and future emissions. Decision-makers need to be aware of this, and factor it into plans for meeting emissions budgets and targets.

Additionally, it helps demonstrate why the best way to meet and sustain 'net zero' is by cutting gross emissions – that is, stopping climate-polluting gases in the first place (for example by changing how industry is powered and how we transport goods and people).

Planting trees – both natives and exotics – gives Aotearoa New Zealand the opportunity to go further with its long-term climate goals. As a country, we are fortunate to have this cost-effective option – but it cannot help with near-term goals, because forests take time to establish and grow. It also needs to be well managed to address potential negative impacts on regions and communities, and the impacts of severe weather events.

Pricing is a powerful policy tool, but there are significant barriers that can reduce its effectiveness, and uncertainties in the way it operates. An example of this is the large and uncertain surplus of units in the New Zealand Emissions Trading Scheme (NZ ETS). That means there is significant uncertainty over how many units will be available for emitters to use over the next few years. To reduce the risk of these uncertainties preventing the NZ ETS from getting emissions down to where they need to be, other levers to reduce gross emissions should also be considered.

Overall, the need for clear and comprehensive climate action is increasingly important. Since our country's climate goals were set in 2019, it has become apparent that the world is still not on track to stay under 1.5 degrees or even 2 degrees. This means sustained reductions in emissions will be needed.

This report comes at a time when the current Government is still shaping up its climate policies, including the second emissions reduction plan that is due by the end of this year.

We believe this report can make a valuable contribution to that work. It is not just a report card with data and assessments. It also identifies opportunities to reduce more emissions, pick up the pace, and improve the lives of New Zealanders – particularly people most affected by climate change and its effects, or by lack of action to tackle them.

In addition, our independent, evidence-based monitoring helps provide transparency about whether current efforts are making a difference and if more needs to be done. Without that kind of impartial oversight, there is a risk that public trust and international confidence could quickly erode.

Ultimately, the Government has choices about how to meet climate goals. But the mix of actions it chooses must add up – that is, if policies are removed or weakened, other policies and approaches are needed to help ensure emissions will reduce enough to keep the country on the path to net zero.

Dr Rod Carr, Chair
16 July 2024

Te kupu a te Pou

E rua ngā koronga ā-ture o te Kōmihana: ko te tuku i ngā kōrero āwhina mātanga ki ngā Kāwanatanga hou e pā ana ki te whakamauru i te huringa āhuarangi me te urutau ki ōna pānga ka tahi. Ka rua ko te aroturuki me te arotake i ngā kokenga o te Kāwanatanga ki te whakahekenga o ngā puhanga me ngā whāinga urutau.

Ā-mohoa nei, ko tō mātou aronga ko te tuatahi o aua tūranga. Ināianei – nā runga i te Climate Change Response Act – kua tīmata tō mātou tūranga aroturuki.

Kei te kapa kotahi ngā kōrero āwhina me ngā mahi aroturuki. Ko tētahi ka āwhina i te paranga o te huarahi ki te whāinga; ko tērā atu ka āwhina ki te whakaū i ngā kokenga pai ki taua whāinga. Hui tahi ana, ka tautoko ēnei i ngā kōwhiringa mātau me ngā mahi whai hua.

He hirahira tēnā, ina hoki ka pā te huringa āhuarangi ki ngā mea huhua e tino arohia nei e ngāi Aotearoa, ā, he wāhanga waiwai anō hoki o te tuakiritanga o te motu. Ka pā ki ō tātou kāinga, ki ō tātou hapori, ki te ao Māori, ki te whenua, ki te taiao, ki te tūāhanga, ki ngā mahi me ngā pakihi o te tangata, ki te ōhanga me te pūnaha ahumoni, me te huhua atu anō.

Ka wāriutia ā mātou mahi aroturuki e te mahi a te tangata me te rōpū whakahaere puta noa i te motu. Ka tautoko i ngā whakatau whai taunakitanga e pā ana ki ngā mahi āhuarangi i ngā taumata katoa, ka kitea ngā kokenga, waihoki ka āwhina ki te tohu i ngā taupā me aro me ngā ara me whai.

E taea ana e te Kāwanatanga me ētahi atu ēnei pārongo te whakamahi ki te whakapai tonu i ngā mahi urupare ki te huringa āhuarangi me te whakangāwari i te whakawhitinga ki tētahi anamata puhanga iti. Hei tauira:

- ka kite te Kāwanatanga mehemea e whai hua ana ngā mahi o te wā me te whakaputa i ngā whakatau mātau e noho ai ki te ara tika
- ka kite a ngāi Aotearoa me ngā hapori he aha te aha, ā, mehemea e whai hua ana

- e pīrangi ana ngā kiritaki o tāwāhi i ngā pārongo horopū e pā ana ki ngā ahatanga o konei, nā te mea e piki haere ana tā rātou titiro ki ngā puhanga puta noa i ngā wāhanga katoa o ō rātou pakihi – tae ana ki ērā o ā rātou kaiwhakarato
- me whai ngā kaihoko whakawaho o Aotearoa i ngā raraunga pai e pā ana ki ngā kokenga ki ō te motu whāinga, i a rātou ka whai kia noho whakataetae i roto i tētahi ōhanga ā-ao e heke haere nei te waro
- mā ngā pūrongo kokenga tapatahi me ngā whakatātaretanga o ngā mahi o konei nā tētahi umanga motuhake o te kāwanatana e āwhina ki te whakapiki i te whakapono me ngā hoa kōtuinga ā-ao.

He tuatahitanga tēnei i roto i tētahi terenga roa o ngā pūrongo aroturuki ā-tau, ka piki haere hoki te wāriu i roto i te wā.

Kitea ai tērā i roto i te horopaki i kōrerohia e te Heamana i tana karere. Ahakoa e ai ki ngā kitenga i tēnei pūrongo tuatahi e aroturuki ana i te hekenga o ngā puhanga ka tutuki te tahua puhanga tuatahi, kei te nui tonu te rangirua.

I pēnei ai nā te mea me wā roa e whakapūmautia ai ngā raraunga e pā ana ki ngā puhanga me ngā hekenga tūturu, nā reira i ōna wā me whakamahi mātou i ngā matapae me ngā raraunga whai tepenga. Waihoki, nā te mea me whakaputa mātou i ā mātou pūrongo i mua o mea angawā kua whakatauhia e te ture, me kōwhiri mātou i tētahi pito poro, me te aha, i muri i tēnei, kāore mātou e āhei te whakauru i ētahi pārongo hou, i ngā huringa āhuatanga rānei i ā mātou aromatawai.

Nā runga i ēnei momo take, ka noho mai te rangiruatana haere ake nei i roto i te tātaritanga o ngā raraunga e wātea ana ki a mātou – engari ka heke haere taua rangiruatanga i ia tau nā te mea ka hua ake te māramatanga i ā mātou pūrongo ā-tau i roto i te wā.

E whakapae ana mātou ka whanake haere ngā pūrongo i a mātou ka whakawhāiti i tā mātou hātepe aroturuki. He akoranga te tohu, te ine hoki i ngā mea e tika ana, me te ara pai katoa e pērā ai.

I tēnei pūrongo tuatahi, kua toro mātou ki ētahi tauira o ētahi atu pūnaha aroturuki e whakamahia ana i konei, ā, i tāwāhi anō hoki, otirā i te ao, e ngā rangatōpū āhuarangi motuhake. Kua takoha atu anō hoki ā mātou rangahau, taunakitanga, tātaritanga anō hoki nā ā mātou mahi tohutohu o nāianei hei hinonga Karauna motuhake – nā te mātanga anō hoki o ā mātou kaimahi, o te Poari Kōmihana me He Pou Herenga (he kaporeihana tohutohu Māori o te Poari).

He kapohanga whai hua ka puta i tēnei hātepe aroturuki me ngā taputapu kua hangaia mō tēnei pūrongo e whakaatu ana i te kokenga o te motu ki ōna whāinga whakaheke puhanga, waihoki ka whakatakoto i tētahi tūāpapa hei whakawhanake mō ngā huringa pūrongo o te anamata.

Jo Hendy, Chief Executive

Chief Executive's message

The Commission's legislated purpose is twofold: to provide independent, expert advice to successive Governments on mitigating climate change and adapting to its effects, and to monitor and review the Government's progress towards its emissions reduction and adaptation goals.

Up until now, our focus has been on the first of those roles. Now – as required by the Climate Change Response Act – our monitoring role is kicking off.

Advice and monitoring are like two sides of the same coin. One helps chart a path to a goal; the other helps ensure you are making good progress towards that goal. Together, they contribute to more informed choices and more effective actions.

That is important, because climate change affects many things that New Zealanders care about, and that are essential parts of the nation's fabric. It impacts our homes and communities, te ao Māori, the whenua, the environment, infrastructure, people's jobs and businesses, the economy and financial system, and more.

Our monitoring work will be of value to a wide range of people and organisations across the motu.

It supports evidence-based decision-making about climate action at all levels, makes progress visible, and helps identify barriers to address and new opportunities to seize.

The Government and others can use this information to continually improve efforts to respond to climate change and smooth the transition to a low emissions future. For example:

- the Government can see if its current efforts are making a difference and make informed choices about how to stay on track
- New Zealanders and communities can see what is happening and know if it is working
- overseas customers want reliable information about what is happening here, because they are increasingly looking at emissions across all parts of their business – including from their suppliers
- New Zealand exporters need trustworthy data about progress towards our country's goals, as they strive to stay competitive in a global economy where other countries are rapidly decarbonising

- objective progress reports and scrutiny on efforts here from an agency independent of the government can help build trust with international partners.

This is the first in an ongoing series of annual monitoring reports, which will become increasingly valuable over time.

That's illustrated by the situation noted by our Chair in his message. While our findings in this first emissions reduction monitoring report suggest the first emissions budget is likely to be met, it is highly uncertain.

This stems from the fact that it takes time to confirm data about actual emissions and reductions, so in some areas we have to use estimates and provisional data. And because we have to produce our reports by a deadline that is set in law, we have to choose a cutoff point after which we cannot reasonably include new information or changes in circumstances in our assessments.

Because of factors like these, there will always be a degree of uncertainty in the analysis of the data that's available to us – but that uncertainty will reduce year by year as our annual reports paint a clearer picture over time.

We expect the reports will evolve as we refine our monitoring approach. Identifying and measuring the right things, and how best to do that, will be a learning journey.

For this first report, we have drawn on examples of other monitoring systems used here and overseas, and internationally by independent climate bodies. Our research, evidence and analysis from our existing advisory work as an independent Crown entity – as well as the expertise of our staff, our Board of Commissioners and He Pou Herenga (a Māori advisory body to the Board) – have also contributed to it.

The monitoring approach and tools we have created for this report provide a useful snapshot of how the country is tracking towards its emissions reduction goals, and provide a foundation to build on for future reporting cycles.

J E Hendy

Jo Hendy, Chief Executive
16 July 2024

Mō He Pou a Rangi Climate Change Commision

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 motuhake, whai taunakitanga hoki mā ngā kāwanatanga hou, mō te whakamauru i te huringa āhuarangi (tae ana ki te whakaheke i te tuku haurehu kati mahana) me te urutau ki ngā whiunga o te āhuarangi.
- aromatawai, hei arotake hoki i te anga whakamua o te whakaheke tukuwaro me te whakawhiti ki te rehu tika.

Kua ū ngā kāwanatanga hou ki te whakaheke i ngā haurehu whakapoke-āhuarangi o Aotearoa me te urutau ki ngā pānga o te huringa āhuarangi. Tukua ai e te Kōmihana ngā pārongo tapatahi e pā ana ki ngā kōwhiringa me urupare rā e te kāwanatanga o te rā. Mā tō mātou motuhaketanga e mōhio ai a Aotearoa – me te ao – ki te motuhenga o ngā mahi huringa āhuarangi o Aotearoa.

Ko te hōkaitanga me ngā angawā kua whakaritea mō ngā aroturukitanga me ngā kupu āwhina a te Komihana, kei roto tonu i te Ture. Kei te Minita Āhuarangi te tikanga rā kia tono motuhake ki te Kōmihana mō tētahi kupu akiaki motuhake.

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.

Kāore mātou e whakatakoto kaupapahere, ehara hoki i te mea me whai te Kāwanatanga i ā mātou kōrero āwhina. Heoi anō, e ai ki te ture, me tāpae te Kāwanatanga i ā mātou pūrongo aroturuki ki te Pāremata, me te urupare tūmatanui mai mā te tuhi. Mō ngā pūrongo aroturuki i te whakahekenga tukuwaro, ka uru ki tēnei ko tā te Kāwanatanga whakaputa i tētahi pūrongo e whakaatu ana i te urupare a te Minita, e whakamahuki ana i ngā kokenga o te whakatinana i te mahere whakaheke tukuwaro o nāianei, me te tuhi i ngā panonitanga ki taua mahere. Ka āwhina ēnei haepapa ki te whakaū i te āta arohia o ngā kōrero āwhina motuhake e pā ana ki te urupare huringa āhuarangi o te motu e ngā Kāwanatanga hou.

E aro ana ngā pūrongo aroturuki me ngā kōrero āwhina a te Kōmihana ki ngā hua ka taea mā ngā mahi, ngā kaupapahere hoki a te kāwanatanga, me ngā kōwhiringa e wātea ana ki te hunga whakatau – tae ana ki ngā ara me ngā tūraru ka tāpaetia e ia kōwhiringa. Ko te whāinga ko te tautoko i te Kāwanatanga ki te whakatutuki i tana tūranga i raro i te Ture, tae ana ki te whakatutuki i ngā tahua tukuwaro me te whāinga o 2050, me te tuku i a ngāi Aotearoa ki te whakarite, ki te urutau anō hoki ki ngā pānga o te huringa o te āhuarangi.

Ko tēnei te tūāpapa o tā mātou mahere mahi, e tuku ana i te kupu akiaki motuhake, i ngā aroturukitanga whai taunakitanga anō hoki, ki te Kāwanatanga mō tā Aotearoa whakamauru me te urutau ki ngā whiunga o te āhuarangi me te whakawhiti atu ki tētahi anamata tōnui, āhuarangi-pakari me te tukuwaro iti.

Kei tā mātou pae tukutuku ētahi pārongo anō e pā ana ki te hōtaka mahi a te Kōmihana, kei www.climatecommission.govt.nz

About He Pou a Rangi Climate Change Commission

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

- provide independent, evidence-based advice to successive governments on mitigating climate change (including through reducing emissions of greenhouse gases) and adapting to the effects of climate change
- monitor and review progress towards emissions reduction and adaptation.

Successive governments have committed to reducing Aotearoa New Zealand's climate-polluting gases and adapting to the impacts of climate change. The Commission provides impartial information about the choices the government of the day has to respond to climate change. Our independence provides assurance to New Zealanders – and internationally – about the credibility of Aotearoa New Zealand's action on climate change.

The scope and timeframes for the Commission's monitoring and advice are set out in the Act. In addition, 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 does not have to take our advice. However, the Act does require the Government to present our monitoring reports to Parliament, and to respond publicly in writing. For emissions reduction monitoring reports, this includes the Government making a report available showing the Minister's response, describing the progress in implementing the current emissions reduction plan, and noting any amendments to that plan. These obligations help ensure independent advice on the country's climate change response is given due consideration by successive Governments.

The Commission's monitoring reports and advice focus on the outcomes that can result from government action and policy, and the choices 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, and allowing New Zealanders to prepare for, and adapt to, the effects of climate change.

This is the foundation of our programme of work providing the Government with independent, evidence-based monitoring and 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.

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

He mawhititanga: te aroturuki i te whakahekenga tukuwaro

At a glance: monitoring emissions reduction

He Pou a Rangi Climate Change Commission (the Commission) is tasked under the Climate Change Response Act 2002 (the Act) with the job of independently monitoring Aotearoa New Zealand's progress on reducing greenhouse gas emissions.

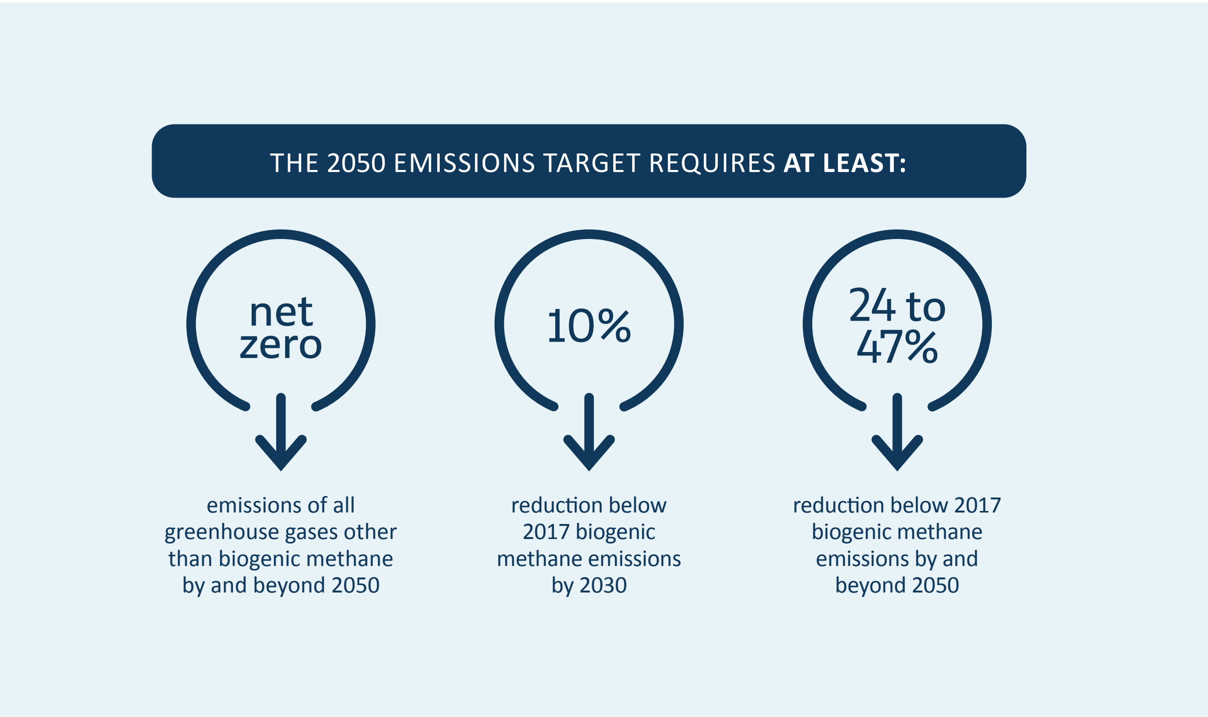
This 2024 report is the first of what will be annual monitoring reports on reductions in greenhouse gas emissions. These objective assessments will build into a series of snapshots forming a picture over time of how the country is tracking towards its climate change goals.

The annual reports will present our assessment of:

- the adequacy of the Government's current emissions reduction plan and its implementation
- how the country is tracking against the 'emissions budgets' that serve as stepping-stones to the long-term target
- progress towards that 2050 emissions target (**Figure A1**).

The monitoring covers reductions in gross emissions, and removals of greenhouse gases from the atmosphere (mostly carbon dioxide absorbed by forests as trees grow), to report against the country's net emissions target.[i]

Figure A1: Aotearoa New Zealand's 2050 emissions target



Source: Commission analysis

i. There are also end-of-budget reports required in the Act, which will evaluate progress made in a particular budget period. The first of these is due in 2027, for the first emissions budget (2022–2025).

Box A1: The questions at the heart of the report

The 2024 report has this overall purpose:

To track progress towards achievement of the first emissions budget (2022–2025), the second budget (2026–2030) and the third budget (2031–2035), and progress towards the 2050 target, and to assess the adequacy of the first emissions reduction plan and progress in its implementation.

We address this through four questions:

- What progress have we seen in emissions reductions to date?
- How is the country tracking towards meeting the first emissions budget for 2022–2025?
- How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current emissions reduction policies and plans?[ii]
- What is needed for Aotearoa New Zealand to be on track for future emissions budgets and the 2050 target?

These are the headings we use for the key findings summarised below and shown in full in *Chapter 3: Our key findings*.

What we found

This summary provides an 'at-a-glance' view of the key findings from our assessment, organised under the four fundamental questions it asks (Box A1). *Chapter 3* sets out our findings in full, while *Part B* of this report presents the supporting evidence.

The assessment shows there is an urgent need to strengthen policies and strategies to put Aotearoa New Zealand on track to meet future emissions budgets and the 2050 target, including the 2030 biogenic methane component of the target.

We identify a range of opportunities to work towards the country's climate goals. This includes a focus on areas where progress has happened faster and more effectively than expected, as these areas offer ways to maintain and enhance momentum.

The assessment of the adequacy of the emissions reduction plan also identifies areas of uncertainty in policy direction and funding, particularly for managing potential impacts of emissions reduction policy, and for the delivery of actions focused on iwi/Māori. These are key challenges that decision-makers will need to address to build a transition to a low emissions Aotearoa New Zealand that supports all to thrive.

The information available for this report

As required in section 5ZK of the Act, our analysis is based on the latest available data from New Zealand's Greenhouse Gas Inventory (GHG Inventory), combined with "the latest projections for current and future emissions and removals".[iii]

ii. See *Chapter 2: Our approach* for what we have considered alongside the plan, which includes evolution in policy since the emissions reduction plan was published, up to 1 April 2024.

iii. Climate Change Response Act 2002, section 5ZK(2)(a).

The GHG Inventory published in April 2024 provides data up until the end of the 2022 calendar year: the first year of the first emissions budget. As explained in *Chapter 2: Our approach*, we complement the GHG Inventory data with emissions estimates and projections to provide a more up-to-date picture of progress. Projections have an inherent level of uncertainty associated with them; this is noted within our findings, where relevant.

The GHG Inventory published in 2024 does not include calculations using the target accounting method on net emissions removals by absorption in forests ('net removals by forest'). This means there are no official estimates for net emissions up to 2022 under the accounting rules that apply to Aotearoa New Zealand's emissions budgets.[iv] In their absence, we have relied on the most recent government projections for removals by forests under target accounting, published in 2023. This is a key caveat to our findings on how Aotearoa New Zealand is currently tracking towards meeting the first emissions budget.

For more info, see the following sections of the report

Part A provides an overview and summary,

including the report's purpose and context, the approach taken to this monitoring, and a synthesis of our key findings.

Part B provides the evidence for our findings,

including analysis of system-wide areas (*Chapters 5–8*) and analysis of sectors reported in the GHG Inventory (*Chapters 9–12*).

SUMMARY FOR DECISION-MAKERS

Precis of key findings – for the full findings with illustrating figures see *Chapter 3*

Global situation

- Global temperatures and greenhouse gas emissions have reached new highs, but climate action and use of new technologies is slowing the rise of emissions (*Chapter 4*). The evidence shows there is continuing global progress on emissions reduction, but further efforts are required to reach global goals.
- Aotearoa New Zealand's gross domestic product (GDP) has risen by 147% since 1990, while gross emissions have only risen by 14% over that time. A global pattern of decreasing gross emissions-per-unit of GDP highlights that a strong and growing economy is possible without increasing gross emissions. While Aotearoa New Zealand's gross emissions-per-GDP ratio since 2014 has been lower than the global average, it is still the third-highest ratio of all advanced economies, behind only Australia and Canada.[v]

iv. Official estimates of net emissions under target accounting will be published in Aotearoa New Zealand's Biennial Transparency Reports under the Paris Agreement, the first of which is due by 31 December 2024. Those official estimates will also be reported annually in the GHG Inventory from 2025.

v. See *Chapter 4*, **Box 4.2** for further information.

Question 1: What progress have we seen in emissions reductions to date?

- Gross emissions in Aotearoa New Zealand have declined each year since 2019, as a result of government policies combined with the impact of external factors – such as economic conditions, weather conditions, and international fossil fuel prices.
- Gross emissions fell in every sector from 2021 to 2022, with the largest drop coming from energy and industry. Those sectors accounted for nearly three-quarters of the gross emissions reductions in 2022.
- These emissions reductions largely rely on variable factors that could change in any year – for example high rainfall, which supported higher hydroelectricity generation and less power generation from coal and gas. The rate of emissions reductions seen in 2022 is therefore unlikely to continue.
- Progress in reducing net emissions is currently uncertain due to the absence of official data on carbon removals by forests using the accounting approach that applies to Aotearoa New Zealand's emissions budgets and targets ('target accounting'). Based on government projections of carbon removals under target accounting published in 2023, net emissions have also fallen since 2019.

Question 2: How is the country tracking towards meeting the first emissions budget for 2022–2025?

- Available emissions data and projections are consistent with the first emissions budget being met. However, this estimate has high uncertainty due to risk factors such as increased levels of loss of forest area (deforestation), low rainfall (dry years) for hydroelectricity generation, and rising transport emissions. Further action by the Government to reduce emissions would decrease the risk of missing the first emissions budget.
- There is opportunity to increase momentum by focusing on areas where there have been positive signs of change, such as uptake of low and zero emissions vehicles. While there is now limited time in the first emissions budget period for new policies to have much impact, increased effort on measures that have proven effective could improve chances of meeting the first emissions budget. Those reductions would also build over time to contribute to meeting the second emissions budget (2026–2030) and third emissions budget (2031–2035).

Question 3: How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current emissions reduction policies and plans?

- There are significant risks to meeting the second and third emissions budgets and the 2030 biogenic methane target.
- The agriculture and transport sectors show the largest risks, and insufficient action to reduce emissions in these sectors will put the second and third emissions budgets at risk.

- If there are insufficient reductions in gross emissions for the second emissions budget (2026–2030), this cannot be made up by increased removals of carbon dioxide through forestry. Additional forest planting can no longer make much difference to this period, because the rates of increase of carbon removal through trees is slow in the early stages of new plantings.
- The New Zealand Emissions Trading Scheme (NZ ETS) is an essential part of an effective policy package for reducing emissions, but it cannot itself ensure the emissions budgets are met. The way the scheme operates does not provide certainty about the units available to emitters over the period to 2035. It therefore does not provide certainty about the quantity of emissions from the sectors and sources it covers.

Question 4: What is needed for Aotearoa New Zealand to be on track for future emissions budgets and the 2050 target?

- A well-designed policy package is needed to deliver cost-effective and durable climate action that will achieve the country's emissions budgets and 2050 target.
- Actions to meet climate goals can have positive impacts, such as reducing living costs, but there can also be negative impacts. The way those impacts fall on different sectors, regions, and communities, and across generations, needs to be managed to avoid inequities.
- There is currently a lack of clarity in how the Government plans to manage potential impacts of emissions reduction policy and to grasp opportunities to improve the lives of New Zealanders, particularly for those most affected by emissions reduction policies.
- The effectiveness of emissions pricing policies (such as the NZ ETS) is limited by barriers such as access to capital, and other challenges in systems, infrastructure and incentives that make it difficult for people and businesses to choose options that have lower emissions. Policies targeted to address these barriers could unlock cost-effective action and make the NZ ETS more effective.
- New policy measures in agriculture will be needed alongside continued action on waste emissions to meet the 2030 biogenic methane component of the long-term target. This 2030 goal applies specifically to reductions in biogenic methane and can only be achieved through action in the agriculture and waste sectors; the goal limits flexibility in how the second emissions budget (for 2026–2030) can be achieved.
- In addition to action on critical sectors, our assessment identified opportunities for government action on issues that limit emissions reduction across the economy. An example would be to ensure robust supply chains and availability of a skilled workforce to increase the speed that the energy sector can deliver projects to reduce emissions. This is particularly important, given that reliable and affordable electricity supply is critical for reducing emissions from transport, industries and buildings, and has flow-on effects across the economy.
- As noted for the current emissions budget period, there are opportunities for more ambition in some areas of emissions reduction where progress has been faster than expected. Examples include faster than anticipated uptake of low and zero emissions vehicles, further emissions reductions from industry, and reducing geothermal emissions through gas capture and reinjection. Maintaining and building momentum in these areas could help balance risks of underachievement in others.

Wehenga A:
Te tirohanga whānui
Part A:
The overview

He whakatakinga | Introduction

This is the first of what will be annual monitoring reports on reductions in Aotearoa New Zealand's greenhouse gas emissions.

He Pou a Rangi Climate Change Commission is tasked under the Climate Change Response Act 2002 (the Act) with the job of independently monitoring Aotearoa New Zealand's progress on reducing greenhouse gas emissions. These objective assessments will build into a series of snapshots forming a picture over time of how the country is tracking towards its climate change goals.

This chapter provides an overview of the purpose of this assessment, and context about Aotearoa New Zealand's system for reducing greenhouse gas emissions. It sets out the Commission's role in monitoring and how this assessment ties into other parts of the country's climate change response, including on adaptation.

Purpose of the report

How we are tracking progress on reducing greenhouse gas emissions

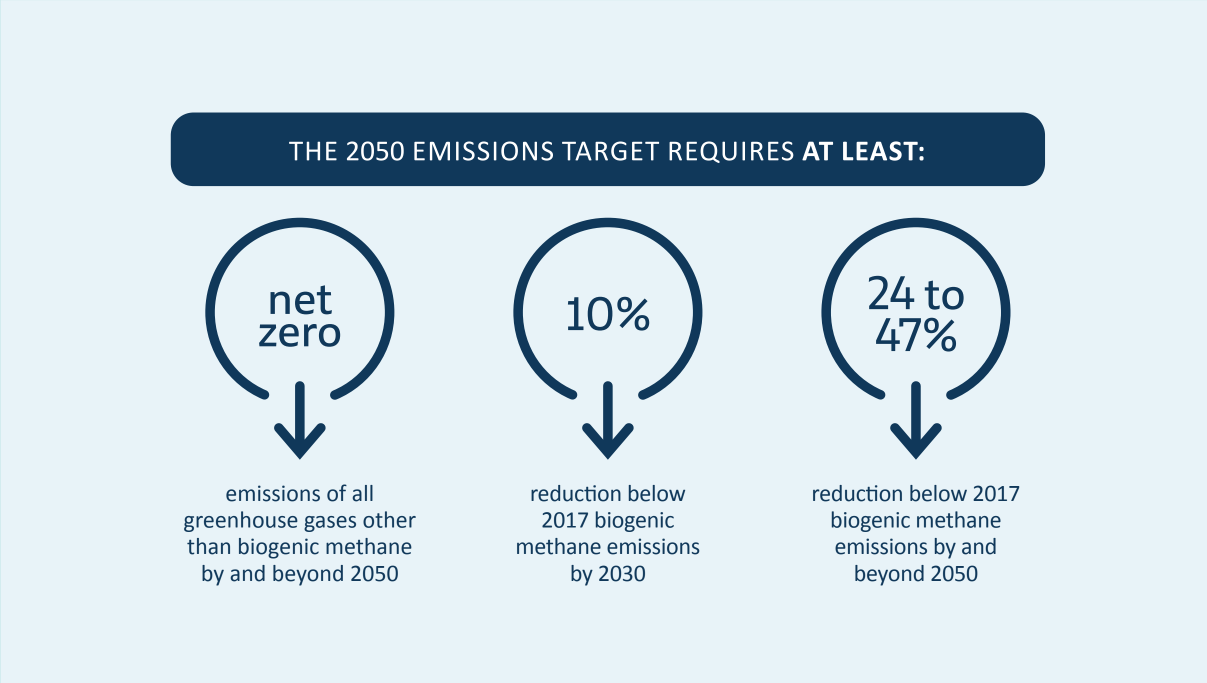
The annual reports will present our assessment of:

- the adequacy of the Government's current emissions reduction plan and its implementation
- how the country is tracking against the 'emissions budgets' that serve as stepping-stones to the long-term target
- progress towards that 2050 emissions target (Figure 1.1).

The monitoring covers reductions in gross emissions, and removals of greenhouse gases from the atmosphere (mostly carbon dioxide absorbed by forests as trees grow), to report against the country's net emissions target.

There will also be end-of-budget reports at the end of each emissions budget period, providing an evaluation of progress made in that time. The first of these will be due in 2027, two years after the end of the first emissions budget period (2022–2025).

Figure 1.1: Aotearoa New Zealand's 2050 emissions target



Source: Commission analysis

What the monitoring provides

As required in section 5ZK of the Act, our analysis is based on the latest available data from New Zealand's Greenhouse Gas Inventory (GHG Inventory), combined with the latest projections for current and future emissions and removals. The GHG Inventory published in April 2024 provides data up until the end of the 2022 calendar year: the first year of the first emissions budget.

As explained in *Chapter 2: Our approach*, we complement the GHG Inventory data with government emissions estimates and projections to provide a more up-to-date picture of progress. This is combined with our assessment of the adequacy and implementation of the current emissions reduction policies and plan.

Overall, this assessment provides an objective and impartial view of how Aotearoa New Zealand is tracking towards its goals to reduce greenhouse gas emissions. It provides insight into the achievements made, challenges experienced, and the opportunities and risks for meeting the emissions budgets and 2050 target.

The annual monitoring report series will provide the Government with the evidence to support decision-making throughout emissions budget periods, identifying areas for attention, and opportunities the Government has to help to achieve its long-term target.

The annual series, together with end-of-budget reports, will support this and successive Governments to get and stay on track, and provide transparency so the public can hold the Government to account.

Box 1.1: The questions at the heart of the report

The 2024 report has this overall purpose:

To track progress towards achievement of the first emissions budget (2022–2025), the second budget (2026–2030) and the third budget (2031–2035), and progress towards the 2050 target, and to assess the adequacy of the first emissions reduction plan and progress in its implementation.

We address this through four questions:

- What progress have we seen in emission reductions to date?
- How is the country tracking towards meeting the first emissions budget for 2022–2025?
- How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current emissions reduction policies and plans?[vi]
- What is needed for Aotearoa New Zealand to be on track for future emissions budgets and the 2050 target?

These are the headings we use for the key findings in *Chapter 3: Our key findings*.

The context of this report

The country's climate change response framework

Monitoring reports are one part of the framework established in the Act for Aotearoa New Zealand to mitigate and adapt to the effects of climate change. This includes contributing to the international effort under the Paris Agreement to limit global warming, by reducing emissions of greenhouse gases.[vii]

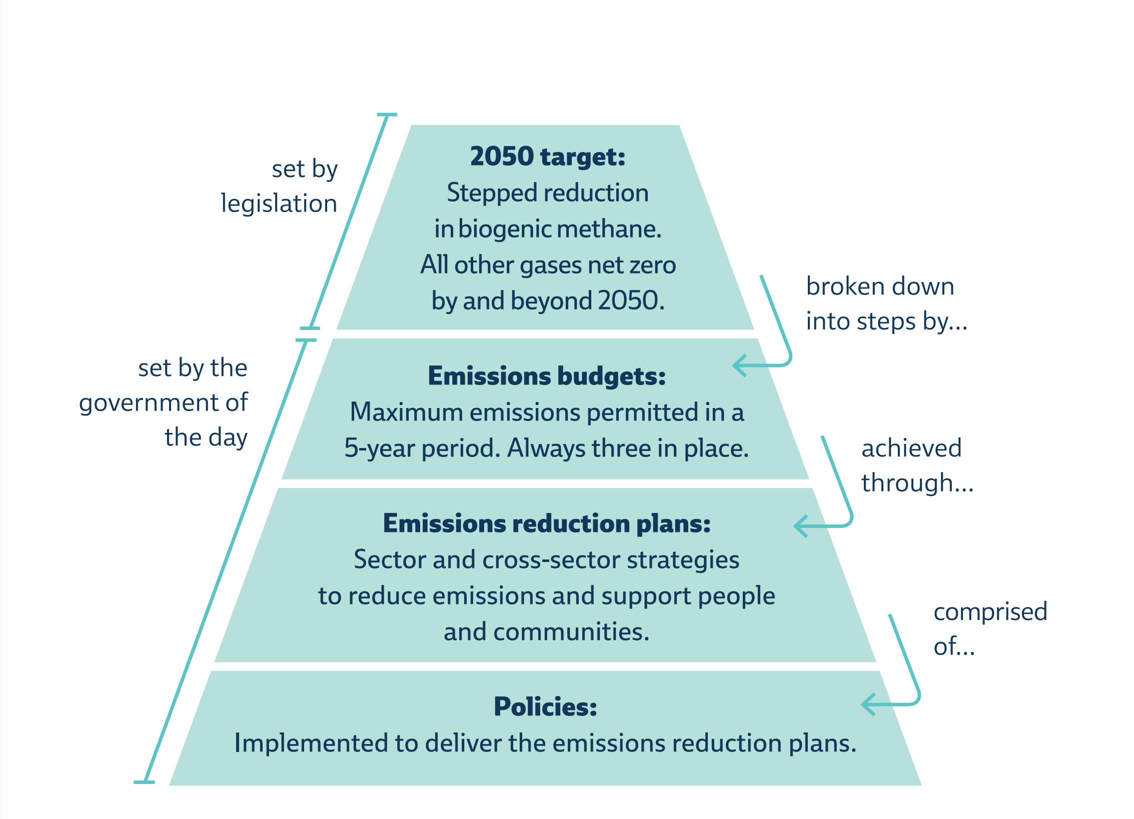
The Act sets out the country's approach to reducing emissions, including putting into law a 2050 emissions reduction target; breaking that down into 'emissions budget' steps, to be achieved through emissions reduction plans and policies; and establishing the Commission to provide independent, evidence-based advice on the target, budgets and plans, and to monitor the country's progress on reducing emissions (see Box 1.2).

- **The 2050 target** focuses Aotearoa New Zealand's efforts on climate action and provides a consistent signal to government, businesses, and communities so they can plan long-term action and investment.
- The **emissions budgets** turn this long-term target into tangible, measurable and achievable steps. The budgets set five-year total limits on greenhouse gas emissions – each budget is smaller than the one before, so that greenhouse gas emissions decline over time (Figure 1.2).
- The **Government's emissions reduction plan** sets out strategies and policies to achieve the current emissions budget and may include strategies and policies for meeting future emissions budgets. The plan must also include a multi-sector strategy to meet emissions budgets and improve the ability of sectors to adapt to the effects of climate change, and a strategy to mitigate the impacts of policies on employees and employers, regions, iwi and Māori, and wider communities.

vi. See *Chapter 2: Our approach* for what we have considered alongside the plan, which includes evolution in policy since the emissions reduction plan was published, up to 1 April 2024.

vii. The first statement of the Act's purpose is to "provide a framework by which New Zealand can develop and implement clear and stable climate change policies that— (i) contribute to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5° Celsius above pre-industrial levels; and (ii) allow New Zealand to prepare for, and adapt to, the effects of climate change".

Figure 1.2: Aotearoa New Zealand's system for reducing domestic emissions



The Climate Change Commission's work includes:

- Providing the government of the day with independent, expert advice on the 2050 target, emissions budgets, and emissions reduction plans
- Monitoring the country's progress on reducing emissions

Source: Commission analysis

Box 1.2: The Commission's monitoring role – emissions reduction and adaptation

Under section 5B of the Climate Change Response Act 2002, the Commission has responsibility for monitoring and reporting progress on the Government's goals for emissions reduction[viii] and progress on the Government's national adaptation plan. This is further set out in sections 5ZJ, 5ZK, 5ZL and 5ZU.

This evidence-based monitoring provides information to support decision-making across central and local government and through all sectors and communities in Aotearoa New Zealand. It makes progress visible, and helps identify where there are adjustments needed to plans, barriers to address, or new opportunities. It can help in the best use of limited resources, by directing resources towards activities that are most likely to achieve the named goals.

Our independent assessments draw on information from a wide range of sources, including central and local government (see Box 2.2 in *Chapter 2: Our approach*). We also use information collated by the Climate Change Chief Executives Board, which is the interdepartmental executive board (IEB) that coordinates implementation of the emissions reduction plan and the national adaptation plan.

The reports are provided to the Minister of Climate Change and published by the Commission. The Minister must provide a response to each emissions reduction monitoring report within three months, noting any amendments to the relevant emissions reduction plan.[ix]

We are required to deliver three kinds of monitoring report

EVERY YEAR:

***Annual emissions reduction monitoring reports* – starting with this 2024 report** These reports track progress against the emissions budgets the Government sets in five-year intervals, working towards the country's 2050 target for emissions reduction (as set in the Act). These reports also assess the adequacy of the current emissions reduction plan, and its implementation.

2-YEARLY:

***National adaptation plan progress reports* – starting also in 2024 (publishing in August)** These reports evaluate the implementation and effectiveness of the national adaptation plan.

5-YEARLY:

***End of emissions budget reports* – the first is due at the end of 2027** These end-of-budget reports are due two years after the end of the period. The first emissions budget covers 2022–2025. These reports look backwards only, providing a close evaluation of progress made in the period.

viii. The Commission monitors progress on domestic emissions budgets and the long-term target set under the Act. This report is not monitoring progress towards Aotearoa New Zealand's nationally determined contribution (NDC), which is the country's international commitment under the Paris Agreement.

ix. The Act sets six months for the Minister's response to our separate report on progress on the national adaptation plan.

How monitoring fits with the Commission's other duties

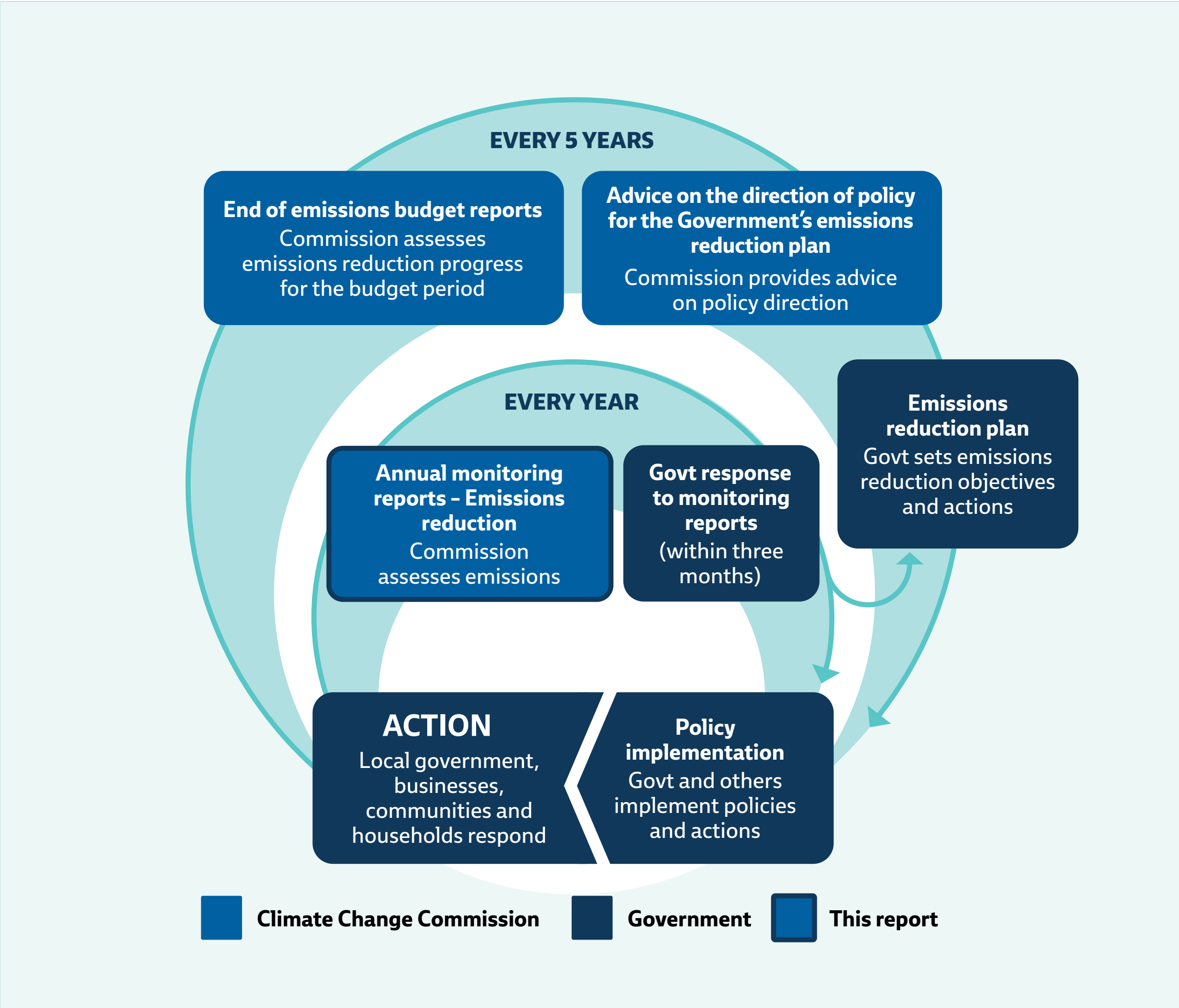
The Commission has two distinct functions under the Act, both of which support successive Governments to achieve the country's climate change goals.

Alongside the monitoring work, the Commission also provides independent advice. This includes advice the Government must consider when it prepares emissions reduction plans. This is a five-yearly task, provided the year before the preparation of the next plan, in advance of a new emissions budget period. The latest Commission advice on policy direction to inform the development of the second emissions reduction plan (for 2026–2030) was delivered on December 2023.

Planning and monitoring work are interwoven and will often overlap. At the same time as the Commission is preparing this first monitoring report, the Government is preparing the second emissions reduction plan to cover the emissions budget period for 2026–2030. This is being consulted on in mid-2024, and is due to be published at the end of the year.

Figure 1.3 shows how our monitoring work feeds into the wider policy cycle. The annual cycle of monitoring, and the reporting at the end of budget periods, will inform our policy advice. The Commission will next provide advice on the direction of policy for the third emissions reduction plan (2031–2035) in 2028.

Figure 1.3: Emissions reduction planning and delivery cycle



Source:Commission analysis

The structure of this report

This report provides an overview of the monitoring task and what we found. This overview is followed by the detailed evidence for our findings, presenting our data and policy analysis.

Source documents

These three documents are core resources for this analysis:

- Ministry for the Environment. (2022). *Te hau mārohi ki anamata – Towards a productive, sustainable and inclusive economy: Aotearoa New Zealand's first emissions reduction plan.* https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf

- Ministry for the Environment. (2024). *New Zealand's Greenhouse Gas Inventory 1990–2022.* https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2022/

- Stats NZ. (2024). *Quarterly greenhouse gas emissions by sector: December 2023 quarter.* Customised report and licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence, supplied by the Climate Change Chief Executives Board. Published as supporting material on our website: https://www.climatecommission.govt.nz/our-work/monitoring/emissions-reduction-monitoring/erm-2024

Other references for source material are provided as endnotes.

For our supporting material, see this page of the Commission website: https://www.climatecommission.govt.nz/our-work/monitoring/emissions-reduction-monitoring/erm-2024

WĀHANGA 2 | CHAPTER 2

Tā mātou kokenga | Our approach

This chapter sets out our approach for assessing Aotearoa New Zealand's progress towards meeting the country's emissions budgets and 2050 target.

To create the first report in what will be an annual series, He Pou a Rangi Climate Change Commission (the Commission) has developed and applied a framework for monitoring. The approach and tools we have created provide a clear view of how the country is tracking to its emissions reduction goals, and will be a foundation to build on for future reporting cycles.

Our assessment of the adequacy and implementation of the first emissions reduction plan, and identification of areas for attention and new opportunities to reduce greenhouse gas emissions, can in turn contribute to the Government's evolution of planning and policy.

This chapter outlines how we have designed our approach, based on international best practice and models. It shows how we combine analysis of the latest available data and the first emissions reduction plan and policies to create the progress assessment required under the Climate Change Response Act 2002 (the Act).

Drawing connections is key to our monitoring work. Our analysis considers the many links between government policies, economy, industry, people and the environment. Taking this kind of 'systems view' means we also consider adaptation to climate change alongside emissions reduction.[x,xi] This recognises that work in one area can benefit the other or conversely make it more difficult to achieve. Making the links between different approaches can reduce the cost of action and avoid working at cross purposes. The strength of this systems approach to monitoring will build over time, enhanced through engagement and future work to deepen our understanding of these complex interdependencies and connections.

Working from evidence: research, analysis and engagement

As an independent Crown entity, we base our work on research, evidence and analysis, and draw on the expertise of our staff, our Board of Commissioners and He Pou Herenga – a Māori advisory body to the Board.

In preparing this report we reviewed international research as well as other countries' reporting of emissions reductions and progress against their

x. Section 5ZG(3)(b) of the Act requires the emissions reduction plan to include a multi-sector strategy to meet emissions budgets and improve the ability of those sectors to adapt to the effects of climate change. We have considered this requirement, as part of our assessment of the adequacy and implementation of the first emissions reduction plan.

xi. The Commission is preparing a separate assessment of the first national adaptation plan and its implementation. That report is due to the Minister of Climate Change in August 2024.

policy goals. The examples we have drawn on include other monitoring systems used within Aotearoa New Zealand, and some international examples in use by independent climate bodies. Our approach is based in particular on work by the UK Climate Change Committee, which has produced an annual emissions reduction progress report since 2009, evolving its framework considerably in this time.[1]

While our work is evidence based, that does not just mean quantitative data. To assess progress on emissions reduction, and the adequacy of the plan and its implementation, we have combined a review of the available data on greenhouse gas reductions with analysis of the effects of government policy and action. Our assessment, including the part that looks at wider systems and issues, is focused primarily on tracking government action. It also draws on our previous work and engagement with iwi/Māori, communities, councils, businesses, and other interested people to inform our understanding of how impacts of policies can affect emissions reduction. Over time, the reports will evolve as we refine our monitoring approach. How we identify and measure the right things, and how best to do that will develop as part of that process.

Our monitoring framework and tools

This section sets out the building blocks of our monitoring approach. It covers the Act's requirements for monitoring emissions reduction, and how we responded to those requirements in 2024. It explains the 'benchmark' we have used to measure progress against.

Elements in our emissions reduction monitoring

As set out in *Chapter 1: Introduction*, the Commission is required under the Act to regularly monitor and report on progress to meet emissions budgets and the 2050 target. The Act outlines the reports that have to be delivered and lists matters that must be considered (Table 2.1).

Table 2.1: Emissions reduction monitoring requirements in the Climate Change Response Act 2002

The Act requires annual monitoring reports to include these elements:	The Act requires monitoring and reporting of progress towards meeting emissions budgets and the 2050 target, and must consider, where relevant, these issues and impacts:
• measured emissions and removals for the most recent year where data are available from New Zealand's Greenhouse Gas Inventory (GHG Inventory) • the latest projections for current and future emissions and removals • an assessment of the adequacy of the emissions reduction plan and progress in its implementation, including any new opportunities to reduce emissions.	• current available scientific knowledge • existing technology and anticipated technological developments, including the costs and benefits of early adoption of these in New Zealand • the likely economic effects • social, cultural, environmental, and ecological circumstances, including differences between sectors and regions • the distribution of benefits, costs and risks between generations • the Crown–Māori relationship, te ao Māori (as defined in section 5H(2)), and specific effects on iwi and Māori • responses to climate change taken or planned by parties to the Paris Agreement or United Nations Framework Convention on Climate Change.

The monitoring framework we have developed meets those requirements while achieving the following aspects.

- **Focus on outcomes.** The focus is on reporting measurable steps towards achieving Aotearoa New Zealand's budgets and targets. This supports an objective assessment of progress. To do this we assess 'outcomes' – specific changes within sectors that contribute to achieving emissions reductions. An example is the outcome of increasing the supply of electricity from renewable sources: to assess whether this is being achieved, we need to consider actions taken in a range of areas. This avoids assessing individual policies within just one area (such as electricity market policy), which would miss the connections with another area (such as resource management planning).
- **Look for early signals of change.** For some of the changes under way, the reduction in greenhouse gas emissions from that change will take a number of years to scale up (for example in transport, increasing the share of low and zero emissions vehicles in the country's fleet takes time to show up as reduced emissions from the fleet, as only a small percentage is replaced each year). Our framework aims to identify where early signs of progress could be expected and when we might see them, to highlight where adjustments are needed to avoid the risk of not achieving the emissions budgets.
- **Take a long-term systems view.** Achieving the transition to a low emissions economy requires long-term investments in infrastructure, in technology, and to support communities and businesses to choose options that reduce emissions. The monitoring framework is designed to examine progress being made in the short term, and how that observed progress sets up the country for the future. Taking a long-term systems view can assist in setting up a climate change response that is equitable and long lasting, and that considers the needs and interests of future generations.

How the 2024 report defines timeframes and focus

This 2024 report provides a view of progress towards reducing the country's greenhouse gas emissions at a particular point in time, showing progress to date and an assessment of how Aotearoa New Zealand is tracking towards its emissions budgets and the 2050 target.

Part of the focus is on the adequacy and implementation of the current emissions reduction plan. We have defined what is covered by 'the current plan', given that the first emissions reduction plan has evolved since its release in May 2022. There has been discontinuation of some actions (such as the Sustainable Biofuels Obligation) and expansion to other actions (such as improving the nationwide network of electric vehicle (EV) chargers). There have also been changes to policy in other areas that influence emissions reduction (such as resource management).

Our assessment of 'current emissions reduction policies and plans' as of April 2024 involved the following elements.

- We included information provided by the Climate Change Chief Executives Board, which is the interdepartmental executive board (IEB) that coordinates implementation of the emissions reduction plan. This covered the implementation status of the cross-agency actions and strategies in that plan up until December 2023.
- We included in our analysis actions and policies that were implemented and in place, or had government agreement (such as Cabinet or formal Ministerial approval), at 1 April 2024.

- Our policy scorecard assessment does not include actions that did not have formal government decision by that date (so does not include government announcements or manifesto commitments without Cabinet decision before 1 April). However, some of these actions are noted in scorecard commentary or cross-cutting analysis where they have significant implications for our assessment, for example the draft Government Policy Statement on land transport. We also noted any significant implications from Budget 2024.

How we assess progress on emissions reduction

Using the Commission's 2022 demonstration path as a benchmark

The Government is yet to set out a clear, quantified pathway for meeting the emissions budgets or 2050 target. For this assessment, we use the Commission's demonstration path, as updated in 2022, as a benchmark for tracking progress (referred to as 'the Commission's 2022 demonstration path' throughout the report).

The first emissions reduction plan used an earlier version of the Commission's demonstration path as a starting point, including for the establishment of subtargets for separate sectors to support the Government's monitoring of progress across sectors. Our approach is consistent with this. We also use other government benchmarks where available, such as those set out in the emissions reduction plan for the transport sector (and these are detailed where relevant in *Part B: Sector analysis*).

The Commission's 2022 demonstration path is grounded in meeting the 2050 target and reflects judgements by the Commission on a durable path consistent with the areas required to be considered under the Act. It is not a prescription. There is flexibility in how the budgets are met, with choices around the pace of actions in different areas and the options pursued.
The first emissions reduction plan used an earlier version of the Commission's demonstration path as a starting point, including for the establishment of subtargets for separate sectors to support the Government's monitoring of progress across sectors. Our approach is consistent with this. However, if emissions in one part of the economy are higher than in our demonstration path benchmark, emissions would need to be lower in another part of the economy for overall emissions budgets to be met.

Using the Commission's 2022 demonstration path as a monitoring tool helps to illuminate where the country might be at risk of not meeting emissions budgets, including where there are increasing risks for the longer term. We compare data against benchmarks from the Commission's 2022 demonstration path to gauge the pace of progress in different areas and inform on challenges and opportunities.

As part of our assessment of the adequacy of government plans and policies, we ask:

Has the Government set clear goals for this outcome area in the first emissions reduction plan or subsequent announcements? If yes, how do these goals compare with the level of change required to meet emissions budgets, using the Commission's 2022 demonstration path as a benchmark?

A list of the key products from our monitoring work, such as the scorecard assessment of policies and plans, is outlined in Box 2.1.

Box 2.1: Key monitoring products

These are key products in our monitoring work:

- **A cross-cutting analysis of policies and plans.** This provides a 'system-wide' view of progress towards the country's emissions budgets and 2050 target. It covers global trends; and domestic policies, systems and tools, including the NZ ETS. The analysis also considers how the first emissions reduction plan addresses matters that are important to iwi/Māori and for a transition that supports New Zealanders.
- **Sector monitoring maps.** These set out a 'theory of change' or 'intervention logic' for the sector, which makes visual the connection between outcomes, enablers, and policies for emissions reduction.
- **An analysis of historical data on emissions and removals.** We compare data against government benchmarks (where available) and benchmarks from the Commission's 2022 demonstration path, to gauge the pace of progress in different areas and inform on challenges and opportunities.
- **Indicators.** We use a wide range of indicators to measure real-world progress; they are built out of our sector monitoring maps. An example in the electricity supply area would be the added amount of electricity generated in new facilities using renewable sources.
- **Scorecard assessment of policies and plans.** We assess the strength of current policies and plans to achieve emissions reduction outcomes within each sector using a scorecard approach (see 'Using a policy scorecard for assessment of key sectors' below).
- **Findings.** Every year we will highlight key findings to the Government based on the core questions for the monitoring framework. In 2024, those core questions are:
    1. What progress have we seen in emissions reductions to date?
    2. How is the country tracking towards meeting the first emissions budget for 2022–2025?
    3. How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current emissions reduction policies and plans?
    4. What is needed for Aotearoa New Zealand to be on track for future emissions budgets and the 2050 target?
- **Data gaps.** We also identify significant data gaps affecting monitoring of emissions reduction, as well as opportunities for linking action for adaptation to climate change impacts (see *Chapter 3: Our key findings*).

Assessing progress in emissions reduction to date

We used historical data to report progress towards meeting emission budgets.[xii] The core data set available for this report is New Zealand's Greenhouse Gas Inventory 1990–2022 (published in April 2024). We supplement these records with provisionally estimated emissions for the 2023 calendar year provided by Stats NZ. We also use wider indicators to give a picture of real-world change – for example, the uptake of new technology such as EVs. See **Box 2.2** below for a summary of the data sources for this report.

The GHG Inventory published in 2024 does not include data using the target accounting method on net emissions removals by absorption in forests ('net removals by forests'). This means there are no official estimates for net emissions up to 2022 under the accounting rules that apply to Aotearoa New Zealand's emissions budgets.[xiii] In their absence, we have relied on the most recent government projections for removals by forests under target accounting, published in 2023 (see 'Government projections' below). This is a key caveat to our findings on how Aotearoa New Zealand is currently tracking towards meeting the first emissions budget (2022–2025).

Box 2.2: Key data sources in our monitoring work

- **Measured emissions and removals from New Zealand's Greenhouse Gas Inventory (the GHG Inventory published in 2024).** These are the latest official government statistics on Aotearoa New Zealand's greenhouse gas emissions and removals by sector, released every year. The Act requires us to report on these statistics. We use the GHG Inventory data to assess progress to date on gross emissions and all sectors other than the forestry sector.

  The GHG Inventory published in 2024 does not include data on emissions and removals by forests under Aotearoa New Zealand's target accounting approach for emissions budgets and the first Nationally Determined Contribution (NDC1). Official statistics on this will be included in GHG Inventory reports from 2025. For this report, we use the government projections (see below) of net removals by forests in 2022 to assess progress to date for the forestry sector. We also combine this with the GHG Inventory data on gross emissions to estimate net emissions up to 2022.
- **Stats NZ's provisional quarterly emissions estimates.** We use these provisional estimates for the 2023 calendar year to assess progress to date on gross emissions reductions. They provide a more up-to-date picture and supplement the GHG Inventory data published in 2024, which only provides greenhouse gas emissions up to 2022.

xii. Under the Act, Aotearoa New Zealand's emissions budgets are a net quantity of carbon dioxide equivalent including all greenhouse gases. The metric used to compare different greenhouse gases in the emissions budgets is the 100-year time horizon global warming potential (GWP_{100}) from the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5). This follows the Paris Agreement decision that GWP_{100} values from AR5 shall be used for reporting greenhouse gas inventories, and for accounting towards nationally determined contributions (NDCs).
We report emissions data in million tonnes of CO_2-equivalent ($MtCO_2e$) using AR5 GWP_{100} values. When discussing biogenic methane emissions specifically, we also report emissions in million tonnes of methane ($MtCH_4$).

xiii. Official estimates of net emissions under target accounting will be published in Aotearoa New Zealand's Biennial Transparency Reports under the Paris Agreement, the first of which is due by 31 December 2024. Those official estimates will also be reported annually in the GHG Inventory from 2025.

- These data are obtained from a customised data request to Stats NZ and differ from the *Quarterly greenhouse gas emissions (industry and household)* that Stats NZ publishes on its website. They use collected data for energy-related emissions combined with government projections for other sources and sectors. They use the GHG Inventory methodology used in 2023, so they are comparable to the GHG Inventory data. We have made adjustments to the data to account for methodological changes in the GHG Inventory published in 2024.

- **A wider set of indicators.** We have compiled a wide-ranging set of indicators to measure real-world progress, such as changes in emitting activities and technology use. These indicators enable a deeper understanding of the drivers of observed changes in emissions, and they can also provide a window to indicate where each sector is heading. For example, the share of EVs entering the vehicle fleet is a key leading indicator of future transport emissions as the composition of the fleet is gradually transformed.
- **Implementation data.** We use data collated by the Climate Change Chief Executives Board for their quarterly reports, to assess implementation progress. These data provide information on whether actions in the first emissions reduction plan (including any new actions announced by the Government since the release of that plan) are being implemented as planned, or if they have been delayed or discontinued. These data informed our scorecard assessment on the strength of current government policies to achieve emissions reduction outcomes. The data were also used in our qualitative assessment of cross-cutting areas, including in *Chapter 7: Whakahekenga haurehu* and *Chapter 8: A transition that supports New Zealanders*.
- **Government projections.** The latest government emissions projections were published in December 2023 and were based on policies and historical emissions data as at 1 July 2023. We have used these projections judiciously, given significant changes that have occurred since then, and some issues with underlying assumptions. Further information is provided in Box 3.2 in *Chapter 3: Our key findings*.

For more information on the key data sources, see the supporting material published on the Commission's website: https://www.climatecommission.govt.nz/our-work/monitoring/emissions-reduction-monitoring/erm-2024

Assessing how the country is tracking to meet emissions budgets

Government projections

The Act requires us to report on the latest projections for current and future emissions and removals. Each year, the Government releases updated estimates of future greenhouse gas emissions out to 2050, for each sector covered under the GHG Inventory.[2]

We use the government projections as part of our evidence base to inform our independent assessment of how Aotearoa New Zealand is tracking towards meeting emissions budgets and the 2050 target.

We use the projections judiciously in our assessment. Projections are inherently uncertain, and that uncertainty increases the further into the future they extend. The latest government projections have been treated with further caution, as they are based on policies implemented or adopted by the Government as of 1 July 2023 and there has been change in policy direction since that time (see 'How this 2024 report defines timeframes and focus').

The first emissions budget

For this year's report, the forward-looking assessment for the remainder of the first emissions budget (2022–2025) focuses on the short-term outlook based on the latest available emissions data and projections. We also consider wider indicators and variable factors that can have significant impacts on emissions over a period of one to two years.

This addresses the question the report poses: "How is the country tracking towards meeting the first emissions budget for 2022–2025?" In answering this we have relied less on assessment of the effect of policies, as these effects can take time to become apparent, meaning policy changes made now will have limited influence on emissions in the remaining 18 months of the first budget period.

Due to issues relating to some assumptions applied in the latest government projections (particularly the assumed closure of the New Zealand Aluminium Smelter in 2024), we have opted to use our own modelled projections for the remainder of the first emissions budget period.[xiv] Our projections are aligned closely with the government projections for all sectors other than energy and industry. We have also made adjustments to account for methodological improvements in the GHG Inventory released in 2024. More information on the 2023 government projections is outlined in Box 3.2 in *Chapter 3: Our key findings*.

The second and third emissions budgets

For the second emissions budget (2026–2030) and the third emissions budget (2031–2035), our assessment of 'how is the country tracking' focuses on the adequacy of the current emissions reduction policies and plans (see 'How this 2024 report defines timeframes and focus'). We have developed a scorecard approach to assess the ability of current policy to achieve the budgets and 2050 target (see 'Using a policy scorecard for assessment of key sectors' below), in combination with examination of wider indicators that can show Aotearoa New Zealand's direction of travel.

xiv. Specifically, we have used the Commission's reference scenario from its draft advice on the fourth emissions budget period (2036–2040).

How we assess government plans and policies

Under the Act, the Commission is required to assess "the adequacy of the emissions reduction plan and progress in its implementation" (section 5ZK). For this assessment, we have analysed current emissions reduction policies and plans as of April 2024 (see 'How the 2024 report defines timeframes and focus').

Looking across the wider system to assess plans and policies

The Act also requires, as part of monitoring and reporting of progress on emissions reduction, that the assessment considers a range of issues and impacts (Table 2.1). For our 2024 monitoring report, our analysis in this area was based primarily on earlier work and engagement when we reviewed options for future policy direction for the Government's second emissions reduction plan. Our assessment of these broader elements falls into two streams.

- We have looked at the overarching approach and framework to address challenges at system-level (see *Chapter 5: Policies, systems and tools, Chapter 6: New Zealand Emissions Trading Scheme, Chapter 7: Whakahekenga haurehu* and *Chapter 8: A transition that supports New Zealanders*).
- We have integrated consideration of how barriers and enablers have been addressed and whether they present any ongoing risk to delivery of emissions reduction outcomes, as part of the policy scorecard assessment.

Over time we will seek to build on our current monitoring framework, including potential options for developing a broader set of indicators to integrate into assessment.

Link to national adaptation planning

Integrating emissions reduction and adaptation can increase the cost effectiveness of actions and avoid locking in counterproductive policies. There are numerous examples where adaptation and emissions reduction actions are combining to benefit New Zealanders, such as where infrastructure and transport systems are designed to both reduce emissions and be resilient to increasing climate change impacts. This type of climate action can provide a wide range of co-benefits for improving people's lives and to reduce the unevenness of impacts across different communities.[3]

There are identifiable common actions across the first emissions reduction plan and the first national adaptation plan that span several critical sectors, including agriculture, forestry, infrastructure and planning, and energy. There are also common actions across the emissions reduction plan and the national adaptation plan that are focused on empowering iwi/Māori and ensuring an equitable transition.

How actions in emissions reduction plans can support adaptation is considered across our analysis and forms part of our assessment of the adequacy of current emissions reduction policies and plans.

Using a policy scorecard for assessment of key sectors

Our analysis of sectors identified in the first emissions reduction plan for reductions in net emissions (either by reducing emissions or increasing removals of CO_2 from the atmosphere) uses 'policy scorecards' to summarise the strength of government policies and plans affecting each area. This helps us answer the question: "How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current policies and plans?"

The scorecard assessment provides a clear, methodical and transparent framework for assessing the strength of emissions reduction policies and plans to drive change in each sector. Specifically, the scorecards gauge the ability of current policies and plans to achieve the identified benchmark outcomes within sectors (based on the Commission's 2022 demonstration path) that contribute to meeting emissions budgets.

Like the monitoring maps, scorecards help make the Commission's analysis visible. They 'show our workings', and they provide a useful way of signalling where there are risks to meeting the emissions budgets and the nature of those risks.

We produce scorecards for the selected benchmark outcomes within sectors – for example, in passenger transport we produce one scorecard looking at reducing the emissions intensity of vehicles, and one scorecard looking at changes in the amount and mode of travel. The scorecard assessment uses four criteria and questions, which are intended to reflect the different elements that are needed to drive towards effective outcomes.

- **Main policy tools:** are there clear policy mechanism(s) capable of delivering the outcome (as identified in the monitoring maps)?
- **Funding and finance:** are levels of funding sufficient and plans to mobilise private finance credible?
- **Barriers and enablers:** are other barriers and enablers being addressed?
- **Timeline:** Are appropriate timelines in place to meet the emissions budgets?

This includes examining barriers and enablers that relate specifically to iwi/Māori and/or have implications for equity, including how impacts of change are distributed across different communities and regions. It also includes consideration of the ability to adapt to climate change. Table 2.2 shows the full scoring criteria for our policy scorecard, including descriptions for each score level.

Table 2.2: The scorecard levels and criteria

Score	Main policy tools	Funding and finance	Barriers and enablers	Timeline	Overall assessment
No significant risks	Main policy mechanism(s) is/are capable of delivering the outcome for this area, with no significant risks identified around their effectiveness or settings.	Together, public funding and plans to encourage private finance are capable of delivering the outcome for this area, with no significant risks identified.	Plans address key enablers (e.g. infrastructure, workers and skills) and key barriers, with no significant risks identified.	Timelines are sufficient, and there is a clear roadmap for future decisions and policy development, with no significant risks identified.	There is no significant risk to delivery. If implemented, the current policies and plans, and their respective settings, are capable of delivering the outcome for this area.
Moderate risks	Main policy mechanism(s) is/are largely capable of delivering the outcome for this area, with some risks identified around their effectiveness of settings.	Together, public funding and plans to encourage private finance may be capable of delivering the outcome for this area, with some risks identified.	Plans address some, but not all, of the key enablers and/or some key barriers remain.	There are some timeline risks or questions around the roadmap for future decisions and policy development.	There is moderate risk to delivery; work is needed to address risks and uncertainties.
Significant risks	There are significant risks around the effectiveness or settings of the main policy mechanism(s).	There are some funding commitments, but many risks are identified, or it is unclear where a significant portion of the necessary funding and finance will come from.	Several key enablers and barriers are not addressed.	There are significant timeline risks and questions around the roadmap for future decisions and policy development.	There is significant risk to delivery; plans are unclear and/or work is needed to implement policies and address significant risks and uncertainties
Insufficient	There is no clear plan or strategy for how to deliver the outcome for this area.	It is unclear where most of the necessary funding will come from, and/or plans to encourage private finance are insufficient.	Plans give negligible consideration of the key enablers and barriers.	There is no clear timeline or roadmap for future decisions and policy development.	Plans are either missing, clearly inadequate, or lack funding. New proposals are needed.

Source: Commission analysis

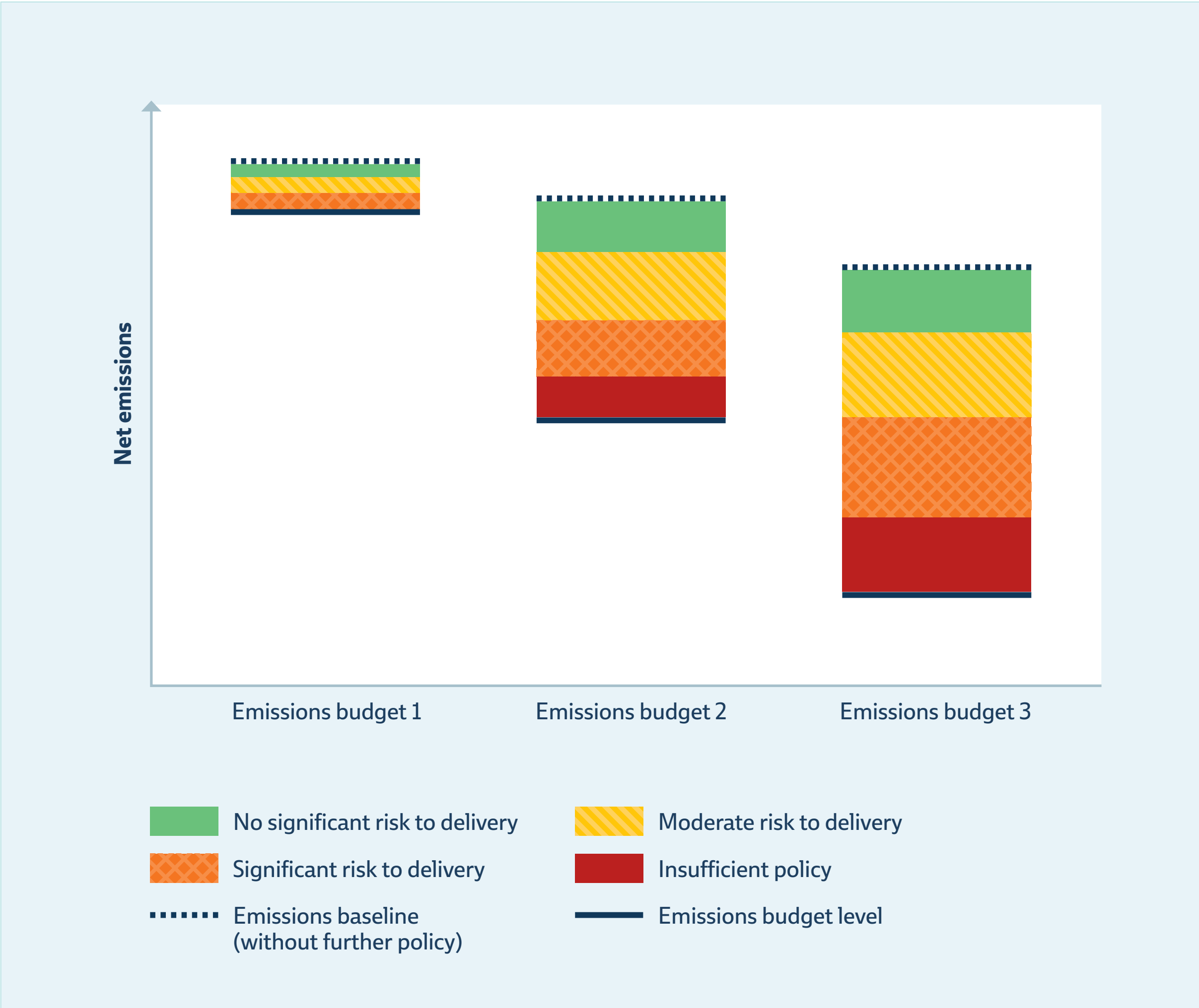
Implications for meeting emissions budgets and the 2050 target

The consolidation of our assessment of policy across individual areas provides an overall picture of what this could mean for future net emissions. This shows how Aotearoa New Zealand could be tracking towards meeting emissions budgets, based on the current emissions reduction plan and policies.

To do this, we quantify the emissions reductions expected from achieving benchmark outcomes in each area. These are calculated against a 'baseline' reflecting how emissions might track in the future without the impact of policies in the emissions reduction plan.[xv,4] We then 'map' the overall assessment scores from our policy scorecards to the potential emissions reductions from each area.

The output provides an indication of how well current policies and plans set Aotearoa New Zealand up to meet the emissions budgets, and the further work that may be needed.[xvi]

Figure 2.1: Assessment of policies and plans (illustrative example)



Source: Commission analysis

xv. We have used the Commission's 2022 current policy reference scenario, which was based on government emissions projections used in the first emissions reduction plan, with some adjustments explained in *Chapter 3: Our key findings.* For further information about the 2022 current policy reference scenario see our 2023 advice on the second emissions reduction plan.

xvi. See an illustrative example in **Figure 2.1** – this is not generated from our assessment but is an indication of what the output will look like. The actual assessment output is provided in **Figure 3.8** in *Chapter 3: Our key findings*.

WĀHANGA 3 | CHAPTER 3

Ngā huranga matua | Our key findings

This chapter sets out our key findings from our assessment of progress towards meeting emissions budgets and the 2050 target, and the adequacy of the emissions reduction plan.

He Pou a Rangi Climate Change Commission (the Commission) is delivering this first progress report almost two-thirds of the way through the first emissions budget period (2022–2025) and a little over two years since Aotearoa New Zealand's first emissions reduction plan came into place in May 2022.

The 2024 edition of New Zealand's Greenhouse Gas Inventory (GHG Inventory) provides data up until the end of the 2022 calendar year – the first year of the first emissions budget. As explained in *Chapter 2: Our approach*, we complement the GHG Inventory data with emissions estimates and projections to provide a more up-to-date picture of progress. Projections have an inherent level of uncertainty, which we have noted within our findings, where relevant.

Our confidence in our findings on how Aotearoa New Zealand's net emissions are currently tracking is reduced by some significant limitations in data available to us for this year's assessment. The 2024 GHG Inventory did not provide data on net removals by forests using the target accounting method. This means we do not have official estimates for net emissions up to 2022 under the accounting rules that apply to Aotearoa New Zealand's emissions budgets. In their absence, we have had to rely on the most recent government projections for removals by forests under target accounting, which were published in 2023.

The Government is yet to set out a clear, quantified pathway for meeting the emissions budgets or 2050 target. For this assessment, we have used the Commission's 2022 demonstration path as a benchmark scenario for tracking progress. We compare data against benchmarks from the Commission's 2022 demonstration path to gauge the pace of progress in different areas and inform on challenges and opportunities. Using the Commission's 2022 demonstration path as a monitoring tool helps to illuminate where the country might be at risk of not achieving emissions budgets, including where there are increasing risks for the longer term.

Question 1: What progress have we seen in emission reductions to date?

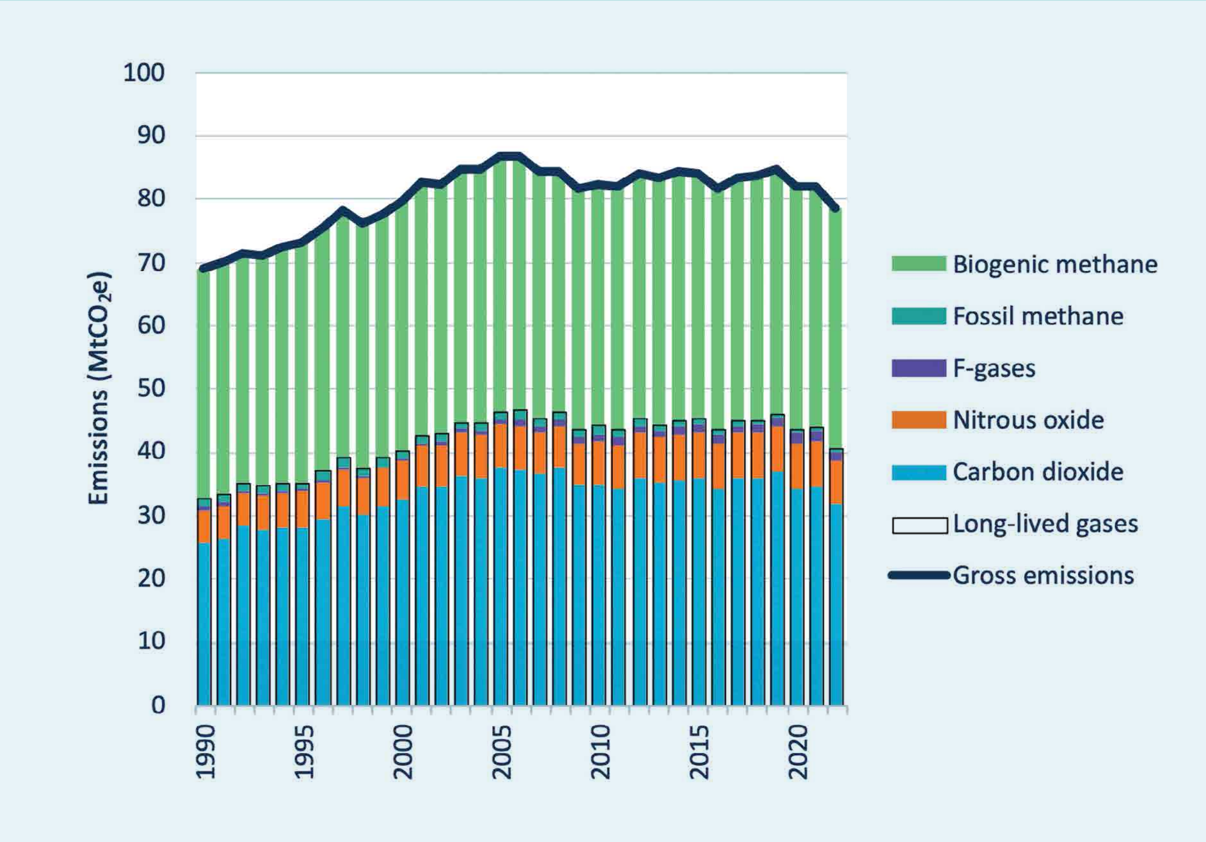
Gross emissions have declined each year since 2019, in response to policy efforts combined with external factors.

Aotearoa New Zealand's gross greenhouse gas emissions fell in 2022 to the lowest they have been since 1999.

The GHG Inventory shows gross emissions in 2022 were 78.4 $MtCO_2e$, a reduction of 4.2% (3.4 $MtCO_2e$) from 2021 (**Figure 3.1**). Gross emissions have now fallen every year since 2019 by an average annual rate of 2.5%. The drop in 2022 was the largest recorded in any year since 1990.

The gross emissions reductions from 2021 to 2022 came mostly from long-lived greenhouse gases (that is, not including biogenic methane),[xvii] which fell by 7.2% (3.2 $MtCO_2e$) to 40.7 $MtCO_2e$. From 2021 to 2022, biogenic methane emissions fell by 0.7% (0.25 $MtCO_2e$) to 37.7 $MtCO_2e$, or 1.35 $MtCH_4$. This was 1.1% below the level in the 2017 reference year used in the 2050 target.

Figure 3.1: Gross emissions by gas, 1990–2022



Source: Commission analysis of GHG Inventory 1990–2022

xvii. While fossil methane is technically a short-lived gas, we include it with long-lived greenhouse gases, in line with the structure of the 2050 target.

Gross emissions fell in every sector from 2021 to 2022, with the largest drop from energy and industry

Emissions from energy and industry fell by 12% (2.5 $MtCO_2e$) from 2021, to the lowest level since 1990 (the base year of New Zealand's GHG Inventory).[xviii] Emissions from transport, agriculture, waste, and fluorinated gases (f-gases) also fell in 2022 (**Figure 3.2**).

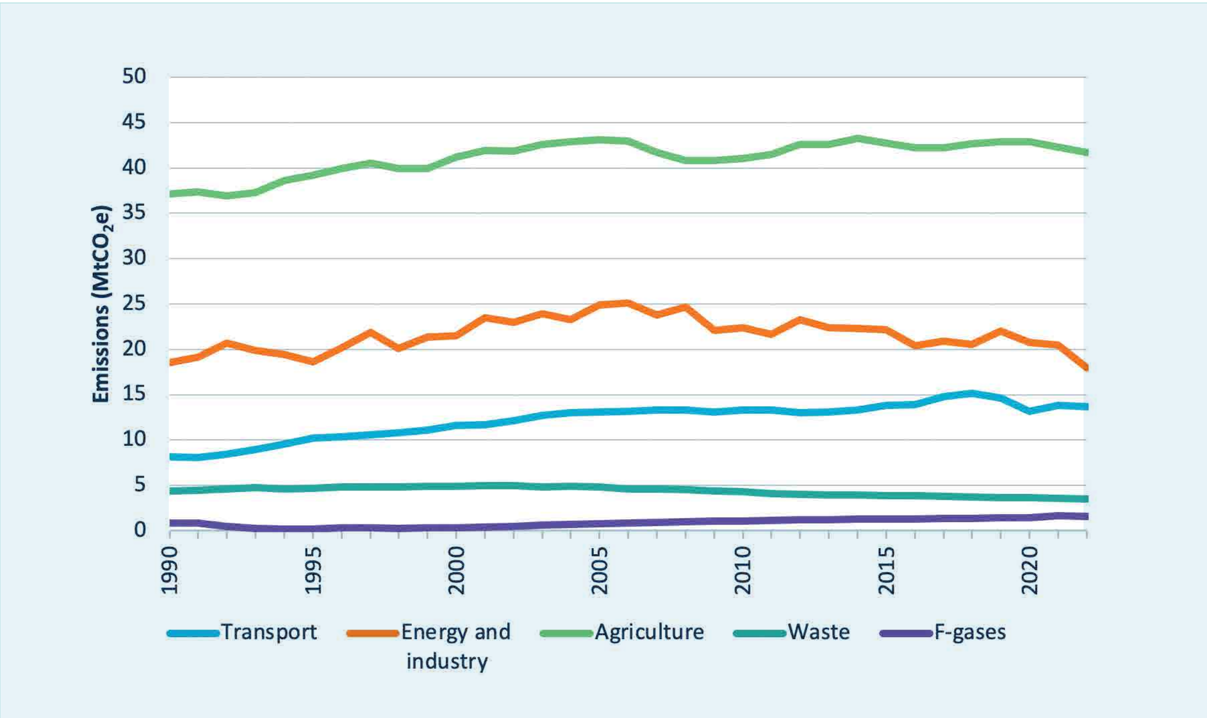
Energy and industry accounted for nearly three-quarters of the gross emissions reductions in 2022, with these coming mainly from:

- electricity generation, due to higher hydroelectricity generation displacing use of coal and gas
- petroleum refining, due to the closure of the Marsden Point Oil Refinery.

Provisional estimates of gross emissions in 2023 suggest a further drop of around 1%

Provisional quarterly emissions estimates from Stats NZ find gross emissions dropped again in 2023, but by a lesser amount of around 1% (0.8 $MtCO_2e$) (**Figure 3.3**). These estimates show transport emissions have rebounded in 2023, increasing by around 5% (0.7 $MtCO_2e$) due to increased road and air travel. The emissions increase from transport was balanced out by further reductions from energy and industry, agriculture, and waste. Stats NZ estimates for agriculture and waste are based on government projections and are more uncertain.

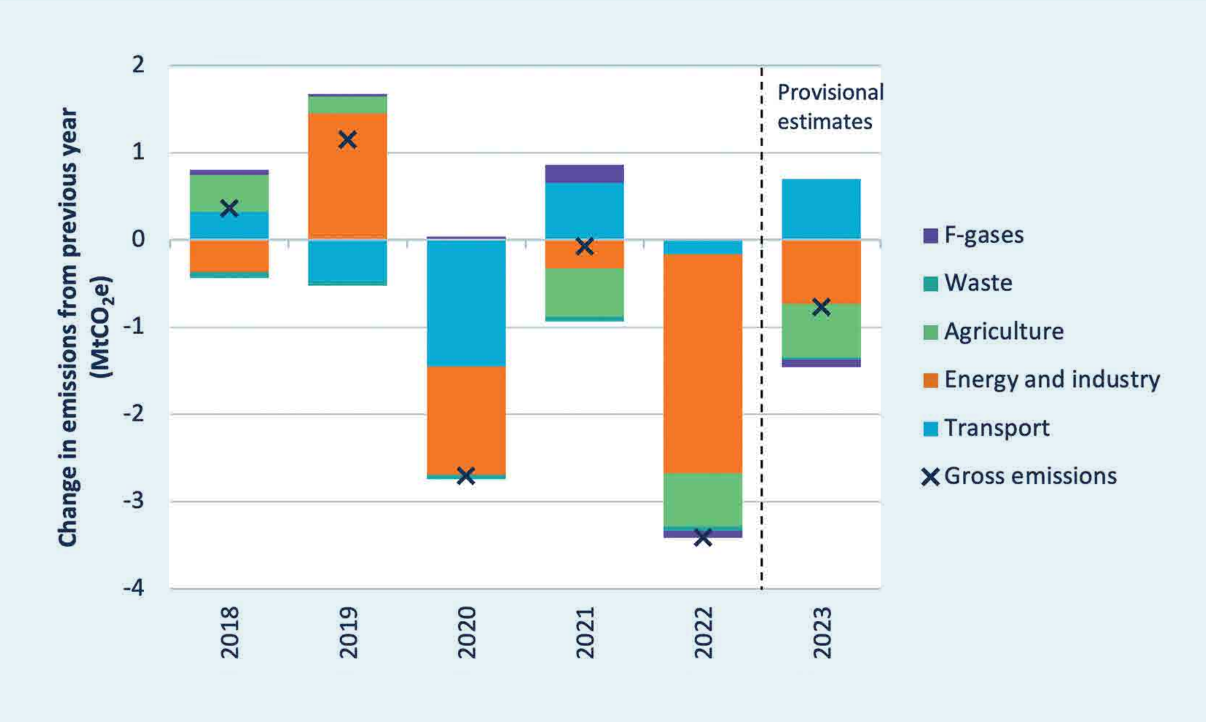
Figure 3.2: Gross emissions by sector, 1990–2022



Source: Commission analysis of GHG Inventory 1990–2022

xviii. For more information on what is covered by the energy and industry sectors please refer to *Chapter 9: Energy and industry*. Note that this sector grouping excludes transport and f-gases.

Figure 3.3: Annual changes in gross emissions by sector since 2017



Source: Commission analysis of GHG Inventory 1990–2022 and Stats NZ provisional emissions estimates (2023)

Recent changes in emissions were heavily shaped by external factors

We use the term 'external factors' to refer to macroeconomic or other factors outside of the Government's direct control, such as climatic events, economic activity and international conflict.[xix]

External factors played a large role in the emissions results for 2022 and 2023.

Some were variable factors that could change in any year (such as increased hydroelectricity generation due to higher inflows into hydro lakes) and some were one-off changes with long-lasting effect (such as closure of the Marsden Point Oil Refinery).

Table 3.1 discusses five areas where the drop in gross emissions in 2022 was significantly influenced by external factors. Together, these five areas account for around 94% of the total reduction in gross emissions.

xix. For instance, weather can affect hydro lake inflows and oil prices are subject to international developments. Specifically, since 2019, the world has seen significant disruptive change due to the COVID-19 pandemic and geopolitical developments such as Russia's invasion of Ukraine.

Table 3.1: Five sources of gross emissions reductions in 2022 strongly influenced by external factors

Emissions source	Gross emissions reduction from 2021-2022	Influence of external factors
Electricity generation	1.71 $MtCO_2e$	Around 1.6 $MtCO_2e$ of this reduction can be attributed to increased hydroelectricity generation due to higher inflows into hydro lakes. This displaced coal- and gas-fired generation. The level of hydroelectricity generation rose slightly further in 2023 to its highest level since 2004, keeping electricity emissions low. The high levels in 2022 and 2023 are significantly above the long-term average and are unlikely to be sustained.
Petroleum refining and hydrogen production	0.58 $MtCO_2e$	The Marsden Point Oil Refinery closed in April 2022 and converted to an import-only terminal following a strategic review by its owner. This reduction in emissions, and a further 0.2 $MtCO_2e$ reduction in 2023, is solely due to the refinery closure.
Nitrogen fertiliser use	0.50 $MtCO_2e$	Use of inorganic nitrogen fertilisers (such as urea) was estimated to have fallen by 24% from 2021 to 2022 in the GHG Inventory published in 2024.[xx] This was likely driven by increased fertiliser prices, influenced by high international fossil fuel prices and the Russian invasion of Ukraine. It remains to be seen how farmers will respond to fertiliser prices returning to lower levels.
Light vehicles	0.23 $MtCO_2e$	Gross emissions from light vehicles fell by 2.6% in 2022, despite a slight increase in total light vehicle travel (1.4%). The smaller-than-projected increase in travel was likely due to some continued COVID-19 restrictions, combined with high oil prices. Increased uptake of low emissions and electric vehicles due to the introduction of the Clean Car Discount in mid-2021 likely contributed to the reduction in emissions.
Steel manufacturing	0.18 $MtCO_2e$	Emissions from steel manufacturing fell by 10% due to reduced production. This drop in production is likely to be temporary.
Total	**3.20 $MtCO_2e$**	**The emissions reductions from the above five sources account for 94% of the overall reduction in gross emissions in 2022 (3.41 $MtCO_2e$).**

xx. More recent data show that nitrogen fertiliser use fell by a smaller amount in 2022, around 10%. We expect this will result in emissions from fertiliser use being revised upwards in next year's GHG Inventory. For further discussion see *Chapter 11.1: Agriculture*.

There are signs of early progress in the low emissions transition

While external factors explain most of the emissions reductions seen to date, this is not unexpected given the short period of time for policies in the first emissions reduction plan to have effect.

Wider indicators show the influence of emissions reduction policies in increased uptake of low emissions technologies and actions in 2022 and 2023, including:

- uptake of electric and hybrid vehicles
- building of new renewable generation facilities
- conversion of boilers from fossil fuels to biomass and electricity
- increased waste recovery efforts
- increased forest planting.

Some of these changes may have minor effects on emissions in 2022 and 2023, but their effects will grow over time.

Net emissions under target accounting have also fallen since 2019, based on current projections of removals by forests

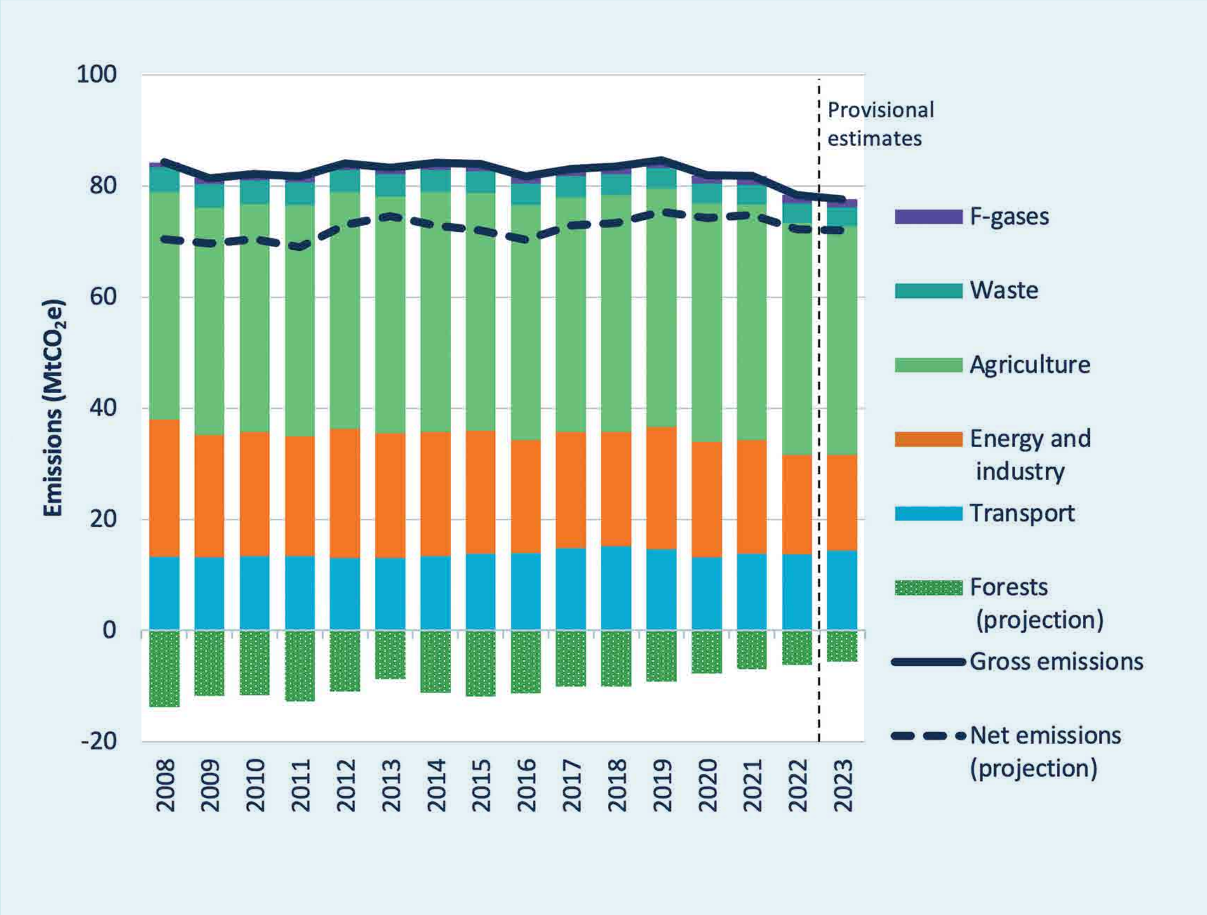
The GHG Inventory published in 2024 did not include data on net emissions using the target accounting method (for further explanation, see Box 2.2 in *Chapter 2: Our approach*). In the absence of official estimates, we have calculated net emissions using the latest government projections for CO_2 removals by forests under target accounting.

Because these net emissions figures are based on projected CO_2 removals, they are more uncertain than gross emissions. Further, these projections were produced in 2023 and do not incorporate the latest GHG Inventory data on afforestation and deforestation.

Projected net emissions for 2022 are 72.2 $MtCO_2e$, a reduction of 3.5% (2.6 $MtCO_2e$) from 2021 (Figure 3.4). A further fall for 2023 is projected, with net emissions of 72 $MtCO_2e$ based on provisional gross emissions estimates.

Since 2008, net emissions have fluctuated within a range of around 6 $MtCO_2e$ (from 68.9–75.4 $MtCO_2e$). CO_2 removals by forests have trended down due to lower rates of forest planting since the 1990s, with higher planting rates since 2019 yet to have effect. Fluctuations in CO_2 removals, such as in 2013, were driven by higher rates of deforestation coinciding with low emissions prices in the New Zealand Emissions Trading Scheme (NZ ETS).

Figure 3.4: Emissions by sector and projected net emissions under target accounting, 2008–2023



Source: Commission analysis of GHG Inventory 1990–2022, Stats NZ provisional emissions estimates (2023), and government emissions projections (for removals by forests).

Box 3.1: Impacts of methodological improvements in the 2024 GHG Inventory

Methodological improvements lead to revisions to GHG Inventory data over time. The emissions data in the GHG Inventory represent the current best estimates of real-world emissions, based on the latest available input data and estimation methods. These estimates are subject to refinement each year through methodological improvements. Revisions to input data sets, such as energy statistics, are also common.

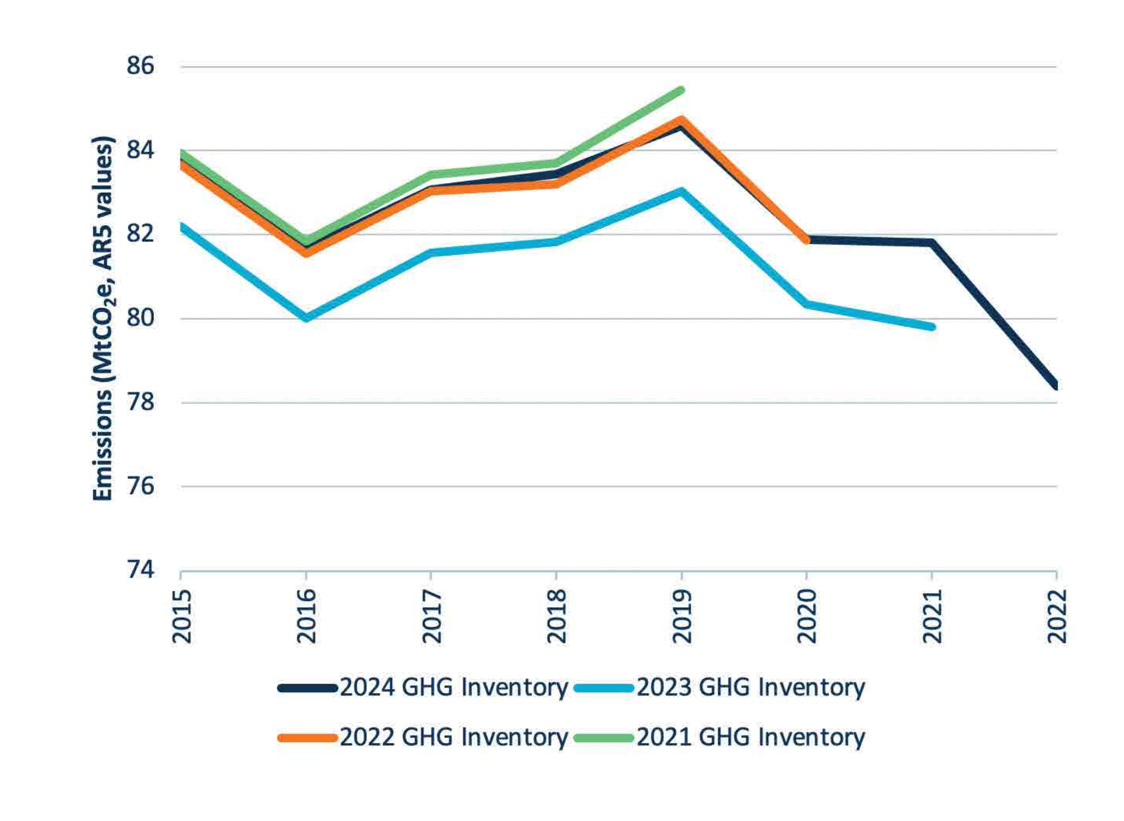
Aotearoa New Zealand's emissions budgets are legislated as a set number (for example, 290 $MtCO_2e$ for the first emissions budget period from 2022 to 2025). This means that methodological improvements to the GHG Inventory and revisions to input data sets can make it easier or harder to meet the emissions budgets.

The Commission's 2022 demonstration path, which we use as a benchmark scenario for meeting the emissions budgets in this monitoring report, is based on the GHG Inventory data published in 2022.

Methodological improvements in the GHG Inventory published in 2023 led to lower estimates for gross emissions, mostly from changes in agriculture emissions (**Figure 3.5**). However, further improvements in the GHG Inventory published in 2024 resulted in gross emissions estimates increasing by a similar amount, again mostly from changes in agriculture emissions.

The latest gross emissions estimates align very closely with the GHG Inventory data published in 2022. Changes to estimates of individual sectors – mainly affecting agriculture and energy and industry – largely cancel out (**Figure 3.6**).

Figure 3.5: Gross emissions since 2015, as reported in the GHG Inventories published in 2021–2024



Source: Commission analysis of GHG Inventory data

Figure 3.6: Gross emissions by sector in 2019, as reported in the GHG Inventories published in 2021–2024

Source: Commission analysis of GHG Inventory data

The 2024 GHG Inventory also marks a change in the metrics used to compare different greenhouse gases. In line with decisions on reporting under the Paris Agreement, the GHG Inventory now uses the 100-year time horizon global warming potential (GWP_{100}) values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). Previous years' inventories used GWP_{100} values from the IPCC's Fourth Assessment Report (AR4). The emissions budgets have always been set based on AR5 values in anticipation of this change in reporting.

The Climate Change Response Act 2002 (the Act) requires that, each time the Commission provides advice on Aotearoa New Zealand's next emissions budget, we must assess whether the existing emissions budgets should be revised due to methodological improvements in the GHG Inventory or any other significant changes. The Commission's final advice on the fourth emissions budget, due by the end of 2024, will include recommendations on whether the existing emissions budgets should be revised. In this monitoring report, we are assessing progress against the emissions budgets currently set in legislation.

Question 2: How is the country tracking towards meeting the first emissions budget for 2022–2025?

Available emissions data and projections are consistent with the first emissions budget being met. This is, however, highly uncertain. Risk factors such as deforestation levels, dry years, and rising transport emissions could result in net emissions exceeding the budget. Further action to reduce emissions would decrease the risk of missing the budget.

At the time of this report, Aotearoa New Zealand is two-and-a-half years into the first emissions budget period (2022–2025), with one-and-a-half years remaining. Considering realistic timeframes for policy changes, and for these to then affect decisions through the economy that influence emissions, we do not expect future policy changes to have a sizeable impact on the outcomes for the first emissions budget.

Given this context, our assessment of how Aotearoa New Zealand is tracking to meet the first emissions budget focuses on the short-term outlook based on the latest available emissions data and projections. We also consider variable factors that can have significant impacts on emissions over a period of one to two years. In the section following this one, we assess how well current policies and plans set Aotearoa New Zealand up to meet future emissions budgets and the 2050 target.

The outlook for meeting the first emissions budget is encouraging based on results to date

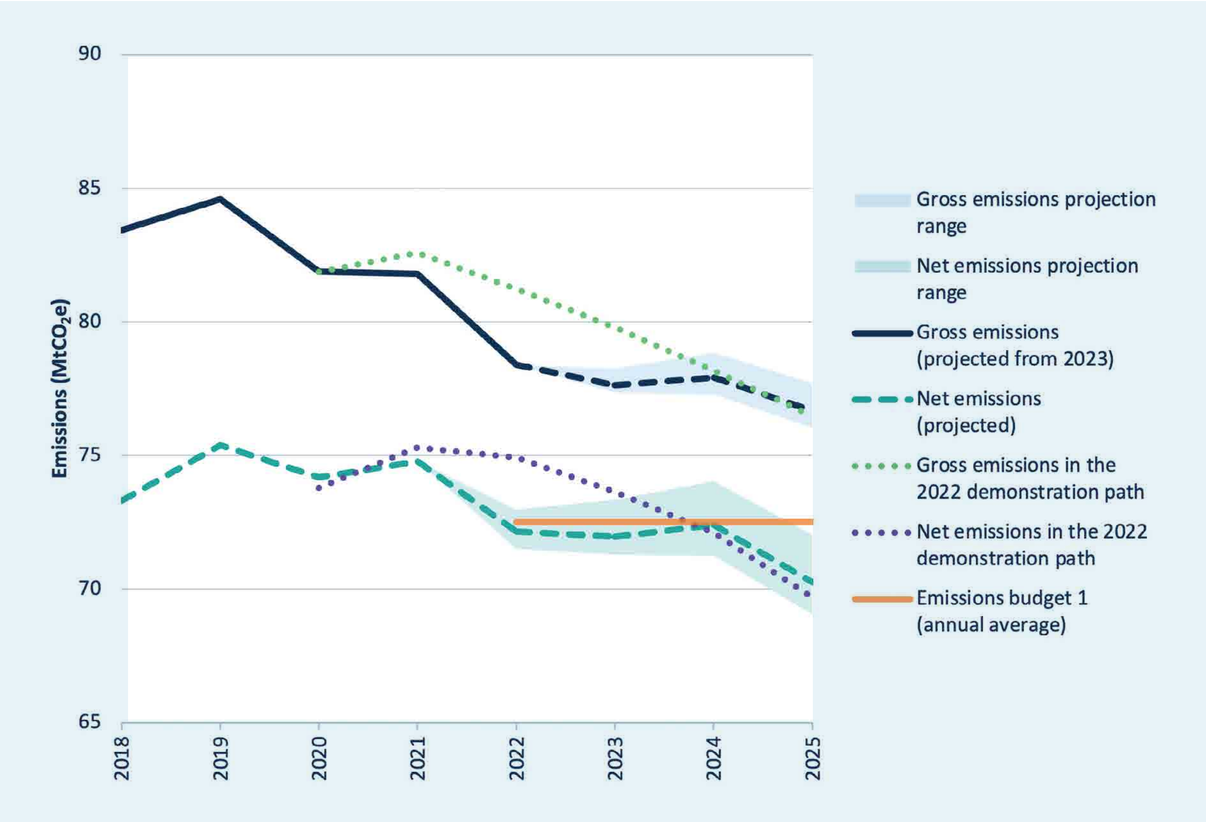
Aided by external factors, gross emissions have so far fallen faster than in the Commission's 2022 demonstration path, which we use as a benchmark scenario for meeting the emissions budgets (Figure 3.7).

As explained above, net emissions under target accounting are not reported in this year's GHG Inventory and we therefore rely on government projections of removals by forests under target accounting. Net emissions in 2022, the first year of the budget period, are projected to be 2.8 $MtCO_2e$ lower than in the demonstration path. At 72.2 $MtCO_2e$, this is already below the annual average net emissions level for the first emissions budget (72.5 $MtCO_2e$).

Figure 3.7 shows that the gap between actual emissions and the Commission's 2022 demonstration path is expected to close. Commission modelling informed by the latest government projections[xxi] suggests net emissions will increase in 2024 and track slightly above the demonstration path from then, but remain below the first emissions budget level.

xxi. We have used the Commission's reference scenario in its draft advice on the fourth emissions budget period (2036–2040), for the central estimate, with the range informed by government projections published in 2023. The reference scenario for the fourth emissions budget is aligned closely with those government projections for all sectors other than energy and industry. A key reason for this is that the government emissions projections assumed the closure of the New Zealand Aluminium Smelter in 2024, while the reference scenario for the fourth emissions budget does not. We made adjustments to account for methodological improvements in the GHG Inventory released in 2024.

Figure 3.7: Historic and projected gross and net emissions compared with the Commission's 2022 demonstration path and the first emissions budget



Source: Commission modelling and analysis of GHG Inventory data and government emissions projections

Table 3.2: Estimates of net emissions over the first emissions budget period (2022–2025) based on current data and projections

	Central estimate	High estimate	Low estimate
	Projected net emissions 2022-2025 ($MtCO_2e$)		
Transport	56.2	56.3	56.1
Energy & industry	72.0	72.0	71.9
Agriculture	163.2	165.5	161.9
Waste	13.8	13.8	13.8
F-gases	5.5	5.6	5.3
Forests	-23.8	-20.8	-26.0
Net emissions	286.8	292.4	283.1
First emissions budget	**290**		

Source: Commission modelling and analysis of GHG Inventory data and government emissions projections

Current data and projections suggest the first emissions budget will be met, but this is highly uncertain

Based on currently available emissions data and projections, our central estimate of net emissions for the first budget period is 287 $MtCO_2e$, with a range from 283 $MtCO_2e$ to 292 $MtCO_2e$, based on available government modelling (Table 3.2).[xxii] This central estimate is consistent with Aotearoa New Zealand meeting the first emissions budget for 2022–2025 (290 $MtCO_2e$). However, several risk factors could cause net emissions to be higher and to exceed the budget.

Uncertainties quantified within the projection range

The largest contributors to the net emissions range above are assumed deforestation levels (official estimates of which take several years to confirm)[xxiii] and agricultural production levels. The figures above show that if net emissions from these sit towards the high end of the assumed range, the budget could be exceeded.

Outcomes above the high end of the assumed range also cannot be ruled out. In particular, data from the latest GHG Inventory suggest greater uncertainty around recent deforestation levels.

Further uncertainties not quantified within the projection range

Short-term variability in sectors other than forests and agriculture is not well quantified in the projections, so the real-world uncertainty is greater than those figures suggest. For example, a dry year could elevate electricity sector emissions by up to around 1 $MtCO_2e$.

Risk of underestimating actual emissions trends

Provisional data show transport emissions grew in 2023 and exceeded the upper range of the government projections, highlighting the risk these projections may underestimate future travel demand. If the growth seen in 2023 were to continue in 2024 and 2025, this would add around 2 $MtCO_2e$ additional emissions over the budget period.

Discontinued or delayed policies

Some policies assumed in the government projections (such as the Clean Car Discount and agricultural emissions pricing) have been discontinued or delayed. While we do not expect these changes to have a large impact on emissions out to 2025, they elevate risk in the context of a narrow margin for meeting the first emissions budget. There is an opportunity for the Government to address the gap resulting from these policy changes, in the upcoming second emissions reduction plan.

Future methodological improvements to the Greenhouse Gas Inventory

Improvements applied to methods and underlying data sets used in producing the GHG Inventory each year can mean previous years' emissions estimates are revised upward or downward. Improvements applied in the 2024 inventory saw the estimated gross emissions for the four years from 2018 to 2021 increase by a total of 6.7 $MtCO_2e$, an average of 1.7 $MtCO_2e$ per year (see Box 3.1).

Government action can improve the likelihood of meeting the first emissions budget

The Government can manage risk by aiming to overachieve the emissions budgets, to provide a buffer for unexpected emissions increases. As noted above, limited time remains for new policies to be able to have a sizeable impact within the first budget period (2022–2025). However, giving attention to the specific risk factors identified and putting actions in place now to sustain momentum in emissions reductions would improve the likelihood of meeting the first emission budget, and future emissions budgets.

Any shortfall in meeting emissions budgets increases the need for offshore mitigation to meet the nationally determined contribution (NDC)

If there is a shortfall in achieving the first and second emissions budgets, Aotearoa New Zealand will need to fund higher levels of offshore mitigation to meet the country's first nationally determined contribution (NDC) for 2021–2030.

xxii. See previous footnote for further explanation of sources.

xxiii. Because of the time needed for mapping and confirming areas of deforestation, official estimates of these in the GHG Inventory lag several years behind. In New Zealand's GHG Inventory published in 2024, deforestation figures for 2021 and 2022 are provisional estimates, informed by the most recent land-use mapping and survey information. This time lag leads to a risk of upwards revisions to deforestation emissions after the end of the budget period.

Question 3: How is the country tracking towards meeting the second emissions budget (2026–2030) and the third emissions budget (2031–2035) and the 2050 target, under current emissions reduction policies and plans?

There are significant risks to meeting the second and third emissions budgets and the 2030 biogenic methane target under current policies.

Most areas show risk of underachievement against benchmark outcomes or goals

We assessed current policies and plans in 15 sector areas for their ability to deliver against benchmark emissions outcomes aligned with meeting the emissions budgets, as described in *Chapter 2: Our approach*. As part of our assessment, we use policy scorecards to evaluate risks across four criteria:

- **Main policy tools.** Are there clear policy mechanism(s) capable of delivering the outcome?
- **Funding and finance.** Are levels of funding sufficient and plans to mobilise private funding credible?
- **Barriers and enablers.** Are other barriers and enablers being addressed?
- **Timeline.** Are appropriate timelines in place to meet the emissions budgets?

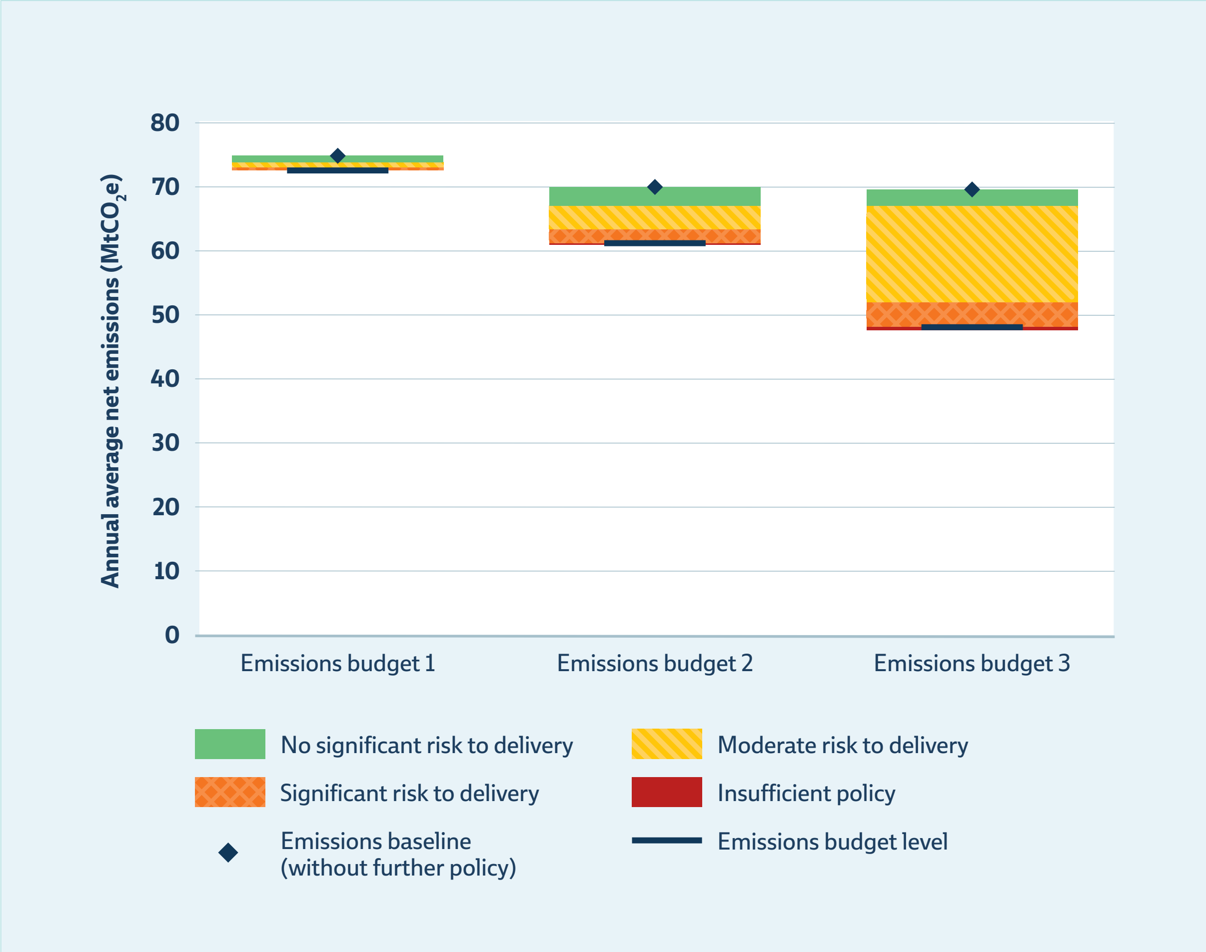
The overall assessment score reflects the overall level of risk we see to achieving the benchmark emissions reductions in the Commission's 2022 demonstration path.[xxiv]

Our assessment is most relevant to the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035), where changes driven by policies will have the most effect. It is less relevant for the first emissions budget due to the significant influence of external factors on emissions in 2022 and 2023, as explained in the previous sections. However, for completeness, we have shown information on the first emissions budget (for 2022–2025) in the figures below.

Overall, in most areas we found at least moderate risk of not achieving the benchmark outcomes set in our 2022 demonstration path. We found significant risk in seven areas, making up 22% of the total emissions reductions across the second and third emissions budgets. We found moderate risk in a further seven areas, making up 61% of the total emissions reductions. The results of our assessment are shown in Figure 3.8, Figure 3.9, and Table 3.3 below.

xxiv. See Table 2.2 in *Chapter 2: Our approach* for a more detailed explanation of our scoring criteria. The relevant sector chapters contain summaries of our rationale for the scores given in each area. Note that the assessment of low-carbon liquid fuels is integrated within the transport scorecards but has been split out here because it affects emissions reductions across multiple areas in the modelling, including off-road vehicles.

Figure 3.8: Overall assessment of risk to meeting the emissions budgets under current policies and plans, based on the benchmark in the Commission's 2022 demonstration path



Source: Commission analysis

Note: Baseline emissions were calculated from the Commission's 2022 current policy reference scenario, which was based on government emissions projections used in the first emissions reduction plan.[xxv,5] Adjustments were made to factor out some emissions reductions assumed to occur from electricity generation and exotic afforestation in the 2022 current policy reference scenario. This is done to show the full extent of emissions reductions from these areas and enable us to map our scorecard results on to these quantities.

xxv. For further information on the 2022 current policy reference scenario see our 2023 advice on the second emissions reduction plan.

Figure 3.9: Assessment of risk to sectors' contributions to meeting the emissions budgets under current policies and plans, based on the benchmark in the Commission's 2022 demonstration path

Source: Commission analysis

Note: The small gap to the first emissions budget line is because net emissions in the 2022 demonstration path are slightly above this budget level due to data updates. This does not affect our assessment of how the country is tracking towards meeting the first emissions budget, which is based on the latest available emissions data and projections.

Table 3.3: Results of our policy scorecard assessment for the second and third emissions budgets, against the benchmark of our 2022 demonstration pathway

Sector	Outcome area	% of total net emissions reductions (benchmark): Emissions budget 2	% of total net emissions reductions (benchmark): Emissions budget 3	Policy scorecard assessment: Overall assessment	Main tools	Funding and finance	Barriers & enablers	Timeline
Energy & industry	Reduce electricity generation emissions	18%	11%	No significant risks	No significant risks	No significant risks	Moderate risks	No significant risks
	Reduce emissions from industry	14%	11%	EB2: No significant risks EB3: Moderate risks	No significant risks	Moderate risks	Significant risks	EB2: No significant risks EB3: Moderate risks
	Phase out fossil fuels in buildings	4%	3%	Moderate risks	Moderate risks	Moderate risks	Moderate risks	Significant risks
	Low-carbon liquid fuels	2%	2%	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient
Transport	Reduce emissions intensity of passenger vehicles	6%	12%	Moderate risks	Moderate risks	Moderate risks	Significant risks	No significant risks
	Passenger mode shift and demand reduction	5%	3%	Significant risks	Significant risks	Significant risks	Significant risks	Significant risks
	Reduce emissions intensity of freight vehicles	1%	3%	Significant risks	Moderate risks	Significant risks	Moderate risks	Significant risks
	Freight mode shift and demand reduction	2%	2%	Significant risks	Significant risks	Significant risks	Moderate risks	Significant risks
	Reduce aviation emissions	0.4%	0.4%	Significant risks	Moderate risks	Significant risks	Significant risks	Significant risks
Agriculture	Reduce emissions from farming	15%	9%	Significant risks	Moderate risks	Significant risks	Moderate risks	Insufficient
	Transition to lower emissions land uses	1%	1%	Significant risks	Moderate risks	Significant risks	Moderate risks	Insufficient
Waste	Reduce organic waste sent to landfill	2%	2%	Moderate risks	Moderate risks	Moderate risks	Moderate risks	Moderate risks
	Improve and expand landfill gas capture	4%	3%	Moderate risks	Moderate risks	Moderate risks	Moderate risks	Moderate risks
F-gases	Reduce HFC emissions	1%	1%	Moderate risks	No significant risks	No significant risks	No significant risks	Moderate risks
Forests	Increase net removals by forests	24%	37%	Moderate risks	Moderate risks	Moderate risks	Moderate risks	Moderate risks

No significant risks Moderate risks Significant risks Insufficient

Source: Commission analysis. See **Table 2.2** in *Chapter 2: Our approach* for scoring criteria.

Note: Net emissions reductions from 'Increase net removals by forests' includes reductions in agriculture emissions resulting from land-use change to forestry.

The agriculture and transport sectors show the largest risks

Our assessment shows agriculture and transport to be at most risk of not achieving the reductions in the Commission's 2022 demonstration path, which we use as a benchmark to assess progress.

- In agriculture, this risk is due to the absence of a confirmed emissions pricing system or alternative policy measures for reducing emissions.
- In transport, this reflects that current policy tools on their own are unlikely to drive a shift to lower-carbon modes of transport and to decarbonise freight and aviation. Alongside this is a risk that uptake of low and zero emissions light vehicles will fall behind benchmark levels due to reduced policy support.

Some past actions lock in future emissions reductions and removals

For the industry and forestry sectors, commitments from previous policies have already locked in a significant share of the emissions reductions and removals needed to achieve outcomes for the second emissions budget (for 2026–2030) that align with the Commission's 2022 demonstration path, which we use as a benchmark to assess progress.

- In industry, we estimate that projects funded through the now-discontinued Government Investment in Decarbonising Industry (GIDI) Fund (including government partnerships with New Zealand Steel and Fonterra) will together achieve the benchmark level of emissions reductions.
- In the forestry sector, high rates of afforestation up to and including 2024 exceed the benchmark level. The CO_2 removals these forests will deliver is more than sufficient for the second emissions budget. However, the net removals outcome will depend on levels of emissions from deforestation during the second emissions budget period.

The New Zealand Emissions Trading Scheme cannot be relied on to ensure emission budgets will be met

The NZ ETS cannot be relied on to drive the emissions reductions needed to meet the second emissions budget period (2026–2030) and third emissions budget period (2031–2035). There is significant uncertainty about how many units will be available for use by emitters over the coming emissions budget periods, due to existing surplus units[xxvi] in the market and to NZ ETS design features. This means the NZ ETS does not provide certainty over the quantity of emissions from the sectors and sources it covers.

Our latest estimates of the number of surplus units in the market show a range of 51 to 84 million New Zealand Units (NZUs), with a central estimate of 68 million NZUs. Even with the Commission's recommended NZ ETS supply settings designed to draw down this surplus over time, there is still significant uncertainty around how many units will actually be available for use by emitters, particularly for the second emissions budget.

For further explanation of the risks of relying on the NZ ETS to achieve emissions budgets, see *Chapter 6: New Zealand Emissions Trading Scheme*.

There are risks that the 2030 biogenic methane target will not be met

Our assessment for the agriculture and waste sectors shows significant risk that the legislated 2030 biogenic methane target will not be met under current policies and plans.

Our findings differ from recent government emissions projections

Our findings on how Aotearoa New Zealand is tracking differ in several ways from the latest government emissions projections, published in 2023. This is due to differences in some underlying assumptions, methodological changes in the GHG Inventory published in 2024, and changes in policy since 1 July 2023. These issues are explained further in Box 3.2.

xxvi. The surplus units are a subset of the total privately held units in the NZ ETS register (the stockpile). The surplus excludes units assessed as being needed for post-1989 forest harvest liabilities and for emitters' hedging requirements, as well as pre-1990 forest allocation units expected to be held long term.

Box 3.2: 2023 Government emissions projections

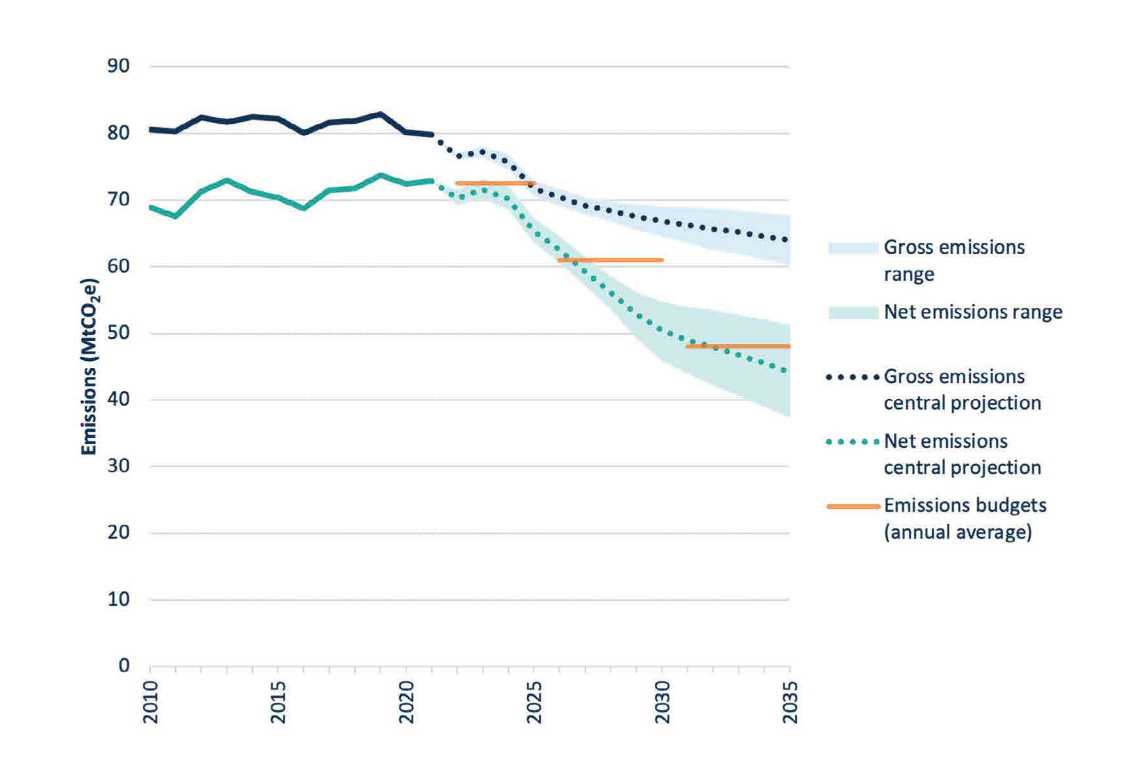
The Act directs the Commission to include the latest projections for current and future emissions and removals.

The latest government emissions projections were published in December 2023, and were based on policies and historical emissions data as at 1 July 2023. We have used these projections judiciously, given significant changes that have occurred since then and some issues with underlying assumptions. These include:

- methodological improvements in the GHG Inventory published in 2024, which led to a significant increase in historical emissions from agriculture (see **Box 3.1**)
- changes in policy since 1 July 2023, such as the disestablishment of the GIDI Fund
- the assumption made in the projections that the New Zealand Aluminium Smelter closes at the end of 2024
- the assumption made in the projections of a strongly rising emissions price in the NZ ETS, which does not reflect current policy settings.

The projections of gross and net emissions are presented in **Figure 3.10**.

Figure 3.10: 2023 government projections of gross and net emissions under target accounting



Source: 2023 government emissions projections

Question 4: What is needed for Aotearoa New Zealand to be on track for future emissions budgets and the 2050 target?

Our assessment shows an urgent need to strengthen policies and strategies to put Aotearoa New Zealand on track to meet future emissions budgets and the 2050 target, including the 2030 biogenic methane target. We identify a range of opportunities to work towards these climate goals.

The second emissions reduction plan is an opportunity for a clear and coherent plan

The Government is in the process of setting the second emissions reduction plan. It has signalled it intends to follow a different path to meeting future emissions budgets, and supports a 'net-based strategy'.[6] Adopting a coherent approach to climate policy, which considers interactions between sectors and the order of key actions, could deliver an emissions reduction plan that would promote economy-wide progress towards the country's climate goals.

Focusing on larger sectors will deliver significant reductions, but smaller areas cannot be neglected

Achieving benchmark outcomes in five key areas – decarbonising electricity supply, decarbonising industry, reducing emissions on farms, adopting electric and hybrid light vehicles, and land-use change to forests – would deliver around three quarters of the net emissions reductions needed to meet the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035). These areas all warrant focus due to their scale, with our assessment highlighting reducing emissions on farms as the outcome most at risk.

For most of the other areas that make up the remaining one-quarter of the net emissions reductions, we find significant risk of not achieving the benchmark emissions reductions laid out in the Commission's 2022 demonstration path. While smaller in size, attention to these areas is needed, or further emissions reductions must be found elsewhere.

There are opportunities to extend ambition in some areas

There are opportunities for greater emissions reductions in some areas that could help balance risks of underachievement in others.

The Act directs us to consider any new opportunities to reduce emissions as part of our assessment of the adequacy of the emissions reduction plan and progress in its implementation. For this report we have focused on identifying emissions reduction options that were either not included in our 2022 demonstration path, or which show potential for greater emissions reductions than previously assumed based on new evidence.

Table 3.4 below summarises key opportunities we have identified to make further emissions reductions beyond the benchmark levels in the demonstration path. These opportunities include faster uptake of low and zero emissions vehicles, further emissions reductions from industry, and reducing geothermal emissions through gas capture and reinjection. These and some further opportunities are highlighted in each sector chapter.

Table 3.4: Key opportunities identified for further emissions reductions

Opportunity	Potential further emissions reductions (relative to the 2022 demonstration path)
Emissions reduction options that were not included in the Commission's 2022 demonstration path	
The installation of an electric arc furnace at the Glenbrook steel mill, expected to be in operation by 2027, was not assumed to happen in the demonstration path. Further cuts to emissions from industry in the second emissions budget period (2026–2030) and third emissions budget period (2031–2035) are achievable if existing opportunities to decarbonise process heat are pursued in addition to this.	The electric arc furnace will cut emissions by 0.8 $MtCO_2e$ each year,[7] or up to 4.0 $MtCO_2e$ in each budget period.
Carbon capture and reinjection can be deployed at existing and new geothermal power stations to reduce the release of greenhouse gas emissions.	Estimated potential to reduce emissions by around 2 $MtCO_2e$ over the second emissions budget and 2.5 $MtCO_2e$ over the third emissions budget.
New renewable electricity generation options, including offshore wind and supercritical geothermal, and greater storage and demand response, could reduce the cost of reducing electricity emissions and enable faster electrification of the wider economy.	Not quantified.
Options where new evidence suggests greater emissions reductions are possible	
Faster adoption of low and zero emissions light vehicles.	Estimated potential to reduce light vehicle emissions by an additional 6.7 $MtCO_2e$ over the second emissions budget and 6.8 $MtCO_2e$ over the third emissions budget.
Greater reductions in emissions of fluorinated gases through training and accreditation for refrigerant handlers and prohibitions on high-GWP gases.	Not quantified.

There is flexibility in how to meet the emissions budgets but it is limited by real-world constraints

Aotearoa New Zealand has flexibility in how it meets its emission budgets and 2050 target. However, the flexibility is limited by real-world feasibility constraints, particularly in the short term. For example, additional forest planting can no longer make much difference to meeting the second emissions budget (for 2026–2030) because the growth of carbon removal is slow in the early stages of new plantings.[8]

There are opportunities to address some barriers and constraints that could limit the pace of decarbonisation. For example, managing supply chain disruptions and skilled workforce availability will allow sectors such as energy and industry to deliver emissions reduction projects across the economy and at pace. Improving access to capital would unlock potential across several sectors by enabling investment in low emissions technology and practices.

The second emissions reduction plan must also deliver on the 2030 biogenic methane target

The 2030 biogenic methane target requires biogenic methane emissions to be at least 10% below their 2017 level by 2030. This target limits flexibility in how the second emissions budget (2026–2030) can be achieved as it applies only to the agriculture and waste sectors. Meeting that target will require methane emissions from agriculture to fall by at least 8% by 2030 relative to 2017, assuming the achievement of the goal in the Government's waste strategy to reduce methane emissions from waste by 30%.[9]

Government projections indicate emissions reductions of this level will require new policy measures, such as agricultural emissions pricing, in addition to reductions from freshwater policy (for which the Government has signalled changes) and land-use change driven by the NZ ETS.

Removing barriers that limit the effectiveness of emissions pricing will help deliver cost-effective and durable climate action

Our assessment highlights that there are many barriers that limit the effectiveness of emissions pricing policies such as the NZ ETS. These include, for example, barriers to accessing capital, and systems, infrastructure and incentives that make it difficult for people to choose low emissions options. Addressing such barriers will improve the prospects of meeting the emissions budgets and support a more cost-effective and durable transition to a low emissions economy.

Managing challenges and opportunities for New Zealanders from the transition is key to success

Actions to meet climate goals can have positive impacts, such as reducing living costs, but there will be some unevenly spread negative impacts on people during the transition that need to be managed. There is currently a lack of clarity in how the Government plans to manage potential impacts of emissions reduction policy and to grasp opportunities to improve the lives of New Zealanders, particularly for those most affected. Proactively managing the social challenges and opportunities is an important enabler of climate action.

Areas for attention by sector and wider policy areas

Monitoring provides information to support decision-making at all levels in Aotearoa New Zealand. It helps identify where there are adjustments needed to plans, barriers to address, or new opportunities. It can help in the best use of limited resources, by directing them towards activities that are most likely to achieve the named goals. At the same time as the Commission is preparing this first monitoring report, the Government is preparing the second emissions reduction plan to cover the emissions budget period for 2026 to 2030. This is being consulted on in mid-2024, and is due to be published at the end of the year.

We have identified further areas for attention for each sector and for the wider policy areas that could assist with narrowing down areas to focus on that have not been discussed above. More detail on these areas for attention can be found in individual chapters later in this document.

These are in addition to the areas we highlighted in our key findings – each section of this list should be read alongside those findings for a complete picture of our assessment of opportunities and challenges for individual sectors and in wider policy areas.

Energy and industry

1. There are barriers relating to capital cost and access to low-cost financing, and emissions reductions from industry may slow or stall if these barriers are not addressed in the second emissions budget period (2026–2030). This may impact achievement for the third emissions budget period (2031–2035) onwards.
2. High costs for connecting to the electricity network, high network charges, and first mover disadvantage could deter switching from fossil fuels to electricity as an energy source. Prioritising putting policies or regulatory incentives in place to adequately address these issues will help to reduce the overall cost and reduce any risk to the pace of electrification.
3. The existing regulatory system does not sufficiently support or require emissions reductions in new or existing buildings. Amendments to the purpose and principles in the Building Act to ensure the building system supports emissions reduction, resilience and adaptation have not been progressed, and updates to the Energy Efficiency (Energy Using Products) Regulations 2002 have been delayed.
4. If there is not enough electricity generation that can turn on as needed (called dispatchable generation) and energy storage this may create a risk for security and affordability of electricity supply. Additionally, markets that can incentivise demand and supply response to peaks and shortages, and therefore help manage overall system costs, are not fully developed. If these issues are not addressed, they could reduce competition in the electricity generation market, increase the cost of electricity, and slow the pace of electrification of the wider economy.

5. Repealing the ban on new offshore oil and gas exploration may enable further exploration but other impediments could still restrict investor interest. In the long term, expanding oil and gas exploration that enables the development, production and use of emissions intensive resources could potentially impact Aotearoa New Zealand's ability to meet emissions budgets and the 2050 target.

Transport

6. Affordability of low emissions vehicles, including upfront cost, creates the risk that uptake will not be achieved at the pace and scale required to meet future emissions budgets. The Clean Car Standard is the primary policy to encourage the uptake of zero and low emissions vehicles. Ensuring the standard is regularly tightened by setting emission caps to encourage the uptake of low and zero emissions vehicles (including electric vehicles (EVs)) will reduce this risk.

7. A clear signal on a further move to road user charges for petrol vehicles would reduce the risk that new road user charges for EVs and plug-in hybrids (PHEVs) will discourage the uptake of these types of vehicles.

8. Uptake of low emissions heavy vehicles is currently slow due to a combination of significantly higher costs of low emissions vehicles, limited supply, and the lack of supporting infrastructure. Building on the policies and tools in place could help to realise the opportunity to reduce freight emissions in the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

9. For walking, cycling and public transport to make a substantial contribution to reducing emissions, barriers will need to be overcome through safe and dedicated infrastructure. Current policy tools on their own are unlikely to drive mode shift away from light vehicles to lower emissions ways of travel. Further mode shift of freight onto rail and coastal shipping is also likely to be limited under current settings. This will put more pressure onto decarbonising the light and heavy vehicle fleets to meet future emissions budgets.

10. Without measures to encourage the development of low-carbon liquid fuels for transport and sustainable aviation fuel (SAF) for aviation, it is unlikely that the carbon intensity of fuel used in the existing vehicle and airline fleets will reduce. This places further reliance on the uptake of EVs to achieve the emissions budgets.

Agriculture

11. Well-designed extension and advisory services will support producers to understand where the emissions are generated in their systems and which mitigations will help reduce them. We assess that there is a still a gap in extension and advisory services that support farmers with the tools to make farming systems changes.

12. Enabling regulations and securing long-term funding for research and development are important to supporting commercialisation of mitigation technologies.

Forests

13. Controlling and reducing deforestation is an important factor in meeting emissions budgets. There are risks – particularly around deforestation of post-1989 forests not registered in the NZ ETS, which do not face a disincentive to deforestation.

14. The aim stated in the first emissions reduction plan to increase levels of native afforestation with less reliance on exotic afforestation is unlikely to be delivered without further policy to incentivise native afforestation. Lower levels of native permanent afforestation have consequences for building a long-term, durable, resilient land-based carbon sink needed to meet and sustain the 2050 target.

Waste

15. The emissions reduction target in the Waste Strategy 2023 is unlikely to be met without improvements in landfill gas capture systems. The installation of landfill gas capture systems at non-municipal landfill sites would provide methane gas capture at these sites, further enabling emissions reductions.

Fluorinated gases

16. Implementing regulated product stewardship for refrigerants, and introducing standards for training and accreditation for handling f-gases, remain important initiatives to be advanced.

Wider policy areas

17. A ready and accessible workforce with the right skills and capabilities, supported through tertiary and vocational education, alongside strong supply chains, can facilitate emissions reductions across the economy.

18. The combination of the end of *Te Ara Paerangi – Future Pathways* Research, Science, Innovation and Technology (RSI&T) reforms, and the conclusion of the National Science Challenges, means that there is a risk of skilled staff leaving Aotearoa New Zealand while there is a gap in science programmes. A new review of the science system has been initiated.

19. Significant progress has been made against the actions in the first emissions reduction plan in funding and finance. However, the Climate Emergency Response Fund (CERF), which was a substantial government funding stream, has been disestablished. $2.6 billion of initiatives previously funded from the CERF will continue such as the public network of electric vehicle charging infrastructure, and the development of an on-farm emissions measurement scheme. While the mechanism for climate funding may change, at present there is a significant gap in government funding for climate change response.

20. Changes have been made to the policy direction for planning and infrastructure systems. The status of climate change considerations within those reforms has not yet been confirmed.

Wehenga B: Ngā taunakitanga

Part B: The supporting evidence

B1: Te tirohanga whāroa | The wide view

Introduction

This part of the report provides a cross-systems view of meeting Aotearoa New Zealand's emissions budgets and 2050 target.

The analysis in these chapters focuses on progress that has been made under the first emissions reduction plan, and on identifying gaps in the Government's approach, as well as opportunities.

We have not identified detailed quantitative indicators across all these areas, and we have not undertaken policy scorecard assessments as we have in the sector chapters.

Over time, we will seek to build on our current monitoring framework, including potential options for developing a broader set of indicators to integrate into assessment.

- **Chapter 4: Global trends and policy progress** provides the international context to Aotearoa New Zealand's action to reduce greenhouse gas emissions. It includes highlights of global climate trends, as well as an update on how the world is progressing to meeting the Paris Agreement.
- **Chapter 5: Policies, systems and tools** looks at the 'cross-cutting' parts of Aotearoa New Zealand's action to reduce greenhouse gas emissions. These are the wider policies, systems and tools that link and enable action across all sectors and regions.
- **Chapter 6: New Zealand Emissions Trading Scheme** looks at the Government's progress in implementing actions relating to the New Zealand Emissions Trading Scheme (NZ ETS) in the first emissions reduction plan. It also discusses the outlook for how the NZ ETS – given its design and settings – may reduce Aotearoa New Zealand's net emissions across the different sectors and sources that it covers.
- **Chapter 7: Whakahekenga haurehu** sets out our approach to monitoring emissions reduction over time in a way that is informed by ongoing engagement with iwi/Māori. It looks at progress on emissions reduction plan actions that centre on iwi/Māori and discusses further opportunities to reduce emissions in the future.
- **Chapter 8: A transition that supports New Zealanders** looks at progress on actions to mitigate the impacts that reducing emissions and increasing removals will have on New Zealanders.

WĀHANGA 4 | CHAPTER 4

Ngā tāera ā-ao me ngā kokenga kaupapahere | Global trends and policy progress

This chapter places Aotearoa New Zealand's action to reduce greenhouse gas emissions in an international context.

In this chapter, we highlight global climate trends and greenhouse gas emissions, as well as providing an update on how the world is progressing towards meeting the Paris Agreement.

Climate trends

Climate action has slowed, but not halted, the growth in global emissions

Annual global carbon dioxide emissions grew by 1.2% in 2022 to a new high of 38.5 $GtCO_2e$, according to the Emissions Database for Global Atmospheric Research (EDGAR) (**Figure 4.1**).[10,xxvii] Global emissions of methane, nitrous oxide, and fluorinated gases (f-gases) also grew in 2022, raising total global gross greenhouse gas emissions by 1.9% to a new high of 53.8 $GtCO_2e$.[xxviii]

The International Energy Agency (IEA) reported that global energy-related CO_2 emissions continued to grow in 2023, increasing by 1.1% (410 $MtCO_2e$) on the previous year.[11,xxix] The IEA found that weather effects and reopening of economies after COVID-19 played a significant role in the emissions increase in 2023.[12] Global hydroelectricity generation also saw a record decline in 2023, due to droughts. Without this drop in hydroelectricity generation, global electricity sector emissions would likely have fallen in 2023.

While global gross emissions are yet to start on a consistent long-term downward trajectory, the rate of annual increase has fallen since 2010, especially for CO_2 (**Figure 4.2**). Growth in clean energy is central to this slowdown. The IEA found that without the growing deployment of five key energy technologies – solar photovoltaic (PV) power, wind power, nuclear power, heat pumps, and electric vehicles (EVs) – the growth in CO_2 emissions from 2019 to 2023 would have been three times larger.[13]

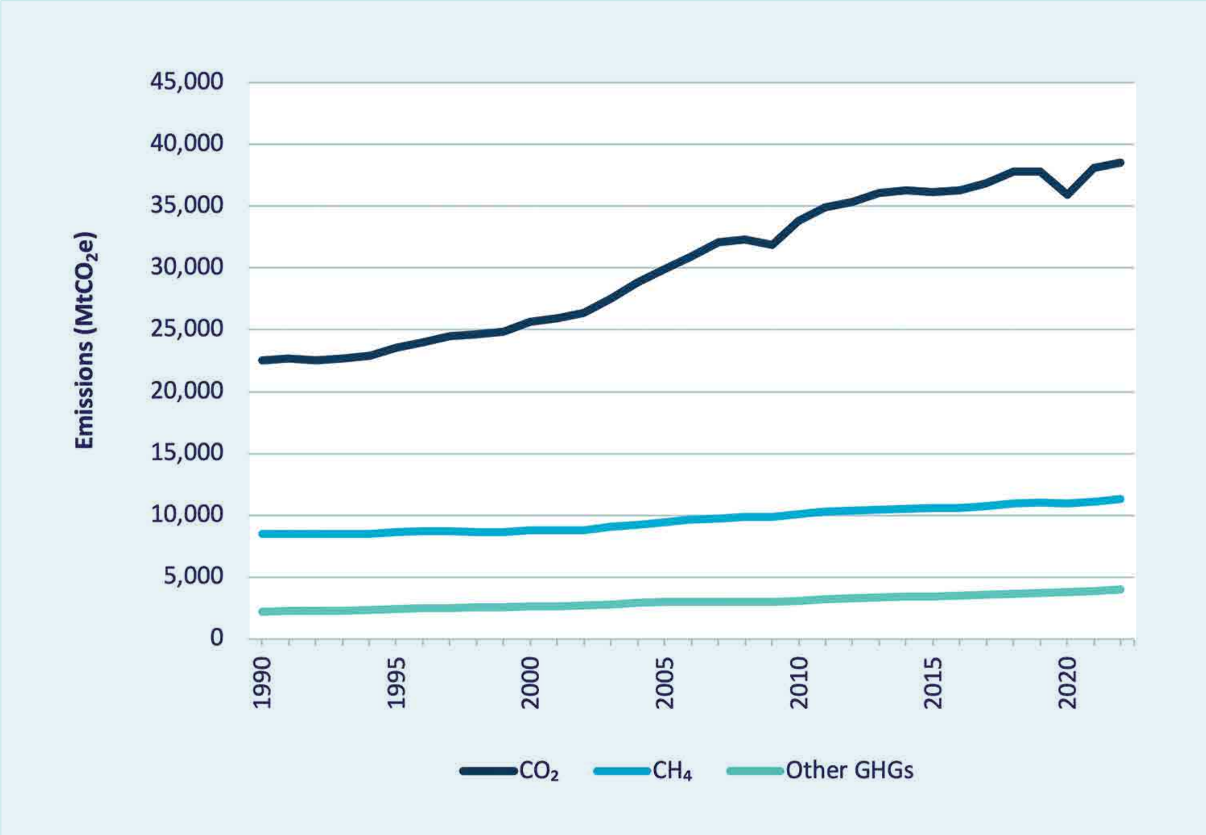
The slowdown in growth of global methane emissions appears primarily driven by a reduction in methane from fossil fuel use, recorded in the EDGAR database. Waste and agriculture have remained at relatively steady levels of growth from 2010.

xxvii. We use EDGAR data throughout this chapter for international emissions estimates. EDGAR is an independent database that provides annual emissions data by country, gas, and sector. There are minor differences between emissions reported by EDGAR compared with national greenhouse gas inventories prepared by governments and submitted to the United Nations Framework Convention on Climate Change (UNFCCC). Appendix A of the United Nations *Emissions Gap Report 2023* explores these differences. We have used New Zealand's Greenhouse Gas Inventory published in 2024, rather than EDGAR, for Aotearoa New Zealand's emissions data.

xxviii. These are gross emissions figures and do not include emissions and removals from land use, land-use change or forestry.

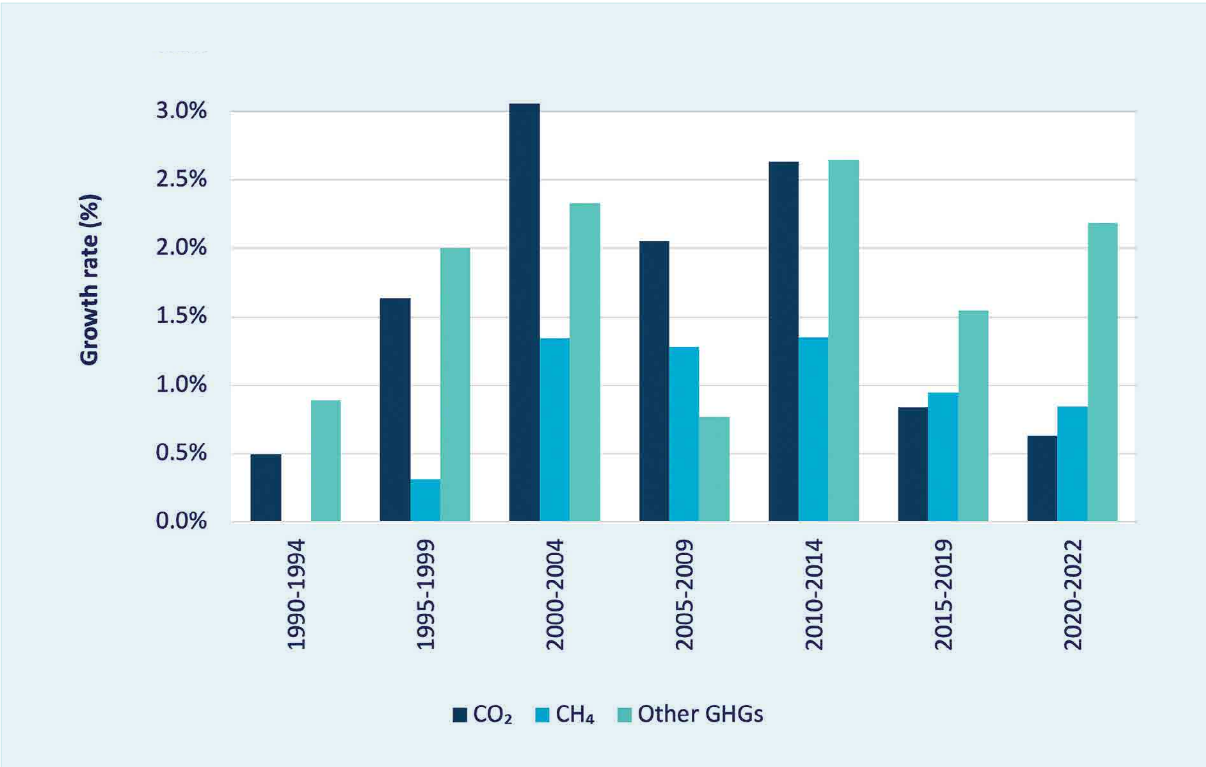
xxix. On average, approximately 90% of total CO_2 emissions are energy related.

Figure 4.1: Global emissions by gas



Source: Commission analysis adapted from EDGAR Community GHG Database

Figure 4.2: Average rate of annual change in global GHG emissions



Source: Commission analysis adapted from EDGAR Community GHG Database

Box 4.1: Global trends in methane

Since 2010 there has been a decline in global methane emissions growth rates based on inventory estimates (see **Figure 4.2**). However, the rate at which methane concentrations are increasing in the atmosphere over that same period is rising, reaching a peak in 2021.[14] This trend is not consistent with declining methane emissions growth rates in the inventories.

Some possible explanations for the differences in the growth rate trends include under-reporting of methane emissions (from fossil fuels, agriculture and waste) and/or natural emissions (such as from wetlands) that are not included in inventories.

Aotearoa New Zealand is contributing to the global effort to understand these issues and reduce global methane emissions, including through investment in MethaneSAT. This is a satellite that will identify opportunities to reduce fugitive emissions and understand other sources of methane emissions both domestically and overseas. It was launched in early 2024.

Rapid growth of clean technologies is driving slow-down in global emissions growth

While global emissions have not yet peaked, there has been a slow-down in the annual growth rate. In recent years, this slow-down has been driven by the decline in emissions in advanced economies.[xxx] The decline is primarily due to significant reductions in emissions from the energy sector, because of the major growth of clean energy technologies such as solar and wind. The IEA reported that, in 2023, advanced economy emissions dropped by approximately 4.5% from the previous year, and nearly two-thirds of the decline was based on the electricity sector.[15] The share of energy emissions from coal has reached a historic low of 17%, reaching levels not seen since around 1900. Although China's overall gross emissions continue to grow, it deployed the majority of 2023's global clean energy in solar PV and wind.

The *IEA World Energy Outlook 2023* report estimated that, based on stated policy scenarios, the world is on track to see demand for all fossil fuels peak before 2030.[16] However, demand for fossil fuels would then need to continue to drop significantly, to reach global climate goals.

Since 2010, the average global growth rate of solar and wind electricity generation was 21% per annum. The growth rate in China was 36%.[17] After accounting for less than 2% of electricity generation in 2010, solar and wind now accounts for approximately 10% of total global electricity supply.[18]

Rapid growth in the use of electric vehicles has also contributed to a slow-down in global emissions growth. The IEA estimated that, in 2023, deployment of electric vehicles rather than internal combustion engines helped avoid net emissions of approximately 130 $MtCO_2e$.[19] The IEA also forecast that two-thirds of cars sold in 2035 will be electric and result in net avoided emissions of approximately 1,800 $MtCO_2e$.[20]

In 2023, Aotearoa New Zealand's percentage of new cars purchased that were electric was 14%. This was below the global average of 18%, and the averages for the European Union (22%) and China (38%).[21] The total global percentage of all cars currently in use that are electric is approximately 3.2%.[22]

xxx. The country classification used by the International Monetary Fund (IMF) in the World Economic Outlook divides the world into two major groups: 'advanced economies' and 'emerging and developing economies'. The IMF classifies advanced economies as: Andorra, Australia, Austria, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Macao SAR, Malta, The Netherlands, New Zealand, Portugal, Puerto Rico, San Marino, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States.

Increased demand for clean energy technologies has contributed to significantly decreasing costs, creating a virtuous cycle, driving increasing uptake and supporting a faster transition to a low emissions future. There has been a significant drop in the international cost of solar PV panels and lithium-ion battery storage, which have both fallen by over 85% in the last ten years.[23]

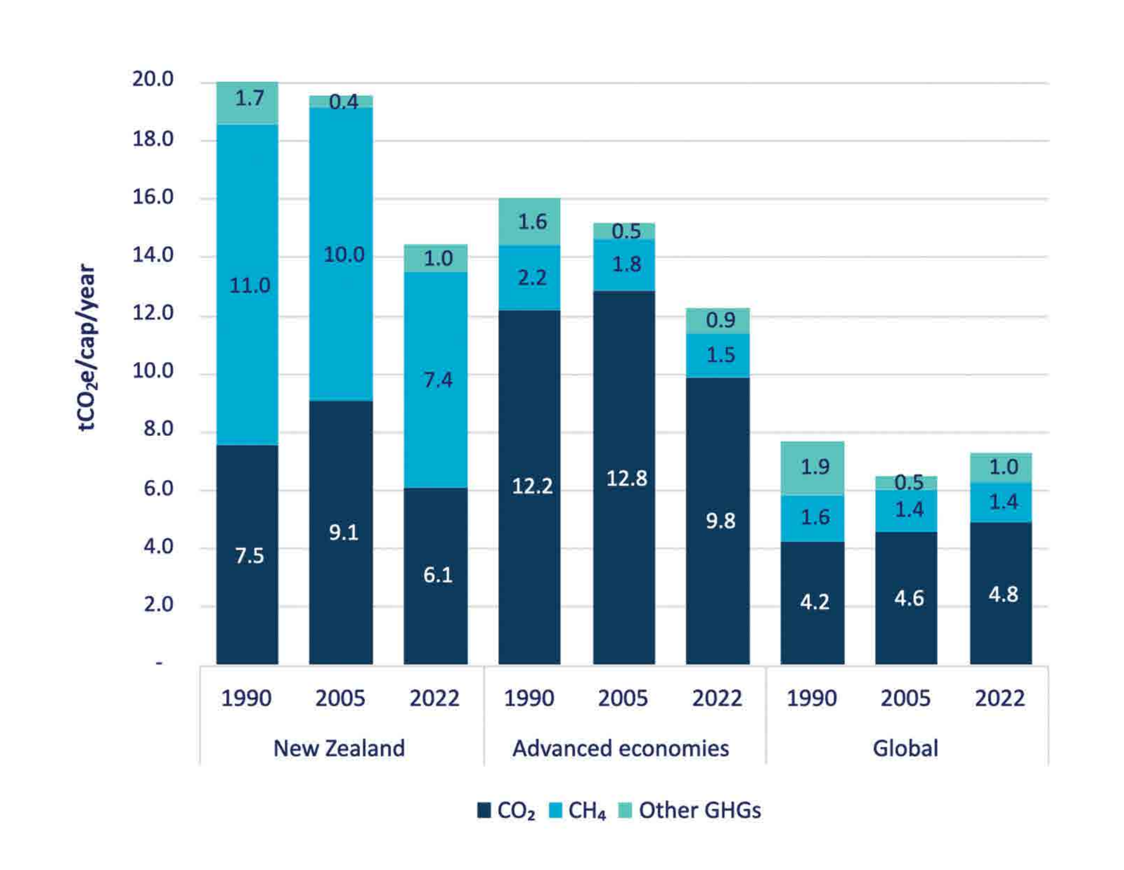
Box 4.2: How Aotearoa New Zealand's progress compares

Emissions per capita

Figure 4.3 highlights the change in gross emissions per person since 1990 (in tCO_2e). The total global emissions per capita ratio has slowly increased since 1990, largely driven by a significant increase in China. Per capita emissions in advanced economies and Aotearoa New Zealand have declined.

Aotearoa New Zealand is one of few countries where methane emissions make up the majority of per capita emissions, but this has dropped by 3.6 tCO_2e between 1990 and 2022. Total gross emissions per capita have also reduced by 1.4 tCO_2e. Aotearoa New Zealand has the fourth-highest total emissions per capita of advanced economies, behind Australia, Canada and the United States.

Figure 4.3: Emissions per capita broken down by GHG



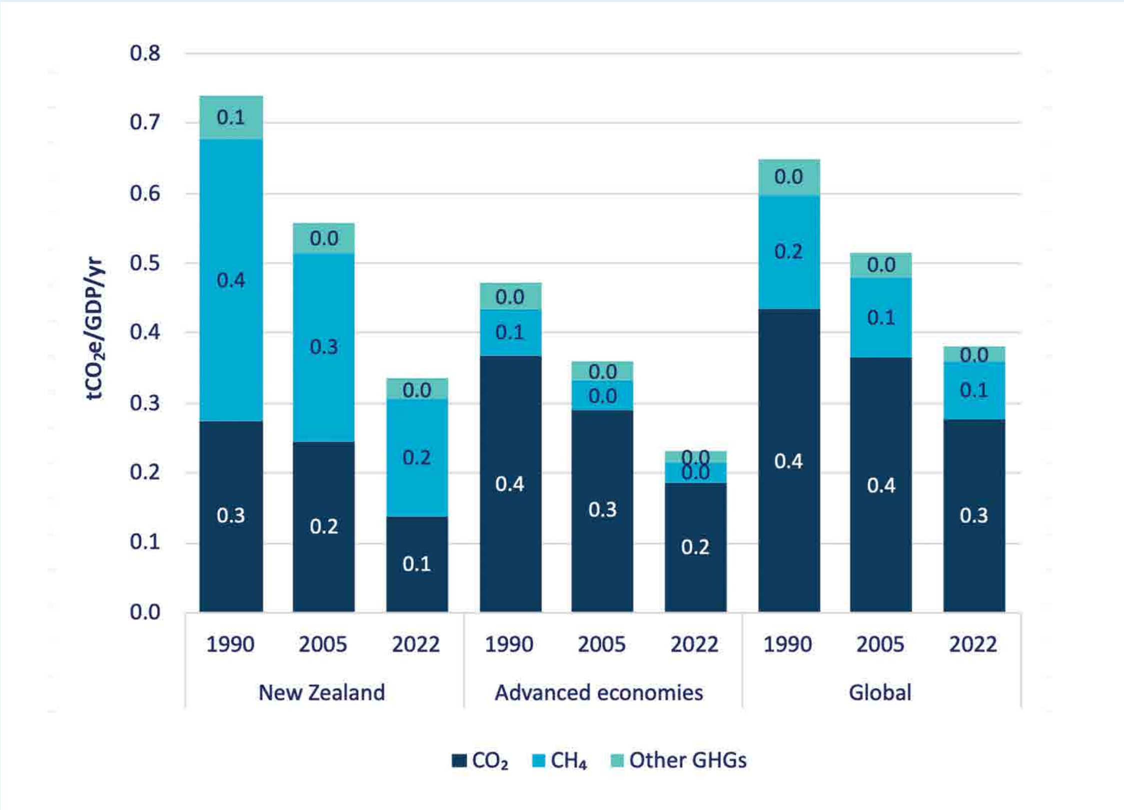
Source: Commission analysis, adapted from EDGAR Community GHG Database and New Zealand's GHG Inventory 1990–2022

Emissions per unit of gross domestic product (GDP)

Figure 4.4 shows that the ratio of total gross CO_2e emissions per unit of GDP has been decreasing globally since 1990. During this time, Aotearoa New Zealand's GDP has risen by 147%, while emissions have only risen by 14%. Since 2014, Aotearoa New Zealand has had a lower gross emissions-per-GDP ratio than the global average, but still has the third-highest ratio of all advanced economies, behind only Australia and Canada.

A global pattern of decreasing gross emissions per unit of GDP highlights that a strong and growing economy is not contingent on simultaneously increasing emissions.

Figure 4.4: Emissions per GDP unit, broken down by GHG[xxxi]



Source: Commission analysis, adapted from EDGAR Community GHG Database and New Zealand's GHG Inventory 1990–2022

xxxi. Based on GDP purchasing power parity (PPP), (constant 2017 international $) (expressed in US$1,000, and adjusted to the PPP of 2017) for 1990 to 2022: World Bank, July 2023.

Emissions reduction policy

Progress continues, but further efforts are required

The first global stocktake reviewing the implementation of the Paris Agreement was completed in 2023

Achieving the goals of the Paris Agreement requires collective effort and significant international coordination. Key milestones were achieved in 2023, including the first global stocktake.[24] The global stocktake, which will take place every five years, is a key part of the Paris Agreement, as it reviews the implementation of the Agreement, assesses collective progress towards achieving the goals of the Agreement, and takes into account equity and the best available science.

The 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28) marked the conclusion of the first global stocktake, which showed that progress has been too slow in all areas of climate action – reducing emissions, enhancing resilience, as well as financing and technical support for vulnerable nations. COP28 resulted in key actions to address these issues,[25] including:

- signalling the 'beginning of the end' for the fossil fuel era by agreeing to speed up the transition away from fossil fuels to renewables in the next round of climate commitments
- new funding for loss and damage with a historic agreement to operationalise funding arrangements
- enhancing global efforts to strengthen resilience through agreement on adaptation targets
- linking climate action to nature conservation was recognised, creating momentum to address both crises simultaneously.

Countries' goals and commitments close the gap to meeting the Paris Agreement temperature goal, but action is not yet on track.

According to the United Nations *Emissions Gap Report 2023*, global greenhouse gas emissions are now expected to be lower in 2030 than previous projections, as a result of commitments under the Paris Agreement.[26] However, the latest estimates indicate that the world is not on track to limit warming in line with the Paris Agreement. The report concluded that if the world achieved all existing commitments and pledges to reduce emissions, temperatures would still likely rise more than 1.5°C.

- In the most optimistic scenario – with all commitments and pledges implemented – the world has a 66% chance of limiting warming to 2.0°C (range: 1.8°C to 2.5°C).
- With only current policies continuing, the world has a 66% chance of limiting 21st century warming to 3.0°C (range: 1.9°C to 3.8°C).

Limiting warming to 2°C will require implementing current targets and increasing the ambition of targets. Existing climate targets and domestic net zero pledges are insufficient to pursue efforts to limit warming to 1.5°C.

While ambition has increased over time, the confidence in the implementation of commitments remains low, as indicators of implementation are limited – including legal status, existence and quality of implementation plans, and alignment of near-term emissions trajectories with net zero targets.

Greater emissions reductions now and after 2050 will be needed to limit global temperature rise.

WĀHANGA 5 | CHAPTER 5

Ngā kaupapahere, ngā pūnaha me ngā taputapu | Policies, systems and tools

This chapter looks at the 'cross-cutting' parts of Aotearoa New Zealand's action to reduce greenhouse gas emissions. These are the wider policies, systems and tools that link and enable action across all sectors and regions.

The different parts of the country's economy and society do not operate in isolation. Transforming Aotearoa New Zealand to a low emissions economy requires a coordinated approach to systems change on multiple levels. There are complex cross-system and cross-sectoral issues that span governance, institutional frameworks, regulatory systems, and access to finance.

Under the Climate Change Response Act 2002 (the Act), the emissions reduction plan that the Minister of Climate Change is required to prepare and make public must include a multi-sector strategy to meet emissions budgets and improve the ability of sectors to adapt to the effects of climate change.

The first emissions reduction plan included chapters that outlined policies and strategies covering both sectors and enabling systems.

In this chapter, He Pou a Rangi Climate Change Commission (the Commission) focuses on two areas of assessment.

- We look at the importance of ensuring governance and policies for emissions reduction are aligned towards the objective of achieving the country's emissions budgets.
- We also set out our qualitative assessment of the 'enabling systems' that support action to reduce emissions, focusing on progress that has been made under the first emissions reduction plan, and identifying areas for attention. This chapter looks at systems and actions identified in the first emissions reduction plan, including funding and finance, research, science, innovation and technology (RSI&T), planning and infrastructure, and the circular economy[xxxii] and bioeconomy.[xxxiii] Our monitoring focuses on how these cross-cutting areas are driving change across the system to support meeting the budgets and targets. In this first report, we have focused on the adequacy and implementation of the first emissions reduction plan. There is scope to consider system alignment more broadly in future reports.

There are separate chapters on specific parts of the wider policy response to emissions reduction. See *Chapter 6: New Zealand Emissions Trading Scheme, Chapter 7: Whakahekenga haurehu* and *Chapter 8: A transition that supports New Zealanders.*

xxxii. Refers to an economic system based on designing out waste and pollution, and 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.

xxxiii. A bioeconomy describes the parts of the economy that use renewable biological resources to produce food, products and energy.

Key points for policies, systems and tools

- While the first emissions reduction plan identified a number of key cross-cutting levers, and actions to help align these towards the transition, it would have benefitted from upfront consideration of how these could best work together, where the priority areas for focus were and key trade-offs, and considered these alongside coherence in sector policy approaches. Increasing the focus on sector interdependencies and the sequencing of key actions could deliver an emissions reduction plan that would best promote economy-wide progress towards the country's climate goals.
- There is uncertainty across cross-cutting areas, either because priorities have shifted since the first emissions reduction plan was set, or because actions in that plan have not been progressed. This is particularly the case for funding and finance, planning and infrastructure, and for the RSI&T system. This uncertainty means it is difficult to make an assessment on these areas and their ability to support achieving the emissions budgets and the 2050 target given the policy reform under way.

Examples are:

i. In RSI&T, *Te Ara Paerangi – Future Pathways* reform of the research system has been officially discontinued in its current form. This discontinuation, alongside the conclusion of the National Science Challenges, is creating uncertainty, and risks the loss of expertise in the areas of climate change science and research.

ii. Significant progress has been made against the actions in the first emissions reduction plan in funding and finance, but the primary government funding stream, the Climate Emergency Response Fund (CERF) has been disestablished. The Government has not yet put in place policies to replace that dedicated government funding that would ensure continued investment in lowering emissions.

iii. Changes in early 2024 to policy direction for planning and infrastructure systems have created uncertainty around how climate change will be prioritised under the resource management reform.

Governance and policy alignment

The governance arrangements that support the first emissions reduction plan are an important part of quality and implementation

Climate change action will be more successful within an enabling environment that has cross-party agreement, well-aligned governance structures and institutional frameworks, and coherence across agencies and policies. Developing, implementing and monitoring effective climate policy that supports an equitable transition to a low emissions Aotearoa New Zealand requires coordination across a wide range of government institutions and levels of government, as well as with iwi/Māori.

Effective governance structures to deliver the transition are important. Without these structures, there is a risk that policies could unintentionally contradict each other or be sequenced in a way that makes change difficult, making efforts to meet emissions budgets less effective.

The Climate Change Chief Executives Board is the interdepartmental executive board (IEB) that was created to coordinate and oversee cross-agency implementation of the first emissions reduction plan, the national adaptation plan, and their future iterations. This has been an important step in the right direction and it plays a significant role in frequent monitoring and reporting on overall progress of the plans, to enable any necessary course corrections to be made to ensure outcomes remain on track.

Local government plays a critical role in the transition. Councils make decisions on land use, urban design, road and transport services, housing, water management (stormwater, wastewater and water supply), waste management, and flood risk management. As part of our previous engagement on past advice, 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. It is difficult for the Commission to monitor what progress is being made in this regard.

Adopting a coherent approach to climate policy

Adopting a coherent approach to climate policy, one that considers sector interdependencies and the sequencing of key actions, could deliver an emissions reduction plan that would promote economy-wide progress towards Aotearoa New Zealand's climate goals.

In 2023, the Parliamentary Commissioner for the Environment (PCE) released a report on the first emissions reduction plan, making a primary finding that "a coherent policy framework was lacking" in the development of the first emissions reduction plan, with key framing questions not tackled upfront.[27] According to the PCE, this indicated that officials and ministers had not stood back to consider how to apply systems thinking and an economy-wide lens that would identify the most significant points of leverage, and then enable all elements of the plan to be assembled correctly.[28]

The second emissions reduction plan, set to be finalised by the end of 2024, is an opportunity to consider interdependencies between sectors as well as a whole-of-economy plan. For example, reliable and affordable electricity supply will be critical for reducing emissions from transport, industries and buildings. In turn, how new transport and industrial electricity loads are integrated into the electricity system will affect user costs.

Coherence across agencies, and policy and legislative alignment

Taking action on climate change will require effective actions across all of society. To support this, legislative and policy alignment across government agencies is necessary for delivering low emissions outcomes. Alignment is needed across many pieces of legislation, including the Local Government Act 2002, the Building Act 2004 and Building Code, and the reforms of the Resource Management Act 1991 (RMA).

The 'mainstreaming' of climate change considerations across government policies and procedures is important for coherence and alignment to promote a successful transition.[29] The Commission has discussed this in previous advice: consistent signalling across investments, policy statements, direction to officials, and internal policies and directives are important to ensure that all regulatory and policy frameworks are aligned with low emissions objectives. Tax levers, procurement procedures, and regulatory impact analysis are all instruments that can be used to support climate outcomes.

Climate-relevant policies have implications for climate change

Policies, including regulation and funding, and decisions relating to sectors or subsectors, that are put in place (or removed) may have impacts on progress towards meeting the emissions budgets and the 2050 target. This is regardless of whether the intent of the policy was to have an impact on climate change or whether the policy was specifically included in the first emissions reduction plan.

Enabling systems

As mentioned above, under section 5ZG(3)(b) of the Act, the emissions reduction plan must include a multi-sector strategy to meet emissions budgets and improve the ability of sectors to adapt to the effects of climate change.

The sections below include the enabling systems that will set Aotearoa New Zealand up for success in meeting its emissions budgets and the 2050 target. They cover funding and finance, planning and infrastructure, research, science and technology, and the circular economy and bioeconomy. These are areas that sit across the economy and do not fit neatly into a sector (like agriculture or energy), but they form part of a multi-sector strategy. Action in these areas may not result in tangible emissions reductions but, without them supporting the more quantifiable emissions reductions in the sectors, it is unlikely that Aotearoa New Zealand will achieve the emissions reductions necessary.

Our analysis in this chapter focuses on highlighting why these areas are important for reducing emissions, what progress has been made toward actioning the first emissions reduction plan, and areas requiring attention. Unlike the sector chapters, these areas do not have policy scorecards, but more quantitative indicators may be developed over time.

Funding and finance

In *Ināia tonu nei*, the Commission estimated that the additional capital investment, beyond business as usual, that would be required to achieve the emissions reductions proposed across key sectors between 2022 and 2050 was around NZ$38 billion (in 2021 dollars), with requirements increasing across successive emissions budgets.[30]

This section focuses on the progress made against the actions in the first emissions reduction plan, and areas for attention for the funding and finance system to enable emissions budgets and the 2050 target to be met.

Progress to date

The first emissions reduction plan set out that the Government's approach to funding and financing of the transition is guided by four main objectives.

- **Adequacy.** There will be enough money available, at the right time, to meet the challenge of the transition.
- **Certainty.** It is clear who is responsible for providing funding and financing. Central government's role in direct investment will also be clear.
- **Durability and flexibility.** Systems and processes supporting climate change actions are durable, fiscally sustainable, and flexible to the dynamic nature of climate change.
- **Private capital.** Private capital is effectively mobilised towards climate objectives, and public spending does not 'crowd out' investment from the private sector.

Several actions have been progressed to achieve these objectives, though one of the primary ones, a dedicated climate fund, has since been disestablished. The gap this creates risks slowing action to address barriers to investment in technology and infrastructure to reduce emissions, until policies to replace that dedicated government funding that would ensure continued investment in lowering emissions are in place.

Equally important is the Government creating an enabling environment for private finance, which is where the Commission's 2023 advice on the second emissions reduction plan gave further direction for the future.[31]

Progress to date in funding and finance includes the following.

- In 2021, the Government established the CERF, which was intended to be a multi-year fund. It was to ensure that longer-term climate change objectives were not crowded out by shorter-term priorities during the annual budget bid process. The CERF had an initial NZ$4.5 billion down payment, proportional to forecast cash proceeds from the New Zealand Emissions Trading Scheme (NZ ETS) over the 2022/23 to 2025/26 financial years.[32] The CERF was disestablished in December 2023 as part of the mini-Budget.[33] Of the initiatives previously funded from the CERF, NZ$2.6 billion worth will continue, including:[34]
  - a public network of electric vehicle (EV) charging infrastructure
  - a grant scheme for heavy vehicles

- development of an on-farm emissions measurement scheme
  - a fund for decarbonising the public transport fleet, supporting local authorities to purchase electric buses
  - public transport concessions for Community Services Card holders
  - supporting Aotearoa New Zealand's International Climate Finance Commitment
  - the Warmer Kiwi Homes programme.
- In November 2022, the Government issued NZ$3 billion in Green Bonds that will mature in 2034. It is intended that money raised from the bonds will be used to support projects that help reach the net zero component of the 2050 target.[35]
- As of 30 June 2023, the New Zealand Green Investment Fund (NZGIF) had NZ$288 million of capital committed and executed, and NZ$468 million co-invested. The total estimated lifetime emissions reductions as a result of NZGIF's investments was 730,000 to 890,000 tCO_2e.[36]
- In October 2021, the Crown Responsible Investment Framework required the NZ Super Fund, the Accident Compensation Corporation, the Government Superannuation Fund and the National Provident Fund to set out a pathway to achieve carbon neutrality by 2050. These organisations collectively manage over NZ$100 billion worth of investments.[37]
- Mandatory climate-related financial disclosures were introduced by the Financial Sector (Climate-related Disclosures and Other Matters) Amendment Act 2021. The new law required around 200 large financial institutions covered by the Financial Markets Conduct Act 2013 to start making climate-related disclosures from 2023.[38]
- In 2022 the Guardians' Board of the NZ Super Fund decided to shift the benchmark Reference Portfolio to market indices that align with the Paris Agreement.[39]
- The private sector is also taking action. For example, in partnership with Rewiring Aotearoa, ASB is financing a study into the barriers and opportunities for the electrification of Aotearoa New Zealand homes.[40] Major banks such as Kiwibank,[41] Westpac,[42] BNZ[43] and ANZ[44] also offer special loans relating to green or sustainable energy solutions, including supporting climate change mitigation and adaptation.[45]

Areas for attention

There is a gap in dedicated climate funding

The CERF and its associated funds, such as the Government Investment in Decarbonising Industry (GIDI) Fund, have been disestablished. The GIDI Fund was expected to deliver projects that would account for around 17% of total emissions reductions planned in the first emissions budget (2022–2025) and 35% of emissions reductions planned in the second emissions budget (2026–2030).[46] There is now a gap in government funding that, considering some of the barriers to the uptake of low emissions technology, risks investment slowing down. This is particularly the case for upfront capital cost, high costs of capital and/or the ability to access funding, as we identify in the sector chapters of this report. An example of this gap is the resulting lack of funding for the decarbonisation of an industrial plant.

While the mechanism for climate funding may change, at present there is a significant gap in government funding for climate change. Providing dedicated long-term funding for climate-related investment with clear priorities provides greater confidence for efficient and effective low emissions investment.

Private capital flow is also influenced by emissions pricing. Pricing emissions changes the relative prices of goods and services across the economy. This influences the behaviour of both producers and consumers by discouraging high emissions activities and rewarding low emissions choices. It is a key mechanism for redirecting private capital to low emissions solutions.

Chapter 6: New Zealand Emissions Trading Scheme sets out some of the barriers that limit the effectiveness of emissions pricing policies. These include, for example, barriers to accessing capital, as well as systems, infrastructure and incentives that make it difficult for people to choose low emissions options. Addressing barriers such as upfront capital cost will support a more cost-effective and durable transition to a low emissions economy.

Creating an enabling environment for private finance and aligning public investments with climate goals

The opportunity to partner with large international funds was highlighted when, in 2023, the Government partnered with BlackRock to launch a NZ$2 billion fund with the goal of making Aotearoa New Zealand one of the first countries in the world to reach 100% renewable electricity.[47] Since that announcement, no further information has been made public about this.

In previous advice, we have noted the importance of ensuring that public investments support low emissions outcomes. For example, the Government has established a Regional Infrastructure Fund with NZ$1.2 billion in capital funding.[48] Together with investments such as those planned under the draft Government Policy Statement for land transport,[49] this represents significant public funding that could align with Aotearoa New Zealand's climate goals.

A sustainable finance taxonomy would bring benefits

A sustainable taxonomy is a classification system that defines which economic activities are aligned to a sustainable, low emissions future, with a goal of directing investment to the activities required for the transition.[50]

The Government has signalled a sustainable finance taxonomy, which would bring benefits such as reducing concerns about greenwashing, enhancing access to sustainable finance, and potentially attracting greener investments by allowing international investors to compare investments here with overseas. In June 2024, an Independent Technical Advisory Group, composed of climate change experts and financial markets participants, is preparing independent, non-binding advice to the Minister of Climate Change on the design of a taxonomy that is fit for purpose for Aotearoa New Zealand.[51]

Planning and infrastructure

The planning and infrastructure system guides decisions on how we use our land and natural resources and where infrastructure investments are made. Infrastructure is part of the solution to reducing emissions, but it also produces and enables emissions. The emissions related to infrastructure 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. Making better use of existing infrastructure and making it more resilient to climate change reduces the pressure on resources.

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 dependencies for development. International studies have demonstrated that denser urban forms result in fewer overall emissions – including embodied, enabled, and operational emissions.[52]

This section focuses on the progress made against the actions in the first emissions reduction plan, and areas for attention for the planning and infrastructure system in meeting emissions budgets and the 2050 target.

Progress to date

The main actions in the first emissions reduction plan were focused around resource management reform, that is, improving the system to support greenhouse gas emissions reductions and climate resilience. The resource management reform programme resulted in two pieces of legislation being passed – the Natural and Built Environment Act 2023 and Spatial Planning Act 2023 – which have been repealed.

The first emissions reduction plan was also seeking to address infrastructure funding and financing challenges to developing low emissions urban environments and using infrastructure efficiently.

Progress to date in planning and infrastructure includes the following.

- There are a number of areas of resource management reform under way. The Government has indicated a phased approach to resource management reform.[53]
  - In December 2023, the Government repealed the Natural and Built Environment Act 2023 and the Spatial Planning Act 2023.
  - In the second phase, the Government introduced legislation for a fast-track consenting approvals regime. It also intends to make amendments to the RMA to provide national direction on the Going for Housing Growth package.
  - In the third phase of reform, the Government intends to replace the existing RMA with new legislation.
- The Medium Density Residential Standards (MDRS) were introduced in 2021. These standards support the development of three homes up to three storeys on each site, without the need for resource consent.[54] These previously compulsory standards have been made optional for councils, allowing councils greater autonomy and nuance as to the levels of density to enable in their urban centres.[55]
- In March 2024, the Wellington City Council approved its new District Plan, which allows denser development with more townhouses and/or more buildings on each section of land. The Housing and Urban Development Minister approved the recommendations which increased density in May 2024.[56]
- Work is under way to progress a national toolkit to quantify the emissions impacts of urban development and infrastructure decisions. Understanding these impact is central to meeting emissions budgets over the long term. Funding is being sought to progress this.[57]
- He Whakakaupapa mō Te Hanganga o Aotearoa | The Infrastructure Action Plan was released in May 2023, and it responds to challenges and

opportunities outlined in the Rautaki Hanganga o Aotearoa New Zealand Infrastructure Strategy 2022–2052.[58] Work is under way to review existing guidelines and tools to include climate mitigation in infrastructure investment decisions.

- The Government has made announcements recently to seek to address the historical infrastructure deficit, including:[59]
  - the proposed development of a 30-year National Infrastructure Plan by the end of 2025, which will include a national infrastructure pipeline, an assessment of infrastructure priorities and an infrastructure needs assessment
  - a new National Infrastructure Agency that will be set up by 2025, with advice being sought from officials on what a high-performing infrastructure system looks like, who is doing what, and what may need to change
  - a Regional Infrastructure Fund of NZ$1.2 billion.

Areas for attention

There is uncertainty surrounding the implications from resource management reform

The purpose of the Fast-track Approvals Bill is to provide a fast-track decision-making process that facilitates the delivery of infrastructure and development projects with significant regional or national benefits. Reaching Aotearoa New Zealand's 2050 emissions target will require substantial acceleration of low emissions infrastructure, such as renewable electricity generation and electricity transmission infrastructure. We have previously given advice on the need to simplify the consenting processes to make renewable infrastructure building quicker and easier.[60] The Bill provides a new mechanism for infrastructure and development projects to be rapidly consented. Projects approved through this new process could have significant impacts on whether emissions budgets and the 2050 target are met.

In the third phase of its resource management reforms, the Government has signalled it will put in place new resource management legislation which it has said will be based on the enjoyment of property rights, while ensuring good environmental outcomes.[61] The status of climate change considerations within those reforms has not yet been confirmed.

Where infrastructure is prioritised in line with achieving the Government's stated emissions reduction goals, the Government's reforms could remove impediments to the low emissions transition. However, the current Fast-track Approvals Bill emphasises the benefits of development and does not appear to give sufficient weight to climate considerations. If infrastructure and development projects support emissions intensive activities, it will be more difficult to meet emissions budgets, will put a greater burden of emissions reductions on the rest of the economy, and could compromise adaptation options under the national adaptation plan. The approval of projects should be made in the context of achieving the country's medium- and long-term goals relating to climate change.[62]

Infrastructure is part of the solution when reducing emissions, but significant infrastructure investment is required

Meeting the 2050 target will require transformation of the energy and transport systems, enabled by significant additional infrastructure investment against a historic infrastructure deficit. There is a risk that delays in investment push the cost of necessary infrastructure onto future generations and limit choices for decarbonisation. As noted above, work is under way in this area and the Government has a work programme to address this. There will be more information available to us to make a thorough assessment in subsequent monitoring reports.

Research, science, innovation and technology

A strong RSI&T system enables the growth of new sectors, market opportunities, and high-value jobs. It can expand low emissions options, create new technologies, and provide critical information and technology support to climate adaptation efforts – all necessary to drive the transformation to a low emissions economy.

This section covers the progress made against the actions in the first emissions reduction plan and areas for attention for the RSI&T system, which can enable emissions budgets and the 2050 target to be met.

Progress to date

While there are many sources of ongoing funding and private investment in research and development, the existing level of investment is well below the OECD average.[63] There were two actions in the first emissions reduction plan for the RSI&T system: Establish climate platforms (Action 8.1.1) and Scale up and further target existing initiatives towards climate change (Action 8.1.2).

- Action 8.1.1, introduced in the first emissions reduction plan, has been discontinued after not receiving funding in Budget 2023.[64]
- There has been mixed progress on Action 8.1.2. In March 2024, it was announced that work on *Te Ara Paerangi – Future Pathways*, which was a programme of science reforms, would not continue in its current form. A new review of the science system has been initiated.[65]
- The Horizon Europe arrangement with the European Commission was finalised, and Budget 2023 funding of NZ$37.6 million was allocated for Aotearoa New Zealand's participation in the European Union's main research and innovation funding programme.[66]

Areas for attention

Reform of the RSI&T system has been signalled but has not been progressed, which is creating uncertainty

Te Ara Paerangi indicated that reform of the RSI&T system is required to help support the transition. To date, little progress has been made.

While the NZ Research Information System is under development, there is no systematic way to track climate change investments across the public and private sectors. Information on investments in mitigation research and development will help to monitor progress and ensure levels of investment are adequate.

There are overlapping efforts of Crown Research Institutes (CRIs) and other Crown Entities, such as Callaghan Innovation and MetService, with a need for improved coordination. *Te Ara Paerangi* was meant to address some of these issues in its reform of the system, but further action is required.

Freely available climate change data and information are essential for a wide range of users (local and regional councils, businesses, farmers, iwi and hapū, and individuals in communities). Without reform of the existing RSI&T system, it will be difficult for CRIs and other organisations to provide data openly without payment. To date, monetisation of such efforts has led to unequal access to information and it will continue to be a barrier to community resilience and emissions reduction efforts.

The combination of the end of *Te Ara Paerangi*, and the conclusion of the National Science Challenges, means that there is a risk of skilled staff leaving Aotearoa New Zealand. A Science System Advisory Group has been established to provide advice on how to improve the effectiveness and impact of the science sector in Aotearoa New Zealand, with a preliminary report due in June 2024 and a final report due in October 2024.[67]

Aotearoa New Zealand spends less than the OECD average on research and development

The transition is more likely to be more expensive, slower, less equitable, and lead to fewer economic opportunities if the RSI&T system continues with status quo operation and funding. The level of core funding has not increased for CRIs, while inflation has significantly increased, effectively eroding the capabilities of the research sector.

Aotearoa New Zealand spends less than 1.5% of GDP on research and development. The OECD average is 2.5%.[68] There is underinvestment in public research and development, and insufficient incentives for private investment.

Bioeconomy and circular economy

The bioeconomy can support transition away from a fossil-fuel based economy to a biologically based one, which makes more use of renewable resources, and decreases emissions and waste. Developing the bioeconomy requires thinking about the natural resources used for goods and services that underpin all levels of human activity.

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.

This section focuses on the progress made against the actions in the first emissions reduction plan, and areas for attention in relation to the bioeconomy and circular economy to support Aotearoa New Zealand to meet its emissions budgets and the 2050 target.

Progress to date

- The development of the Circular Economy and Bioeconomy Strategy and its supporting evidence base is a primary action in the first emissions reduction plan. Several research projects have been completed, and there has been a stocktake and gaps analysis of circular and bioeconomy initiatives in central and local government.[69] However, the development of the Circular and Bioeconomy Strategy will not be proceeding any further.[70]
- Research to build the circular economy evidence base is progressing, and circular economy cross-agency working groups have been established. Research projects are due to be completed by June 2024.[71]
- Initiatives as part of the action to support businesses moving to circular economy models were included under the Advanced Industry Manufacturing Industry Transformation Plan. Work on industry transformation plans has been discontinued.[72]

Areas for attention

Improved data and emissions transparency related to embodied emissions would enable more informed consumer choices and policy decision-making

There is potential for a higher use of 'bioproducts', including biofuels and replacements for products made from fossil fuels such as plastics. However, conducting embodied emissions lifecycle assessments will be important to ensure there is a net benefit in terms of emissions reductions (as well as other environmental and social criteria).

A continued ad hoc approach creates risk of a disconnect in the supply and demand of bioproducts

An ad hoc approach to use of bioresources and bioenergy creates the risk of a disconnect between future available bioresource supply and demand. Decisions are being made with long-lasting implications, particularly regarding infrastructure. The proposed Bioeconomy Framework in the first emissions reduction plan (Action 9.1.5), which was intended to help guide the optimal use of Aotearoa New Zealand's biological resources, would help support this.

Iwi/Māori organisations have the potential to become agents for change within a circular economy and bioeconomy

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 practices that sit at the heart of tikanga Māori. Developing a circular economy informed by mātauranga Māori is discussed in more depth in our 2023 advice on the second emissions reduction plan.[73]

WĀHANGA 6 | CHAPTER 6

Kaupapa Hokohoko Tukunga o Aotearoa (NZ ETS) | New Zealand Emissions Trading Scheme

The New Zealand Emissions Trading Scheme (NZ ETS) is the main emissions pricing tool in Aotearoa New Zealand. This chapter looks at progress on actions relating to emissions pricing through the NZ ETS and the outlook for its impact on emissions in future.

Pricing emissions changes the relative prices of goods and services across the economy. It influences the behaviour of both producers and consumers by discouraging high emitting activities and rewarding low emissions choices. Emissions pricing is an essential component of an effective policy package for reducing emissions, and the NZ ETS is a key mechanism for redirecting private capital to low emissions solutions.

The NZ ETS applies to emissions from energy, transport, industrial processes, municipal landfills, and fluorinated gases (f-gases). Overall, in 2022 the NZ ETS covered 43% of gross emissions (approximately 34 $MtCO_2e$), with the major exception being biological emissions from agriculture.[74] The NZ ETS also covers carbon dioxide removals and emissions by forests planted after 1989 (post-1989 forests) that have been voluntarily registered into the scheme, and emissions from the deforestation of forests planted before 1990 (pre-1990 forests).

The first emissions reduction plan recognised the key role of the NZ ETS in delivering emissions budgets. It highlighted that providing the right emissions pricing incentives is a key economic system setting to support businesses to cut pollution and invest in clean tech alternatives.

The Government has emphasised that the NZ ETS will be central to its approach to reducing emissions.

This chapter looks at how the NZ ETS under its current design and settings may reduce net emissions across the different sectors and sources it covers, to provide insights about the path emissions may follow in future towards meeting emissions budgets and the 2050 target. It complements the discussion of the sector-specific effects of the NZ ETS in chapters on forests, energy and industry, transport, waste, and fluorinated gases (f-gases). It examines progress in implementing actions relating to the NZ ETS from the first emissions reduction plan and informs the Commission's assessment of the adequacy of that emissions reduction plan.

It does not include recommendations on how to make the NZ ETS fit for achieving emissions budgets and the 2050 target, or for managing the scheme's distributional or other impacts through the transition. This report is focused on monitoring progress and tracking emissions, and the Commission provided advice on how the NZ ETS could be improved in its December 2023 report advising on the direction of policy for the second emissions reduction plan.[75]

Key points for the New Zealand Emissions Trading Scheme

The NZ ETS cannot be relied on to assure that the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035) will be met. There is significant uncertainty about how many New Zealand Units (NZUs, which are the unit of trade in the NZ ETS) will be available for use by emitters over the coming emissions budget periods, due to existing surplus NZUs in the market and to NZ ETS design features. This means that the scheme does not provide certainty over the quantity of emissions from the sectors and sources it covers.

There are many barriers that limit the effectiveness of emissions pricing policies such as the NZ ETS. These include, for example, barriers to accessing capital, and systems, infrastructure, and incentives that make it difficult for people to choose low emissions options. Addressing such barriers will improve the prospects of meeting the emissions budgets and support a more cost-effective and durable transition to a low emissions economy.

There are important gaps in the first emissions reduction plan that affect the NZ ETS, and progress against the NZ ETS-related actions identified in the plan has been limited:

- The plan did not directly address the extent to which the Government is seeking to reduce gross emissions and use forests to remove carbon dioxide to meet emissions budgets and the 2050 target. It included an action to adjust the NZ ETS to drive a balance of gross emissions reductions and net removals, but did not provide any indication of what this balance should be. This issue of the balance of net removals and gross reductions sits above the NZ ETS, which is a tool to support achievement of the outcomes the Government seeks rather than a strategy in itself. While this issue remains unresolved, it may be challenging to instil confidence in and maximise the potential of the NZ ETS for driving investment in both gross emissions reductions and forests.
- An NZ ETS review was launched in mid-2023 but has since been halted. The Government has said it intends to restrict the type of land that can enter the NZ ETS for forestry. This could affect the balance of gross and net emissions driven by the NZ ETS, although this is not the stated purpose of the intended new policy. Not enough information is yet available to understand the impacts of this intended policy.
- There has been limited progress on other NZ ETS actions in the first emissions reduction plan. Progress that has occurred includes:
  - updating NZ ETS unit limits and price control settings in mid-2023 to better reflect what is needed for meeting targets (however, further updates are now necessary, as assessed by the Commission in its latest advice on these settings, with the Government's decisions on the annual settings regulation update due in September this year)[76]
  - updating of industrial allocation baselines, which is on track for implementation later in 2024
  - Cabinet decisions to progress NZ ETS market governance work.

Recent NZ ETS market developments

The emissions price has experienced volatility

The material below summarises recent developments in the NZ ETS market. We have used information on trends in and health of the market to inform the assessment of progress and adequacy of the emissions reduction plan in respect of the NZ ETS.

Figure 6.1 shows the evolution of the secondary market spot price for NZUs – the unit of trade in the NZ ETS – since the beginning of 2022, noting the timing of key policy and/or market events.

Figure 6.1 shows that in early 2022, a strong peak and then decline in NZU spot prices coincided with similar price movements in other carbon markets and global energy market disruptions associated with Russia's invasion of Ukraine. Subsequently, the emissions price moved between around NZ$70 to NZ$88, before trending down from December 2022. The NZU price showed volatility in the following period, around the same time as key policy announcements and government auctions.

All four Government sales of NZUs by auction in 2023 declined. Bids at the auctions did not meet minimum requirements, so no units were sold.[xxxiv] These auction outcomes reflect the system operating as designed but are a sign of low market confidence and that there is a large amount of units in the market already.[xxxv,79] The results also continue earlier trends of declining demand for units. Throughout 2022, the volume of bids compared to the units for sale at each auction (the cover ratio) steadily reduced, until in 2023 the demand at prevailing market prices was insufficient for the auctions to clear.

The first auction of 2024 in mid-March partially cleared, with 84% of the available units sold at NZ$64, the 2024 auction reserve price (ARP) level.[80] The ARP is the price floor which operates at auctions, below which bids are not accepted, and units cannot be sold. Since then, the spot price hovered between NZ$50 and NZ$60, until 15 May 2024 when the Ministry for the Environment released the consultation document on the NZ ETS settings for 2025 to 2029.[81] This document signalled that the Government was considering an option to lower the price corridor for the price control settings, prompting a further price decline, with NZUs trading as low as NZ$43 in the days afterwards. The NZU auction on 19 June 2024 did not clear, as no bids were submitted.[xxxvi] If NZU secondary market spot prices remain at levels below the ARP, the remaining two auctions in 2024 may also decline.

Uncertainty is undermining confidence in the NZ ETS

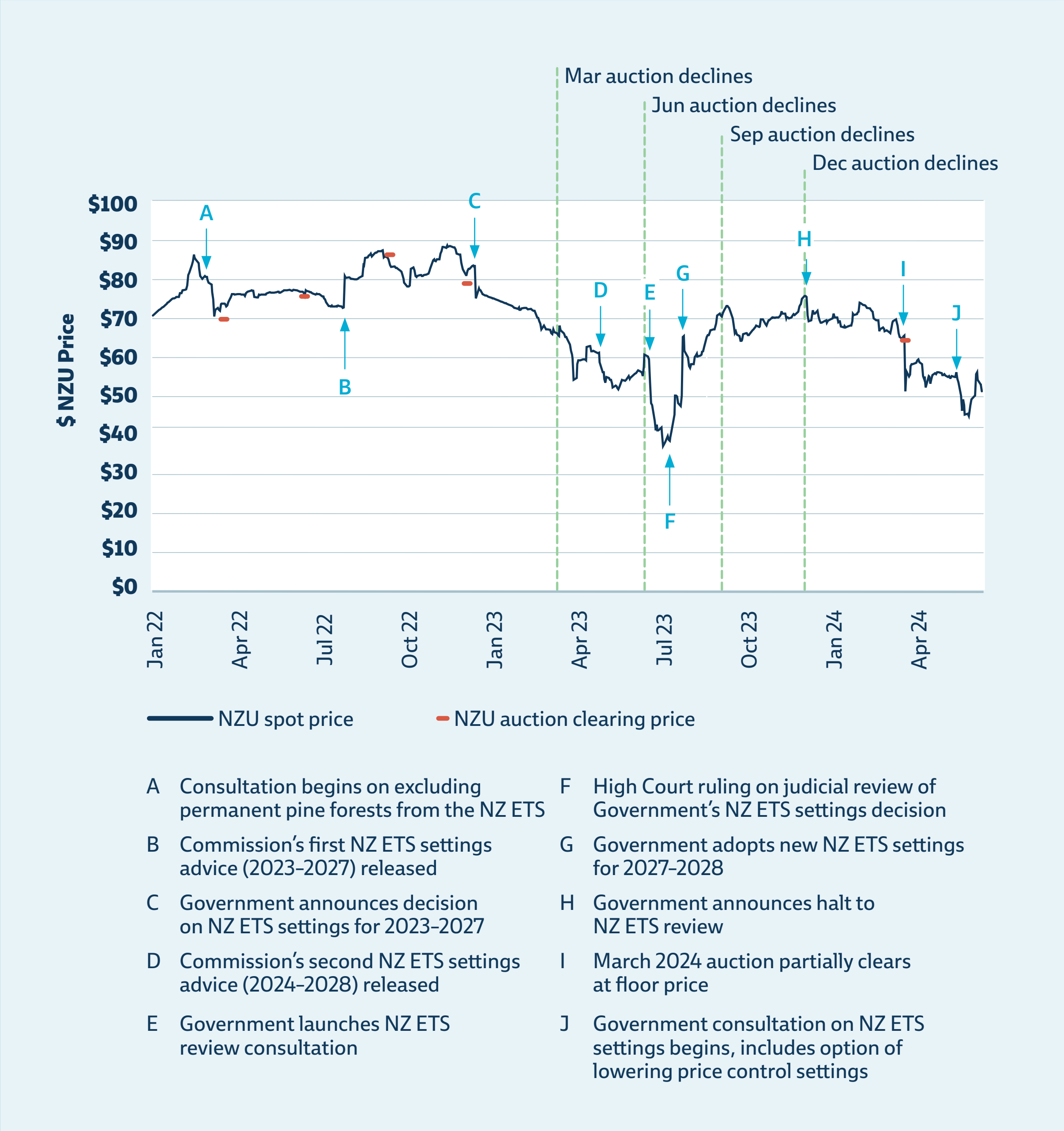
The Commission engaged with several NZ ETS market participants in late 2023 to gather insights for its 2024 advice on NZ ETS unit limits and price control settings.[82] A key theme of these discussions was that developments over 2023 (such as uncertainty about future policy associated with some of the events marked on Figure 6.1) had reduced confidence in some aspects of the NZ ETS. Some market participants highlighted that policy signals were a major driver of the NZU price, rather than supply and demand, and that the lack of clarity about future NZ ETS rules made it difficult to take a long-term view on the emissions price and therefore undermined investments in both decarbonisation and forests.

xxxiv. There were insufficient bid volumes above each auction's confidential reserve price. The confidential reserve price prevents the Government from selling units significantly below their price on the secondary market to avoid unduly disrupting the secondary market (see section 30GA(2A)(b)(ii) of the Act). The confidential reserve price is separate from the auction reserve price below which bids will not be accepted, which is part of the regulated and published NZ ETS price control settings.

xxxv. The Commission's most recent advice on NZ ETS unit limits and price control settings assessed that there were 68 million surplus units in the market, which, if not addressed, would present a high risk to the achievement of emissions budgets.

xxxvi. This most recent auction is not shown in Figure 6.1, as the chart was finalised prior to the auction occurring.

Figure 6.1: NZU spot prices from January 2022 to June 2024



Source: Spot price data sourced from Theecanmole (2024)[77] and auction clearing prices from the NZ ETS auctions website [78]

Regulatory uncertainty was also a theme of interviews undertaken of forest owners, forestry consultants and others involved in afforestation in late 2023 for the most recent *Afforestation and Deforestation Intentions Survey* (ADS).[83] Potential changes to NZ ETS rules were cited as a factor influencing some decisions, both to bring forward planting or to scale back plans for exotic afforestation. Of the 61 exotic forestry respondents who undertook afforestation in 2023, 29 referred to uncertainty about the NZ ETS as a barrier to afforestation.

Policy uncertainty has persisted into 2024, with changes signalled but detailed proposals not yet clear. The Government is signalling plans to limit the conversion of farmland to forestry by restricting land that can enter the NZ ETS for newly planted forestry.[84] The Government's annual NZ ETS settings consultation released in May 2024 included an option to lower the price corridor for the price control settings, but without a description or analysis of the option. Media reporting of the views of market participants, intermediaries, and analysts indicates that uncertainty continues to weigh on market sentiment.[85,86]

Implementation of the first emissions reduction plan

The emissions pricing chapter of the first emissions reduction plan set out five focus areas, each with at least one associated action, as summarised in Table 6.1 below.

Table 6.1: NZ ETS focus areas and actions from the first emissions reduction plan

Focus area	Actions
1 NZ ETS settings	• Align NZ ETS settings with emissions budgets (Action 5.1)
2 Adjust the NZ ETS to drive a balance of gross and net emissions reductions	• Adjust the NZ ETS to drive a balance of gross and net emissions reductions (Action 5.2.1) • Investigate new sources of emissions removals (Action 5.2.2) • Assess how the NZ ETS can support indigenous biodiversity (Action 5.2.3) • Assess the role of the NZ ETS in supporting the nationally determined contribution (NDC) (Action 5.2.4)
3 Market governance of the NZ ETS	• Develop an overarching market governance framework (Action 5.3)
4 The risk of emissions leakage	• Update industrial allocation policy (Action 5.4.1) • Investigate long-term options to address emissions leakage (Action 5.4.2)
5 The voluntary carbon market	• Develop a voluntary carbon market framework (Action 5.5)

The forestry chapter of the first emissions reduction plan also contained actions relevant to the NZ ETS. Progress on these is discussed in *Chapter 11.2: Forests.*

The first emissions reduction plan was set in 2022. The Government is in the process of setting the second emissions reduction plan and has signalled that it intends to follow a different approach to meeting future emissions budgets under that plan. Information on the Government's proposed approach to the NZ ETS as part of development of the second emissions reduction plan was not available to the Commission at the time of writing this report. As noted in *Chapter 2: Our approach,* we have assessed implemented or agreed Government policy as of April 2024, although indications of future policy, such as manifesto commitments or Government statements about its intended approach, have been noted in the progress assessment below where relevant.

Progress to date

Overall, there has been limited progress against the actions set out in the first emissions reduction plan. The actions most consequential for how the NZ ETS helps with meeting emissions budgets relate to:

- aligning the NZ ETS settings with emissions budgets, where steps have been taken but ongoing action will be required to maintain alignment and further necessary steps are currently under consideration
- adjusting the NZ ETS to drive a balance of gross and net emissions reductions, which has not advanced.

One area where progress is on track is updating industrial allocation policy to address overallocation.

Align NZ ETS settings with emissions budgets

The NZ ETS unit limit and price control settings (NZ ETS settings) are managed using a rolling five-year process, with an extra year of settings added to the regulations each year and some limited ability to adjust the existing settings. Before making final policy decisions on the annual regulations update, the Minister of Climate Change must consider the Commission's settings recommendations.

The design of the NZ ETS means that a range of factors can cause unit volumes in the scheme to vary as circumstances change in ways that are challenging to predict (see Box 6.1 for more explanation). This means that ongoing adjustments to NZ ETS unit limit settings to keep them aligned with emissions budgets will be necessary. Possible future events such as the notification of new (or revisions to existing) emissions budgets, changes to the 2050 target and the adoption of a second NDC could also cause NZ ETS settings to need to be revised.

Keeping NZ ETS settings aligned with emissions budgets, the 2050 target and NDCs will be an ongoing process, with updates needed annually into the future.

An important development for aligning NZ ETS settings with emissions budgets was the mid-2023 judicial review judgment that clarified the Government's obligations to adopt settings that are in accordance with emissions budgets, the 2050 target and the NDC.[87] This led to Government decisions on revised settings in July 2023 which better reflected what was needed, as assessed at that date, for the NZ ETS to support meeting these targets.

The Commission submitted our 2024 NZ ETS settings advice for the 2025 to 2029 period to the Minister of Climate Change at the end of February 2024.[88] In this advice, the Commission updated our assessment of the units in the scheme, based on new data since our last advice in 2023. This assessment found that there are now so many units in the scheme that the existing regulated unit limit settings are no longer in accordance with emissions budgets, the NDC and the 2050 target, so adjustments to existing settings are required.

The Government is currently considering this advice, having publicly consulted over May to June 2024, and must finalise updated settings regulations by the end of September 2024.

Adjust the NZ ETS to drive a balance of gross and net emissions reductions

Little progress has been made on this action, which is of high significance for how the NZ ETS supports the achievement of emissions budgets and the 2050 target.

A review of the NZ ETS was launched in mid-2023 to progress this action. This review put forward some options for amending the NZ ETS, but without clarifying the Government's intended approach or desired outcomes for gross emissions and removals in meeting emissions budgets and the 2050 target. Public consultation was held, but no conclusions or decisions were reached by the time the review was halted in December 2023.[89]

The Government is now emphasising meeting budgets through net emissions reductions, rather than seeking to achieve a level of gross emissions reductions. It has indicated that the market should determine the balance of gross reductions and net removals by forests.[90]

The Government has committed to not undertaking any major NZ ETS reforms.[91] It has also said it intends to restrict the type of land that can enter into the NZ ETS for newly planted exotic forestry, using limits based on land use capability (LUC) – a measure of land quality.[92] The stated purpose is to prevent whole farm conversions to exotic forests and protect productive agricultural land. This policy could affect the balance of gross and net emissions driven by the NZ ETS, but this is not its aim. Not enough information or analysis is available yet to understand the possible impacts of the signalled policy in this regard, or how it fits into an overall strategy for achieving emissions budgets and the 2050 target.

There has been little progress on the other actions in this area, which were also being pursued though the now-halted NZ ETS review.

There are currently no clear plans for assessing how the NZ ETS can support indigenous biodiversity or the role of the NZ ETS in supporting Aotearoa New Zealand to meet its NDC.

On investigating new sources of removals, the Government has indicated its support for non-forestry carbon sequestration (such as riparian planting and wetlands) earning NZUs, and that it will investigate enabling wood processors to earn NZUs for carbon embedded in wood products. Government made relevant decisions in July 2023 related to developing a carbon removals strategy.[93] The status of the strategy is unclear, as are next steps in relation to the NZ ETS due to the halting of the NZ ETS review.[94]

Develop an overarching market governance framework for the NZ ETS

The first emissions reduction plan noted that NZ ETS market governance responsibilities are currently fragmented across agencies, and the lack of an overarching framework gives rise to significant advice, trading, and market conduct risks.

Cabinet decisions made in 2023 on how to progress the NZ ETS market governance work programme are a step forward.[95] However, the process and timeline remain unclear for legislative change and implementing other steps towards a more robust market governance framework.

The risk of emissions leakage

Emissions leakage refers to costs from climate change policies causing production to shift offshore in a way that increases global emissions. This outcome would be contrary to the goals of a policy to reduce emissions. The risk of emissions leakage due to NZ ETS costs is currently managed by providing free units to firms undertaking activities that are considered at risk of emissions leakage.

The action to update industrial allocation policy to address overallocation is on track. Outdated regulations mean that the Government is providing more units to eligible industries than needed to reduce the risk of emissions leakage. A Bill passed with bipartisan support in August 2023, enabling the industrial allocation regulations to be updated.[xxxvii] Technical work to gather data and update the baselines contained in these regulations is under way. Approval and implementation of updated regulations appear likely by late 2024.

xxxvii. Climate Change Response (Late Payment Penalties and Industrial Allocation) Amendment Act 2023.

The action to investigate long-term options to address emissions leakage – which is important as providing output-based industrial allocation over the long term is inconsistent with deep decarbonisation[96] – has not produced any outputs yet.

Develop a voluntary carbon market framework

There has been no demonstrated progress on this action. This is not critical for meeting emissions budgets, but it is important for harnessing the desire for voluntary action among the private sector, local government and other entities, for the benefit of the climate.

Areas for attention

Clear and consistent policy signals

Policy signals have contributed to emissions price volatility over the past two years. While it is an inherent feature of emissions trading schemes that prices vary, high volatility makes it harder to reduce emissions as it makes investments riskier, potentially leading to underinvestment in lowering emissions and stranded assets. In a market that only exists because of regulation, clear and consistent signals about the long-term direction of travel are critical to underpin an investable emissions price.

A key area of policy uncertainty is a lack of clarity over the gross emissions reductions and net removals by forests that the Government is seeking for meeting emissions budgets. A focus on net emissions does not resolve the uncertainty. Gross emissions reductions are needed for meeting the second emissions budget (for 2026–2030), as it is too late for planting forests to help much over the relatively few years to 2030.

Uncertainty also appears to be limiting the ability of the NZ ETS emissions price to incentivise exotic afforestation, in combination with other issues such as changes to rules on foreign investment in forestry[97] and local government regulations. This could lead to planting rates between now and 2030 that are insufficient for meeting the third emissions budget (for 2031–2035). The 2023 ADS report found that there is significant uncertainty about intended exotic forest planting beyond 2024. To some extent this reflects foresters' focus on near-term activities in 2024 rather than future plans, and that forecasting future planting trends is challenging. However, the report also noted that many respondents were waiting to see what happens in terms of land-use restrictions, NZ ETS settings, emissions prices and local government rules and processes.[98]

Over the longer term, the NZ ETS does not cover all long-lived greenhouse gas emissions, which means that it cannot deliver all the reductions and removals needed to achieve the net zero element of the 2050 target.

Market governance framework is needed

Market governance failures have the potential to be catastrophic to the integrity and function of the NZ ETS. Prioritising and progressing the development and implementation of a framework in a timely manner will be important to mitigate these risks.

Long-term options to address emissions leakage

Investigating options for alternatives to industrial allocation is likely to take time but remains necessary. Current industrial allocation settings will limit the ability of the NZ ETS to contribute to the achievement of the net zero component of the 2050 target. It will be important for Aotearoa New Zealand to follow developments in other countries, and to stay engaged in international initiatives and cooperation on these issues, to inform its approach to transitioning away from industrial allocation while managing emissions leakage risk.

Expanding NZ ETS coverage of carbon removals

As noted above, the way forward is unclear on the action to investigate new sources of emissions removals, previously being pursued through the NZ ETS review and the development of a carbon removals strategy.

Expanding NZ ETS coverage to other ways of removing or storing carbon dioxide (for example, vegetation, blue carbon, wetlands, harvested wood products) remains of high interest to the Government[99] and stakeholders. An essential precursor to this is to bring these other types of removals into Aotearoa New Zealand's target accounting (if they are not already part of it) and into the setting of emissions budgets and the 2050 target in a way that has environmental integrity. Otherwise, expanding NZ ETS coverage to include them will undermine both the ability of the scheme to support meeting those targets and Aotearoa New Zealand's climate action overall. The NZ ETS may also not be the most appropriate policy tool to incentivise action in these areas.

Expanding NZ ETS coverage of removals could also bring forward the date by which the NZ ETS emissions cap reaches zero, which is currently projected to happen in the mid-2030s.[100] The Government will need to consider how to incentivise further emissions reductions and removals after that point, as the ability of the NZ ETS to assist will be compromised.

Outlook for NZ ETS impact on emissions

The Government has choices about its strategy for meeting emissions budgets and the 2050 target. Government plans and policies are currently in a state of change, but some choices have been signalled.

The Government has indicated it supports a 'net-based strategy'.[101] It has stated that it intends to retain the current architecture of the NZ ETS, and that it aims to bring more stability to the scheme.

It has emphasised the NZ ETS as the primary tool for driving emissions reductions, with limited use of other emissions reduction policies.

The Commission's advice has also strongly and consistently supported emissions pricing as an essential component of an effective approach to reducing emissions, and the NZ ETS as a key mechanism for incentivising change to low emissions solutions. However, it is important to consider the implications of choosing a strategy centred around the current NZ ETS, based on how the NZ ETS works in practice and the evidence about the efficacy of emissions pricing across different sectors.

In this section, as a part of our adequacy assessment we discuss how the current design of the NZ ETS is likely to affect emissions in the future to provide a cross-sector view that complements the sector-specific assessments in other chapters. It highlights the capabilities and limitations of the NZ ETS, and the consequences and risks of using it as the primary tool for reducing emissions.

Box 6.1 outlines some design features of the NZ ETS. The consequence of these features is that the Government cannot reasonably rely on the NZ ETS alone to guarantee achievement of emissions budgets – particularly in the near term, while the surplus of NZUs is so large. This highlights the importance of other policies to drive emissions reductions both inside and outside the NZ ETS.

Box 6.1: The NZ ETS does not provide quantity certainty

The typical definition[102] of emissions trading schemes includes that they are market instruments which provide certainty about the quantity of emissions – the Government sets a cap on emissions, then the market determines the price to deliver that emissions quantity. This contrasts with emissions taxes, where the Government sets the price, and the market determines the emissions quantity outcome.[103]

The reality, however, is that the NZ ETS is not a textbook ETS, and it does not provide the certainty over emissions outcomes that is often assumed. There is significant uncertainty over how many units will be available to emitters over the coming emissions budget periods, and therefore uncertainty over whether the scheme can effectively limit emissions in line with budgets.

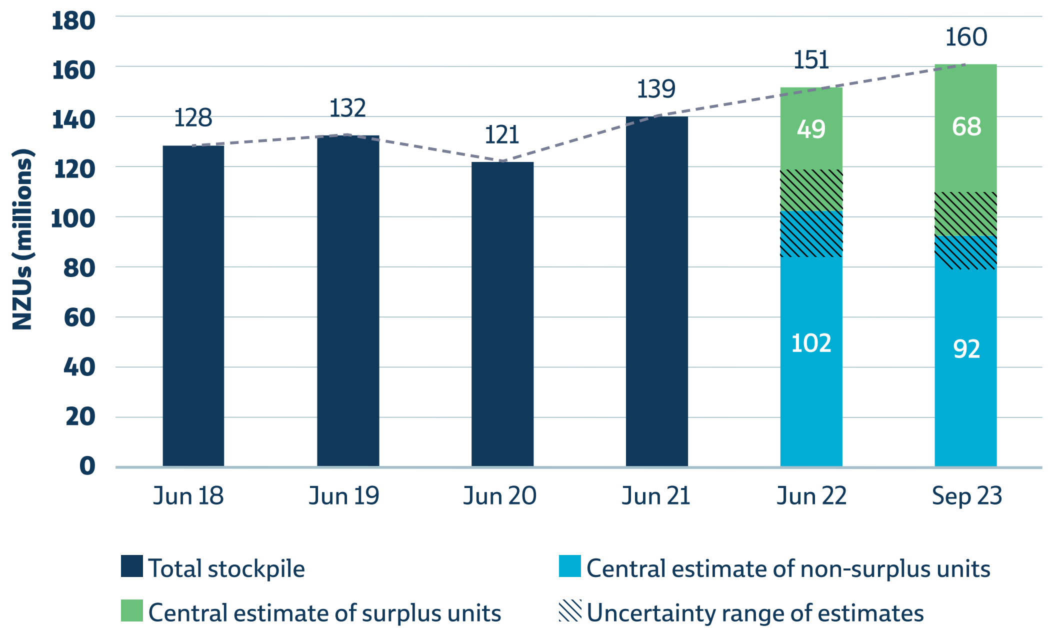
This is due to a set of interacting circumstances and NZ ETS design features.

- **Banking.** NZUs are not time limited, and NZ ETS participants can bank them indefinitely for use in future. Unlimited banking is a common feature of emissions trading schemes internationally. It gives participants flexibility to manage their emissions over time in a way that suits their individual circumstances, which helps reduce overall mitigation costs and price volatility. An ETS with unlimited banking cannot precisely control what emissions occur within a given time period. In the NZ ETS, this has combined with other design features and government choices about operating the scheme in a way that has amplified the emissions quantity uncertainty to a much greater extent than in other emissions trading schemes, as discussed below.
- **Surplus units.** These are units that present risks of enabling emissions exceeding emissions budgets. The Commission's latest estimate is that there are 68 million surplus units in the NZ ETS market.[xxxviii,104] If NZU auction volumes do not take into account the presence of surplus units already in the market, they will exceed the unit volume that aligns with Aotearoa New Zealand's emissions reduction targets. The Commission's latest NZ ETS settings recommendations are designed to draw the surplus down to zero by 2030. However, even if these are adopted by the Government, there will still be uncertainty over the emissions allowed from NZ ETS sectors in the period to 2030. This is because there is uncertainty in the surplus estimate – the recommended settings are based on the central surplus estimate of 68 million, but that sits within a range of 51 to 84 million units. This wide uncertainty band is due, in part, to uncertainties in the supply and demand for units from post-1989 forestry.

Figure 6.2 shows how the total number of units in the market (the stockpile) has changed over time, and the Commission's estimates of surplus units since 2022 when it first provided advice on NZ ETS settings.

xxxviii. The surplus units are a subset of the total privately held units in the NZ ETS register (the stockpile, which totalled around 160 million units as of late 2023). The surplus excludes units assessed as being needed for post-1989 forest harvest liabilities and for emitters' hedging requirements, as well as pre-1990 forest allocation units expected to be held long term. The surplus units have built up over time due to various factors, such as the participants' exploitation of price differences between NZUs and international units, use of the fixed price option that previously existed in the NZ ETS, the release of units into the market from the cost containment reserve, and pre-1990 forest allocation units.

Figure 6.2: NZUs held in private accounts (the stockpile) and surplus estimates over time



Source: Commission analysis of EPA unit holdings data.[105]

- **Uncertain unit supply and demand from forestry.** Forests are incorporated into the NZ ETS using rules that reflect the nature of forestry activities as well as choices made when the NZ ETS was established in 2008. However, as the context has changed – most notably with the shift from the Kyoto Protocol to the Paris Agreement – and the emissions price has increased, this design means there is significant uncertainty over the supply and demand for units from forests.
- Features that contribute to this ncertainty include the following.
  - *Multi-year mandatory emissions reporting periods with allocation of units in arrears.*[xxxix] As information reported by forestry participants is less regular, tracking and predicting the units earned or to be surrendered due to harvest or deforestation is more difficult compared to other sectors.

xxxix. Unlike other NZ ETS participants who follow a one-year compliance cycle, emissions reporting and corresponding unit allocations and surrenders by post-1989 forestry participants are usually only required at the end of a mandatory emissions reporting period, which generally cover five years.

- *Voluntary participation by post-1989 forests.* Owners of post-1989 forests can choose whether to register their land into the scheme and can also deregister if they no longer wish to participate. A newly registered forest can earn units back to the beginning of the reporting period in which it joined, and units must be paid back if the forest deregisters. An example of how this can make unit supply uncertain is that in 2022, a very large area of previously unregistered forest (over 220,000 hectares) registered into the NZ ETS, causing a significant amount of units to be allocated into the scheme.[xl] Conversely, it is possible that participants could deregister a significant amount of forest land from the NZ ETS, decreasing the amount of units in the scheme in an unpredictable way.
- *Variable low risk carbon levels for forests using stock change accounting.* Most forests registered in the NZ ETS are subject to stock change accounting, where a forest earns units as it grows, and units must be surrendered when it is harvested. If the forest is replanted, there is a portion of units earned that would not need to be surrendered to cover harvest liabilities and that may be considered low risk to sell ('low-risk carbon'). The amount of low-risk carbon units can vary significantly across participants, depending on the age classes of forests in their portfolio as well as how they manage these forests.[106] This contributes to uncertainty over how many units are needed by foresters for their harvest obligations, and how many will be available for use by other participants in the scheme.
- *Decisions to not harvest forests.* Some forests originally intended to be production forests and registered in the NZ ETS on stock change accounting may not be harvested. In this case, there would be no harvest liability, the forest can continue earning units, and units previously earned but held for future harvest surrenders could be sold to emitters to use. Participants' decisions to leave forests unharvested could therefore free up significant amounts of banked units for use by other emitters.

Box 6.2 outlines that some sectors have features that mean that it is harder for the NZ ETS to drive reductions in those sectors. This has implications for the role of the NZ ETS in meeting the second and third emissions budgets, which are discussed below.

xl. To illustrate the scale of this, in 2021 around 330,000 hectares of post-1989 forest land were registered in the NZ ETS. The registrations in 2022 therefore increased the amount of forest land in the NZ ETS by nearly 70%, resulting in several million units allocated to reflect sequestration over the 2018 to 2022 reporting period.

Box 6.2: The NZ ETS is unlikely to materially reduce emissions in some sectors

Emissions pricing, if designed well, can be a powerful tool for reducing emissions – but it has limitations. Some sectors have characteristics that impact how effective emissions pricing can be, and some features of the NZ ETS also reduce its ability to drive emission reductions. A more detailed explanation of these issues is outlined in the Commission's first advice in 2021, *Ināia tonu nei*.[107]

Emissions pricing works well in sectors where decisions about emitting activities are focused on optimising costs. This decision-making behaviour generally holds true for large businesses operating in industries where energy costs make up a large proportion of total costs. Pricing is also more effective where low emissions options are already commercially available, with a low/medium cost gap relative to standard technology. These conditions hold for the electricity sector, parts of industry, and for land-use change to exotic forestry.

On the other hand, emissions pricing tends to play a limited role where decisions are made by individuals, or by smaller firms for whom energy and emissions are not business critical. These decision-makers are less likely to optimise effectively for cost, due to behavioural factors, lack of information or capability.

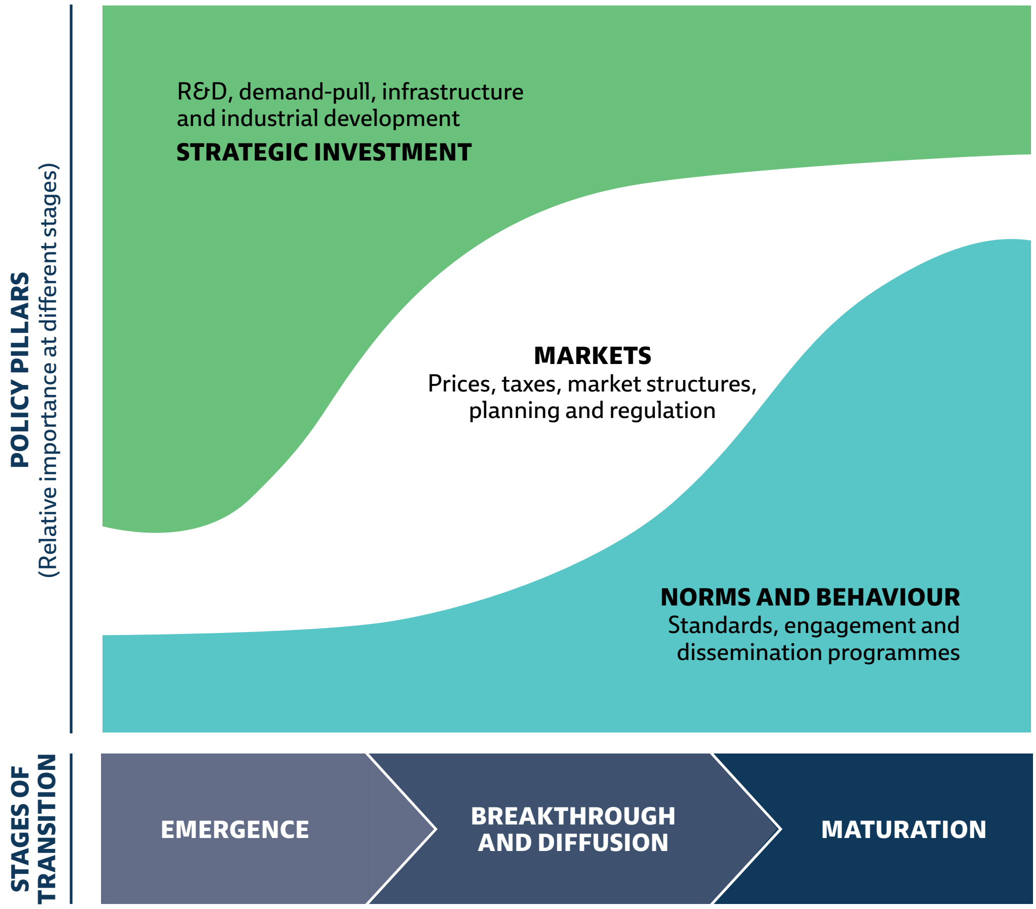
In some sectors, including transport, buildings, and urban form, there are also various barriers such as high up-front capital costs, lock-in to existing systems or infrastructure, and lack of readily available or affordable low emissions options.[xli] These make it difficult for pricing to influence choices about emitting activities. The NZ ETS by itself is also less likely to drive change in parts of industry where transformation at scale to entirely new technologies is needed.

Several key emitting activities are not exposed to the full emissions price because firms undertaking them receive industrial free allocation. In the NZ ETS, industrial allocation uses an output-based method. This effectively addresses emissions leakage risk and can maintain an incentive for the recipient to improve emissions efficiency. But it severely weakens the incentive for any options that would reduce emissions by reducing the production of the relevant good. For example, it means that the emissions price incentive is not transmitted to domestic users of concrete or steel to encourage them to switch to lower emissions alternatives, such as laminated timber in building construction. If industrial allocation continues, other policies will be needed to incentivise these emissions reduction opportunities.

These issues, among others, mean that multiple policies are needed to drive an effective transition towards net zero emissions of long-lived gases. Research and analysis of innovation, economic transitions and transformation recognises this need, as highlighted by the Intergovernmental Panel on Climate Change (IPCC) in its 2022 assessment report on the mitigation of climate change.[108] Figure 6.3 shows an analytic framework included in that report which draws on empirical evidence to provide insight on how the relative emphasis on different pillars of policy may need to vary across the process of social and technological transitions to launch, accelerate and scale change. This changing policy mix over time can be recognised in the Government's current approach to reducing agricultural emissions.

xli. For a more thorough discussion of the range of market failures and barriers that can hinder the response to an emissions price, see pp 215–218 of *Ināia tonu nei*.

Figure 6.3: Indicative evolution of policy mix over the course of transition



Source: Economics of Energy Innovation and System Transition[109]

The NZ ETS will work better when it is part of a cohesive package of policies that addresses the full range of market failures and barriers and helps generate more low emissions options. This approach will enable people and businesses to better respond to the emissions price, improve the prospects of meeting the emissions budgets, and help support a more cost-effective and durable transition to a low emissions economy.

Implications of the current NZ ETS for the second and third emissions budgets

Due to the flexibility and uncertainty in NZ ETS unit supply discussed above, actual emissions from NZ ETS covered sectors can exceed the emissions cap in any given year and across an emissions budget period.

This risk is particularly strong for the second emissions budget (for 2026–2030), because of the large and uncertain surplus of units currently in the market, and the timeframe for afforestation to deliver removals. Forests planted from 2025 on can make very little contribution towards the second emissions budget. This means that practically, gross emissions reductions are needed to meet the second emissions budget.

For the reasons outlined in Box 6.2, with limited complementary emissions reduction policies alongside the NZ ETS, delivering the level of gross emissions reductions needed to meet the second emissions budget primarily through the NZ ETS would require much higher prices. Modelling undertaken by the Commission in 2022 found that with weaker complementary policies, emissions prices may need to rise potentially to upwards of NZ$300 by 2030.[110] This is particularly the case to reduce emissions in the transport sector, highlighted elsewhere in this report as a key area of risk for meeting the second emissions budget. In reality, price rises could be limited to well below that level by responses which increase unit supply but do not fill the gap in reductions – such as foresters deciding not to harvest and selling their banked units for emitters' use. Expectations of increased unit supply from forestry at lower prices in the longer term would also likely limit how much prices rise in the nearer term.

Looking out to the third emissions budget (for 2031–2035), economic fundamentals suggest the NZ ETS emissions price incentive would have the most impact on emissions and removals by exotic forests. Converting land to exotic forests is economic at low emissions prices, there is a large amount of land in Aotearoa New Zealand that is suitable for conversion to forest, and it is unclear that the Government's plans to restrict whole-farm conversions to forest would create a meaningful constraint on the total area of NZ ETS-driven land-use change to exotic forest. If this forest planting happened over the years between now and 2030, it would have a large impact on how the third emissions budget is met, with risk that forestry activities displace emissions reductions in other sectors (as discussed in the Commission's advice on the second emissions reduction plan).[111] However, if the current lack of confidence in the NZ ETS continues, it is also possible that planting rates over the next several years will be insufficient for meeting the third emissions budget.

Over the longer term, as highlighted by the Commission in its second emissions reduction plan advice, under current policy the NZ ETS emissions cap will reach zero in 2037.[112] This will limit its ability to further contribute to meeting the 2050 target after that date.

We therefore assess that a policy approach centred on the NZ ETS with few complementary emissions reduction policies increases the risks of not meeting the second emissions budget (for 2026–2030). Over the longer term, it is likely to reduce emissions mainly through planting more exotic forests and/or through decisions not to harvest existing forests. Forests are likely to remain the marginal source of abatement that determines the emissions price in the scheme, keeping it at relatively low levels that will drive only limited reductions in gross emissions.

The consequences of this strategy would be a less durable, more costly, and more risky transition with fewer of the benefits from reducing gross emissions. It would also shift to future generations the burden of decarbonisation and continued need to compensate for ongoing gross emissions, with impacts for rural communities and landscapes.

WĀHANGA 7 | CHAPTER 7

Whakahekenga haurehu

This chapter addresses actions centred on iwi/Māori in the first emissions reduction plan, and further opportunities. It also sets out our evolving approach to monitoring informed by engagement with iwi/Māori.

In this chapter, we assess progress in establishing a platform for Māori climate action under the first emissions reduction plan and discuss where government action could support iwi/Māori to accelerate emissions reduction, including by removing current barriers. Our assessment is informed by requirements in section 5ZG(3)(c) of the Climate Change Response Act 2002 (the Act).[xlii] As part of our assessment, we identify some opportunities for harnessing the potential of kaupapa Māori research and mātauranga Māori to support Aotearoa New Zealand in achieving its emissions reductions goals.

The Act also requires He Pou a Rangi Climate Change Commission (the Commission) to consider te ao Māori in our emissions monitoring work,[xliii] and we set out our approach to this below. We discuss how our approach will evolve over time, as informed by whakaaro from a diverse range of iwi/Māori representatives.

xlii. Section 5ZG(3)(c) of the Act requires emissions reduction plans to include "a strategy to mitigate the impacts that reducing emissions and increasing removals will have on employees and employers, regions, iwi and Māori, and wider communities, including the funding for any mitigation action".

xliii. Section 5M(f) of the Act requires the Commission, in performing its functions and duties and exercising its powers under the Act, to consider "the Crown-Māori relationship, te ao Māori..., and specific effects on iwi and Māori...".

Introduction

Iwi/Māori have a key role

Climate change and Aotearoa New Zealand's approach to reducing emissions hold specific, significant implications for iwi/Māori.

The first emissions reduction plan acknowledged the role of Māori as kaitiaki of their whenua, as leaders in their communities, and as decision-makers, landowners and business owners. The plan noted that, through each of these roles, Māori will help lead the transition to a low emissions economy.

Iwi/Māori face unique – in some cases, disproportionate – impacts of climate change. For example, for Māori, sea level rise poses a threat to taonga such as marae, urupā, wāhi tapu, and archaeological sites, as these are frequently located near coasts and rivers at risk of flooding.[113] Māori also experience disparities in the health system, compared to the general population. Climate change exacerbates these issues by increasing the prevalence of diseases, respiratory problems, and mental health issues related to climate stress.[114]

Government action to reduce emissions can help mitigate these kinds of impacts, as outlined in our 2023 advice to the Government on the second emissions reduction plan.[115] For example, a recent study found that reducing transport emissions may help reduce health inequities between Māori and non-Māori if policies are implemented equitably, particularly where increased walking and cycling is involved. That study, as referenced in our 2021 assessment of health benefits of actions on transport – for our technology and behaviour change scenarios in *Ināia tonu nei* – found that health gains for Māori were 20 to 30% larger than for non-Māori.[116]

Iwi/Māori are also addressing climate change through low emissions investments. With an asset base estimated to be worth NZ$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.[117]

Progress in implementing the emissions reduction plan

This section reports progress in implementing actions centred on iwi/Māori under the first emissions reduction plan, based on information provided by the Climate Change Chief Executives Board, which is the interdepartmental executive board (IEB) that coordinates implementation of the emissions reduction plan.[118] We then provide our assessment of potential risks to delivery, focusing on these two foundational elements of an effective Crown–Māori relationship.

- **Engagement and partnership.** Across different iwi, hapū, hapori, and sectors, there are many distinct and diverse kōrero and whakaaro on climate change and emissions reduction. Through partnership between the Crown and iwi/Māori, the diversity of iwi/Māori needs and perspectives can inform and accelerate Aotearoa New Zealand's emissions reduction. In our assessment, we have considered how the Government's actions reflect that partnership.
- **Adequate resourcing.** Ensuring iwi/Māori are resourced to accelerate emissions reduction in accordance with tikanga and mātauranga Māori will help Aotearoa New Zealand achieve its emissions budgets and 2050 target. In our assessment, we have considered how the Government's actions support resourcing iwi/Māori to continue their work to reduce emissions and bring about shared benefits for all of Aotearoa New Zealand.

Some progress has been made

The first emissions reduction plan set out four actions to empower Māori in the transition to a low emissions future. The progress of these actions as provided by the Climate Change Chief Executives Board (as of 30 March 2024) is summarised in Table 7.1.

Table 7.1: Tracked actions for first emissions reduction plan, Empowering Māori *chapter*[119]

Actions for delivery	Proposal outputs	Timeline	Status as recorded
2.1 Establish a platform for Māori climate action	Initial interim Ministerial advisory committee. Consolidate an enduring platform for Māori representation and recognition of Māori rights and interests in the climate response.	2022–2024	Delivery confidence is high
2.2 Embed partnership and representation	Mechanisms to ensure diverse Māori input into climate policy and climate action.	2022–2025	Delivery confidence is high
2.3 Support development of a Māori climate strategy	A Māori climate strategy and action plan that prioritises mātauranga Māori, adaptation, and mitigation aspirations, addressing barriers for the Māori economy, and local iwi and hapū objectives. Investigate options for creating a climate planning and education toolbox.	2022–2024	Delivery confidence is high
2.4 Activate kaupapa Māori, tangata Māori solutions	Dedicated funding aimed at increasing the impact of Māori climate action and knowledge, raising community capacity and capability, and developing Māori data.	2022–2025	Delivery confidence is high

We note that Budget 2024[120] included the downscaling of the following programmes.

- **Hapori Māori programme to improve evidence available to Māori communities about climate change, adaptation and resilience.** The programme will be delivered at a smaller scale. The component of this programme that invests in improving internal data systems at Te Puni Kōkiri will be delivered within existing baseline funding.
- **Programme to develop approaches based on mātauranga Māori for accelerating development of agriculture greenhouse gas emissions mitigation**. This programme will be consolidating investment funds within the Accelerating Development of Agricultural Greenhouse Gas Mitigations Programme.

Engagement and resourcing are uncertain

Our assessment reveals risks to the successful delivery of the initiatives outlined in the 'Empowering Māori' chapter of the first emissions reduction plan. One of the concerns is the uncertainty surrounding the extent and quality of engagement with iwi and hapū. Without robust, meaningful, and ongoing engagement, there is a risk the initiatives may not fully reflect the needs, aspirations, and priorities of Māori communities. This may lead to less effective and less supported outcomes for Aotearoa New Zealand.

The successful implementation of actions relies on sufficient funding and resource allocation. Initiatives such as establishing a platform for Māori climate action, embedding partnership and representation, and supporting the development of a Māori climate strategy need resourcing to achieve their intended goals.

The Climate Emergency Response Fund (CERF) – established in 2021 and intended to support initiatives to drive emissions reductions and manage the impacts of climate-related policies – was disestablished in December 2023. No alternate funding for the actions relating to iwi/Māori has been identified. This could potentially stall progress in implementation of actions and undermine trust and partnership between the Crown and iwi/Māori.

Transparent communication and adequate resourcing can help address these risks. This includes clear documentation of engagement processes and outcomes, as well as funding and support to enable effective implementation. By addressing these issues, the Government's actions can more effectively enable iwi/Māori to empower Māori communities and contribute to a robust and inclusive national climate response.

Box 7.1: Data gaps

Our assessment of emissions reduction efforts and opportunities that centre on iwi/Māori shows a lack of regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood. Improved data can also strengthen public and private decision-making and policy development.

We have identified that it is difficult to access information on funding and resource allocation due to the nature of funding for climate programmes in Aotearoa New Zealand. Numerous initiatives exist, at various stages of progress, and the level of funding is currently unclear.

Better information and specific data tracking are needed, to monitor resourcing allocated to iwi/Māori climate change initiatives and programmes and assess the proportions of funding for these, compared to wider Aotearoa New Zealand efforts.

Areas for attention

The diversity of the Māori economy

The allocation of assets within the Māori economy highlights the diversity of the sectors contributing to its overall structure. From agriculture and forestry, to fisheries and manufacturing, Māori economic activity reflects a multifaceted approach to wealth generation and resource management. This diversity underscores the resilience and adaptability of the Māori economy in navigating the dynamics of different economic sectors and contributing to growth and development.

Emissions intensity within the Māori economy is greater than Aotearoa New Zealand as a whole. The Māori economy has an emissions intensity of 0.47 $MtCO_2e$ per billion dollars of GDP, compared to the country's 0.27 $MtCO_2e$ per billion dollars of GDP.[121] This over-representation is mainly because of the large proportion of agricultural activities included in the Māori economy. Just over 72% of the Māori economy emissions profile comes from agricultural activities, with 51.4% of this coming from sheep and beef farming and 21% from dairy.[122] By contrast, agricultural emissions represent 49% of Aotearoa New Zealand's emissions profile as a whole.

The next-largest source of emissions from the Māori economy is manufacturing. These businesses have a high representation in Tāmaki Makaurau (Auckland) and the Waikato region. These emissions are mostly from activities such as dairy processing, and textile and clothing manufacturing.

Whenua Māori faces unique complexities

The Māori economy has a strong orientation towards land-based activities, with a significant portion of its asset base allocated to sectors such as agriculture, forestry and fishing. This means Māori economic activity is intertwined with land management and resource use. This investment in land-based activities underscores the importance of agriculture to iwi/Māori.

Land collectively owned by Māori in Aotearoa totals approximately 1.4 million hectares and plays a significant role in the primary sector. However, this land faces distinct challenges due to physical, ownership, and governance limitations. These constraints are rooted in historical change that influenced land management and ownership structures. The number of owners per land block varies, ranging from a single owner to over 14,000 owners,[123] which introduces complexity in decision-making processes, compliance, and development opportunities.

Policy-based disruptions over time have had lasting effects on iwi/Māori, resulting in the retention of steeper, less versatile land. This has limited the capability of the land retained by iwi/Māori, further complicating land use and development possibilities. Moreover, about 86% of land collectively owned by Māori falls within the less productive land use capability (LUC) classes, hindering diversification and efficiency enhancements.[124] Parcels of land are often small and fragmented, with an average size of 49.8 hectares and a median size of 2.2 hectares.[125]

In terms of land use, around 44% of land collectively owned by Māori is covered by natural forest, while approximately 28% is used for agriculture – primarily sheep and beef farming, with some involvement in dairy.

Together, these characteristics underscore the challenges and constraints faced by Māori collective owners of land, impacting the potential for diversified land use and increased productivity.[126]

Many Māori businesses face emissions reduction challenges

Most Māori businesses are small or medium sized, in terms of employee numbers. Challenges faced by small or medium enterprises (SMEs) differ from those encountered by collectives, particularly in agriculture. SMEs are often capital-intensive ventures, and accessing capital presents a significant obstacle for Māori businesses, irrespective of climate policy implications.

For the Māori economy, the focus is on the transport, construction, and manufacturing sectors, which are predominantly where Māori employers and self-employed individuals own assets. The transition toward a low emissions economy is expected to necessitate substantial capital expenditure for these Māori SMEs, which already face challenges in accessing capital.

Further opportunities to reduce emissions

Mātauranga Māori

Mātauranga Māori is foundational to Māori identity and wellbeing, encompassing a diverse array of localised knowledge, historical perspectives, and indicators essential for understanding environmental changes and devising targeted strategies to mitigate the effects of climate change. These traditional approaches offer insights that benefit not only iwi/Māori, but all people throughout Aotearoa New Zealand.

Opportunities to develop enduring and locally relevant solutions to climate change exist, through recognising the potential of frameworks based on mātauranga Māori, prioritising data collection aligned with Māori data sovereignty, and embracing kaupapa Māori research methodologies.

Harnessing the wealth of knowledge embedded in mātauranga Māori in partnership with iwi/Māori offers a pathway to innovative and effective climate solutions.

Kaitiakitanga

In many ways, Māori businesses are leading the way when it comes to upholding their obligations of kaitiakitanga. This includes integrated investment – frequently incorporating social, cultural, and environmental goals (often through an intergenerational lens) into their business analysis.[127,128] In addition, Māori businesses tend to centre outcomes that are increasingly attractive to investors, such as sustainability, accessing and building people skills, community development, ethical production, and social impact.[129]

This kaitiakitanga approach aligns closely with iwi/Māori values and worldview. By integrating these approaches, emissions reduction initiatives may better capture the full spectrum of impacts and outcomes, ensuring that responses to climate change are equitable, culturally sensitive, and sustainable in the long term.

Further, this approach emphasises the interconnectedness of various aspects of wellbeing, highlighting the importance of balancing economic prosperity with social cohesion, cultural preservation, and environmental stewardship. This perspective encourages a comprehensive evaluation of climate change policies and practices, fostering a deeper understanding of how emissions reduction efforts affect different communities and ecosystems.

Iwi- and hapū-led initiatives

An opportunity lies in empowering iwi and hapū to lead initiatives focused on emissions reductions monitoring, considering localised perspectives and insights. This approach ensures that solutions are responsive to the specific needs of different regions. Beyond that, incorporating mātauranga Māori into climate action leverages that knowledge, enabling iwi and hapū to offer unique perspectives and solutions grounded in their cultural heritage and deep connection to the land. This localised, community-driven approach holds the potential to enhance the effectiveness and relevance of emissions reductions monitoring efforts across Aotearoa New Zealand.

Many current iwi- and hapū-led projects address emissions reductions through a te ao Māori lens. One such project, Ngā Tai-o-Rongo, focuses on revitalising te taiao and allowing for the transfer of tūpuna knowledge for better on-farm decision-making and environmental monitoring.[130] Progress is being made at the hapū level, though this is not always aligned with the quantitative indicators often used in mainstream approaches. Overlooking this progress undermines the extensive work being developed and its applications to emissions monitoring through a holistic te ao Māori perspective.

Our approach

In our work as an independent, evidence-based advisor to the Government, the Commission considers the Crown–Māori relationship, te ao Māori, and specific effects on iwi/Māori. This involves being informed by evidence and insights we gather through engagement with iwi/Māori, recognising Māori rights and interests, and enabling active partnership and participation in our work.

While the Commission is not itself a Treaty partner, Te Tiriti o Waitangi/The Treaty of Waitangi is foundational to our work. Advising on and monitoring progress towards Aotearoa New Zealand's climate goals requires us to understand the Government's commitments and obligations under Te Tiriti/The Treaty, including the principles of partnership, participation, active protection, and equity.

This progress assessment builds on our previous advice and engagement. As described above, we have focused on engagement and partnership and on adequate resourcing – the two key elements of an effective Crown–Māori relationship.

The Crown–Māori relationship is important

An effective Crown–Māori relationship, underpinned by Te Tiriti/The Treaty, is foundational to Aotearoa New Zealand transitioning to a low emissions future in a way that benefits all New Zealanders. This involves developing and implementing emissions reduction strategies, policies, and actions that address the diverse needs and aspirations of iwi/Māori. An effective relationship will complement the action to reduce emissions happening at the iwi, hapū, and hapori levels.

In our 2023 advice to the Government on the direction of policy for the second emissions reduction plan,[131] we discussed what is needed to achieve a fair and enduring transition to a low emissions economy. We highlighted the importance of the Government considering the role of iwi/Māori in the country's approach to reducing emissions, as well as considering the specific, localised needs of iwi/Māori. This includes ensuring iwi/Māori are resourced and enabled to accelerate emissions reduction in accordance with tikanga Māori and mātauranga Māori, and while realising the aspirations of their people and communities.

Our approach will evolve over time

This first assessment of progress assessed through a te ao Māori lens has limitations, as outlined in Box 7.2 below.

Box 7.2: Limitations of this assessment

As defined by the Act, the role of the Commission is to monitor progress in emissions reduction – including the adequacy of the current emissions reduction plan, and its implementation. This monitoring report focuses on the progress of government action and policy, and for this year's report, the analysis is based on data collated by the Climate Change Chief Executives Board[132] (see *Chapter 2: Our approach*).

Since it was established in 2019, the Commission has been working towards building enduring, meaningful and respectful relationships with iwi/Māori. The considerations of te ao Māori presented in this chapter have mostly been informed by the Commission's previous engagement with iwi/Māori, such as Māui.Tech.[133] We acknowledge that, as a result, our assessment is unlikely to reflect the scale and range of emissions reduction progress being made:

- within iwi, hapū, and hapori Māori
- by Māori trusts, incorporations, and businesses
- as a result of mātauranga Māori and/or te ao Māori frameworks.

We recognise te ao Māori is diverse. To be effective and accurate, our monitoring work will need to be informed by ongoing engagement to include the different experiences, perspectives and aspirations of Māori from different iwi, hapori and sectors.

Through initial engagement, we heard that this first emissions reduction monitoring report is a foundational piece of work that should evolve over time. Our approach will continue to develop through ongoing engagement, as our understanding of iwi/Māori priorities and desired outcomes related to climate change grows, and new data become available. This dynamic approach will help us avoid the unintended consequences of focusing solely on quantitative metrics, which could lead to inaccurate assessments and limit our ability to deliver on our monitoring responsibilities.

Embracing Māori-led initiatives and incorporating te ao Māori perspectives into emissions monitoring offers many benefits, particularly in fostering a holistic and culturally responsive understanding of environmental impacts. Māori, as kaitiaki of the land, possess a deep, intergenerational knowledge of ecosystems, land use, and sustainable practices. This mātauranga is invaluable for developing tailored, region-specific monitoring systems that reflect the ecological and cultural landscapes of Aotearoa New Zealand. By integrating this expertise, emissions monitoring can become more precise and effective – capturing nuances that conventional methods might overlook.

Several frameworks anchored in mātauranga and reflective of Māori values have been developed after engagement with hapū and iwi, to guide approaches on important issues. For example, the Rauora framework[134] was included in the Government's first national adaptation plan, to outline a set of cohesive cultural values and principles from which to approach climate action. The Treasury's He Ara Waiora framework focuses on human wellbeing, and on the relationship of wellbeing to Māori perspectives.[135] While the principles of He Ara Waiora are derived from mātauranga Māori, its application can be viewed as relevant to the wellbeing of all New Zealanders.

Box 7.3 outlines some possible principles to guide our future monitoring work with iwi/Māori, and we will continue to explore, through engagement, how these can be further integrated into our work.

We have also heard about the importance of the Commission using place-based indicators developed by iwi/Māori that reflect what progress looks like through a holistic te ao Māori lens. Many impacts and outcomes that affect iwi/Māori are the result of interweaving environmental policies, economic policies, and cultural considerations. To monitor progress effectively, the Commission will need to be informed of these dynamics and how they are affecting businesses, communities, iwi, hapū and whānau.

Some iwi/Māori representatives have called for our monitoring work to reflect the structure of the Māori economy, including having specific indicators for different sectors. Developing these indicators will require dedicated effort and continuing engagement with iwi/Māori, including experts and representatives from a range of iwi, hapori and sectors. The sector chapters in this report highlight sector-specific opportunities where government action could support iwi/Māori to accelerate emissions reduction.

Box 7.3: Initial work on principles to guide future work

The Commission received external advice on potential guiding principles to use, as outlined below, and we are looking at how we can apply these principles to our future work.

- **Te ao Māori:** a philosophy and knowledge system that forms the basis for all advice we provide.
- **Taiao ora:** the collective belief that tangata and taiao are inextricable and connected – if te taiao thrives, the people thrive.
- **Mātauranga ake:** recognition of iwi, hapū and whānau knowledge systems and practices that have always protected te taiao.
- **Ki tua**: a firm focus on the future to ensure te taiao remains thriving for generations to come.

Te reo Māori glossary

Kupu/rerenga kupu Māori
English contextual translation

whakahekenga haurehu
emissions reduction

kaitiaki
guard, custodian, guardian, caregiver, keeper, steward

kaitiakitanga
guardianship, stewardship, trusteeship

whenua
land

taonga
treasure, anything prized: applied to anything considered to be of value including socially or culturally valuable objects, resources, phenomena, ideas, and techniques – children and future generations may also be regarded as taonga

marae
the open area in front of the wharenui, where formal greetings and discussions take place; often used to include the complex of buildings around the marae

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

iwi
extended kinship group of whānau and hapū who share a common ancestry and are associated with a distinct territory

hapū
kinship group comprised of whānau who share a common ancestry

hapori (Māori)
Māori communities

kōrero
to speak, talk, converse

tikanga (Māori)
custom and protocol

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

kaupapa Māori [research methodologies]
kaupapa Māori research (and evaluation) done by Māori, with Māori and for Māori – it is informed by tikanga Māori, or Māori ways of doing things

te ao Māori
the Māori world – a philosophy and knowledge system

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

Guiding principles

Te ao Māori
(as written into the report) a philosophy and knowledge system that would form the basis for all advice we provide

Taiao ora
the phrase 'taiao ora' is referring to the collective belief that tangata and taiao are inextricable and connected – if te taiao thrives, the people thrive

Mātauranga ake
the phrase 'mātauranga ake' is recognising iwi, hapū and whānau knowledge systems and practices that have always protected te taiao

Ki tua
used here as a principle to support 'a firm focus on the future to ensure te taiao remains thriving for generations to come'

WĀHANGA 8 | CHAPTER 8

He whakawhitinga e tautoko ana i a ngāi Aotearoa | A transition that supports New Zealanders

This chapter looks at progress on actions to mitigate the impacts that reducing emissions and increasing removals will have on New Zealanders.

Introduction

In the face of the climate change challenge, the world is intensifying efforts to reduce greenhouse gas emissions in ways that will sustain and keep their communities safe. Aotearoa New Zealand has committed to this global response and is building its own transition to a thriving, climate-resilient and low emissions economy.

This transition can support people, businesses and communities in Aotearoa New Zealand to respond to the emerging opportunities of the global transition to a low emissions economy, while building the resilience the country needs to adapt to the climate impacts already felt across the motu.

Under section 5ZG of the Climate Change Response Act 2002 (the Act), the Government's emissions reduction plan must include "a strategy to mitigate the impacts that reducing emissions and increasing removals will have on employees and employers, regions, iwi/Māori, and wider communities, including the funding for any mitigation action".

The first emissions reduction plan responded to these requirements by setting out five key objectives[xliv] of the Government's strategy to mitigate the impacts for these groups, along with a range of actions to support them. This included an action to develop an equitable transitions strategy, to address challenges and leverage opportunities of transition, targeted towards those groups most in need of support.

xliv. Seize the opportunities of transition; support proactive transition planning; enable an affordable and inclusive transition; build the evidence base and tools; and encourage informed public participation.

In this chapter, He Pou a Rangi Climate Change Commission (the Commission) sets out our assessment of progress in developing a strategy and related actions to mitigate impacts. Our assessment is qualitative, focusing on progress that has been made under the first emissions reduction plan, and identifying risks, gaps, and opportunities that could be addressed moving forward.
This monitoring report focuses on the progress of government action and policy, and for this year's report, the analysis is based on data collated by the Climate Change Chief Executives Board[136] (detailed further in *Chapter 2: Our approach*). This is the interdepartmental executive board (IEB) that coordinates implementation of the emissions reduction plan and national adaptation plan.

There are links between this chapter and other sections of this report, including *Chapter 7: Whakahekenga haurehu*, which addresses specific progress towards a transition that supports iwi/Māori aspirations.

Key points for a transition that supports New Zealanders

- Actions to meet climate goals can have positive impacts, such as reducing living costs or health co-benefits from reduced air pollution, but there will be some unevenly spread negative impacts on people during the transition that need to be managed.
- There is currently a lack of clarity in how the Government plans to monitor and manage potential impacts of emissions reduction policy and to grasp opportunities to improve the lives of New Zealanders, particularly for those most affected by change. Proactively managing the social challenges and opportunities is an important enabler of climate action.
- The development of an equitable transitions strategy has been delayed.
- Many actions for an 'equitable transition' under the first emissions reduction plan have not progressed or have been delayed, with implications for the transition as well as the ability to meet emissions budgets.

Progress in implementing actions related to mitigating impacts on New Zealanders under the first emissions reduction plan

Some actions related to mitigating impacts have progressed, but most have been delayed or discontinued

As of 10 May 2024, out of the fourteen actions[xlv] outlined in the first emissions reduction plan that relate to a transition that supports New Zealanders:

- four have been progressed
- five have been delayed or are on hold
- three have been discontinued
- two have not been progressed at all.

These are discussed further below.

This section reports progress in implementation based on tracking information provided by the Climate Change Chief Executives Board[137] followed by our assessment of areas for attention.

Four actions have been progressed

- **Action 3.2.2 Support regions and industries to manage the transition.** This action uses the Regional Strategic Partnership Fund to support the development of more productive, resilient, sustainable, inclusive, and Māori-enabling regional economies. The fund has been fully allocated and was closed in mid-2023.
- **Action 3.3.2 Improve welfare system income adequacy.** This ongoing action was to ensure that people have adequate income and standard of living. The Income Support Survey publication was delayed to early 2024, but the Government continues to monitor levels of support through, for example, main benefits and the Winter Energy Payment.[138]
- **Action 3.3.3 Strengthen employment support services.** This ongoing action was to strengthen services tailored to respond to different needs and priorities to enable New Zealanders to prepare for, find and retain suitable employment. Agencies will implement time-limited funding received through Budget 2023 to support economically displaced workers, which includes an evaluation of programme effectiveness.[139]
- **Action 3.5.1 Inform low-emissions choices through a Climate Information Centre.** The investigation into the benefits of a Climate Information Centre was completed and included as part of a budget bid for a Climate Action Hub. This bid was not funded. However, another bid for a Climate Data Infrastructure Initiative was funded in Budget 2023, with aims to deliver on some of the benefits sought by bringing together climate data as a trusted source and making it accessible for decision-making.[140]

Five actions have been delayed or are on hold

- **Action 3.1.1 Equip all children and young people for the transition.** This ongoing action included a range of initiatives in the early learning and schooling system to equip all children and young people to contribute positively to the transition. The NCEA Change Programme has been rephased and pushed out by two years, to 2028.[141]
- **Action 3.2.1 Develop an equitable transition strategy.** Budget 2022 allocated NZ$16 million to the development of an equitable transition strategy, to be developed in collaboration with people and communities who will be most affected by the transition.[142] Consultation on a draft strategy intended for mid-2023 was postponed by Cabinet, pending further advice on inclusion of adaptation and further work on options to support New Zealanders who are vulnerable to potential cost of living challenges.[143]

xlv. There are twelve distinct actions, one of which (Action 3.2.2) has been divided into three by the Climate Change Chief Executives Board to more accurately monitor and report on the original action's outputs individually.

- **Action 3.2.2(a) Support regions and industries to manage the transition.** This ongoing action included a Regional System Leadership Framework intended to strengthen regional partnerships to improve community wellbeing. This action is related to industry transformation plans (ITPs) and Regional Skills Leadership Groups (RSLGs), which the Government has stopped work on and/or disestablished.
- **Action 3.2.3 Implement the Just Transition Partnerships Programme.** This action included implementing Just Transition Partnerships in Taranaki, Southland, and other regions facing transition challenges with tailored levels of support, and publishing guidance to support regional partners to develop their own just transition plans. These initiatives have been put on hold pending ministerial direction.
- **Action 3.4 Build the evidence base and monitor and assess impacts.** This action was to improve the monitoring and forecasting of transition impacts and support better policy design to avoid or mitigate negative impacts of the transition. The Government has developed a prototype data tool that will enable Government and others to monitor and respond to distributional impacts of the transition. The tool was intended to be tested and refined over the second half of 2023.[144] It is unclear whether this has progressed.

Three actions have been discontinued

- **Action 3.1.2 Create an accessible, responsive, and flexible tertiary education and training system.**
  - Te Pūkenga – New Zealand Institute of Skills and Technology was set up to operate as a single vocational education institution responsible for workplace and provider-based learning, with a focus on meeting the needs of regions, learners and communities. It was disestablished[xlvi] in early 2024 in favour of regionally based, individual institutions.[145]
  - Fifteen RSLGs have been disestablished.[146] The groups were intended to enable better planning for regional labour markets and ensure that our workforce, education and immigration systems are working together to meet skills and labour market needs.
  - Two Centres of Vocational Excellence (for food and fibre, and construction and infrastructure) will continue until the end of their existing contracts in June 2025.[147]
  - Six Workforce Development Councils (WDCs) will remain in place until 30 June 2025.[148]
- **Action 3.2.2(b) Support regions and industries to manage the transition.** The Government has closed the ITP programme. ITPs were set up as a mechanism for implementing industry policy to grow and transform sectors of the economy with significant potential to contribute to a high-productivity, high-wage, low emissions economy.
- **Action 3.3.1 Develop an income insurance scheme.** The proposed scheme was cancelled in early 2023.

Two actions have not been progressed

- **Action 3.5.2 Enable inclusive and participatory climate responses.** This action was to investigate ways of increasing public participation in climate policy and localised actions. Further exploration of options (for example, citizens assemblies) was to take place in 2023, but this was not funded.
- **Action 3.5.3 Support localised and community-based solutions.** This action was to look at options to support communities and Māori to champion local actions and share ideas that encourage adoption of low emissions behaviours. Further exploration of options and proofs of concept was to take place in 2023, but this was not funded.

xlvi. Disestablishment requires the introduction of new or amended legislation which is expected to take 12 to 18 months.

Areas for attention

Under the first emissions reduction plan, the Government's approach to mitigating the impacts that reducing emissions and increasing removals will have on New Zealanders was that of an 'equitable transition' that would lead to a "prosperous economy, higher wages and more productive and resilient businesses".[149] That approach set out five objectives for the transition, outlined above – met through actions that included the development of an equitable transitions strategy (Action 3.2.1).

Many actions for mitigating impacts are not being progressed, with implications for the transition as well as the ability to meet emissions budgets

Proactive and inclusive policy development increases acceptability, provides predictability to individuals, communities and businesses, and allows time to plan and invest in the choices, systems and infrastructure needed to respond to systemic shifts in the economy and society. Two of the actions that have not been progressed aimed to increase public participation and inclusion in the climate response, and this remains a gap in the Government's approach to delivering a transition that improves the lives of New Zealanders.

Several actions have been delayed or discontinued that related to equipping young people, regions and communities with the skills, capacity and tools to take advantage of the opportunities in the transition. These actions act as enablers to long-term change and climate action across sectors.

For example, the work stemming from the fifteen RSLGs, six WDCs, eight ITPs, and two just transition partnerships can provide useful insights and pathways for employees, employers, and regions in having a ready and capable workforce across energy, industry, and the built environment. The Future of Work Forum has also been disestablished.[150] A skilled and accessible workforce and competitive domestic manufacturing industry are critical enablers in the pace and scale of action needed to meet emissions budgets (see *Chapter 9: Energy and industry*).

A strategy to mitigate the impacts that reducing emissions and increasing removals will have on New Zealanders has been delayed

There is currently a lack of clear direction and specificity from the Government in how it will mitigate impacts on employees and employers, regions, iwi/Māori, and wider communities – including the funding for any mitigation action.[151] The Climate Emergency Response Fund (CERF) was established in 2021 to support initiatives to drive emissions reductions and to manage the impacts of climate-related policies. The fund was disestablished in December 2023.

In early 2023, the Ministry of Business, Innovation and Employment (MBIE) and Ministry of Social Development undertook a series of workshops, meetings and surveys to inform the development of a strategy. However, there has been no further information on the outcome(s) of this engagement – for example, iwi/Māori perspectives, specific regional concerns, summary of themes or potential milestones out to the end of 2024.

A strategy was intended to be developed by the end of 2024,[xlvii] in collaboration with people and communities who will be most affected by the transition.[152] Consultation on a draft strategy intended for mid-2023 was postponed by Cabinet, pending further advice on inclusion of adaptation and further work on options to support New Zealanders who are vulnerable to potential cost of living challenges.[153]

The strategy was also to include a "framework to monitor the impacts of the transition and to identify challenges and opportunities in advance".[154] A lack of measurable objectives, tracked and reported over time, leaves a gap in the evidence base needed to monitor and assess impacts of climate policies (as outlined in Action 3.4: Build the evidence base and monitor and assess impacts) and inform decisions that could support New Zealanders in the transition.

There are gaps in the range of actions outlined in the plan

The first emissions reduction plan highlighted sector-specific actions that could contribute to a transition that improves the lives of New Zealanders. However, the plan did not communicate to what extent these sector-specific actions are expected to contribute or how they are expected to work with other policies or actions, and the plan did not set measurable objectives.

There is also limited information on how the Government will manage the impacts on wider communities, such as rural communities, and on employers, particularly small businesses.

Coherent planning and change at the system level, in addition to action at the sector level, can help minimise impacts and maximise opportunities.

Monitoring progress on mitigating impacts requires adequate data

The Government has choices in how it shapes the distributional profile of impacts during the transition. Monitoring the outcomes of those choices provides opportunities to continuously improve policy design for the benefit of New Zealanders. However, there are currently limited data and evidence to do so, particularly in a format that lends itself to long-term monitoring of progress.

The development of indicators, or key measures, to track over time will enable the Government to better respond to challenges of the transition and maximise opportunities.

The release of MBIE's first annual report into energy hardship in 2023, which includes an initial list of five measures for monitoring levels of energy hardship, is a positive step. This work also highlights the current limitations of available data, particularly for Māori and Pacific populations. Other data exist across different Government initiatives[xlviii] and could be drawn upon in a more coordinated manner to monitor progress towards specific objectives.

As part of our ongoing monitoring role, the Commission intends to develop a set of indicators to report on annually, to provide transparency on how Government decisions on climate action are affecting households, whānau and communities. This work will include the identification of critical data gaps.

xlvii. The Terms of Reference for the strategy stated a final version was to be complete prior to June 2024.

xlviii. For example, the Living Standards Framework indicators, Government Policy Statement on Housing and Urban Development indicators, MAIHI Ka Ora indicators, data from government Climate Implications of Policy Assessments, transport indicators and others. Longitudinal studies such as the Living in Aotearoa and Growing Up in New Zealand surveys may also be beneficial; these studies were discontinued in 2024.

B2: Whakahekenga tukuwaro – ā-rāngai | Emissions reduction – by sectors

This part of the report covers how much emissions have reduced to date in four sectors, and the future emissions projections of those sectors.

The sector chapters cover four areas.

- **Energy and industry** – including industry, buildings, electricity supply, and domestic fossil fuel supply
- **Transport** – including passenger transport, freight transport, and aviation
- **Land** – including agriculture and forests
- **Waste and fluorinated gases**

Figure B2.1 shows the layers of information that make up each section of these sector chapters.

Figure B2.1: The building blocks of sector chapters

Sub-sector name, e.g. Industry

Introduction:
what this section covers – kinds of emissions and sources, key context

Key points
including areas for attention and new opportunities to reduce emissions in this subsector

Progress to date: how emissions have reduced

Benchmark
we use to assess progress – based on the Commission's 2022 demonstration path

Indicators
that help track progress towards goals and outcomes (e.g. gas use in industrial sector)

Data gaps
that limit tracking of emissions

A **monitoring map** showing:

- **benchmark goals** (e.g. reduce by 28% by 2025)
- **pathway outcomes** (e.g. switch to low-carbon fuels)
- **government policies and enablers** (e.g. energy transition support programmes, reliable data)

Policy assessment: how emissions are tracking – for this emissions budget, and the next two

Summary of analysis
of the policies and how they contribute to emissions reduction in this subsector

How the policies connect to climate change adaptation

Scorecard:
assessed level of risk of achieving the budget – and the rationale for our assessment. This is organised by outcome area, and the pathway outcomes listed in the monitoring map

Areas for attention
in this subsector

New opportunities
to reduce emissions in this subsector

Other government policies that could affect emissions reductions in this subsector

For each sector we assess progress on reducing emissions against our benchmark, and report to indicators that will help track reductions over time. We then provide a summary of our analysis of policy progress for emissions reduction in the sector, followed by scorecards for each outcome area. We highlight areas for attention and new opportunities to reduce emissions.

The 'monitoring map' in the middle of the chapter provides a view of all parts of the analysis, showing how the policy actions feed up to outcomes and goals that would achieve the country's emissions budgets (Box B2.1).

Chapter 2: Our approach explains our monitoring framework and tools we have used to make our assessments (see Box 2.1 in that chapter).

The Climate Change Response Act 2002 (the Act) sets out the functions of He Pou a Rangi Climate Change Commission (the Commission). The Act requires us, where relevant, to consider in our advice matters under section 5M, such as the distribution of benefits, costs and risks between generations and specific effects on iwi and Māori. These issues and impacts have been considered as part of the sector assessments, where relevant. Also see *Chapter 7: Whakahekenga haurehu* and *Chapter 8: A transition that supports New Zealanders*.

Box B2.1: What are monitoring maps?

Monitoring maps show the building blocks that make up a complex change.

We have used them in our monitoring of emissions reductions to make our assumptions clear.

It is a way of showing our workings. These 'theory of change' maps break down into steps the various elements of a change. See for example Figure 9.1.1.

Different layers of information make up a monitoring map for each sector we report on.

- **Emissions goal.** This is a working 'target' for the mapping exercise, which is used to measure emissions reduction progress (for example, "electricity generation emissions reduce 60% by 2035"). Where available, the goals are based on government plans; otherwise the goal on the map draws on the Commission's 2022 demonstration path (the benchmark used for this monitoring), in line with the Government's subsector targets set in the first emissions reduction plan.

  The content in any paler boxes relates to emissions occurring outside of Aotearoa New Zealand. These are out of scope of emissions budgets and targets, but they are included for completeness.
- **Pathway outcomes.** These are the specific changes within sectors that contribute to achieving emissions reductions as identified in government or Commission pathways (for example, "phase out fossil fuel generation").
- **Enablers.** These are factors necessary to achieve that outcome (for example, "workforce and skills" or "investment and finance").
- **Government policies.** These are policies and strategies that affected this sector during the emissions budget period. They may drive emissions reductions or address barriers (for example, resource management law reform).
- **Contextual factors.** These are changes outside government climate policy that could have major effect on this area (for example, global technology change).

Monitoring maps are used to derive the wider set of indicators we use to show and assess real-world progress towards pathways outcomes and enablers for emission reductions.

WĀHANGA 9 | CHAPTER 9

Ahungao, Ahumahi | Energy and industry

This chapter looks at greenhouse gas emissions in four areas: industry, buildings, electricity supply, and fossil fuel supply.

This chapter summarises the progress to reduce greenhouse gas emissions in the energy and industry sector, which includes industry, buildings, electricity supply, and domestic fossil fuel supply.

This assessment:

- tracks changes in emissions to date alongside other notable sector trends
- examines progress on implementing policies intended to drive emissions reductions
- looks at whether and how those policies connect to climate change adaptation.

We use policy scorecards to assess the strength of emissions reduction policies and plans to drive change in each sector, as described in *Chapter 2: Our approach*. From the policy scorecards, we have identified areas for attention where gaps in the suite of policies for each sector could pose risks to meeting emissions budgets, or where new opportunities for emissions reductions could be pursued.

Energy and industry emissions in 2022 were 18 $MtCO_2e$, which is 23% of the country's gross greenhouse gas emissions and 44% of long-lived greenhouse gases (other than biogenic methane).

These emissions are created by burning fuel for electricity generation, manufacturing goods, running mobile and stationary equipment, and operating buildings. Emissions are also created during the refining of oil, during the production, transmission, and storage of fossil fuels, and from non-productive combustion.

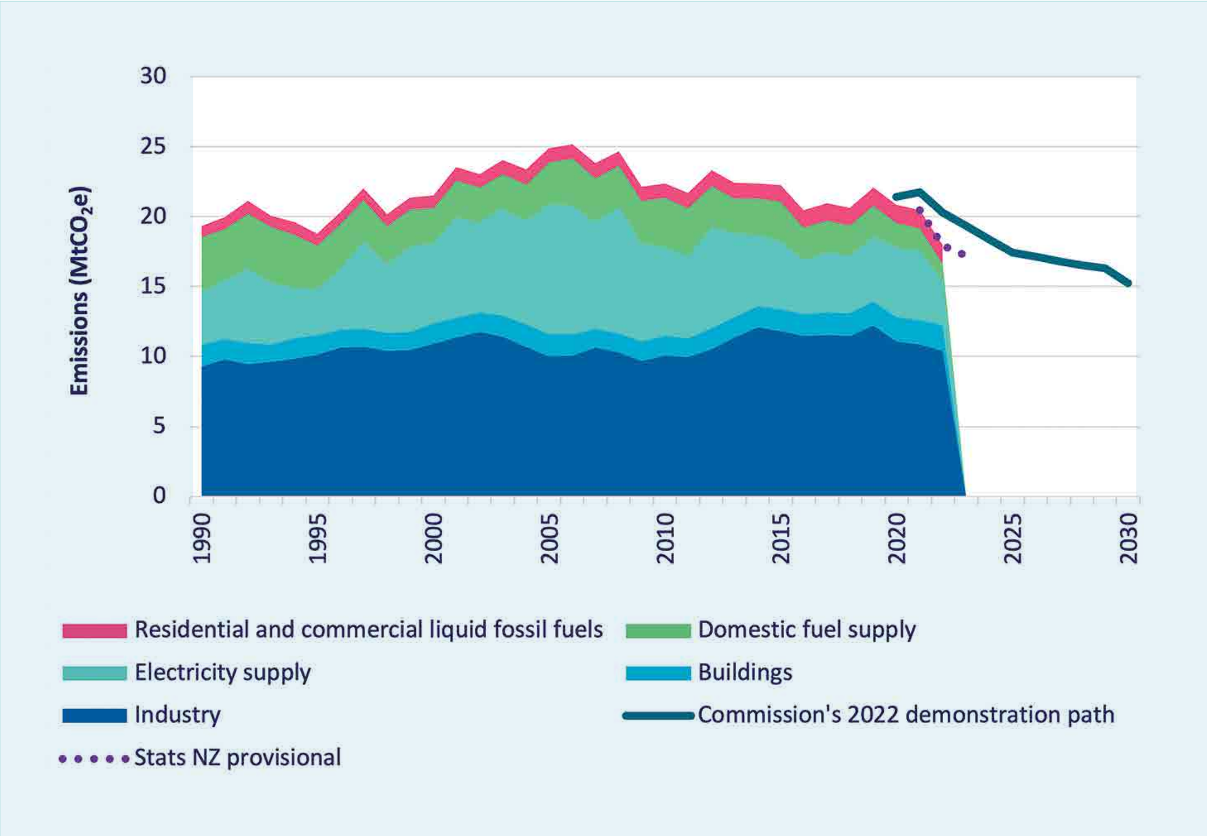
The four groupings we use in our emissions reduction monitoring work are divisions of categories of energy and industry emissions as reported in New Zealand's Greenhouse Gas Inventory (GHG Inventory), published in 2024. These are shown in **Table 9.4.1** at the end of this chapter.

Industry accounted for 58% (10.4 $MtCO_2e$) of total energy and industry emissions in 2022, followed by electricity supply with 18% (3.2 $MtCO_2e$). The remaining 24% (4.3 $MtCO_2e$) of emissions came from operation of buildings, domestic fuel supply, and residential and commercial liquid fossil fuel use (**Figure 9.1**).

Emissions from 2020 to 2022 have been lower than the Commission's 2022 demonstration path, which is the benchmark we use to track progress. This is largely driven by a decrease in gross greenhouse gas emissions from industry and electricity supply,[xlix] as described further below.

xlix. Some data have been revised since the 2022 demonstration path was produced, which drives the gap between modelled and actual emissions in 2020.

Figure 9.1: Overall energy and industry emissions



Source: Commission analysis, GHG Inventory, Stats NZ

9.1: Ahumahi | Industry

This section focuses on the greenhouse gas emissions created when goods are manufactured, and when off-road vehicles and mobile machinery (motive power) are used in the construction, mining, agriculture, forestry, and fishing sectors.[1] There are diverse fuel uses in these sectors.

Emissions come from coal and fossil gas being burnt in boilers, kilns, and furnaces, and from diesel and petrol being combusted to drive engines and motors. Emissions also come from a range of chemical reactions that take place to produce certain goods, such as steel or methanol.

This sector has a critical role in the transition to a low emissions economy, including by:

- reducing emissions intensity of production (tCO_2e/$ million GDP) by increasing energy and resource efficiency and switching to low emissions fuels and feedstocks
- providing increasingly low emissions products and materials for use domestically and around the world.

Contextual factors such as the composition of Aotearoa New Zealand's heavy industrial sector, high interest rates, and global competition for equipment and skills add challenges to achieving these outcomes.

KEY POINTS FOR INDUSTRY

Progress to date

- Between 2021 and 2022, greenhouse gas emissions from industry reduced by 4.2% (0.5 $MtCO_2e$) to 10.4 $MtCO_2e$, while production largely remained within historic levels. Specific activities have contributed to this reduction.
  - The Waitara Valley methanol production facility has been closed since the start of 2021.
  - One Motunui methanol production facility underwent planned maintenance and inspection (temporary shutdown in production) in Q2 2022 during a scheduled outage at the Maui gas field.
  - The wood, pulp and paper manufacturing sector reduced emissions from fossil gas use by 30% (0.06 $MtCO_2e$) between 2021 and 2022. The sector has increased use of biomass and geothermal energy.
  - Food and beverage processing sector emissions grew steadily up to 2019 but have been declining since, driven by the sector switching from coal boilers to lower emissions alternatives and improving energy efficiency.
- Provisional data from Stats NZ for 2023 indicate a decrease in gross greenhouse gas emissions of 0.3 $MtCO_2e$ from 2022.

1. Manufactured goods include but are not limited to milk powder, glass, cement, and steel. Off-road vehicles and mobile machinery include but are not limited to logging trucks, diggers and excavators.

- The sector continues to implement emissions reduction and energy efficiency projects in response to government policies, market conditions and other external factors, as in the examples below.
  - *Methanex:* completion of a project to improve operational energy efficiency at its Motunui site (distillation column debottlenecking project), which reduced energy demand and provided cost savings.[155]
  - *Fonterra:* completion of boiler conversions from coal to renewable energy at its Stirling, Waitoa, Hautapu, and Edendale sites, and installation of a high temperature heat pump and solar thermal system at its Palmerston North FBNZ site. Fonterra will also be closing some plants at its Waitoa and Te Rapa manufacturing sites in 2024.[li]
  - *OceanaGold:* adoption of an electric excavator at its Macraes mining operation to reduce diesel use.
- Changes observed to date are ahead of pace compared to the benchmark level of emissions reductions in the Commission's 2022 demonstration path

Our assessment of policy

Scorecard summary for reducing emissions intensity of production

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	Moderate risks	Significant risks	EB1–2 – No significant risks	**EB1–2 – No significant risks**
			EB3+ – Moderate risks	**EB3+ – Moderate risks**

- Overall, we assess that the policies and plans to reduce greenhouse gas emissions from industry present **no significant risks** across the periods of the first emissions budget (2022–2025) and the second emissions budget (2026–2030). Past actions and policy settings may have already locked in sufficient emissions reductions to achieve benchmark outcomes for the sector.
- We estimate that projects funded through the now-disestablished Government Investment in Decarbonising Industry (GIDI) Fund will together achieve the benchmark level of emissions reductions. The Government has confirmed that previously funded projects will continue.[156]

li. At the Waitoa manufacturing site, the specialty powder plant and coal centre will close, but the specialty nutrition dryer and UHT plants will remain open. At the Te Rapa manufacturing site, two dryers will discontinue operations.

- However, there are **moderate risks** for the third emissions budget period (2031–3035), as projects under the GIDI Fund are required to be fully operational by 31 December 2027. Additional tools could help to maintain momentum beyond 2027.
- The absence of alternative policies to address upfront capital cost barriers and transition planning places a higher dependence on an effective emissions price through the New Zealand Emissions Trading Scheme (NZ ETS). However, on its own, the current design of the NZ ETS may not be sufficient to overcome the barriers to investing in decarbonisation actions. There is a risk the emissions price will be too low to drive gross emissions reductions across industrial sectors.
- The National Policy Statement for Greenhouse Gas Emissions from Industrial Process Heat and the related National Environmental Standard target low- to medium-temperature process heat generated from coal. Greenhouse gas emissions from high-temperature process heat and process heat generated from other fossil fuels are unaddressed.
- There is also unclear progress on key enablers such as workforce and skills planning, network connection charges, strong supply chains, and competitive and secure access to low emissions fuels. These barriers can limit the pace of change, even when policy direction is clear.

Areas for attention

- There are barriers relating to capital cost and access to low-cost financing, and emissions reductions from industry may slow or stall if these barriers are not addressed in the second emissions budget period. This may impact achievement for the third emissions budget period (2031–2035) onwards.
- Under the current settings of the NZ ETS there is a risk that the emissions price will be too low to drive gross emissions reduction across industrial sectors.
- High costs for connecting to the electricity network, high network charges, and first-mover disadvantage could deter switching from fossil fuels to electricity as an energy source. Prioritising putting policies or regulatory incentives in place to adequately address these issues will help to reduce the overall cost and reduce any risk to the pace of electrification.
- A ready and accessible workforce with the right skills and capabilities, supported through tertiary and vocational education, alongside strong supply chains, can facilitate emissions reductions in industry.

New opportunities to reduce emissions[lii]

- The installation of an electric arc furnace at the Glenbrook steel mill, expected to be in operation by 2027, means greater reductions to industry emissions are achievable in the second emissions budget period (2026–2030) and third emissions budget period (2031–2035), than was expected under the benchmark of the Commission's 2022 demonstration path.

lii. Section 5ZK of the Climate Change Response Act 2002 directs the Commission to consider new opportunities to reduce emissions as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path, or that show potential for greater reductions than previously assumed, based on new evidence.

How we monitor industry emissions

As well as monitoring how much emissions have reduced, to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for industry.

In 2022, greenhouse gas emissions from industry were 10.4 $MtCO_2e$.[liii] This was 13% of gross emissions and 25% of long-lived greenhouse gas emissions (other than biogenic methane). The benchmark level of emissions reductions in the Commission's 2022 demonstration path sees emissions from industry reduce to 11.1 $MtCO_2e$ by 2025 and 8.5 $MtCO_2e$ by 2035.

Emissions from industry come from coal and fossil gas being burnt in boilers, kilns and furnaces. Some industries also burn biomass and/or black liquor during their manufacturing processes. Emissions also come from a range of chemical reactions that take place to produce certain goods, such as steel, cement or methanol. Emissions can be reduced by switching away from fossil fuels to low emissions fuels such as electricity and bioenergy for energy use, and by switching away from fossil fuels to low emissions feedstocks for chemical reactions. Increasing use of secondary materials such as scrap steel in primary steel production can also reduce greenhouse gas emissions while increasing the circularity of the economy.

Industry emissions also come from diesel and petrol being combusted to drive engines and motors in machinery and off-road vehicles. Emissions can be reduced by switching away from fossil fuels to electricity or low-carbon liquid fuels.

Industries provide products that are fundamental to the economy, and some industries have emissions that are harder to reduce, such as the emissions created during chemical reactions. Industry can support the transition to a low emissions economy by increasing energy and resource efficiency, and switching to low emissions fuels and feedstocks to reduce emissions intensity of production, while also providing increasingly low emissions products and materials for use domestically and around the world.

The industry monitoring map (**Figure 9.1.1**) below reflects these goals and sets out the pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (**Figure 9.1.3**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

liii. This includes greenhouse gas emissions from motive power, process heat, and industrial processes.

Figure 9.1.1: Industry monitoring map (see Box B2.1 for legend)

Monitoring map for industry

Domestic industry emissions reduce 28% by 2035 (relative to 2021) in line with the benchmark level under the Commission's 2022 demonstration path

Reduce emissions from imported manufactured products (out of scope for target and budgets)

PATHWAY OUTCOMES

Reduce emissions intensity of production
- Emissions intensity of production

Material and product use and output
- Domestic production of manufactured products

Imported materials
- Tonnes of materials imported

Emissions intensity of imports
- Emissions intensity of imported materials

Increase energy efficiency and demand flexibility
- Energy intensity of production

Switch to low carbon fuels
- Electricity and renewable energy use
- Fossil fuel use
- Liquid fossil fuel use

Reduce process emissions
- Industrial process and product use emissions

Increase resource efficiency and material substitution
- Recovery or diversion rate of construction and demolition waste (*see Waste monitoring map*)

ENABLERS

Investment and finance
- Access to capital and financial instruments
- Fair and efficient pricing (*see Electricity supply monitoring map*)

Workforce and skills
- Number of key personnel
- Investment in apprenticeship support

Innovation
- RD&D investment
- Flexible electricity system (*see Electricity supply monitoring map*)

Acceptance of low-carbon materials
- Product availability
- Price premium
- Market share

Waste collection and infrastructure
- Tonnes of material processed or reused (*see Waste monitoring map*)

Competitive and secure low emissions fuels
- Electricity (*see Electricity supply monitoring map*), bioenergy (*see Forests monitoring map*), and hydrogen supply chains and networks
- Enabling infrastructure and consenting regimes

Reliable and transparent data
- Energy and emissions data collection and reporting
- Companies' climate targets and plans

POLICIES

Abatement-measure-specific policy
- Grants and contestable funding
- Energy transition support programmes
- Extended producer responsibility (*see Waste monitoring map*)

Policies to enable conditions for success
- Efficient and flexible electricity networks (*see Electricity supply monitoring map*)
- Resource Management Act and national policy direction
- Workforce, skills and capability initiatives
- Mandatory climate-related disclosures

Cross-cutting incentives
- Emissions pricing (NZ ETS) and industrial allocation
- Electricity pricing reform
- Product standards and environmental product declarations
- Government procurement rules
- Competitive markets

CONTEXTUAL FACTORS

Industrial sector composition
- Single firm heavy industries
- Regional economic contribution
- Employment demographics
- New industries

Supply chain
- Transport/ freight costs
- Supply chain constraints and delivery delay

Technologies and fuels
- Technology costs
- Energy prices
- Global learning rates and drivers
- Interest rates

Global competition and trends
- Price and availability of critical materials and minerals
- International trade and competitiveness
- Emissions pricing mechanisms
- Overseas innovation and RD&D investment
- Competition for skills and equipment
- NZ trade agreements

Source: Commission analysis

Box 9.1.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved, to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

- **Aggregate capacity (MW) of demand flexibility contracts.** Some information is publicly available on the total capacity of demand that can be shifted or temporarily turned off but is not consistently tracked and reported. The Electricity Authority's demand-side flexibility survey may provide data in the future if it continues. New metrics could be developed to show what proportion of demand can be shifted or turned off when needed.
- **Low-carbon fuels project pipeline.** Some information is publicly available but is not consistently tracked and reported. Competitive and secure supply of low emissions fuels is a key enabler in switching away from fossil fuels for energy or feedstock. Low-carbon fuels projects many include, for example, development of green hydrogen and bioenergy production facilities.
- **Carbon intensity of materials.** Environmental Product Declarations (EPDs) are available and used to populate different tools and databases. However, tools and databases are not in a standardised format to enable comparison and monitoring of changes in the carbon intensity of materials over time. A more standardised and centralised approach that collates EPD data could help.
- **Secondary material collection and use.** Data on secondary material collection and use could improve monitoring and reporting at the sector and/or product level (for example, volume of scrap metal collection, and construction and demolition waste). Over time, this could include data on recycling and reuse of critical minerals and metals. The first emissions reduction plan committed to developing metrics to measure circularity (Action 9.1).

Progress in reducing industry emissions

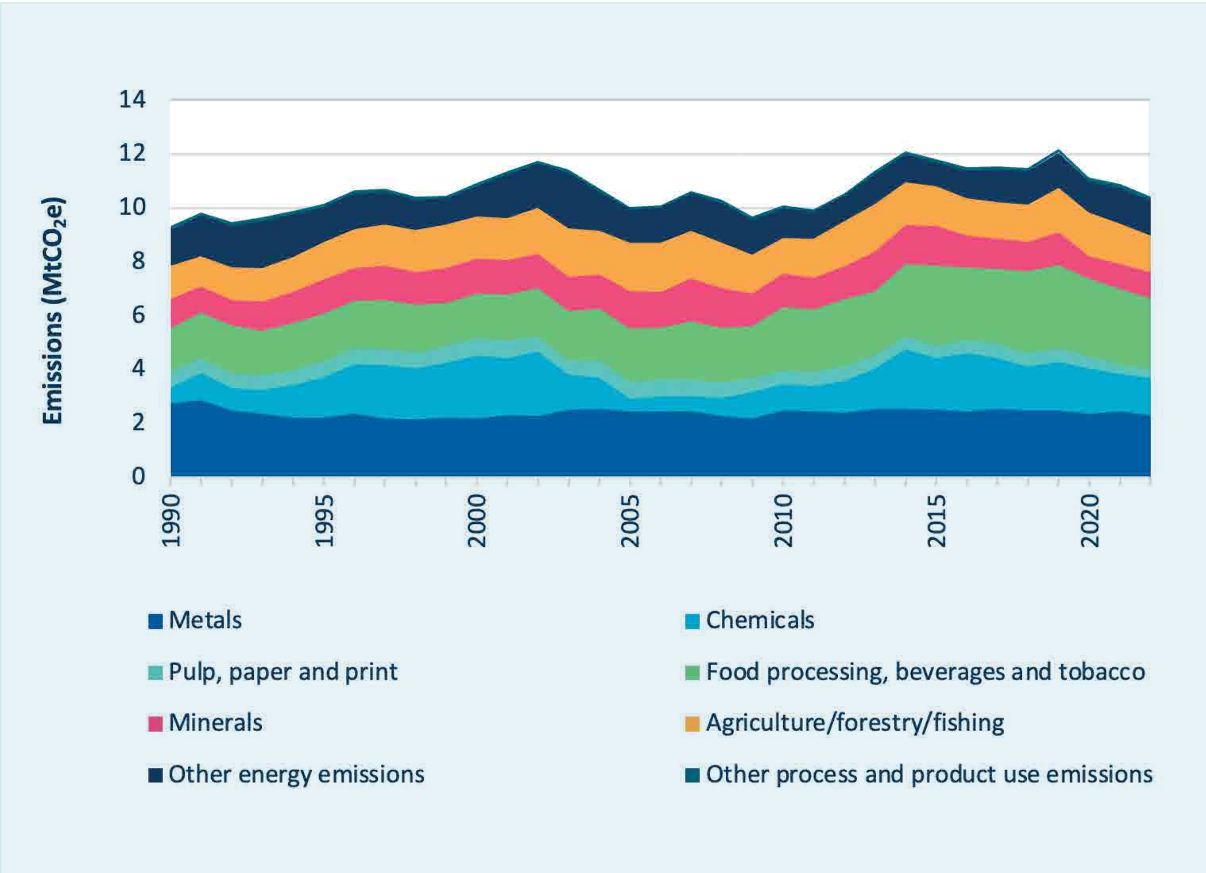
Industry emissions in 2022 reduced while production remained broadly within historical levels

Between 2021 and 2022, gross greenhouse gas emissions from industry reduced by 4.2% (0.5 $MtCO_2e$) from 10.9 $MtCO_2e$ to 10.4 $MtCO_2e$, while production remained broadly within historic levels (Figure 9.1.2). This change was driven by a 9.2% (0.2 $MtCO_2e$) reduction in emissions from iron and steel making, attributed to a reduction in process emissions that come from the chemical reactions that take place during iron and steel making.

There was an 18% (0.1 $MtCO_2e$) reduction in emissions from the wood, pulp and paper manufacturing sector, largely from reduced fossil gas use and increased use of renewables (bioenergy and geothermal). Emissions from fossil gas use in this sector reduced by 30% (0.06 $MtCO_2e$) between 2021 and 2022.

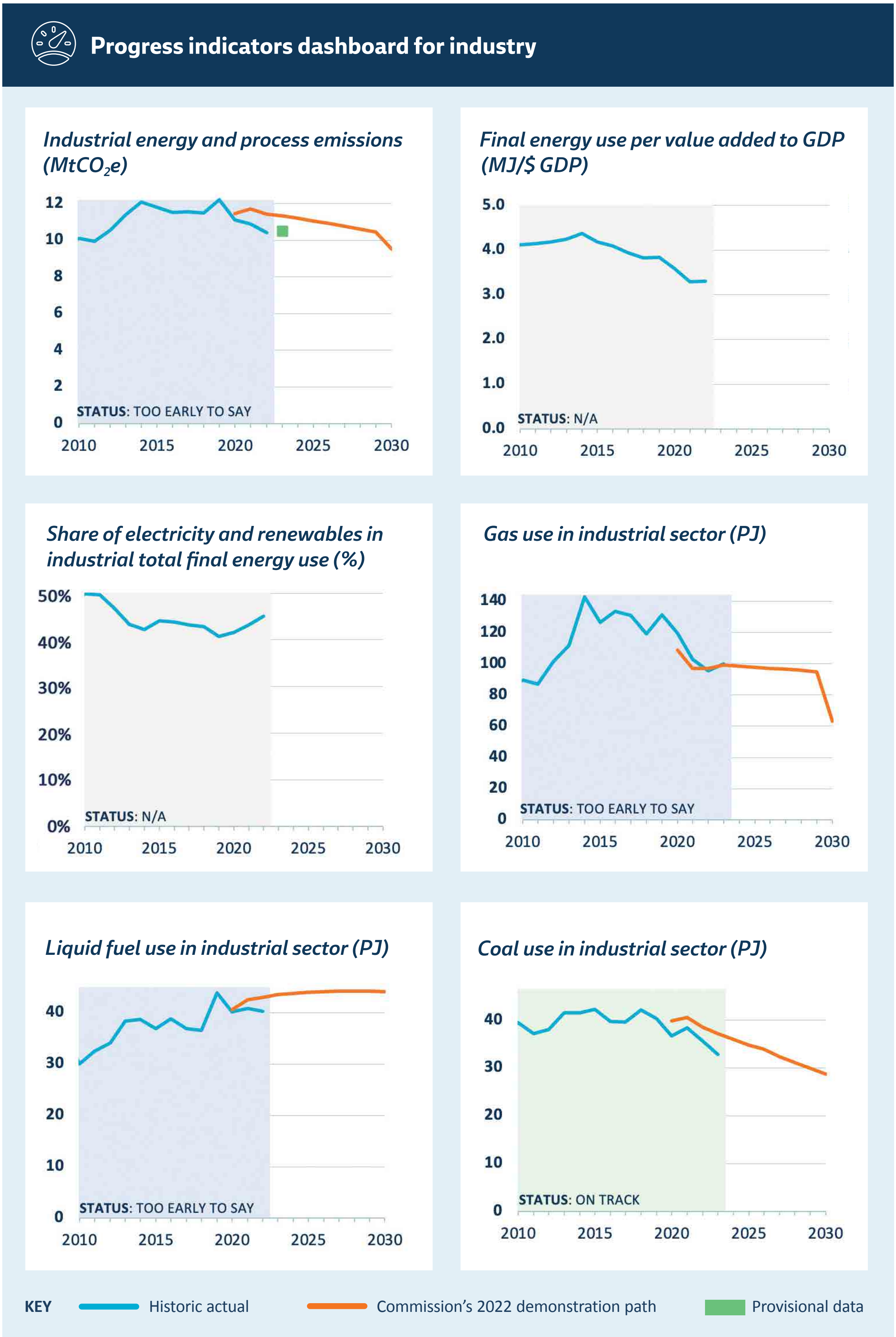
Emissions reduction from motive power reduced by 0.1 $MtCO_2e$ between 2021 and 2022. This was largely driven by reductions in liquid fossil fuel use in agriculture, forestry and fishing.

Figure 9.1.2: Gross emissions by industry from 1990 to 2022



Source: GHG Inventory

Figure 9.1.3: Progress indicators dashboard for industry



Source: Commission analysis, Ministry for the Environment (MfE), Ministry for Business, Innovation, and Employment (MBIE) energy statistics

Changes observed to date are ahead of pace compared to the benchmark level of emissions reductions in the Commission's 2022 demonstration path

Industry greenhouse gas emissions in 2022 were 1.1 $MtCO_2e$ lower than the benchmark level of emissions in the Commission's 2022 demonstration path, indicating that the sector is ahead of the pace needed to meet the first emissions budget. However, some of these reductions were driven by external factors such as temporary production disruptions and shutdowns rather than a direct response to climate policies. Note that MBIE has revised its coal-use data, so historical data from 2020 are now lower and do not line up well with the Commission's 2022 demonstration path (Figure 9.1.3).

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by a scorecard for the outcome area in focus (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for industry focuses on the outcome area to 'Reduce emissions intensity of production' (tCO_2e/$ million GDP). This is supported by pathway outcomes to:

- increase energy efficiency and demand flexibility
- switch to low-carbon fuels
- reduce process emissions.

We have included a placeholder outcome area on 'Material and product use and output'. There are related actions under Waste, Buildings, and Circular and Bioeconomy. However, insufficient data, and a lack of specific actions in the first emissions reduction plan, mean this outcome area cannot be monitored at this time. While there is no specific policy assessment related to this area, it remains relevant for future monitoring consideration.

The industry monitoring map (Figure 9.1.1) illustrates how more specific pathway outcomes, enablers, and policies relate to this broader outcome area.

Policy progress

- In 2023, the National Policy Statement and National Environmental Standards for Greenhouse Gas Emissions on Industrial Process Heat were introduced. The national direction will phase out existing low- to medium-temperature coal boilers by 2037 and ban the installation of new low- to medium- temperature industrial coal heating devices from 27 July 2023.[157]
- From August to November 2023, MBIE consulted on a range of policies and work programmes such as the hydrogen roadmap, gas transition issues paper, offshore renewable energy regulatory settings, electricity market measures, and a ban on new fossil fuel baseload generation.[158]
- Under the GIDI: Industrial funding stream, as of November 2023, there were 88 active projects representing NZ$122.9 million in co-funding to leverage NZ$226.2 million in private funding. This is expected to avoid 0.48 $MtCO_2e$ per year.
- Under the GIDI: Partnerships funding stream, the Government will co-fund up to NZ$90 million to support Fonterra's decarbonisation plan and up to NZ$140 million to support NZ Steel's installation of an electric arc furnace. These partnerships are expected to contribute to emissions reductions from the second emissions budget period (2026–2030).
- In 2023, the Energy Efficiency & Conservation Authority (EECA) completed Regional Energy Transition Accelerator (RETA) assessments for the South Island, has work under way for North Island assessments, and continues to build interactive online dashboards to support data sharing and collaboration.[159]
- Policy progress for the NZ ETS is discussed in detail in *Chapter 6: New Zealand Emissions Trading Scheme.*

How these policies connect to climate change adaptation

The first National Climate Change Risk Assessment (NCCRA) in 2020 found that climate change poses risks to the insurability of industries' assets, to distribution and supply chain security, and to their ability to fund investment needs.[160] The first national adaptation plan did not include specific actions to increase industry climate resilience and adaptation but does include an action to provide guidance for small businesses to adapt (Action 10.18) and an action to review gas and electricity distribution businesses' climate risk and resilience management plans (Action 3.18).

The plans and policies outlined in the first emissions reduction plan did not explicitly account for climate change adaptation in relation to industry. However, there has been some progress in improving access to transparent and reliable data that can support assessment of risks across business and financial sectors within which industry operates. For example, NIWA is developing updated national climate projections for Aotearoa New Zealand; these are expected to be completed in mid-2024. These projections will enable New Zealanders to access the latest detailed climate projections, which will then support decision-making for adaptation and support resilience to extreme weather.[161]

Climate-related disclosures are mandatory for some large financial market participants, with reporting from financial years beginning on or after 1 January 2023. The goal is to ensure that the effects of climate change are routinely considered in business, investment, lending, and insurance underwriting decisions.[162] Refer also to *Chapter 5: Policies, systems and tools*.

Policy scorecard: Reduce emissions intensity of production

This outcome area encompasses pathway outcomes to:

- increase energy efficiency and demand flexibility
- switch to low-carbon fuels
- reduce process emissions.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	Moderate risks	Significant risks	EB1–2 – No significant risks	**EB1–2 – No significant risks**
			EB3+ – Moderate risks	**EB3+ – Moderate risks**

Rationale for our scores

Main tools	
No significant risks	The main policy tools to drive delivery of the outcome area are, in our assessment, the NZ ETS, capital grants administered through the GIDI Fund, and a regulated phase out of low- and medium-temperature coal boilers enacted through national direction under the Resource Management Act 1991 (RMA). These policies were designed to address barriers related to uncertainty around the future emissions price path, limited access to upfront capital, use of high discount rates, and a permissive regulatory regime. Past actions through the GIDI Fund may have already locked in sufficient emissions reductions to achieve benchmark outcomes for the industry sector in the first emissions budget period (2022–2025) and the second emissions budget period (2026–2030). However, the closure of the GIDI Fund leaves a gap in the suite of tools to address barriers around upfront capital costs and access to capital for firms. If the gap remains unaddressed from the third emissions budget period (2031–2035), we expect this to place higher dependence on an effective emissions price through the NZ ETS. The current design of the NZ ETS means there are risks to its effectiveness at reducing industrial emissions. The way forestry is integrated into the scheme means it is unlikely to be able to maintain a strong and rising emissions price. Policy uncertainty has contributed to emissions price volatility and includes a lack of clarity over the gross emissions reductions the Government is seeking, as well as the role it sees the NZ ETS playing in driving them. This makes investments to reduce emissions that rely on the emissions price riskier, increasing costs and likely delaying action. Overall, we assess that, given the legacy effect of past policies, the main tools present no significant risks to emissions reduction in industry.

Funding and finance **Moderate risks**	Investment is needed to switch away from fossil fuels to low emissions fuels (such as electricity or bioenergy) as an energy source, and to ensure local infrastructure such as electricity networks can enable the transition. For industries with emissions created from chemical reactions, funding and finance including in research, development and demonstration can also support shifting away from fossil fuel feedstocks. Plans rely on a combination of public funding from the Climate Emergency Response Fund (CERF) and private funding, but the CERF was disestablished in December 2023. Addressing barriers related to high upfront capital cost and access to low-cost financing can help maintain momentum in reducing emissions from industrial sectors. Current high interest rates can also make project financing difficult. We have identified moderate risks that funding will be insufficient to address key barriers to action and maintain momentum in reducing industrial emissions.
Other barriers and enablers **Significant risks**	Important enablers in this area, which plans and policies do not adequately address, include workforce and skills, secure supply chains, competitive and secure supply of low emissions fuels, and reliable and transparent data. We assess this poses risks to success in this area because an accessible and capable workforce is required to undertake the design, engineering, and implementation of mitigation actions. A shortage of electrical engineers and design engineers may limit the pace of process heat decarbonisation.[163] Global and domestic competition for labour and equipment is rising as countries work to meet climate change goals. Companies require affordable and long-term supply certainty to switch to low emissions fuels, and producers require long-term demand certainty to invest in building out low emissions fuel supply chains. Competition between sectors – for example, for bioresources across transport and industry – may increase over time. A strategic assessment of the highest-value use of limited resources that considers regional and national circumstances has not been completed. Action 9.1: Commence a circular economy and bioeconomy strategy has been discontinued, and investigation of supply options for renewable gas and bioenergy is on hold.[164] Plans may not be sufficient to provide industries with enough confidence and incentives to invest in shifting from fossil fuels to electricity (electrification). Access and connection to networks can be costly. High upfront connection charges and first-mover disadvantage – where the cost of network upgrades to accommodate future increases in demand is allocated to the first customer that connects – can deter connection of both industrial customers and new electricity generation. In most cases, there is currently minimal regulation that puts pressure on lines companies to reduce the costs of connection. Public funding and government initiatives are not necessarily aligned with the way iwi/Māori organise themselves economically, socially, and culturally. Māori landowners and businesses may not necessarily have sufficient capital to leverage if programmes require co-funding, which can make it difficult to adopt low emissions technologies or invest in fuel supply chains. A significant increase in supply of bioenergy could also have flow-on effects to iwi/Māori and rural communities.

Timeline	
First and second emissions budget period – No significant risks **Third emissions budget period and beyond – Moderate risks**	The legacy effect of past policies and actions such as the GIDI Fund may have already locked in sufficient emissions reductions to achieve benchmark outcomes in the Commission's 2022 demonstration path for the industry sector in the first (2022-2025) and second emissions budget period (2026-2030). From the third emissions budget period (2031-2035), there are moderate risks that changes to the mix of main policy tools will slow down momentum on reducing emissions from industry. If design issues within the NZ ETS are not addressed by the third emissions budget period (2031-2035), the emissions price may not be sufficient to drive emissions reductions. Plans do not set out clear timeframes for key policy development milestones. Where high-level timelines have been set for policies or strategies, milestones have not been met (for example, a gas transition plan and a plan for decarbonising heavy industries).

Overall assessment

First and second emissions budget period – No significant risks **Third emissions budget period and beyond – Moderate risks**	Overall, we assess that the main policies do not demonstrate significant risks across the first emissions budget period (2022–2025) and the second emissions budget period (2026–2030). However, there are moderate risks from the third emissions budget period (2031–2035) that the main policies may underdeliver, due to the possibility of the emissions price being too low to drive meaningful gross emissions reductions across industrial sectors. Coupled with the closure of the GIDI Fund, on its own the current design of the NZ ETS may not be sufficient to overcome the hurdle rate to investing in decarbonisation actions. The risk of a funding shortfall, coupled with the lack of clarity from the Government on the role of the NZ ETS in meeting emissions budgets and the 2050 target, and unclear progress on other barriers and enablers, all add risk to not delivering on the outcome area.

Areas for attention

The current NZ ETS risks underdelivering on reducing emissions in industry

The NZ ETS creates an economic incentive to invest in emissions reduction measures, such as boiler conversions, provided the emissions price is sufficiently high and expected to remain so over the life of the investment.

The emissions price has been volatile, and there are several areas of policy uncertainty about the NZ ETS. These make investments to reduce emissions that rely on the emissions price riskier, increasing costs and likely delaying action.

Under the current NZ ETS, there is a significant risk that the emissions price will be too low to drive gross emissions reduction across industrial sectors over time (see also *Chapter 6: New Zealand Emissions Trading Scheme*).

Barriers such as capital cost and access to finance remain unaddressed

Barriers related to upfront capital cost and access to low-cost financing remain unaddressed, and these risk stalling momentum on reducing industrial greenhouse gas emissions.

A key lever in addressing barriers related to capital cost and access to low-cost financing was the GIDI Fund, which was discontinued at the end of 2023. In the absence of policies to replace the GIDI Fund, we expect this to slow the pace of industrial emissions reductions and place higher dependence on an effective emissions price through the NZ ETS, particularly from the third emissions budget period (2031–2035) onward.[liv]

Maintaining momentum on reducing emissions in industry

We estimate that projects funded through the now-discontinued GIDI Fund (including government partnerships with New Zealand Steel and Fonterra) will together achieve the benchmark level of emissions reductions for the second emissions budget period (2026–2030).

However, pursuing continued emissions reductions in industry can balance risks of underachievement in other sectors. Maintaining momentum and ambition in reducing emissions from process heat, transforming industrial processes, and improving energy efficiency will help Aotearoa New Zealand stay on track to meet future emissions budgets and the 2050 target.

Using data and recommendations from EECA's RETA programme could help inform design of targeted measures for reducing emissions in industry and developing low emissions fuel supply chains.

Workforce capability and access to low emissions technologies

A ready and accessible workforce with the right skills and capabilities, supported through tertiary and vocational education, can accelerate emissions reductions in industry.

Continued domestic and international competition for a skilled workforce may also limit the ability to accelerate implementation of planned projects. The Government's commitment to reverse the Te Pūkenga national polytechnic merger and stop funding workforce development councils (WDCs) and regional skills leadership groups (RSLGs) could impact availability of tertiary training for areas where skills are needed.

liv. GIDI-funded projects must be fully commissioned and operational by 31 December 2027.

The Government's commitment to issue stop-work orders on all industry transformation plans (ITPs) could impact business connectivity and competitiveness, access to specialist workers, and technology innovation. If there are no mechanisms or plans to deliver on the shared commitment between industries and government to grow investment and adoption of advanced technologies and boost sector productivity, this adds risk to the ability of businesses to access low emissions fuels and emissions reduction technologies that are competitive and secure.

Continued supply chain constraints and increasing global competition for decarbonisation technologies may limit the ability of industry to deliver at pace and scale. Central government leadership and coordination may help to monitor progress in electricity networks supporting electrification (and generation) and development of low emissions fuel supply chains. Greater regional collaboration and information sharing/shared visibility to improve efficiency and optimise outputs from EECA's RETA programme could also help.

New opportunities to reduce emissions

Part of the monitoring role of He Pou a Rangi Climate Change Commission (the Commission), under section 5ZK of the Climate Change Response Act 2002 (the Act), is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

The installation of an electric arc furnace at the Glenbrook steel mill, expected to be in operation by 2027, means greater reductions to industry emissions are achievable in the second emissions budget period (2026–2030) and the third emissions budget period (2031–2035), than was expected under the Commission's 2022 demonstration path.

Box 9.1.2: Other government policies that could affect industry emissions

Industries and the products they produce are fundamental to the economy and support regions and communities through employment and regional development. Several different policy domains could affect industry emissions, such as:

- Building Act 2004 and Building Code (contained in Building Regulations 1992, Schedule 1)
- Crown Minerals Act 1991
- Overseas Investment Act 2005
- Rautaki Hanganga o Aotearoa – New Zealand Infrastructure Strategy 2022–2052 and He Whakakaupapa mō Te Hanganga o Aotearoa | The Infrastructure Action Plan 2023
- trade policies and free trade agreements.

Other policies such as building and construction product standards can influence demand for low emissions materials. Oil and gas (fossil fuel supply) policies will affect industry emissions and transport policies can influence vehicle fleet emissions in industry.

9.2:
Ahuwhare | Buildings

This section focuses on the emissions created when buildings are used. These come from direct fossil fuel use when fossil gas, LPG, or coal is combusted to produce heat for cooking and space and water heating.

Indirect emissions from electricity use are not accounted for within this section, but electricity demand from households and businesses will influence the amount of electricity supply required and the level of investment and services needed to help networks manage demand growth and changing use patterns.

Addressing emissions from buildings can support Aotearoa New Zealand's emissions reduction and adaptation goals, through reducing energy demand, phasing out fossil fuels for operational energy, and increasing building performance. Many actions to reduce emissions can increase resilience through improved energy security and improved building quality, durability and comfort.

KEY POINTS FOR BUILDINGS

Progress to date

- Between 2021 and 2022, greenhouse gas emissions from operational energy use in buildings increased by 4.9% (0.08 $MtCO_2e$) to 1.8 $MtCO_2e$, mainly from liquid fossil fuel use in the commercial sector.
  - Coal use in commercial buildings increased while coal use in residential buildings decreased.[165] There was a net decrease of 9% (0.04 petajoules (PJ)).
  - Fossil gas use in commercial and residential buildings decreased by 4.2% (0.6 PJ) in 2022.
  - However, fossil gas use in residential buildings has been slowly trending upwards since 2011. Residential demand corresponds with a significant growth in connections to the pipeline network and an increase in the number of private dwellings. However, the amount of gas delivered per connection has been relatively flat.[166]
- The Carbon Neutral Government Programme has made progress towards phasing out the largest and most active coal boilers by the end of 2025, with 23 out of 24 projects on track to be completed on time. An additional 151 coal boilers in schools are anticipated to be replaced by June 2025. Chiller replacements and lighting upgrade projects will further contribute to improved energy efficiency.[167,168]
- Between 2021 and 2022, electricity demand[lv] from the residential sector decreased by 1.1% (148 gigawatt hours (GWh)) from 13,559 GWh to 13,412 GWh, while demand from the commercial sector increased by 0.6% (59 GWh) from 9,290 GWh to 9,350 GWh.[169]

lv. Consumption based on actual sales.

Our assessment of policy

Scorecard summary for phasing out fossil fuels for operational energy and reducing energy

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Significant risks	**Moderate risks**

- Overall, we assess that there are **moderate risks** in the current policies and plans to deliver operational emissions reductions from buildings in line with meeting emissions budgets.
- Delayed action on the Building for Climate Change (BFCC) programme's operational (and embodied) emissions workstream could impede progress in reducing emissions and managing growth in energy demand. The programme has not yet expanded to address emissions from existing buildings, and this remains a gap.
- Amendments to the Building Act 2004 intended to be in place by late 2023 did not progress, and we assess that there are significant risks that policies will not be in place in time to achieve outcomes from the second emissions budget period (2026–2030) and beyond.
- Public and business attitudes, workforce planning, and reliable and transparent data are important enablers that were not fully addressed in the first emissions reduction plan.

Areas for attention

- The existing regulatory system does not sufficiently support or require emissions reductions in new or existing buildings. Amendments to the purpose and principles in the Building Act to ensure the building system supports emissions reduction, resilience and adaptation have not been progressed, and updates to the Energy Efficiency (Energy Using Products) Regulations 2002 have been delayed.
- Continued high upfront capital cost and information barriers can impede the uptake of energy-efficient products and practices and the switch from fossil fuels to low emissions fuels, particularly for existing buildings.
- A ready and accessible workforce with the right skills and capabilities, supported through tertiary and vocational education, can support the shift towards low emissions and climate-resilient buildings.

How we monitor building emissions

As well as monitoring how much emissions have reduced to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for building emissions.

In 2022, greenhouse gas emissions from direct fossil fuel use in buildings was 1.8 $MtCO_2e$. This was 2.3% of gross emissions and 4.3% of long-lived greenhouse gas emissions (other than biogenic methane). The benchmark level of emissions reductions in the Commission's 2022 demonstration path sees emissions from buildings decrease to 1.6 $MtCO_2e$ by 2025 and 1.0 $MtCO_2e$ by 2035.

Operational emissions from buildings come from direct fossil fuel use when fossil gas, LPG or coal is combusted to produce heat for cooking, and for space and water heating. Emissions can be reduced by switching away from fossil fuels to electricity which can be sourced from the grid, local distributed energy generation, or rooftop solar photovoltaic (PV) power. Improving building thermal performance and increasing energy efficiency helps to reduce the amount of energy needed when occupying and using the building.

Buildings can also play a role in electricity supply if they have a rooftop solar PV plus battery energy storage system that acts as a distributed flexibility resource. Controllable loads such as hot water heaters in buildings can also help with system flexibility.

The building monitoring map (Figure 9.2.1) below reflects these goals and sets out the pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (Figure 9.2.3) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

*Figure 9.2.1: Buildings monitoring map (see **Box B2.1** for legend)*

Monitoring map for buildings

Building operational energy emissions reduce 44% by 2035 (relative to 2021) in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Phase out fossil fuels for operational energy use
- Percentage of (space and water) heat demand in buildings met by low emissions sources
- Volume of coal use in commercial buildings
- Volume of fossil gas use by consumer segment

Reduce energy demand in buildings
- Total annual energy demand by consumer segment
- Average electricity demand per metered connection
- Average fossil gas demand per metered connection

Increase uptake of electric or renewable heating/cooking
- Number of buildings using fossil gas

Improve thermal performance
- Energy intensity of new buildings
- Energy intensity of existing buildings

Increase energy efficiency and demand-side measures
- Efficiency of lighting and appliances
- Share of consumers on time-of-use or load control tariffs (*see Electricity supply monitoring map*)
- Distributed generation capacity (*see Electricity supply monitoring map*)

ENABLERS

Funding and finance
- Access to capital and low-cost finance
- Number of green mortgage or loan products

Reliable and transparent data
- Share of consumers with smart meters and smart technologies
- Lines companies' visibility of load
- Standardisation of emissions tools and databases

Workforce and skills
- Number of key personnel
- Investment in apprenticeship support
- Availability of training and continued professional development courses

Public and business attitudes
- Public opinion surveys
- Building owner/developer surveys

Other enablers
- Governance and planning
- Digital platforms for energy management
- Energy pricing (*see Electricity supply monitoring map*)

POLICIES

Low emissions fuels
- Price signals (*see Electricity supply monitoring map*)

Workers and skills
- Programmes and funding to support apprenticeships and upskilling

Energy efficiency and demand reduction
- Building Act and Building Code
- Healthy Homes Standards
- Voluntary guidelines and/or regulated smart EV charging
- Performance-based ratings for buildings
- Equipment energy efficiency standards and labels
- Targeted funding and finance mechanisms

Public engagement
- Energy advice and education services
- Campaigns to raise public awareness

Other policies
- Central and local government procurement rules
- Standard protocols for communication and data exchange

CONTEXTUAL FACTORS

Building stock
- Number of new buildings consented
- Number of new buildings constructed
- Average age of building stock
- Share of homes that are always or often too cold in the winter
- Share of homes that are damp or mouldy

Socio-economic
- Energy hardship indicators
- Energy prices (across regions)
- Share of owner-occupied vs tenanted
- Supply of public housing

Trends
- Commercial building occupancy rates
- Growth in new gas network connections
- Average residential building size

Source: Commission analysis

Box 9.2.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

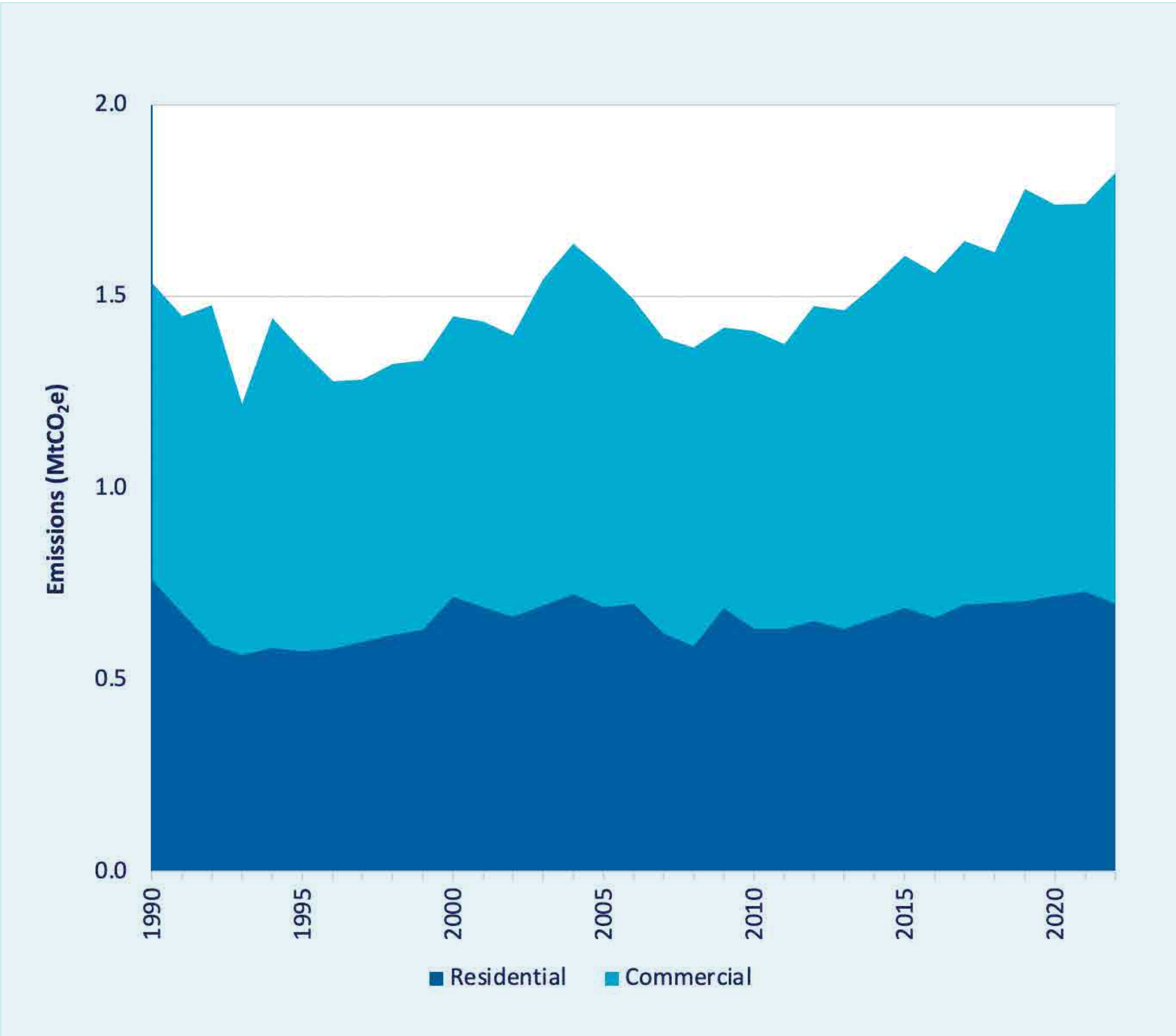
- **Public and business attitudes** towards the impacts of climate change, climate action, energy use, government policies, and the effects of those policies on them, are difficult to track but a key enabler in meeting pathway outcomes. Some data is collected as part of one-off or irregular independent surveys and other data is collected through both one-off and quarterly surveys by EECA.
- **Increase energy efficiency of products.** EECA tracks improvements in the energy efficiency of products through sales and product performance information as part of the Equipment Energy Efficiency (E3) Programme. Data on improvement in the energy efficiency of products and the range of products offered are not reported in a format that is suitable for tracking progress.
- **Rate of buildings switching away from fossil gas.** Data are not reported in a format that is suitable for tracking progress. Existing data may be accounting for all existing connection points and meters even if a consumer has disconnected from gas through their service provider. Data on switching could be aggregated and reported by a central entity, such as the Commerce Commission or the Gas Industry Company.
- **Building stock retrofit rates.** Data are not collected on building retrofits – where the owner undertakes renovations to improve energy efficiency, increase use of renewable energy, improve insulation or similar. Some building projects require a building or resource consent, but others do not. Data from consents are not collected and reported consistently across building consent authorities. A hub for building consent authorities, such as Simpli, could be a centralised way to collect and report such information.[170]
- **Building efficiency and thermal performance improvements.** The NABERSNZ programme collects data from commercial building participants and publishes case studies, but the data are not collated and reported in a format that is suitable for tracking progress. An annual report and database similar to NABERSAUS published by, for example, the New Zealand Green Building Council, could support the development of indicators to monitor progress. There is no centralised collection of data from new or existing residential buildings, but BRANZ has work under way to develop a national housing indicator framework for new builds.

Progress in reducing building operational emissions

Building operational emissions in 2022 increased slightly.

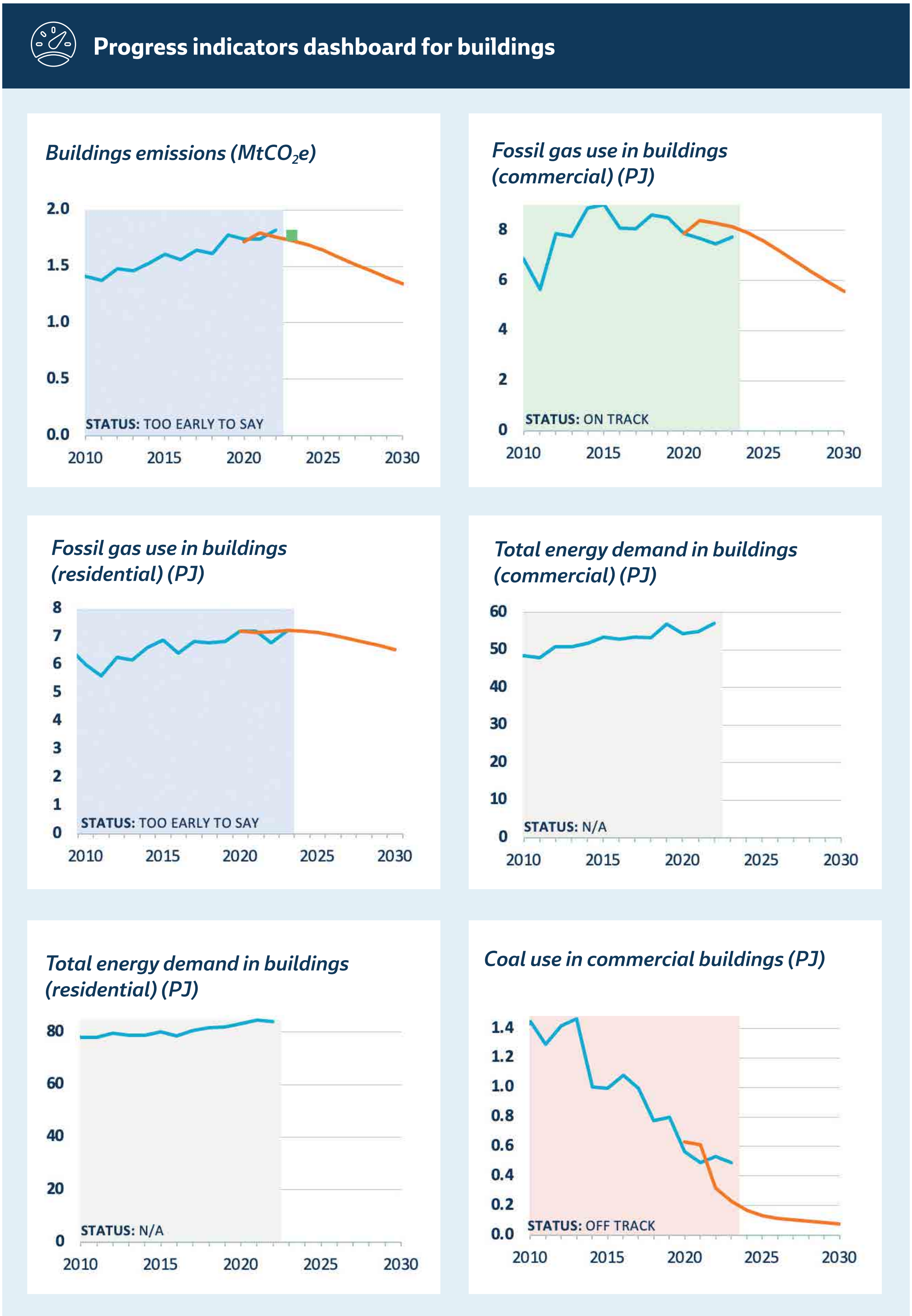
Between 2021 and 2022, greenhouse gas emissions from direct fossil fuel use in buildings increased by 4.9% (0.08 $MtCO_2e$). This was driven by an increase of 0.11 $MtCO_2e$ in the commercial sector (**Figure 9.2.2**), which was offset by a reduction of 0.03 $MtCO_2e$ in the residential sector. Emissions from commercial buildings have risen 45% since 2010.

Figure 9.2.2: Residential and commercial buildings gross emissions from 1990 to 2022



Source: GHG Inventory

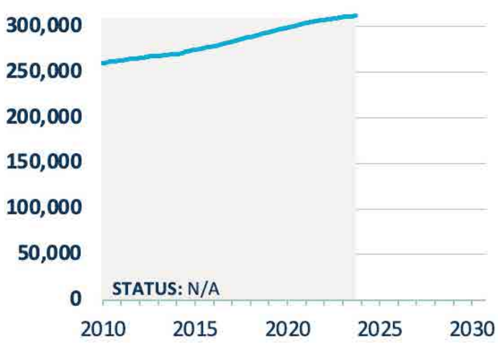
Figure 9.2.3: Progress indicators dashboard for buildings



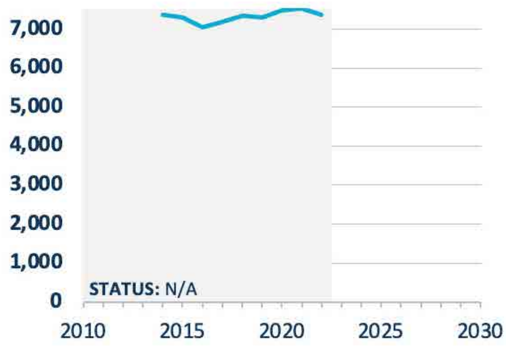
Key on the following page

Progress indicators dashboard for buildings

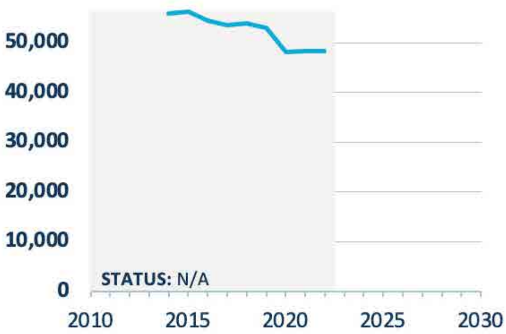
Number of buildings using fossil gas (active ICPs)



Average electricity demand per metered connection (residential) (GWh)



Average electricity demand per metered connection (commercial) (GWh)



KEY

- Historic actual
- Commission’s 2022 demonstration path
- Provisional data

Source: Commission analysis, GHG Inventory, MBIE energy statistics, MfE

Changes in building energy demand are broadly on track compared to the benchmark level in the Commission's 2022 demonstration path

Overall energy demand in the residential sector reduced by 0.8% (0.6 PJ) from 2021 to 2022, largely from a reduction in fossil gas use.[171] However, fossil gas use in the residential sector has been on an upward trend since 2011, corresponding with growth in connections to the pipeline network, an increase in the number of private dwellings, and population growth. The amount of gas delivered per connection has been relatively flat.[172,173]

Residential electricity consumption decreased by 1.1% (148 GWh) in 2022, alongside a reduction in average consumption per connection. Commercial sector consumption increased by 0.6% (59 GWh) against a decrease in consumption per connection in 2022 compared to 2021.[174] When looking at a longer-term trend, electricity consumption is broadly in line with the benchmark level in the Commission's 2022 demonstration path, which sees electricity consumption across residential and commercial buildings increase every year from 2021, due to electrification (Figure 9.2.3).

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by a scorecard for the outcome area in focus (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for buildings focuses on the outcome area to 'Phase out fossil fuels for operational energy use and reduce energy demand'. This is supported by pathway outcomes to:

- increase uptake of electric or renewable heating/cooling and cooking
- improve thermal performance
- increase energy efficiency and demand-side measures.

Industrial buildings are not included in this assessment.

The buildings monitoring map (Figure 9.2.1) illustrates how more specific pathway outcomes, enablers and policies relate to these broader outcome areas.

Policy progress

- From 2022 to 2023, MBIE's BFCC programme released technical methodologies for assessing operational emissions and embodied carbon.
- In November 2023, compliance with updates to Building Code clause H1 'Energy Efficiency' came into full effect.
- In December 2022, the Government announced proposed amendments to the Building Act 2004, introducing requirements for energy performance certificates and waste minimisation plans.[175,176]
- Under Budget 2023, the Warmer Kiwi Homes programme was granted an extension and additional funding to June 2027.
- Released in January 2024, the design requirements from Kāinga Ora (version 1.1) no longer permit fossil gas as an energy source.[177]
- New Zealand Sovereign Green Bonds allocated NZ$1.3 billion to the green buildings' eligible expenditure pool.[178]
- In 2024, the Credit Contracts and Consumer Finance Regulations 2004 were amended to provide full exemption to voluntary targeted rate (VTR) scheme loans administered by local governments.[179] VTR scheme loans aim to provide environmental and social benefits by enabling consumers to install heating and insulation, among other things, in their homes.

How these policies connect to climate change adaptation

The first National Climate Change Risk Assessment (NCCRA) found that climate change poses risks to buildings and the broader built environment due to extreme weather events, drought, increased fire weather, and ongoing sea level rise and other associated natural hazards. This was identified as one of its ten most significant climate change risks, based on urgency.[180] There is also a risk to cultural assets on Māori land, communities, and cultural buildings such as marae.

The Government committed to ensuring system settings mitigate the risk of trade-offs between emissions reduction and building adaptation or resilience. While the first emissions reduction plan acknowledged that what, how and where we build impacts emissions reductions and adaptation, there is no explicit inclusion of climate resilience and adaptation in the Government's plans and policies for the building and construction sector.

MBIE's BFCC programme included an adaptation component to "focus on how buildings are designed and constructed to withstand, or be less vulnerable to, the effects of climate hazards".[181] This workstream includes an action to publish adaptation resources in 2023. Some resources have been made available, such as guidance on natural hazard provisions in the Building Act 2004, which came out in October 2023. It is unclear whether this component of the programme will continue to be progressed.

There are several actions under the national adaptation plan related to buildings, such as Action 7.4: Update regulatory requirements to ensure buildings are designed and constructed to withstand more extreme climate hazards; Action 7.6: Manage potential impacts of adaptation related to regulatory change; and Action 5.7 Reduce and manage the impacts of climate hazards on homes and buildings.

Policy scorecard: Phase out fossil fuels for operational energy and reduce energy demand

This outcome area covers pathway outcomes to:

- increase uptake of electric or renewable heating/cooling and cooking
- improve thermal performance
- increase energy efficiency and demand-side measures.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Significant risks	**Moderate risks**

Rationale for our scores

Main tools **Moderate risks**	The main policy tools for new buildings are the Building Act 2004 and the Building Code. For existing buildings, additional main tools include capital grants administered through the now-discontinued GIDI Fund, the State Sector Decarbonisation Fund, and the Warmer Kiwi Homes programme. However, main policies do not explicitly have the phase-out of fossil fuels as a core objective[lvi] and have a more general purpose of promoting sustainable development. Planned policies and regulation (such as under the BFCC programme) could act as highly effective tools for phasing out fossil fuel use in new buildings. The BFCC programme has not yet been expanded to address emissions in existing buildings, and this remains a critical gap. Action 12.5.5: Establishing an enabling legislative framework was intended to clarify that actions to address climate change and reduce emissions falls within the scope of the Building Act 2004. Amendments to that Act to enable the making of regulations related to emissions caps and enable collection of necessary information to support climate change goals have not progressed beyond Cabinet committee, and a Bill has not yet been introduced to Parliament.[lvii] Overall, we assess there is some risk that current tools are insufficient in addressing important barriers such as upfront capital cost, and that planned tools may not be implemented. If planned tools are implemented as was proposed in 2020, there is still a risk that they cannot deliver on the level of ambition under the Government's vision that all building-related emissions are near zero by 2050, because there are no proposed settings for existing buildings.

lvi. The purpose of the Building Act 2004 is to regulate building work to ensure safety of the people who use buildings and to promote the accountability of parties to ensure that building work complies with the Building Code.

lvii. As of 10 May 2024.

Funding and finance **Moderate risks**	For existing buildings, plans rely on public funding from the CERF,[lviii] State Sector Decarbonisation Fund, EECA levy, and general appropriations to mobilise private funding. For new buildings, plans rely on private funding, whereby developers make the initial investment with costs passed onto the buyer(s) or subsequent occupants. However, in new buildings the capital cost of a low emissions option is not necessarily additional to that of a fossil fuel equivalent. We assess that there are moderate risks in the durability and scope of funding and financing to deliver on the outcome areas, as the CERF has been disestablished.
Other barriers and enablers **Moderate risks**	Important barriers and enablers in this area include workforce and skills, investment and finance, and public and business attitudes. The first emissions reduction plan and subsequent government announcements have acknowledged these barriers and enablers, but progress towards addressing them is unclear. Changes in government direction around ITPs, tertiary and vocational education, workforce development, and fostering innovation may affect the ability to deliver long-lasting change in the sector. We assess this poses moderate risks because shifting expectations around, growing the market for, and delivering low emissions buildings are strongly influenced by building designers, developers, and construction companies, as well as by consumer choice. Public and business attitudes alongside barriers such as imperfect information, split incentives (where the person or entity who could make a change is different from the beneficiary of that change) and conflicts in priorities between a building owner and its operator remain unaddressed. These non-financial barriers can impede decision-making towards low emissions choices. While renewable energy is increasingly available, access is not always equitable or equal, particularly in the regions. Rural or remote communities may have limited access to reliable and affordable electricity service, or the capital cost of rooftop solar PV may be too high.

lviii. CERF funding administered through the GIDI Fund and the Warmer Kiwi Homes programme.

Timeline	Many of the policies and actions under the first emissions reduction plan seek to establish foundations for future emissions reduction; progress on most of these actions is unclear or delayed. This includes: • development of the gas transition plan • development of the equitable transitions strategy • assessing the equity impacts of shifting away from fossil gas use • identifying potential regulatory levers to address barriers to fuel switching • updating the New Zealand Energy Efficiency and Conservation Strategy • updating the Energy Efficiency (Energy Using Products) Regulations 2002 • implementing the BFCC work programme. Because many of the actions under the first emissions reduction plan are exploratory, no clear timeframes or key policy development milestones have been set out. This increases the risk that policies will not be in place in time to achieve outcomes from the second emissions budget period (2026–2030) and beyond. Amendments to the Building Act 2004 intended to be in place by late 2023 did not progress, and high-level BFCC programme milestones have not been met.
Significant risks	

Overall assessment	
Moderate risks	Main tools do not demonstrate significant risks, but lack of action on the BFCC programme's operational (and embodied) emissions workstream could impede progress. Delays mean there is moderate risk to achieving emissions reductions in this outcome area in future emissions budget periods. There are additional risks that public and business attitudes and workforce capability are not adequately addressed, which could limit compliance with any regulatory changes or demand for low emissions options.

Areas for attention

Establishing an enabling legislative framework

If the regulatory system cannot sufficiently consider the need for emissions reduction and adaptation, there is moderate risk that greenhouse gas emissions from buildings will not deliver against the benchmark outcomes in the Commission's 2022 demonstration path. It also means that the regulatory system may not adequately address the risks associated with climate change impacts on buildings and their occupants.

Amendments to the Building Act 2004 have not progressed since Cabinet agreed in 2022 to update the purpose and principles in that Act to ensure the building system supports emissions reduction, resilience and adaptation. This includes amendments to enable making of regulations related to emissions caps and enable collection of necessary information to support climate change goals.[182] There are no specific legislative or regulatory requirements to phase down fossil fuel combustion emissions or to phase out use of fossil fuels for operational energy by 2050.

Fossil gas space heating remains an acceptable heating solution under the Healthy Homes Standard, which could see the installation of new fossil gas appliances for many years.

Delays in delivering the Building for Climate Change programme and updating energy efficiency regulations and strategies

Continued delays in delivering the BFCC programme, updating the New Zealand Energy Efficiency and Conservation Strategy (NZEECS), and amending the Energy Efficiency (Energy Using Products) Regulations 2002 leave a gap in setting targets and a trajectory that could drive progress in the sector.

The BFCC programme consulted on operational emissions caps for new buildings in 2020[lix] and has not yet expanded the programme to include existing buildings. Lack of progress on regulatory reform leaves a gap in the system where action could be pursued from both a mitigation and adaptation perspective.

Work was under way in 2021 to amend the Energy Efficiency (Energy Using Products) Regulations 2002 to enhance the energy efficiency regulatory system for products and services.[183] The Regulations have not been reviewed since their introduction in 2002. Regulatory review presents an opportunity to cover additional products and services to achieve larger efficiency gains, and enable greater regulation and standardisation of demand-side response equipment.

Broader energy efficiency targets can also be set through the NZEECS, which was due to be replaced by 2022 but its update has been put on hold pending ministerial decisions.[184] Development of a national energy strategy and an update of the NZEECS to refresh targets and establish secondary indicators would provide evidence to monitor progress against energy-efficiency improvements.

lix. MBIE also consulted on embodied carbon in new buildings.

Capital cost and information barriers remain unaddressed

Addressing capital cost and information barriers can accelerate the uptake of energy-efficient products and practices, and drive the switch away from fossil fuels as an energy source.

Disestablishment of the GIDI: Commercial Buildings and GIDI: Clean Tech funding streams removes a key lever for addressing barriers to action. This leaves a gap in the tools that businesses can access to assist with transition planning and investment in emissions reduction technologies.

Additionally, there are some groups where changes in price do not change their demand for a product, fuel or service. This can be driven by a number of reasons. For example, some households and small businesses may not have the upfront capital to invest, may not have the time and know-how to access support and advice, or may have other pressing concerns. Others may not have the same kind of access to low emissions alternatives as other groups, particularly if they live in remote or rural areas where alternatives to bottled LPG is limited or electricity infrastructure is under pressure. Without measures to help these groups to transition, they may be burdened with a disproportionate share of impacts.

If demand-side policies to manage the pace and scale of fuel switching are not in place, this increases the risk of thousands of new and existing buildings relying on a finite supply of fossil fuels with rising costs. It also increases the risk of uneven impacts in the transition. Demand-side policies that accelerate deployment of distributed flexibility resources can help manage the electricity system's emissions and overall system costs, which could help manage consumer energy bills.

Workforce, skills and capabilities

A ready and accessible workforce with the right skills and capabilities, supported through tertiary and vocational education, can assist the shift towards low emissions and climate-resilient buildings.

Te Waihanga Infrastructure Commission notes that Aotearoa New Zealand's ability to deliver more infrastructure or to maintain existing infrastructure is limited by the current size, composition and regional location of the workforce. Forecasts show that Aotearoa New Zealand will have a shortfall of approximately 118,500 construction workers in 2024 alone.[185]

A 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.[186]

The Government has committed to issue stop-work orders on industry transformation plans (ITPs), reverse the Te Pūkenga national polytechnic merger, and stop funding workforce development councils (WDCs) and regional skills leadership groups (RSLGs).[187] The Centre of Vocational Excellence for construction and infrastructure will continue until the completion of its existing contracts in June 2025.[188]

The Construction Sector Accord's Transformation Plan 2022–2025 has been closed, and the form of the Accord is under review.[189] This potentially leaves a gap in ensuring the country has a ready and accessible workforce to undertake mitigation and adaptation actions across energy, industry, and the built environment. An alternative mechanism could be put in place to deliver on the shared commitment and partnership between the building and construction industry and government to transform the sector by tackling systemic challenges and building resilience.

Box 9.2.2: Other government policies that could affect building emissions

Buildings are complex systems at the intersection of other complex systems like energy, transport, land use, and industry. Other government policies that could affect building operational (and embodied) emissions include:

- Electricity Industry Participation Code
- Commerce Act 1986
- Government procurement rules
- Medium Density Residential Standards
- National Policy Statement on Highly Productive Land
- National Policy Statement on Urban Development
- Rautaki Hanganga o Aotearoa New Zealand Infrastructure Strategy 2022–2052 and He Whakakaupapa mō Te Hanganga o Aotearoa | The Infrastructure Action Plan 2023.

9.3:
Te tuku hiko | Electricity supply

This section looks at the greenhouse gas emissions created when electricity is generated, and how the electricity sector can support emissions reduction in other parts of the economy, through the shift from fossil fuels to electricity as an energy source (electrification).

This sector has a critical role in the transition to a low emissions economy, including by:

- reducing greenhouse gas emissions from electricity generation (this includes emissions from coal, diesel and fossil gas being burnt in power stations, and from gases released to the atmosphere in geothermal generation)
- increasing electricity generation from renewable sources to support a shift away from fossil fuels across the economy
- evolving towards an efficient, resilient and flexible system where networks reliably deliver electricity when and where it is needed, at affordable cost.

A key challenge for the sector is ensuring adequate energy and capacity[lx] to provide reliable and affordable supply during peak demand periods and dry years (when lower rainfall limits hydroelectricity generation). This will be essential for the electrification of transport, industry, and buildings. The suite of solutions that can address this challenge includes: progress on enabling greater capacity in the system to make it easier for electricity consumers to change use patterns (demand-side flexibility), electricity generation that can turn on as needed (dispatchable generation), and energy storage.

Electricity supply is part of the broader energy system, and this sector's dynamics are closely interlinked with the gas sector and energy end users. Choices made in one part of the system can impact what happens in another part, which will influence the energy system transformation as a whole.

lx. Security of electricity supply considers two areas: 'energy', which refers to the availability of generation and transmission capacity to meet *expected national demand over a longer period of time*; and 'capacity', which refers to the availability of generation and transmission capacity to meet *peak electricity demand at any point in time.*

KEY POINTS FOR ELECTRICITY SUPPLY

Progress to date

- Between 2021 and 2022, electricity generation increased by 0.5% (0.2 terawatt hours (TWh)) from 43.3 TWh to 43.5 TWh, while emissions from electricity generation reduced by 35% (1.7 $MtCO_2e$) from 4.9 $MtCO_2e$ to 3.2 $MtCO_2e$.[190]
  - Emissions from coal-based generation reduced by 69% (1.6 $MtCO_2e$) and from fossil gas generation by 2.9% (0.06 $MtCO_2e$).
  - Emissions from geothermal generation reduced by 2.5% (0.01 $MtCO_2e$).
- Between 2021 and 2022, the quantity of electricity consumed[lxi] reduced by 1.2% (0.5 TWh) from 39.9 TWh to 39.4 TWh, led by a reduction in demand from industry and agriculture, forestry, and fishing.[191]
- Provisional data from Stats NZ for 2023 show a further reduction in gross emissions of 5.5% from 3.2 $MtCO_2e$ to 3.0 $MtCO_2e$, alongside a lift in the amount of electricity consumed.
- Favourable conditions for hydroelectricity generation are a key factor in the emissions reductions we have seen.
  - Above-average rainfall in 2022 boosted hydroelectricity generation, which accounted for most of the overall increase in generation from renewable energy sources.
- A stronger indication of how we are tracking comes from increases in the amount of electricity that can be generated from renewable sources, in newly built or expanded facilities.
  - The electricity generation from new plants using geothermal, wind and solar grew by 1.5 TWh in 2022 (based on expected average annual production); this suggests the build over 2022 and 2023 will likely meet or exceed the Commission's 2022 demonstration path, which we are using as a benchmark for this report.
  - A further 5 TWh of generation projects using renewable sources are committed and expected to be in operation by 2027.[192]
- As new generation from renewable sources comes online, fossil fuel power plants may retire. For example, Contact Energy's 377 megawatt (MW) Taranaki Combined Cycle fossil gas plant is expected to close in 2024 once the company's geothermal power station at Tauhara is fully commissioned. Contact Energy's 44 MW Te Rapa co-generation plant closed in 2023.
- An indication of increased system flexibility can be estimated from the number of resources in the system that have flexibility built in. These flexible resources can be grid-connected, on the distribution network, or within consumer premises (flexible resources that are not grid-connected are sometimes referred to as distributed flexibility resources (DFR)[lxii]). For example:
  - WEL Networks launched the country's first grid-connected battery energy storage system (35 MWh) in 2023.
  - New Zealand Aluminium Smelter (NZAS) and Meridian Energy's demand response agreement for 2023 and 2024

lxi. Consumption based on actual sales. The volume of electricity generated and consumed do not perfectly match due to lines losses.

lxii. Distributed flexibility resources (DFR) are controllable energy resources, located in the electricity distribution network or within consumer premises. This includes battery energy storage systems, electric vehicles, solar photovoltaics, and other demand response technologies. DFR provides energy services to its owner/operator and to the energy system. Electricity lines companies can use DFR as non-network solutions – an alternative to investing in greater physical distribution network capacity.

reduces NZAS's consumption by up to 50 MW when requested by Meridian. An additional 20 MW can be called upon in 2024 under a separate agreement.[lxiii,193]
- New Zealand Steel and Contact Energy have a 30 MW, 10-year hedge contract.
- The total installed distributed solar generation capacity (with or without battery) increased 93% (178 MW) to 370 MW between December 2021 and December 2023.[194]

- Changes in emissions from electricity generation observed to date are broadly on track with the benchmark set by the Commission's 2022 demonstration path, while measured emissions were lower than the benchmark, due to above-average hydroelectricity generation.

Our assessment of policy

Scorecard summary for reducing electricity generation emissions

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	No significant risks	Moderate risks	EB1 – No significant risks EB2+ – Moderate risks	**No significant risks**

Scorecard summary for building flexible networks

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

lxiii. At time of writing, NZAS's new 20-year electricity arrangements had not yet been announced.

- Overall, we assess that current policies and plans present **no significant risks** to deliver emissions reductions from electricity generation and to increase electricity supply from renewable sources in line with emissions budgets.
- The market conditions are currently favourable for investment in generation from renewable sources. Government work to make sure the wholesale electricity market functions well and is competitive can facilitate continued investment in cost-competitive generation from renewable sources and solutions outside the physical grid (non-network solutions).
- However, we assess there are **moderate risks** that current regulatory settings may not be able to provide sufficient incentives or permit the level of investment and innovation needed in transmission and distribution networks. This investment and innovation could facilitate increased electricity generation, electrification of wider energy uses, and greater system flexibility.
- Timely delivery of planned policies can support continued progress beyond the first emissions budget period (2022–2025). This will influence how quickly the sector can act to build new generation from renewable sources, reinforce electricity network infrastructure, and deploy new technologies to support system security, reliability and resilience while maintaining or improving affordability in future emissions budget periods.
- Across the sector, there are also some challenges in supply chain constraints, workforce planning and access to labour, resource consent processes, the acceptance of change and construction by communities (social licence), and the management of development impacts to meet the pace and scale of build required in future emissions budget periods.

Areas for attention

- Legislative changes could reduce the time and costs associated with consenting and reconsenting but may not result in durable changes to the resource management system, particularly if the promotion of sustainable management of natural and physical resources is not upheld as a purpose of the legislation. Combined with the potential impact on social acceptance of the actions needed to reduce greenhouse gas emissions, this presents risks around meeting the scale and pace of energy development and other significant infrastructure build required over time for the transition to a low emissions economy.
- If there is not enough electricity generation that can turn on as needed (dispatchable generation), and not enough energy storage, this may create a risk for security and affordability of electricity supply. Additionally, markets that can incentivise demand and supply response to peaks and shortages, and therefore help manage overall system costs, are not fully developed. If these issues are not addressed they could reduce competition in the electricity generation market, increase the cost of electricity, and slow the pace of electrification of the wider economy.

- Regulatory and market measures that encourage uptake of smart technologies, distributed flexibility resources, and demand-side management (for example a contract to reduce electricity usage during times of peak demand in exchange for a lower price) have diverse benefits. For example, reducing overall system costs, offsetting the need for network investment, balancing supply from variable renewable sources (such as wind and solar), and reducing the need for higher-cost dispatchable generation.
- A ready and available workforce and strong supply chain underpin delivery of new generation from renewable sources and strengthened electricity networks. Addressing critical skills shortages, access to labour, and access to emissions reduction technologies can shore up Aotearoa New Zealand's ability to meet climate change targets.
- Issues around the NZ ETS may undermine incentives and investor confidence (see *Chapter 6: New Zealand Emissions Trading Scheme*).

New opportunities to reduce emissions[lxiv]

- Carbon capture and reinjection can be deployed at existing and new geothermal power stations to reduce fugitive emissions. Fugitive greenhouse gas emissions from geothermal power plants come from the gases dissolved in the geothermal fluid that are released during electricity generation.
- New renewable electricity generation options, including offshore wind and supercritical geothermal, and greater storage and demand response, could reduce the cost of reducing electricity emissions and enable faster electrification of the wider economy.

lxiv. Section 5ZK of the Act directs the Commission to consider new opportunities to reduce emissions as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path or show potential for greater reductions than previously assumed, based on new evidence.

How we monitor electricity supply emissions

As well as monitoring how much emissions have reduced, to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for the electricity supply sector.

In 2022, greenhouse gas emissions from electricity generation were 3.2 $MtCO_2e$. This was 4.1% of the country's gross emissions and 7.9% of long-lived greenhouse gas emissions (other than biogenic methane). The benchmark level of emissions reductions in the Commission's 2022 demonstration path sees emissions from electricity generation decrease to 2.4 $MtCO_2e$ by 2025 and 2.1 $MtCO_2e$ by 2035.

Emissions from electricity generation come from coal, diesel and fossil gas being burnt in power stations, and from gases dissolved in geothermal fluid that are released to the atmosphere during geothermal power generation. Emissions can be reduced by increasing the supply of renewable generation and storage to displace fossil fuel generation, and through carbon capture and reinjection at geothermal power stations.

The electricity system will play a critical role in decarbonising the wider energy system as energy users in the transport, industry, and buildings sectors switch from direct use of fossil fuels to electricity. The electricity system will need to expand at the same time as emissions from generation reduce.

In the context of a growing share of electricity generation from intermittent resources (that vary in availability, such as wind and sun) and increasing cost of fossil fuel generation, clear price signals are key to incentivising efficient energy use and investment to reduce emissions and increase system flexibility. Other enablers include a fit-for-purpose regulatory framework, a skilled and accessible workforce, strong supply chains, robust data to support decision-making, and whole-of-system coordination as the electricity system is one component of a wider energy system.

The electricity supply monitoring map (Figure 9.3.1) reflects these goals and sets out the pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (Figure 9.3.3) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

*Figure 9.3.1: Electricity supply monitoring map (see **Box B2.1** for legend)*

Monitoring map for electricity supply

Electricity generation emissions reduce 60% by 2035 (relative to 2021)
Renewable sources make up 50% of total final energy use by 2035
in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce electricity generation emissions
- Annual electricity generation emissions
- Emissions intensity of electricity generation
- Percentage of generation from renewable sources

Build flexible networks
- Renewable sources as proportion of total final energy consumption
- Efficient electricity use (*Refer to Transport, Buildings, Industry maps for electrification measures*)

Increase electricity supply from renewable sources
- Total renewable generation capacity
- Planned capacity
- Dispatchable low-carbon generation capacity
- Energy storage capacity

Phase out electricity generation from fossil fuels
- Electricity generation from:
  - coal
  - fossil gas
  - diesel (oil)
  - cogeneration

Reduce fugitive emissions from geothermal generation
- Geothermal generation emissions intensity

Networks support generation and electrification
- Network reliability

Efficient and flexible system
- Growth in peak and energy demand
- Distributed generation or storage capacity

ENABLERS

Consenting and infrastructure
- New generation build
- Network upgrades
- Social licence
- Consenting timeframes

Security, reliability and resilience
- Energy and capacity margins met in short and medium term
- Availability of operational data
- Visibility of large distributed energy resources on low voltage networks

Fair and efficient pricing
- Competitive market
- Average wholesale electricity price
- Standardised and efficient connection pricing
- Cost of new supply relative to forward contract prices
- Availability of cost-reflective tariffs

Enabling flexibility
- Smart meter functionality
- Flexible tariffs
- Number of metered connections or total capacity contributing to non-network solutions

Workforce and skills
- Number of key personnel
- Investment in apprenticeship and training

Other enablers
- Reliable and transparent data
- Coordination across energy system

Investment and financing
- Total sector investment
- Spend on system growth

POLICIES

Reducing fossil fuel use/ increasing use of renewables
- Resource Management Act and national policy direction
- Transmission pricing
- Risk management tools
- Competition measures
- Real-time pricing and dispatch notification products

Electricity market rules and regulations
- Electricity Industry Participation Code
- Price-quality regulation and information disclosures
- Market rules that enable innovation and efficiency

Distributed flexibility
- Distribution pricing reform
- Equipment regulatory system
- Standard protocols for communication and data exchange

Cross cutting
- Emissions pricing (NZ ETS)

CONTEXTUAL FACTORS

Supply chain
- Transport/freight costs
- Supply chain bottlenecks

Global competition and trends
- Price of critical minerals and materials
- Technology costs and learning rates
- International trade and competitiveness
- Overseas innovation and RD&D investment
- Competition for skills and equipment
- High interest rates

Iwi/Māori role and interests
- Kaitiaki of renewable resources
- Developers of renewable generation
- Energy users – interests in affordability and energy hardship, development of community energy solutions

Source: Commission analysis

Box 9.3.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

In the first emissions reduction plan, the Government committed to developing secondary indicators for the energy system to measure progress across energy and industry and to ensure the energy system remains affordable, secure and reliable as we transition (Action 11.5.1). In addition to these secondary indicators, regular and sufficiently detailed data for the following areas would be beneficial.

- **Planned renewable capacity and build rate**. The data that are currently collected are not comprehensive. The Electricity Authority's Generation Investment Survey and Transpower's Connection Enquiry Dashboard provide short-term data, but it may be a few years before a more robust data set is available or is in a format that can be readily analysed. The Electricity Authority has also signalled intent to develop a dashboard to provide ongoing increased visibility of generation investment.
- **Capacity (MW) of demand flexibility.** The Commerce Commission indicated that its information disclosure requirements could require electricity distribution businesses to report on demand flexibility in the future. However, this may not be in a format that can be readily analysed. The Electricity Authority's demand-side flexibility survey may provide data in the future if it continues. New metrics could be developed to show what proportion of demand can be shifted or turned off when needed.
- **Dispatchable low-carbon generation capacity and build rate**. Some information about capacity and building of dispatchable generation (that can be turned on as needed) is available for grid-connected resources, but information is not required to be divulged or collected. Data are currently too sparse and inconsistently collected to provide meaningful insights for monitoring purposes.
- **Grid storage capacity and build rate.** There is some information about capacity and building of grid-connected energy storage collected by Transpower and the Electricity Authority, but this information is not required to be divulged or collected. Sparse and inconsistently collected data cannot provide meaningful insights for monitoring purposes.

Progress in reducing electricity supply emissions

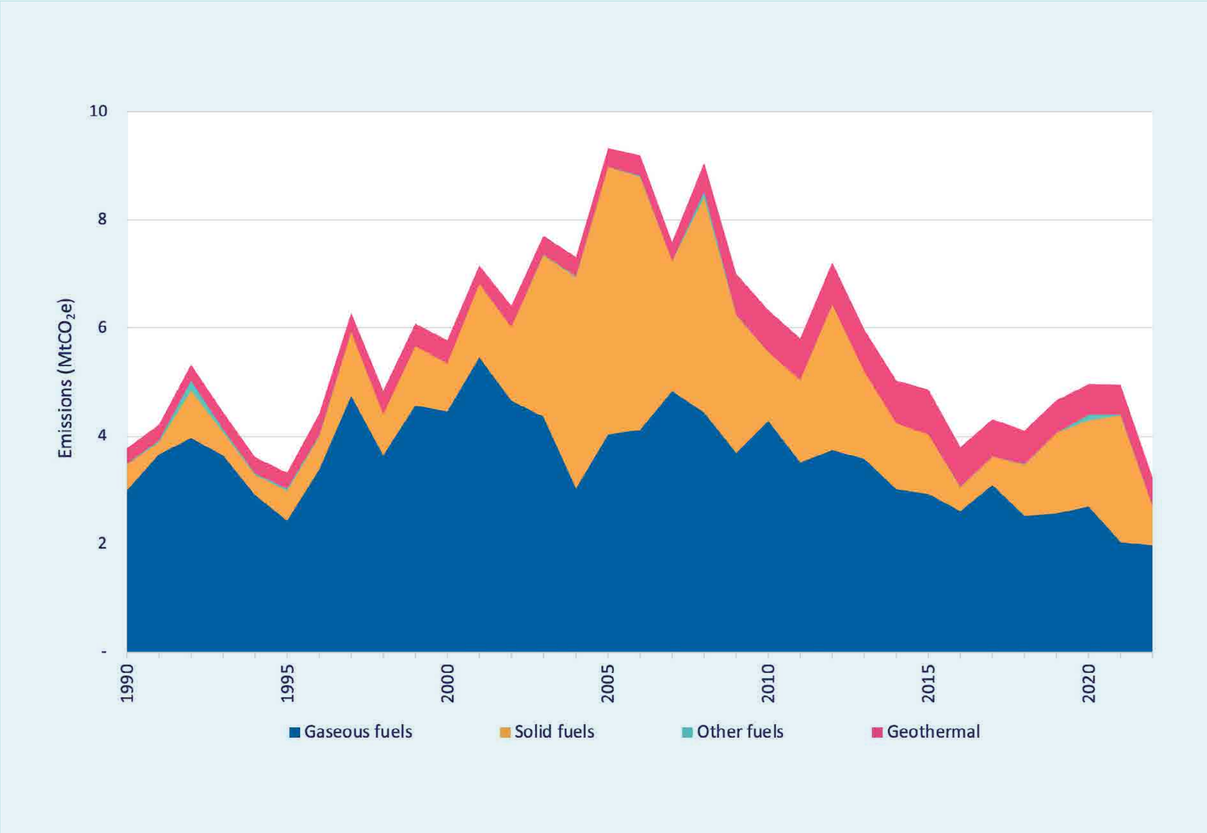
Electricity supply gross emissions reduced in 2022, reaching the lowest level since 1995

Between 2021 and 2022, greenhouse gas emissions from electricity generation reduced by 35% (1.7 $MtCO_2e$), from 4.9 $MtCO_2e$ to 3.2 $MtCO_2e$. Higher levels of renewable generation led to emissions from coal falling by 69% (1.6 $MtCO_2e$) and from fossil gas generation by 2.9% (0.06 $MtCO_2e$).

Emissions from geothermal generation also reduced by 2.5% (0.01 $MtCO_2e$) due to increased carbon capture and reinjection.

Emissions from electricity generation have largely been trending downwards since peaking in 2005 at 9.3 $MtCO_2e$ (see Figure 9.3.2). This is largely attributed to a reduction in fossil fuel generation and increase in renewable generation build, mainly wind and geothermal.

Figure 9.3.2: Electricity supply emissions by fuel type from 1990 to 2022



Source: GHG Inventory

Favourable conditions have resulted in above-average hydroelectricity generation

Above-average hydroelectricity generation was a key driver of the reduction in coal and fossil gas generation and related emissions in 2022 and 2023. In 2022, Aotearoa New Zealand also experienced its warmest year on record and its eighth-wettest year on record.[195]

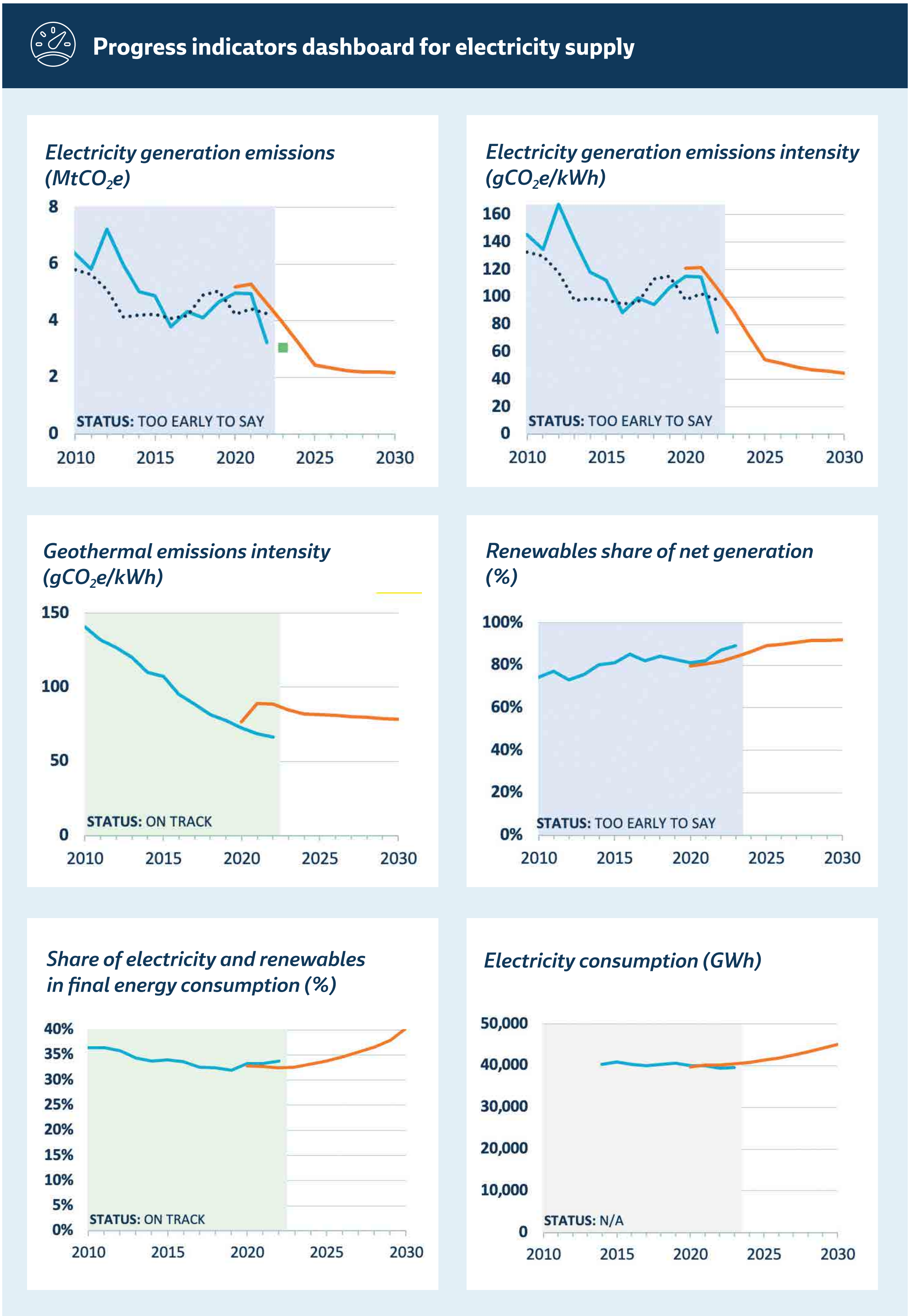
After low hydro inflows in 2021, above-average rainfall into hydro lakes in 2022 saw hydroelectricity generation increase from 24 TWh to 26 TWh. Hydroelectricity generation accounted for 2.0 TWh of the overall 2.3 TWh increase in renewable generation from 2021 to 2022. Generation from coal reduced by 1.8 TWh. Hydro inflows or rainfall and snowmelt into hydro lakes will vary from year to year and are influenced by global climate patterns such as El Niño and La Niña.

Hydroelectricity generation stayed high in 2023, growing further to 26.2 TWh.

Electricity supply emissions reduced further in 2023 based on provisional data

Provisional estimates from Stats NZ show that in 2023 emissions from electricity generation reduced to 3.0 $MtCO_2e$, a reduction of 5.5% (0.2 $MtCO_2e$) from 2022. This was supported through new generation from renewable sources coming online, a continuation of favourable hydroelectricity generation conditions in the first half of 2023, and continued adoption of carbon capture and reinjection at geothermal power stations.

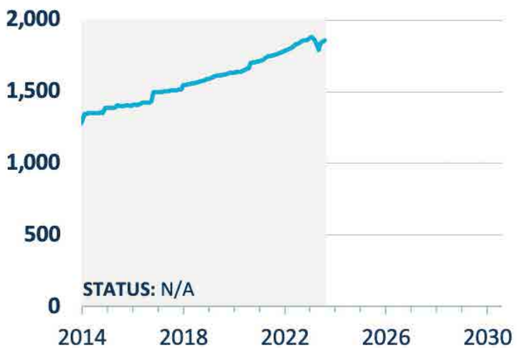
Figure 9.3.3: Progress indicators dashboard for electricity supply



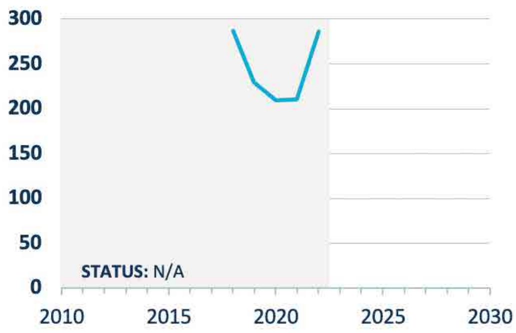
Key on the following page

Progress indicators dashboard for electricity supply

Installed distributed generation (Total capacity, MW)

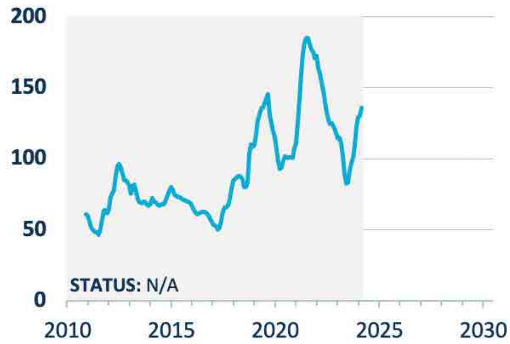


Network average outage duration index (SAIDI) (minutes)



Network average outage frequency index (SAIFI) (number of outages)

12 month rolling average wholesale electricity price ($/MWh)



KEY

- Historic actual
- Commission's 2022 demonstration path
- Average weather year adjusted
- Provisional data

Source: Commission analysis, Stats NZ, GHG Inventory, MBIE energy statistics, Electricity Authority

Electricity demand reduced in 2022 but is expected to grow over time

In 2022, the quantity of electricity consumed reduced by 1.2% (493 GWh) to 39,430 GWh, led by a reduction in demand from agriculture, forestry, fishing, petrochemical production, and the wood, pulp and paper manufacturing sectors. Notably, Norske Skog's Tasman Mill operation in Kawerau closed in mid-2021. While demand from transport had the largest year-on-year increase of 45.8% (60.7 GWh) it did not offset the reduction in demand from other sectors.[196] There was also a significant reduction of 148 GWh in demand in the residential sector.

Despite this single-year drop, overall demand is expected to grow as a result of economic growth and the electrification of transport, industry and buildings. Available electricity generation capacity to meet the highest point of electricity demand on any given day (peak demand) has been increasingly limited since 2021, with the second-highest peak on record in August 2023.[197] Total electricity demand varies year to year but has not changed significantly over the last three years, while peak electricity demand has been increasing. Figure 9.3.4 shows total demand each year along with the 20 highest peaks observed in the year. It shows not only that peak demand is increasing, but that these peaks are not one-off events.

Figure 9.3.4: Peak and total electricity demand

Source: Electricity Authority, Electricity Market Information website

Managing growth in demand through solutions outside the physical grid (non-network solutions), shifting or reducing electricity use (demand-side management), energy efficiency, and optimisation of existing assets can help to reduce the amount of new electricity infrastructure required for generation, transmission and distribution.

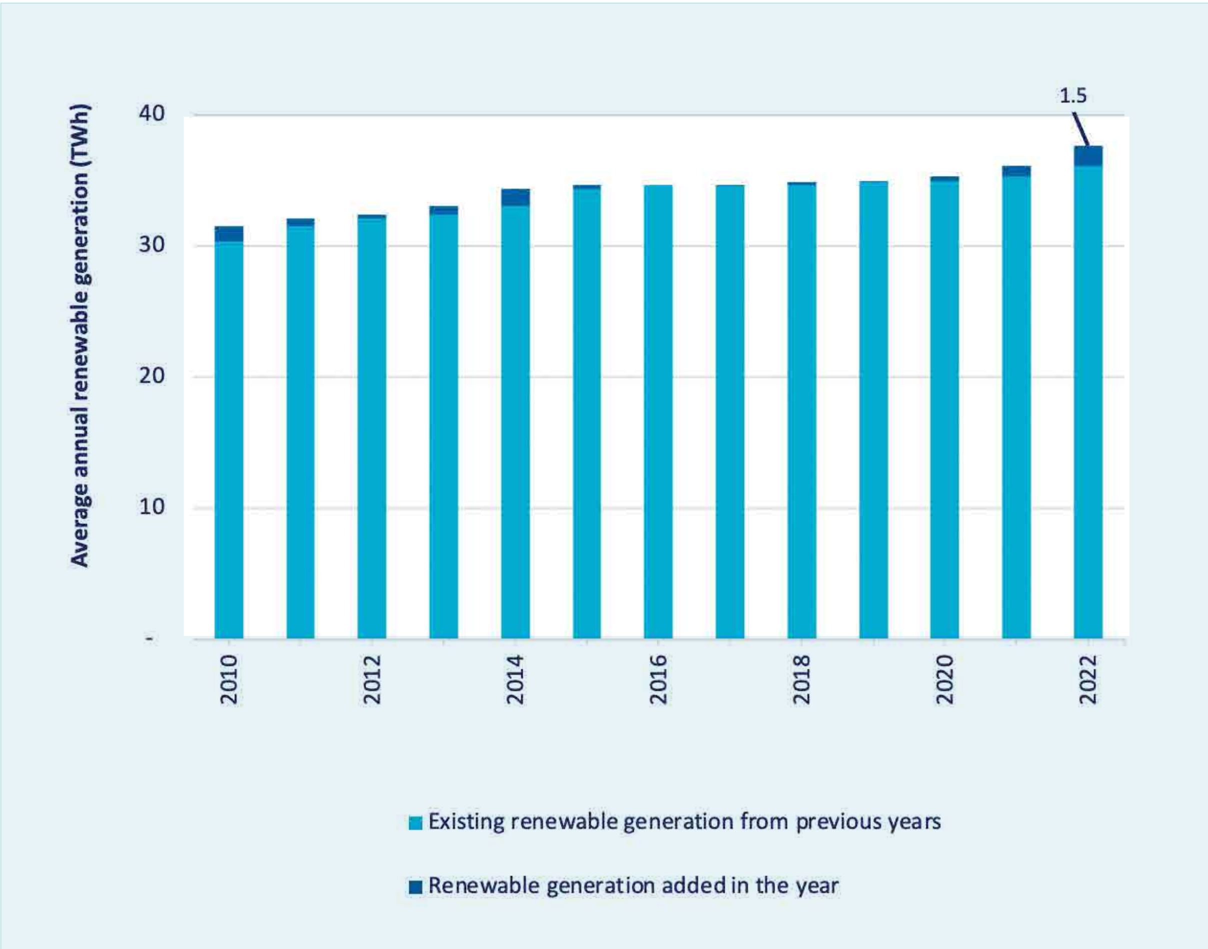
The amount of new supply from renewable sources is a better signal of durable changes

Adding new electricity supply from renewable sources will displace coal and fossil gas generation in a sustained way. This means 'built capacity' (the maximum generating output) of electricity generation from renewable sources is a key progress indicator for achieving emissions budgets. Built capacity of geothermal, wind and solar grew in 2022 and 2023. A record amount of electricity was generated from wind and geothermal in 2022 (10.9 TWh or 25% of total generation).[198]

Overall, the additional capacity built in 2022 increased the expected annual average generation from renewable sources by 1.5 TWh.

The benchmark outcome in the Commission's 2022 demonstration path indicates additional annual generation from renewable sources of 1.7 TWh from 2021 will be required by 2023. According to MBIE electricity statistics, in 2022 alone, an additional 1.5 TWh of renewable generation became available. This suggests that build over 2022 and 2023 will likely meet or exceed the benchmark level of additional renewable generation capacity for the first emissions budget period (2022–2025) under the Commission's 2022 demonstration path (**Figure 9.3.5**).[199] Data on the capacity of generation from renewable sources added in 2023 are not yet available.

Figure 9.3.5: Average annual renewable electricity generation



Source: Commission analysis, MBIE electricity statistics

Looking forward, the Electricity Authority's 2023 Generation Investment Survey indicates that committed and actively pursued projects with a combined annual average generation of over 20 TWh could be completed by 2028.[200]

There has also been a sharp increase in the total number of distributed generation systems[lxv] in recent years, although the average installed capacity has been decreasing.

Electricity supply emissions to date are broadly on track to meet the first emissions budget

Emissions from electricity generation in 2022 were 1.4 $MtCO_2e$ lower than the benchmark level of emissions reductions in the Commission's 2022 demonstration path. This indicates the sector is ahead of the pace needed to meet the first emissions budget (2022–2025). However, caution is needed given the strong short-term influence of rainfall variation for hydroelectricity generation discussed above.

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by scorecards for each outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for electricity supply focuses on two outcome areas: 'Reduce electricity generation emissions' and 'Build flexible networks'. Achieving these outcomes will help ensure success in reducing emissions from the electricity system while enabling emissions reduction in the wider energy and transport sectors. The policy tools used for this are mostly regulatory, supported by pricing mechanisms and robust information and data.

The electricity supply monitoring map (Figure 9.3.1) illustrates how more specific pathway outcomes, enablers and policies relate to these broader outcome areas.

Policy progress

- In 2022, as part of the first emissions reduction plan, the Government set a target of 50% of total final energy consumption coming from renewable sources by 2035. In late 2023, the Government removed the aspirational 100% renewable electricity by 2030 target.[201]
- In early 2023, MBIE completed feasibility studies for the NZ Battery Project, narrowing down the options to a pumped hydro scheme at Lake Onslow and a portfolio approach. In November 2023, the Government issued a stop-work order on the Lake Onslow option.[202]
- From April to June 2023, MBIE consulted on strengthening national direction on electricity generation from renewable sources and electricity transmission activities to provide consistency with Aotearoa New Zealand's emissions reduction target. These include changes to the National Policy Statements for Renewable Electricity Generation and Electricity Transmission, the National Environmental Standard for Electricity Transmission Activities, and a new National Environmental Standard for Renewable Electricity Generation.[203] The Government has also announced plans to introduce a national policy statement for electricity distribution.[204]
- From August to November 2023, MBIE consulted on a package of policies to advance the energy transition, including regulatory settings for offshore renewable energy, a ban on new baseload generation from fossil fuels, and electricity market measures to manage the transition to an expanded electricity system with a high proportion of renewable sources. Regulatory settings for offshore energy are expected to be in place by mid-2024.[205]
- In late 2023, the Government committed to doubling renewable electricity production, including work to issue a National Policy Statement on Renewable Electricity Generation.[206] The Government also joined the Global Renewables and Energy Efficiency

lxv. Distributed generation refers to a variety of technologies that generate electricity at or near where it will be used, for example, a rooftop solar PV system. These technologies are connected directly or indirectly to local networks rather than the national grid.

Targets Pledge during the 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), committing to work with other countries to:[207]

  - triple the world's installed renewable energy generation capacity to at least 11,000 GW by 2030
  - double the global average annual rate of energy efficiency improvements from around 2% to over 4% every year until 2030
  - put the principle of energy efficiency as the 'first fuel' at the core of policymaking, planning and major investment decisions.

- The Natural and Built Environment Act 2023 and Spatial Planning Act 2023 came into force in August 2023, and both were repealed at the end of December 2023. The Government introduced a Fast-track Approvals Bill in March 2024 and intends to introduce new Resource Management Act 1991 (RMA) replacement legislation during its tenure.[208]
  - The Fast-track Approvals Bill proposes to allow energy (and other) projects to apply for a wide range of environmental and planning approvals and permits in an all-in-one process to speed up consenting.
- Electricity (Low Fixed Charge Tariff Option for Domestic Consumers) Regulations 2004 will be phased out over five years beginning 1 April 2022, to facilitate electricity distribution pricing reform and more innovative price structures.[209]
- The Electricity Authority and Commerce Commission are progressing a broad work programme to ensure networks support new generation and electrification, which includes:[210]
  - the Electricity Authority's work on wholesale electricity market competition, future security and resilience, and distribution network pricing and setting
  - the Commerce Commission's review and reset of information disclosure requirements, and revenue and quality requirements for electricity networks.
- In December 2023, the Electricity Authority's Market Development Advisory Group released its final recommendations as part of the 'Price discovery in a 100% renewable electricity system' project.
- In May 2024, the Commerce Commission released its draft decisions for Transpower's individual price-quality path and the default price-quality path (DPP) for electricity lines businesses for the regulatory control period (RCP) starting 1 April 2025 (RCP4 and DPP4, respectively).[211]
- Policy progress on the NZ ETS is discussed in detail in *Chapter 6: New Zealand Emissions Trading Scheme*.

How these policies connect to climate change adaptation

The first National Climate Change Risk Assessment (NCCRA) in 2020 found that climate change could increase risk to electricity generation, transmission, and distribution infrastructure. Both the first emissions reduction plan and first national adaptation plan identified the NZ Battery Project (Action 8.3) and development of a national energy strategy (Action 8.2) as actions to reduce emissions and improve the resilience of the energy system. The NZ Battery Project has been stopped, and the development of the national energy strategy is awaiting ministerial direction on next steps.[212] Additional national adaptation plan actions relate to reviewing gas and electricity distribution businesses' management of climate risk and resilience (Action 3.18) and developing and implementing Transpower's adaptation plan (Action 5.10).

The Commerce Commission has developed guidance which notes that it can have regard to section 5ZN of the Climate Change Response Act 2002, meaning it can account for the 2050 target, emissions budgets, or emissions reduction plans in its economic regulation of infrastructure for the long-term benefit of consumers.[213] However, there is insufficient guidance around electricity lines companies' statutory obligations for continuance of electricity supply in the face of managed retreat from areas at risk of flooding or coastal inundation.

Currently, the Government's plans and policies do not sufficiently account for connections between electricity supply and network infrastructure and other critical infrastructure such as telecommunications, water, and transport – particularly when considering extreme weather events.

Policy scorecard: Reduce electricity generation emissions

This outcome area covers pathway outcomes to:

- increase electricity supply from renewable sources
- phase out electricity generation from fossil fuels
- reduce fugitive emissions in geothermal generation.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	No significant risks	Moderate risks	EB1 – No significant risks EB2+ – Moderate risks	**No significant risks**

Rationale for our scores

Main tools **No significant risks**	The main policy tools to drive delivery of this outcome area are, in our assessment, the RMA and related national policy instruments, and the NZ ETS. The Government has committed to doubling electricity generation from renewable sources through fast-track consenting processes and stronger national direction. A Fast-track Approvals Bill was approved by Cabinet under urgency in March 2024. The Government expects new national direction rules to take effect in 2025. Details of the Bill and new national direction are not currently available.[lxvi] A consenting framework that is stable and has regard to the reasonable concerns of affected parties in the development of projects is important for the development of renewable electricity generation. MBIE's package of policies on advancing the energy transition is intended to align with and support delivery of the outcome areas, but the next steps are unclear. A well-functioning NZ ETS and an effective emissions price, combined with a competitive wholesale electricity market, allows the market to determine the most efficient means of reducing electricity generation emissions. A strong emissions price can also incentivise investment in technologies to reduce emissions from geothermal generation. The current design of the NZ ETS means there are risks to its effectiveness at reducing electricity generation emissions. The way forestry is integrated into the scheme means it is unlikely to be able to maintain a strong and rising emissions price over the long term. Policy uncertainty has contributed to significant emissions price volatility, making investments to reduce emissions that rely on the emissions price riskier. Overall, we assess there are no significant risks in the ability of the main tools to deliver on the goals and/or expected outcomes. Renewable energy is now more cost-competitive than fossil fuel generation due to cost reductions driven by global deployment subsidies.

lxvi. As of 18 April 2024.

Funding and finance **No significant risks**	Additional investment is needed to increase electricity supply from renewable sources, displace fossil fuel generation, increase the amount of resources with flexibility built in (distributed flexibility resources), and deploy new technologies or services to support system security, reliability and resilience while maintaining or improving affordability. In our assessment, there are credible plans to deliver the necessary investment, with a focus on ensuring the right regulatory settings are in place alongside strong price signals to incentivise private sector investment. Spot price volatility is an inherent feature of an electricity system with a high proportion of renewable sources, and the ability to manage price risk effectively can influence investment in supply (and demand). The Electricity Authority has work under way to address this issue, but it is too early to determine whether outputs from this work will be adequate.
Other barriers and enablers **Moderate risks**	Important enablers in this area include workforce and skills; fair and efficient pricing; and electricity system security, reliability, and resilience. The plans acknowledge or address these enablers and barriers through main policies and through supporting actions, but there are gaps. For workforce and skills, there are few policies to understand and address sector-specific requirements, and progress on most actions in this area under the first emissions reduction plan is unclear (refer also to *Chapter 8: A transition that supports New Zealanders*). Domestic and international competition for specialised labour and emissions reduction technologies will impact the pace of the transition. In *Ināia tonu nei*, we called for greater coordination of efforts to address climate change across government.[214] Governance arrangements can impede or enable progress (refer also to *Chapter 5: Policies, systems and tools*). Electricity (and energy) sector regulations and policy frameworks are governed by several agencies including MBIE, the Ministry for the Environment (MfE), Commerce Commission, Gas Industry Company, and the Electricity Authority. This could result in dispersed capability and resourcing to deliver on the Government's plans. Many of the policies to address issues around wholesale market competition, ensuring an orderly phase out of thermal generation, connecting to the grid, and coordinating grid capacity with generation are still under development, led by the Electricity Authority. It is too early to determine whether outputs from this work will be adequate.

Other barriers and enablers (continued) **Moderate risks**	For iwi/Māori, energy sovereignty is a critical component of the transition. There are unaddressed enablers that could support greater iwi/Māori participation in reducing electricity generation emissions, including equity partnerships, collective approaches to the use of natural resources (for example, geothermal energy), and access to capital or low-cost financing. Additionally, public funding and government initiatives are not necessarily aligned with iwi/Māori economic, social and cultural structures. Another barrier is a situation where iwi/Māori own valuable assets but have limited immediate cash or liquid funds available (commonly referred to as being 'asset rich but cash poor'). For some Māori collective owners of land, particularly iwi and post-settlement governance entities who are just starting to generate returns from their recently returned assets, there is a risk of creating inequitable outcomes in the transition to a low emissions Aotearoa New Zealand.[215] Monitoring whether and how policies have given effect to the principles of Te Tiriti o Waitangi/The Treaty of Waitangi and considered potential implications for iwi/Māori who are mana whenua and mana moana, and their rights and interests, would provide evidence of progress in this space. We assess that these factors pose risks to success in this area because the absence of efficient price signals, whole-of-system coordination, and a ready workforce can delay project delivery and increase overall costs. Further, continued barriers to market participation for iwi/Māori could limit participation and investment in electricity generation from renewable sources that would also provide local energy resilience and other benefits.
Timeline **First emissions budget period – No significant risks** **Second emissions budget period and beyond – Moderate risks**	Timelines as outlined in the first emissions reduction plan present no significant risks to achieve outcomes during the first emissions budget (2022–2025). However, there are moderate risks from the second emissions budget period (2026–2030) and beyond. MBIE's consultation on a package of policies to advance the energy transition was delayed by nearly a year. The Government has discontinued work to develop a gas transition plan but remains committed to delivering a national energy strategy by the end of 2024; however, next steps are unclear.[216] The Fast-track Approvals Bill and revised national direction on electricity generation, transmission and distribution are likely to have greater impact from the second emissions budget period (2026–2030). However, the Bill emphasises the benefits of development, but does not appear to give sufficient weight to climate considerations. If infrastructure and development projects instead support emissions intensive activities, these will make it more difficult to meet emissions budgets.[217]

Overall assessment	
No significant risks	The main policy tools to drive delivery of this outcome area do not present significant risks but may underdeliver, due to lack of action on addressing structural design issues and price uncertainty within the NZ ETS. This could limit the ability of the NZ ETS to drive investment in renewables and, for geothermal generation, in carbon capture and reinjection. Resource-consenting processes can add cost pressures and impact the rate of development. Social acceptance of significant infrastructure build can help deliver on the Government's commitment to double generation. This includes action that gives effect to the principles of Te Tiriti/The Treaty.[218] There are some additional risks around governance arrangements, whole-of-system coordination, and workforce and skills that may limit the ability of the main policy tools to drive the level of action required from the second emissions budget period onwards. We expect that the market can deliver the projected new generation needed – given an enabling regulatory framework that provides sufficient incentives. The build of new generation from renewable sources is strongly driven by more favourable economics compared to fossil fuel generation. A strong emissions price signal alongside measures to ensure a competitive wholesale electricity market, manage security of supply, and maintain affordability can drive retirement of fossil fuel electricity generation that operates for most of the time.

Policy scorecard: Build flexible networks

This outcome area covers pathway outcomes for:

- networks that support increased electricity generation and electrification
- an efficient and flexible electricity system.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

Rationale for our scores

Main tools **Moderate risks**	The main policy tools to drive delivery of outcomes related to networks and an efficient and flexible electricity system are regulatory settings – in particular, the Commerce Act 1986, the Electricity Industry Participation Code 2010, and the RMA. A key challenge for regulation is to enable sufficient investment for current and future electricity demand, while managing risks of overinvestment where there is insufficient demand. It can be difficult to predict where, when and to what extent growth in demand will take place. In addition, the range of solutions to address network restrictions is becoming more diverse. Regulatory settings will need to balance the need for investment against affordability to encourage electrification. The regulatory environment for network investment needs to be able to respond quickly to changing circumstances and new technologies. There is a substantial joint work programme by the Electricity Authority and the Commerce Commission to address these risks. The Government has also committed to update the Commerce Act 1986 and associated regulations to provide greater certainty around cost recovery for regulated infrastructure.[219,220]
Funding and finance **Moderate risks**	Additional investment is needed for transmission and distribution network infrastructure and for the technologies or services that can enable a more efficient and flexible system. Examples include smart devices, automation, and new digital platforms. Plans rely on private funding, where network infrastructure investments are recovered from consumers through network charges, connection charges, fees, capital contributions and repayments. Lines companies may seek to attract new capital to service debt and equity in order to make investments. Businesses and households are likely to rely on a combination of public and private funding to adopt new technologies.

Funding and finance (continued) **Moderate risks**	A step change in investment can support the transition both for emissions reduction and for adaptation. We have identified some risks of insufficient funding being available to support affordable, secure and resilient electrification for the long-term benefit of consumers. Distributed flexibility resource (DFR) providers can 'value-stack' by bundling together the different ways that allow them to earn revenue or compensation in the electricity market. The regulatory incentives and ability for DFR providers to value-stack market services may not be adequately addressed by current plans and policies, which could limit the uptake of DFR by businesses and households.
Other barriers and enablers **Moderate risks**	Important barriers and enablers in this area include fair and efficient pricing; consenting and infrastructure; workforce; and electricity system security, reliability and resilience. Plans do not adequately address the barriers or enablers. In late 2023, Transpower stated that weak property rights under the RMA are impeding the upgrade and expansion of the grid.[221,222] These issues sit alongside barriers related to insufficient funding, slow consenting processes, and long lead times for equipment. Cabinet approved a Fast-track Approvals Bill in March 2024. However, as currently[lxvii] drafted, new line projects and many of Transpower's critical maintenance and upgrade projects would be ineligible for the streamlined approvals process as they are on various conservation and reserve land and Māori freehold land. There is also an unintended potential outcome of new housing and infrastructure being prioritised over existing infrastructure such as electricity networks, as the National Policy Statement on Electricity Transmission sits relatively low in the Bill's weighting hierarchy of matters that must be considered.[223] While there are actions in the first emissions reduction plan to create a responsive education and training system, plans and policies to deliver are unclear or have been discontinued, and may not be well targeted to address the specific skills shortages required to deliver on this outcome area.
Timeline **Moderate risks**	Policy development timeframes for plans led by regulators appear sufficient and on track for delivering outcomes in the second emissions budget period (2026–2030) and beyond; the impact in the first emissions budget period (2022–2025) may be limited. Government plans are less clear in setting out timeframes for key policy development milestones.

lxvii. As of 10 May 2024.

Overall assessment	
Moderate risks	There are moderate risks in the ability of the main policy tools to drive delivery of this outcome area. The current regulatory focus on efficient service provision may not sufficiently enable regulators to take into account the 2050 target, an emissions budget, or an emissions reduction plan.[lxviii] This may discourage some investments that would otherwise deliver sustainability benefits for consumers. Current regulatory settings[lxix] may not effectively incentivise the type and level of investment and innovation required to support an electricity system that increasingly relies on renewable sources of energy, alongside higher demand and consumer participation, all while maintaining and/or improving affordability and reliability. A more flexible and adaptable regulatory system could allow for greater ability to innovate and for cross-industry collaboration on projects that span the value chain. Plans may not adequately address other enablers and barriers to delivering on the outcome area because they are not well targeted. An example of this would be workforce planning, training, and skills retention in the face of increasing global competition for talent.

lxviii. See Climate Change Response Act 2002, section 5ZN.
lxix. As of 10 May 2024.

Areas for attention

A stable and durable planning and permitting regime that enables emissions reductions

Ongoing reform of the RMA, national direction instruments, and introduction of the Fast-track Approvals Bill could reduce the costs and time associated with consenting or reconsenting electricity generation assets and related infrastructure. The Fast-track Approvals Bill proposes to allow energy projects to apply for a wide range of environmental and planning approvals and permits in an all-in-one process to speed up consenting. These settings would likely have a greater impact from the second emissions budget period (2026–2030) onwards.

However, there is a risk that legislative changes may not result in durable improvements to the resource management system, particularly if the promotion of sustainable management of natural and physical resources is not upheld as a purpose of the legislation. The Bill emphasises the benefits of development but does not appear to give sufficient weight to climate considerations, in terms of emission reductions (and climate adaptation).[224] Qualifying criteria for significant projects are not well linked to outcomes set in regional or national policy statements including, for example, the National Policy Statements for Renewable Electricity Generation and Electricity Transmission.

There is no requirement for other development projects to engage with Transpower or lines companies, or for jointly responsible Ministers[lxx] to invite written comments from those organisations. The wide geographic distribution of electricity infrastructure means that other development is likely to be in proximity to electricity assets, especially as Transpower and lines companies often do not own the land where their assets are situated.

These elements of legislative change, combined with the potential impact on social acceptance of the actions needed to reduce greenhouse gas emissions, present risks around meeting the pace and scale of energy development and other significant infrastructure build required for the transition to a low emissions economy.

Adequately meeting electricity demand over a long period of time and at any given point in time

Ensuring electricity supply is affordable and reliable supports shifting to using electricity as the country's main energy source (electrification). However, electrification can present issues for managing demand over time, and in periods of peak demand. Since mid-2021 there has been an increase in the frequency of periods of 'tight supply' when the country's electricity supply approaches its limit. Five of the top ten daily peak demand periods on record in Aotearoa New Zealand were in 2023.[225]

Regulatory and market measures that encourage uptake of smart technologies, distributed flexibility resources, and demand-side management (for example, a contract to reduce electricity usage during times of peak demand in exchange for a lower price) have diverse benefits. For example, reducing overall system costs, offsetting the need for network investment, balancing supply from variable renewable sources (such as wind and solar), and reducing the need for higher-cost dispatchable generation.

In the absence of such measures, there is moderate risk in the electricity system's ability to ensure New Zealanders' electricity needs are reliably and affordably met. It also presents a risk in further reducing reliance on fossil fuels for electricity generation.

lxx. Notably, the Minister for the Environment is not one of the jointly responsible ministers.

Coordination, resourcing and a ready workforce could accelerate the pace of action

Electricity and the broader energy system cut across multiple agencies and regulators, but there is currently no way to ensure wider goals are met, either nationally or regionally.[226] Improved whole-of-system coordination to sequence efforts and optimise the efficient use of existing infrastructure can deliver a lower-cost, more orderly transition to a low emissions economy. Otherwise, there is some risk that the scale of work required across the energy system is not achieved.

The pace and scale of the build of new electricity generation and stronger electricity networks will require a ready workforce and specialised skills. The Government has issued stop-work orders on industry transformation plans and ended funding for workforce development councils (WDCs) and (RSLGs).[227] If measures to address labour market constraints are not in place, there is significant risk in the ability of Aotearoa New Zealand to meet emissions budgets and deliver actions to adapt to climate change beyond the first emissions budget period (2022–2025).

The current NZ ETS may risk underdelivering on reducing emissions from electricity generation

As discussed in *Chapter 6: New Zealand Emissions Trading Scheme*, the NZ ETS is not currently structured to drive gross emissions reductions and may not be able to maintain a strong price signal over time. Policy uncertainty about the scheme's role in reducing gross emissions as well as emissions price volatility could delay investment decisions that would reduce emissions in electricity supply, and in other sectors.

The NZ ETS is an important policy tool for reducing electricity generation emissions and a key factor in developer investment decisions. The scheme should incentivise investors to develop technologies that can generate electricity at a lower cost than when the wholesale electricity price is set by a fossil fuel plant (that is, the most expensive plant that needs to supply electricity at that period of time). However, renewables are now cost-competitive against fossil fuel generation, due to cost reductions driven by global deployment subsidies. As such, we assess that there are no significant risks to reducing emissions from electricity generation under the current NZ ETS in the short-to-medium term.

New opportunities to reduce emissions

Part of the Commission's monitoring role under the Act is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

- Carbon capture and reinjection could be deployed at existing and new geothermal power stations to reduce fugitive emissions. Fugitive greenhouse gas emissions from geothermal power plants come from the gases dissolved in the geothermal fluid that are released during electricity generation.
- New renewable electricity generation options, including offshore wind and supercritical geothermal, and greater storage and demand response, could reduce the cost of reducing electricity emissions and enable faster electrification of the wider economy.

Box 9.3.2: Other government policies that could affect electricity supply emissions

The pivotal role that electricity and the broader energy system play in modern society means these systems intersect with many other areas of government action, including:

- Crown Minerals (Petroleum) Amendment Act 2018
- Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
- National adaptation plans
- National Policy Statement for Freshwater Management 2020
- National Policy Statement for Indigenous Biodiversity 2023
- National Policy Statement for Natural Hazard Decision-making 2023 (proposed)
- Overseas Investment Act 2005.

These policies could affect electricity supply emissions by influencing the pace and costs associated with renewable generation development and the viability of continuing to run fossil fuel power generation. Delayed build can directly and indirectly impact emissions if more fossil fuel generation needs to run for longer, or if high electricity prices deter electrification.

Other policies, such as demand-side policies in the transport sector, can also affect electricity supply emissions, as these influence the amount of generation that needs to run to meet demand.

9.4: Te tuku kora mātātoka rāroto | Domestic fossil fuel supply

This section focuses on the greenhouse gas emissions from fossil fuel supply which result from fugitive emissions during production, transmission, and storage of fuels, and from non-productive combustion. It also includes emissions from oil refining. Examples of fugitive emissions include the venting of CO_2 at the Kapuni Gas Treatment Plant, gas flaring at oil production facilities, and methane leaks from the pipeline network.

Fossil fuels currently play an important role in energy and industry, providing back-up for intermittent electricity generation from renewable sources, capacity to meet winter energy and peak demand periods, and as a feedstock in the production of, for example, methanol and nitrogen-based fertiliser. Fossil fuels also currently play a role in meeting the energy needs of businesses and households.

As the energy system transforms, and businesses and households seek lower emissions fuels to meet their needs, emissions from fossil fuel use will reduce, and we expect emissions from fossil fuel supply will reduce accordingly.

A key challenge is uncertainty around the pace, timing, and extent of this reduction in fossil fuel demand and supply, with implications for related infrastructure. Supply-side policies accompanied by corresponding demand-side policies can ensure efforts to manage fuel supply are matched by the ability to deliver that fuel when and where it is needed, ***if*** it is needed. Suitable regulatory and financial mechanisms or new market arrangements, as well as a coherent, overarching approach to the energy system transition, are likely required to manage this transition.

KEY POINTS FOR DOMESTIC FOSSIL FUEL SUPPLY

Progress to date

- Between 2021 and 2022, emissions from fossil fuel supply reduced by 27% (0.44 $MtCO_2e$) to 1.2 $MtCO_2e$, which is largely attributed to the transition of the refinery at Marsden Point to an import-only terminal in 2022.
  - Emissions from venting and flaring in the oil and gas sector increased but remain on an overall downward trend since peaking in 2010.
- Changes observed to date are broadly on track with the Commission's 2022 demonstration path. We expect that, as demand for fossil fuels declines, emissions from fossil fuel supply will also reduce.

Our assessment of policy

- The Government did not include policies and plans to address emissions from fossil fuel supply in the first emissions reduction plan. As such, we did not undertake a policy assessment for this sector but note that the Government intends to repeal the ban on new offshore oil and gas exploration, and investigate the feasibility of reopening the Marsden Point Oil Refinery.[228] The ban was introduced through the Crown Minerals (Petroleum) Amendment Act 2018.
- 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.[229]
- Consideration of the fossil fuel supply sector is included in the development of the national energy strategy and the gas transition plan, but progress and next steps on these actions are unclear.

Areas for attention

- Repealing the ban on new offshore oil and gas exploration may enable further exploration but other impediments could still restrict investor interest. Long term, expanding oil and gas exploration enables the development, production and use of emissions intensive resources that otherwise would have remained in the ground, which could potentially impact Aotearoa New Zealand's ability to meet emissions budgets and the 2050 target.

New opportunities to reduce emissions[lxxi]

- Reduce fugitive emissions from upstream oil and gas production and target key sources of emissions such as venting and flaring in the first instance. Carbon capture, use and storage (CCUS) technologies could potentially be applied to upstream oil and gas production facilities to reduce fugitive emissions.

lxxi. Section 5ZK of the Act directs the Commission to consider new opportunities to reduce emissions as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path or show potential for greater reductions than previously assumed, based on new evidence.

How we monitor fossil fuel supply emissions

As well as monitoring how much emissions have reduced, to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for fossil fuel supply.

In 2022, greenhouse gas emissions from fossil fuel supply were 1.2 $MtCO_2e$. This was 1.5% of gross emissions and 2.9% of long-lived greenhouse gas emissions (other than biogenic methane). The benchmark level of emissions reductions in the Commission's 2022 demonstration path sees emissions from fossil fuel supply decrease to 1 $MtCO_2e$ by 2025 and 0.8 $MtCO_2e$ by 2035.

Conversion of the Marsden Point Oil Refinery into an import-only terminal has reduced sector emissions. As transport electrifies and transitions to other low emissions fuel, total imported refined products will likely also decrease.

The supply of fossil gas could reduce over time. Current fossil gas fields are likely to reach the end of their economic life. This would reduce the amount of fossil gas available for all users. In the long term, it may become uneconomic for large industrial gas users and upstream oil and gas companies to continue operating in Aotearoa New Zealand in their current form.

Based on reporting by fossil gas producers, Aotearoa New Zealand's annual production from 2P Reserves[lxxii] is expected to peak at 170 PJ in 2024. It is then expected to start a sustained decline in the absence of further investment to extract contingent resources (2C Resources[lxxiii]).[230] However, fossil gas will continue to play an important role across the energy system for at least the medium term. The Government and regulators have a critical function in developing supply- and demand-side regulatory settings and financial mechanisms that support an orderly, well-managed transition away from fossil fuels that considers both fuel supply and fuel infrastructure like gas pipelines and electricity generation.

We have not developed a monitoring map for domestic fossil fuel supply, as the Government did not include policies and plans to address emissions from fossil fuel supply in the first emissions reduction plan. However, we are tracking emissions and activity from this sector as part of overall energy and industry progress.

lxxii. 2P Reserves represent the amount of gas that field operators expect to extract from the ground based on current technological and economic conditions.

lxxiii. 2C Resources represent estimates of quantities of gas in a field that may be extracted, but only under different economic or technological conditions from what we have today.

Progress in reducing fossil fuel supply emissions

Emissions in 2022 reduced, continuing a downward trend since peaking in 2010

Overall greenhouse gas emissions from fossil fuel supply decreased by 27% (0.44 $MtCO_2e$) in 2022 to 1.2 $MtCO_2e$.

Between 2021 and 2022, emissions from oil refining reduced by 75% (0.58 $MtCO_2e$). Emissions from oil refining peaked in 2015 (see **Figure 9.4.1**).

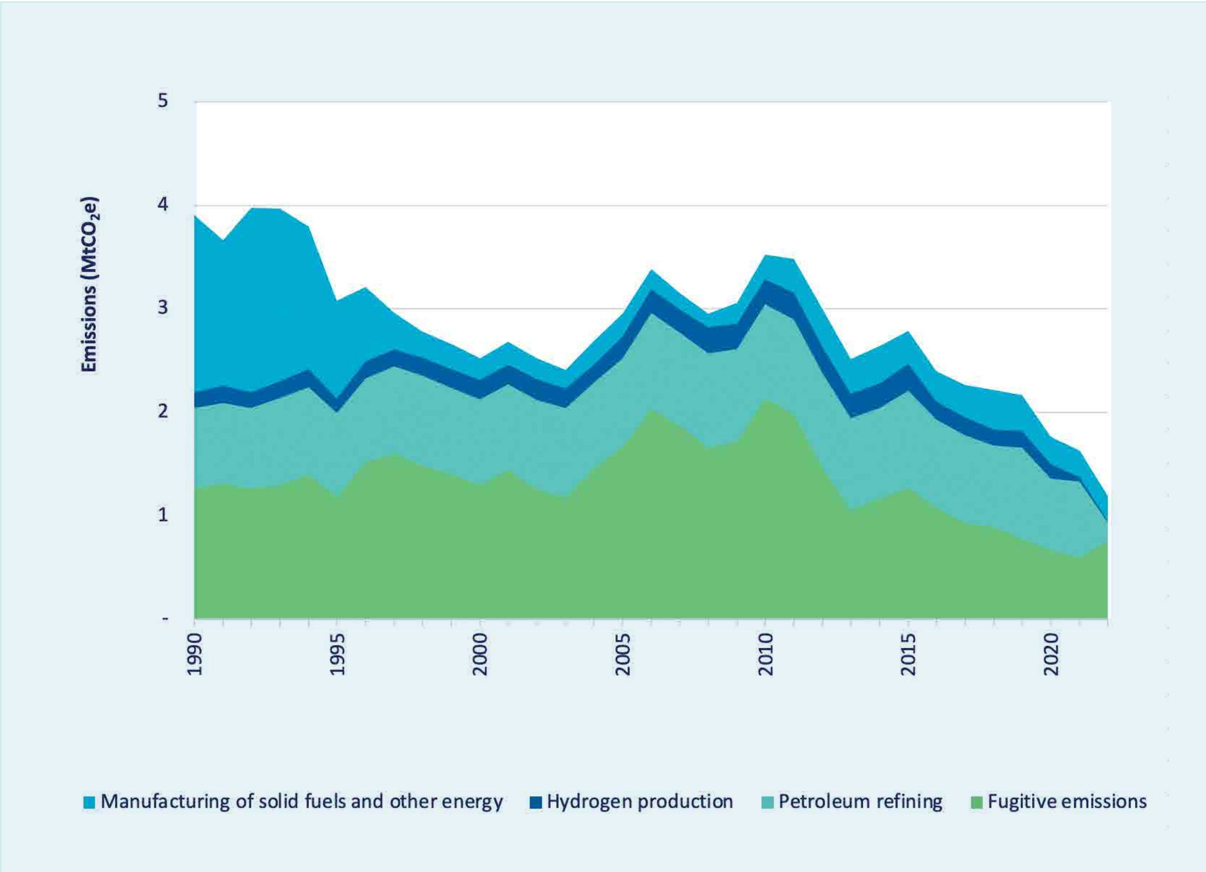
Emissions reductions from oil refining were offset by a 17% (0.15 $MtCO_2e$) increase in fugitive emissions to 1 $MtCO_2e$ in 2022, mainly due to an increase in emissions from venting and flaring. While fugitive emissions from fossil fuel supply increased in 2022, they have been on a downward trend since 2010.

Fossil gas production reduced

Between 2021 and 2022, net production of fossil gas reduced by 9.1% (14.3 PJ) from 157.5 PJ to 143.2 PJ, with consumption falling 8.2% (5.7 PJ).

The reduction in fossil gas use was largely driven by the closure of the Marsden Point Oil Refinery and by Methanex closing its Waitara Valley facility in 2021 (which was driven by fossil gas supply constraints).

Figure 9.4.1: Fossil fuel emissions from 1990 to 2022



Source: GHG Inventory

Policy assessment

The Government's first emissions reduction plan did not include any specific actions, policies or plans on reducing emissions from fossil fuel supply. We did not carry out a targeted policy assessment or develop specific outcome areas for domestic fossil fuel supply.

Areas for attention

The Government has committed to repealing the ban on new offshore oil and gas exploration.[231] It is unclear what effect repealing the ban will have on further oil and gas exploration, as other impediments could still restrict investor interest.

There has been a strong downturn in oil and gas exploration in Aotearoa New Zealand since 2014. To be economic, any new field in a frontier basin probably needs to be comparable in size to Maui, the largest fossil gas field in offshore Taranaki. Aotearoa New Zealand also has relatively high exploration and extraction costs compared to its competitors.[232] Aotearoa New Zealand's existing gas fields have entered the plateau/decline phase. This decline is a function of reduced investment, rather than a reduction in the amount of gas in the ground. However, both 2P Reserves and 2C Resources estimates have been revised down, meaning that producers are less sure they can economically extract gas from their fields and that they believe there is less gas available in those fields.[233]

Gas exploration and supply in the context of a climate transition is likely to become increasingly uneconomic as consumers switch to lower emissions fuels and electricity generation becomes more renewable. Policy instability (real or perceived) and lack of a clear path forward for fossil gas further erodes investor confidence.[234]

The development of a carbon removals strategy[lxxiv] and gas transition plan may lead to amendments for a more permissive regulatory regime for CCUS to address greenhouse gas emissions from upstream oil and gas production. However, it is possible that CCUS deployment could also increase overall emissions as it would enable the development, production and use of emissions intensive resources that otherwise would have remained in the ground.

System-wide issues to manage that phase down may be addressed as part of the national energy strategy and gas transition plan, and by the Commerce Commission in its economic regulation of gas pipeline infrastructure for the long-term benefit of consumers.

lxxiv. Progress is unclear, but consultation on a draft strategy was planned for early 2024 as part of the Government's second emissions reduction plan. Refer to Ministry for the Environment's website.

Table 9.4.1: How our areas of analysis group GHG Inventory categories

Commission areas of analysis	GHG Inventory categories
Industry (chapter 9.1)	
Agriculture, forestry and fishing	1.A.4.c Agriculture/Forestry/Fishing
Food and beverage processing	1.A.2.e Food Processing, Beverages and Tobacco
Petrochemical production	Gaseous fuels from 1.A.2.c Chemicals 2.B.1 Ammonia Production 2.B.8.a Methanol
Iron and steel production	1.A.2.a Iron and Steel Production 2.C.1 Iron and Steel
Cement and lime production	1.A.2.f Non-metallic Minerals 2.A.1 Cement Production 2.A.2 Lime Production 2.A.4 Other Process Uses of Carbonates
Aluminium production	2.C.3 Aluminium Production
Wood, pulp and paper production	1.A.2.d Pulp, Paper and Print
Mining and construction	1.A.2.g.iii Mining (excluding fuels) and quarrying 1.A.2.g.v Construction
Other industry	Non-gaseous fuel from 1.A.2.c Chemicals 1.A.2.b Non-ferrous metals 1.A.2.g.i Manufacturing of machinery 1.A.2.g.vi Textile and leather 1.A.2.g.viii Other 2.B.5 Carbide production 2.D Non-energy products from fuels and solvents 2.G Other product manufacture and use
Buildings* (chapter 9.2)	
Residential	1.A.4.b Residential
Commercial	1.A.4.a Commercial/Institutional
Electricity supply (chapter 9.3)	
Electricity supply	1.A.1.a Public Electricity and Heat Production 1.B.2.d Other (Geothermal)
Domestic fossil fuel supply (chapter 9.4)	
Refining	1.A.1.b Petroleum Refining 2.B.10 Hydrogen Production
Other fossil fuel production	1.A.1.c Manufacture of Solid Fuels and Other Energy Industries 1.B.1 Fugitive emissions from solid fuels 1.B.2 Fugitive emissions from oil and natural gas

*Our analysis for residential and commercial buildings includes liquid fossil fuel use for heating. It does not include liquid fossil fuel use for other purposes such as motive power for recreational marine.

WĀHANGA 10 | CHAPTER 10

Tūnuku | Transport

This chapter looks at greenhouse gas emissions in three areas: passenger transport, freight transport, and aviation.

This chapter summarises the progress to reduce greenhouse gas emissions in the transport sector. Transport emissions in 2022 were 13.7 $MtCO_2e$, which is 17% of gross emissions and 34% of long-lived greenhouse gases (other than biogenic methane) (**Figure 10.1**). These emissions are created by the burning of fossil fuels for road and rail transport, domestic aviation, and domestic shipping.

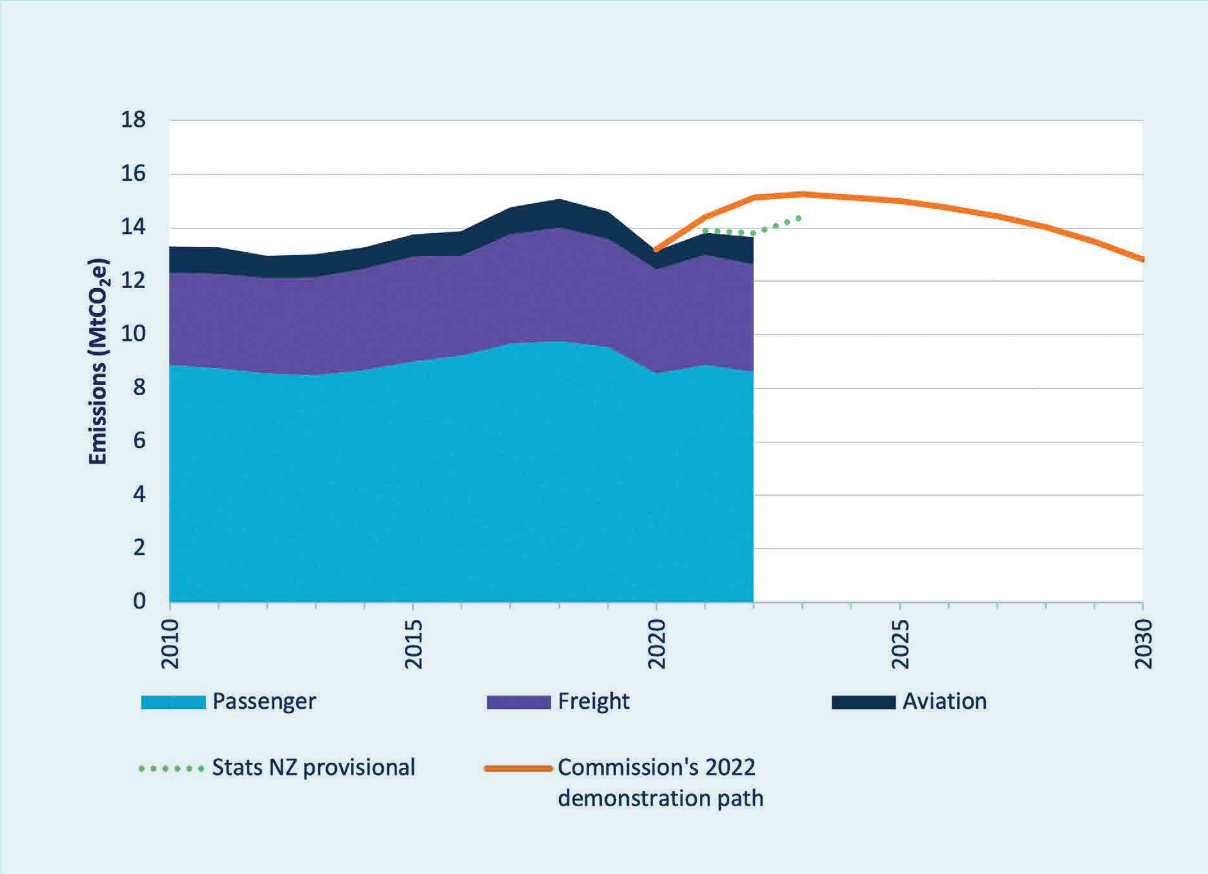
This assessment:

- examines progress on implementing policies intended to drive emissions reductions
- looks at whether and how those policies connect to climate change adaptation
- tracks changes in emissions to date, alongside other notable sector trends.

We use policy scorecards to assess the strength of emissions reduction policies and plans to drive change in each sector as described in *Chapter 2: Our approach*. From the policy scorecards, we have identified areas for attention where gaps in the suite of policies for each sector could create risks for meeting emissions budgets, or where new opportunities for emissions reductions could be pursued.

The Government's first emissions reduction plan also contained actions to support the development of low-carbon liquid fuels by implementing a sustainable aviation fuel (SAF) mandate and a sustainable biofuels obligation. The sustainable biofuels obligation was discontinued in February 2023.[235] There is further uncertainty around the current status of the SAF mandate.[236] We have considered biofuels within the passenger, freight and aviation transport scorecard assessments, but we did not complete a full scorecard assessment for low-carbon liquid fuels, as the policies to support their development were taken account of in those transport scorecards. However, for our summary presentation, it has been split out as a separate outcome area because it affects emissions reductions across multiple areas, including off-road fuel use in industry.

Figure 10.1: Transport emissions divided by subcategory (Stats NZ provisional data for 2023 and the Commission's 2022 demonstration path projected emissions)



Source: Commission analysis, New Zealand's GHG Inventory 1990–2022, Stats NZ

For the purposes of emissions reduction monitoring, for our analysis, we have divided transport sector emissions within New Zealand's Greenhouse Gas Inventory (GHG Inventory) into groupings, outlined in **Table 10.1**.

Table 10.1: How our areas of analysis group GHG Inventory categories

Commission areas of analysis	GHG Inventory categories
Passenger transport *(Chapter 10.1)*	1.A.3.b.i Cars 1.A.3.b.ii Light duty trucks 1.A.3.b.iv Motorcycles
Freight transport *(Chapter 10.2)*	1.A.3.b.iii Heavy duty trucks and buses 1.A.3.c Railways 1.A.3.d Domestic shipping
Aviation *(Chapter 10.3)*	1.A.3.a Domestic aviation

This categorisation of emissions does not perfectly align with activity in the transport sector. For instance, domestic aviation moves a relatively small amount of freight, which is not captured by this categorisation. However, we think it is the most sensible categorisation to use as it is consistent with the division of emissions made in the first emissions reduction plan, and it reflects the overall trends in each of the transport subsectors.

Passenger transport accounts for 63% (8.6 $MtCO_2e$) of total transport emissions in 2022, followed by freight transport with 29% (4 $MtCO_2e$) and aviation with 8% (1 $MtCO_2e$) (**Figure 10.1**).

Stats NZ's provisional emissions data for 2023 show a 4% increase (0.6 $MtCO_2e$) in transport emissions from 2022 to 2023. This increase in emissions in 2023 is due to growth in aviation (0.25 $MtCO_2e$), and road transport (0.38 $MtCO_2e$), while declining rail and domestic shipping have offset some of the growth.

Provisional emissions for 2023 remained lower than that projected for the same period in the Commission's 2022 demonstration path, which is the benchmark we are using for this analysis. However, the gap between the demonstration path projections and actual transport emissions narrowed from 1.5 $MtCO_2e$ to 0.8 $MtCO_2e$ in 2022 and 2023. If emissions growth continues on the current trajectory in 2024, there is a risk that it will exceed our chosen baseline for the Commission's 2022 demonstration path.

10.1: Te tūnuku tāngata | Passenger transport

This section focuses on the greenhouse gas emissions from passenger transport. These emissions are created by the burning of fossil fuels by light vehicles, and by buses and trains used for public transport.

Reducing emissions from passenger transport primarily involves:

- moving from internal combustion engine (ICE) vehicles to zero or low emissions transport options
- increasing the number of people making trips by public transport, cycling and walking.

International evidence comparing cities that have walking, cycling, and public transport networks to cities that do not shows that the cities with those networks can substantially reduce transport emissions and pollution.[237] These reductions are increased when combined with more compact urban development.[238]

Our assessment of how well emissions reductions in passenger transport are tracking against emissions budgets looks at action to reduce the average emissions per kilometre from the country's fleet of light vehicles (emissions intensity), and to reduce demand for modes of travel that involve burning more fossil fuels (and are more carbon intensive).

KEY POINTS FOR PASSENGER TRANSPORT

Progress to date

- Gross emissions from passenger transport in 2022 were 8.6 $MtCO_2e$. Emissions for 2022 reduced 3% from 2021 (8.9 $MtCO_2e$).[lxxv] Emissions have been trending downwards since a peak in 2018.
- Reduced overall vehicle travel is a key driver of this decline. As a result, passenger transport emissions are tracking lower than projected in the Commission's 2022 demonstration path. However, this trend is unlikely to continue, as the first half of 2023 shows a growth of 6% compared to the first half of 2022.
- There was a dramatic fall in the emissions intensity of light vehicles added to the country's fleet over the years 2021 to 2023. The drop was due to fast growth in uptake of electric vehicles (EVs), hybrids and more fuel-efficient conventional vehicles. It is likely this uptake was due to the Clean Car Discount.
- There was slower growth in the distance travelled over the years 2021 to 2023 than in the projections for passenger transport in the Commission's 2022 demonstration path. This was likely influenced by high oil prices.
- There has been an increase in the age of the passenger fleet, while almost all household travel is by car, van and motorcycle – a proportion not changed since 2018.

lxxv. This includes emissions from cars and motorbikes and LCVs such as utility vehicles and vans.

Our assessment of policy

Scorecard summary for reducing vehicle emissions intensity

Scorecard summary				
Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Significant risks	EB1 – No significant risks EB2 – Moderate risks	**Moderate risks**

Scorecard summary for reducing demand for carbon-intensive travel modes

Scorecard summary				
Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Significant risks	Significant risks	Significant risks	EB1 – Significant risks EB2 – Insufficient	**Significant risks**

- We assess there are **moderate risks** to the outcome of reducing light vehicle emissions intensities. The Clean Car Standard is a credible policy tool. However, there are other barriers that could significantly limit EV uptake, such as the upfront capital cost of EVs compared to ICE vehicles and the recent introduction of road user charges for EVs and plug-in hybrids (PHEVs).
- Expanding EV-charging infrastructure will be an important enabler.
- There is a policy gap in reducing the emissions intensity of the existing light vehicle fleet. The implementation of the Sustainable Biofuels Obligation has been discontinued, which was also an instrument to encourage the development of a low-carbon liquid fuels market.
- Overall, we assess that there are **significant risks** to the policies and plans for encouraging more people to travel by active and public transport for the first emissions budget (2022–2025), but for future budgets we assess there are insufficient plans. Key policy tools have been discontinued, and a change to urban planning standards could lead to less-compact urban development.
- Congestion charging, which has been signalled by the Government, can be an effective policy tool to encourage people to shift to public and active transport.
- The investment pipeline for major public transport works is being progressed at a pace unlikely to be sufficient to deliver changes that would contribute to achieving the second emissions budget (2026–2030) or even the third emissions budget (2031–2035).

Areas for attention

- Affordability of low emissions vehicles, including upfront cost, creates the risk that uptake will not be achieved at the pace and scale required to meet future emissions budgets. The Clean Car Standard is the primary policy to encourage the uptake of zero and low emissions vehicles.[lxxvi] Ensuring the standard is regularly tightened by setting emission caps to encourage the uptake of low and zero emissions vehicles will reduce this risk.
- A clear signal on a further move to road user charges for petrol vehicles would reduce the risk that new road user charges for EVs and plug-in hybrids will discourage the uptake of these types of vehicles.
- For walking, cycling and public transport to make a substantial contribution to reducing emissions, barriers will need to be overcome through safe and dedicated infrastructure. Current policy tools on their own are unlikely to drive mode shift to lower emissions ways of travel.
- Without policy to encourage the development of low-carbon liquid fuels for light vehicle transport, it is unlikely that the carbon intensity of fuel used in the existing fleet will reduce. This places additional reliance on the uptake of EVs to achieve the emissions budgets.

New opportunities to reduce emissions[lxxvii]

- There has been faster than expected uptake of EVs to date (when compared with the level of uptake projected in the Commission's 2022 demonstration path, which we use as a benchmark), indicating that there is an opportunity to use additional policy tools to leverage demand in order to decarbonise the light vehicle fleet more quickly.

How we monitor passenger transport emissions

As well as monitoring how much emissions have reduced, to assess if Aotearoa New Zealand is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we consider for passenger transport.

Gross emissions from light vehicles in 2022 were 8.6 $MtCO_2e$. This was 11% of the country's gross emissions and 21% of long-lived greenhouse gas emissions (other than biogenic methane). In the Commission's 2022 demonstration path, which we use as a benchmark for assessing whether current levels are on track to achieve the emissions budgets, emissions from light vehicles grow to 9.7 $MtCO_2e$ by 2025 and then fall to 4.9 $MtCO_2e$ by 2035.

Emissions from passenger transport are created through the burning of fossil fuels by light vehicles, and by buses and trains used for public transport. These emissions can be reduced by decreasing carbon-intensive travel, shifting to walking, cycling and public transport, increasing the uptake of low and zero emissions vehicles, and improving the fuel efficiency of ICE light vehicles.

The passenger transport monitoring map (**Figure 10.1.1**) reflects these goals and sets out pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (**Figure 10.1.4**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

lxxvi. Zero emissions vehicles include EVs and vehicles powered by hydrogen fuel cells. Low emissions vehicles include hybrid and plug-in hybrid EVs.

lxxvii. Section 5ZK of the Climate Change Response Act 2002 directs the Commission to consider new opportunities to reduce emissions as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path or show potential for greater reductions than previously assumed, based on new evidence.

*Figure 10.1.1: Passenger transport monitoring map (see **Box B2.1** for legend)*

Monitoring map for passenger transport

Reduce passenger transport emissions 50% by 2035 (relative to 2019) in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce demand for carbon-intensive travel modes
- Total vehicle-kilometres travelled

Reduce vehicle emissions intensities
- Average emissions intensity of light vehicles

Reduce overall travel demand (Avoid)
- Total household travel per person
- Average vehicle occupancy
- Trip distances and time spent traveling using carbon-intensive travel modes

Shift to low carbon travel modes (Shift)
- Share of active and public transport
- Travel by mode

Rapid uptake of zero-emissions vehicles (ZEV) (Improve)
- ZEV share of vehicles entering fleet
- ZEV share of vehicle fleet

Conventional vehicle emissions intensity (Improve)
- Emissions intensity of fossil fuel vehicles entering fleet
- Market share of low-carbon liquid fuels (including biofuels)

ENABLERS

Accessible low emissions infrastructure
- Coverage and quality of walking and cycling infrastructure
- Coverage of public transport services
- Investment in public and active transport
- High occupancy vehicle lanes
- Pricing and demand management tools

Zero emissions vehicle (ZEV) charging/refueling infrastructure
- Public vehicle charging infrastructure
- Private vehicle charging/refueling

Supply of zero emissions vehicles (ZEV)
- Availability of ZEV in different vehicle classes
- ZEV uptake in key markets
- Capital cost of new and used ZEV
- Bike, scooter and micro-mobility device sales

Public and business attitudes
- Use of ride share services
- Public opinion surveys

Compact urban development
- Percentage of consented buildings with access to frequent public transport services
- Percentage of trips in high-growth urban areas using public or active transport

Workers and skills
- Number of key personnel

Sustainable low carbon liquid fuels
- Emissions intensity of fuels

POLICIES

Funding
- Heavy vehicle grants
- Low Emission Transport Fund
- National Land Transport Fund
- Carbon Neutral Government Programme

Charging access
- EV Charging Infrastructure Strategy
- Electricity network connection policies and charges
- Enabling private-sector investment

Low emissions fuel strategies and regulation
- Vehicle emissions standards
- National and regional hydrogen roadmaps

Price incentives
- Road pricing
- Public transport fare structures

Transport modes and urban development
- National Policy Statement on land transport
- Resource Management Act and national policy direction
- Local government district planning
- Active travel infrastructure
- Walking and cycling strategies/plans

CONTEXTUAL FACTORS

Costs to users
- Energy prices
- Household expenditure on transport as proportion of income

Technology advancements
- Battery technology, prices and supply chains
- Hydrogen and low-carbon liquid fuels prices and supply chains

Global availability of zero emissions vehicles (ZEV)
- Global supply and uptake of ZEV passenger vehicles
- Global supply and uptake of ZEV public transport buses and ferries

Source: Commission analysis

Box 10.1.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

For passenger transport, there are the following gaps in the data for measuring the reduction of overall travel demand and shift to low-carbon modes.

- A variety of data are published for public transport passenger movements across Aotearoa New Zealand. However, data sets are incomplete for public transport usage per passenger kilometre. These data would be helpful to track changes in passenger kilometre movements by mode and support existing data sets like the household travel survey.
- Measuring emissions from passenger movements by bus, rail and ferry services would improve emissions reporting through a better division of emissions between freight and passenger transport. In particular, splitting buses off from other heavy vehicles would allow bus emissions to be captured under passenger transport.

Progress in reducing passenger transport emissions

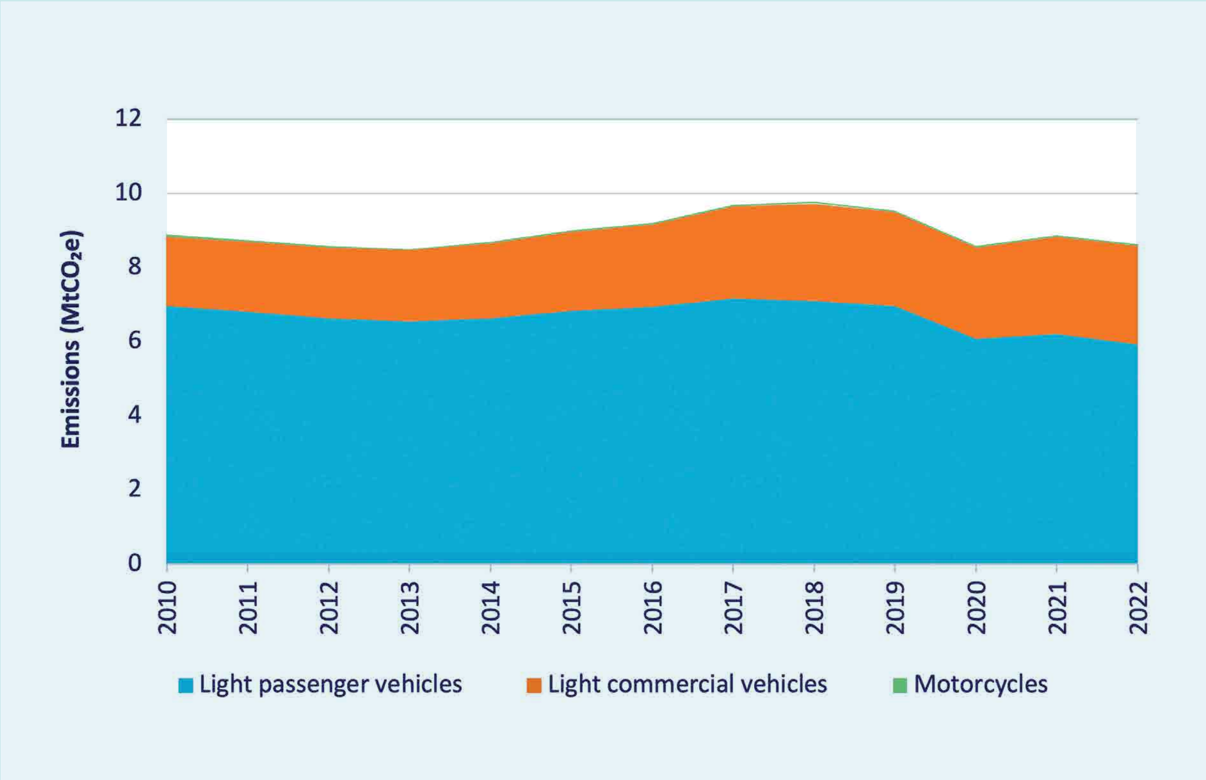
Passenger transport gross emissions fell in 2022

Passenger transport gross emissions fell by 3% (0.2 MtCO_2e) from 2021 (8.9 MtCO_2e) to 2022 (8.6 MtCO_2e). Passenger emissions in 2022 are composed of light passenger vehicles (LPVs) (69% or 5.9 MtCO_2e), light commercial vehicles (LCVs) (31% or 2.7 MtCO_2e) and motorcycles (0.5% or 0.04 MtCO_2e) (**Figure 10.1.2**).

Passenger transport emissions have declined 12% since their peak in 2018 (9.8 MtCO_2e). This has been driven by LPVs, which have reduced by 17% (1.2 MtCO_2e) from 2018. Emissions from LCVs, by contrast, have grown (0.05 MtCO_2e) since 2018.

Reduced overall vehicle travel is a key driver of this decline in emissions. Vehicle kilometres travelled (VKT) peaked in 2018 at 44.6 billion and fell to 43.7 billion in 2022 (**Figure 10.1.4**). This includes both EV/hybrid and ICE vehicles. However, this trend is unlikely to continue, as available travel data for these vehicles for the first half of 2023 show growth of 6% compared to the first half of 2022.[239]

Figure 10.1.2: Passenger transport emissions to 2022 by vehicle type



Source: New Zealand's GHG Inventory 1990–2022

Passenger transport emissions in **Figure 10.1.4** compare historic emissions with the Commission's 2022 demonstration path, which we use a benchmark for assessing progress on emissions reduction. Current emissions remain lower than those benchmark emissions for 2022. A key driver of the difference between current and demonstration path emissions is the higher projected VKT in the demonstration path (**Figure 10.1.4**). It is likely that this difference between the demonstration path and actual VKT is due to higher fuel prices in 2022 that discouraged people from driving their vehicles.

Decline in the fleet's emissions intensity is driven by changes in light passenger vehicles

Light vehicles cover LPVs and LCVs (including vans and utility vehicles (utes) and motorcycles).

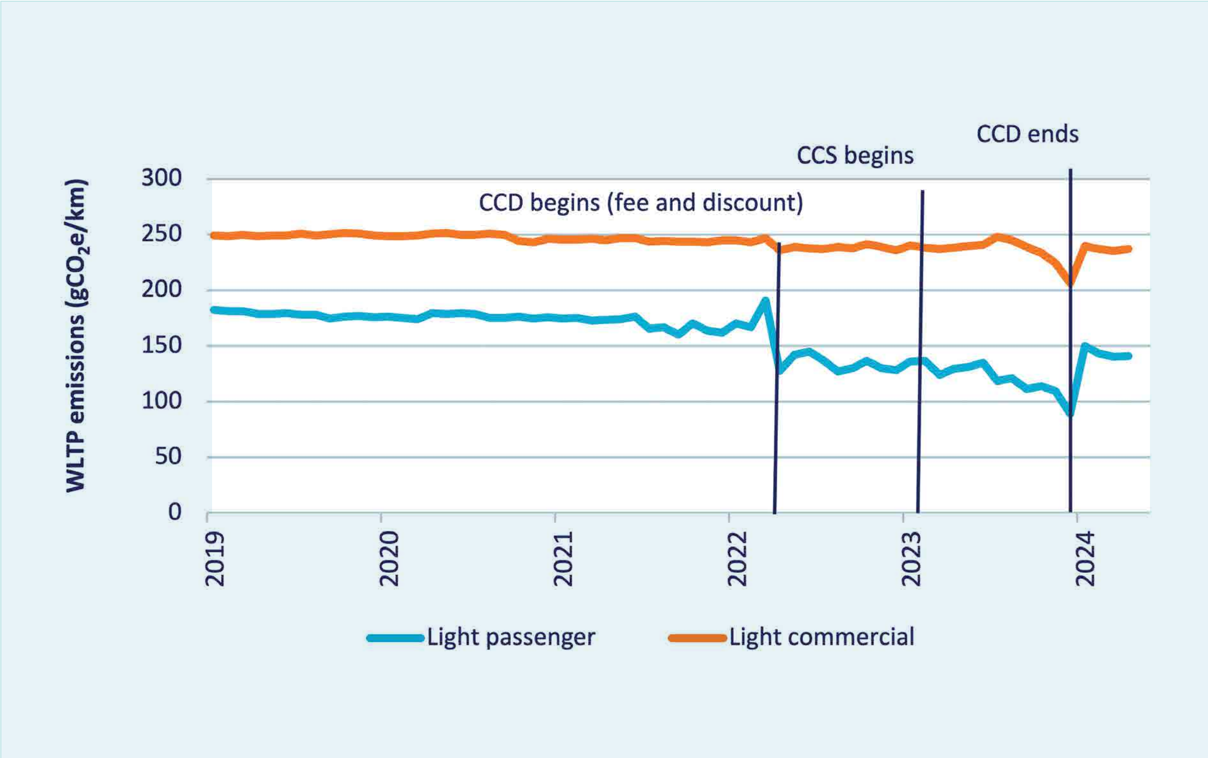
Average emissions intensity of light vehicles (including EVs) in **Figure 10.1.4** shows that the average emissions intensity has reduced since 2001. The rate of reduction is consistent with the Commission's 2022 demonstration path we are using to track progress.

The reduction in emissions intensity is reflected in the increased share zero emissions vehicles have of the light vehicle fleet (**Figure 10.1.4**), and of new LPVs.

The emissions intensity of LPVs entering the fleet fell dramatically over the course of 2022 and 2023, due to the fast growth in uptake of EVs and hybrids. It is likely this uptake was due to the Clean Car Discount (**Figure 10.1.3**). In contrast, LCVs are showing a reduction in emissions intensity (**Figure 10.1.3**). There has been an increase in the emissions intensity of LPVs in the first quarter of 2024, with the removal of the Clean Car Discount on 31 December 2023.

The zero emissions vehicle share of LCVs in the fleet has only increased slightly from 1% of vehicles registered in 2020 to 1.3% in 2023.

Figure 10.1.3: Emissions intensity of light vehicles entering the vehicle fleet and key policy dates



Source: Ministry of Transport Fleet statistics (monthly)

Note: Clean Car Standard = CCS, Clean Car Discount = CCD, World light vehicle testing protocol = WLTP

Little change in age of fleet or in distance travelled

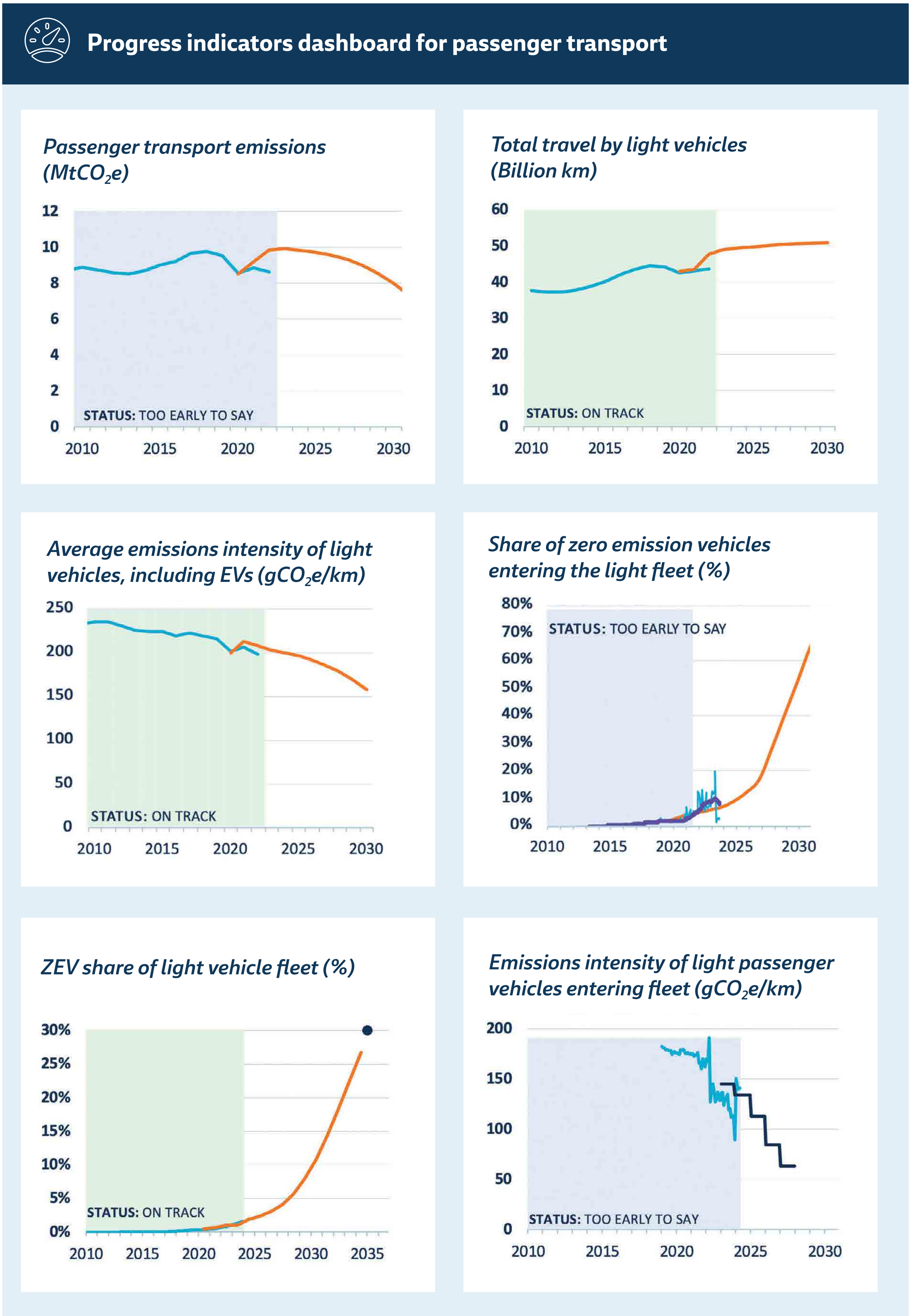
The age of light vehicles (in years) has increased from 13.5 in 2010 to just under 14.5 years in 2022.[240]

Figure 10.1.4 shows the total distance travelled (VKT) rose after a drop due to the impact of COVID-19. However, this increase was slower than projected, likely influenced by high oil prices. Quarterly data show stronger growth in VKT in the first half of 2023, which was 6% higher than the same period in 2022.[241]

No change in how households travel

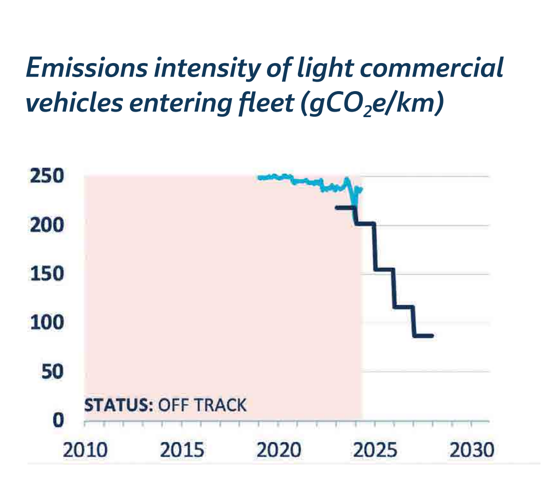
The proportion of household travel by mode has not changed since 2018 (Figure 10.1.4). Almost all (90%) is by car, van and motorcycle while around 5% of household travel is by public transport, cycling and walking.

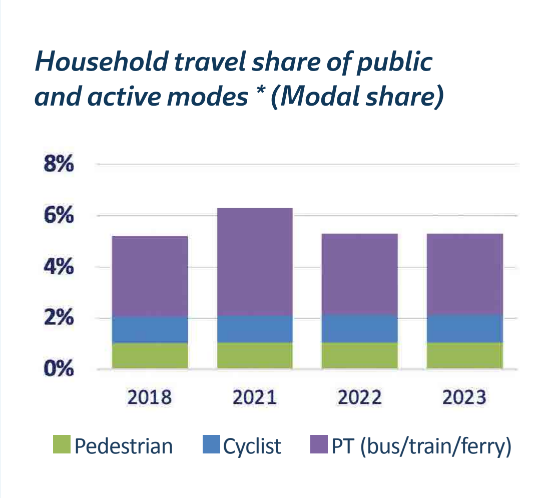
Figure 10.1.4: Progress indicators dashboard for passenger transport

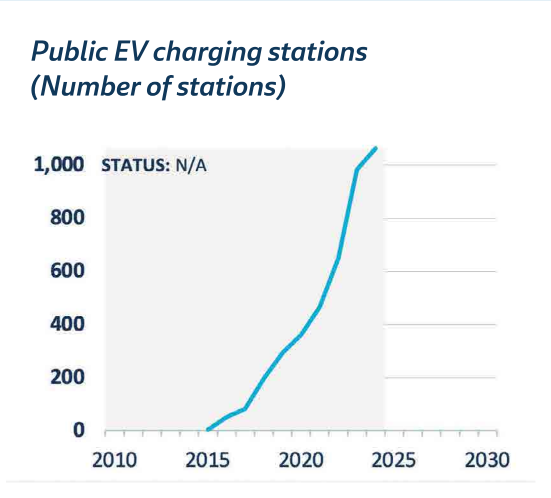


Please see the next page for the key

Progress indicators dashboard for passenger transport







Source: Commission analysis and GHG Inventory 1990–2022, Ministry of Transport Annual Motor Vehicle Fleet Statistics (2023),[242] Ministry of Transport Fleet Statistics (monthly),[243] New Zealand Household Travel Survey (2024),[244] EECA Public EV Charger Dashboard (2024)[245]

Note: The household travel share of public and active modes chart shows final year of survey campaign; data correspond to surveys conducted 2015–2018, 2018–2021, 2019–2022, 2021–2023

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by scorecards for each outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for passenger transport focuses on two outcome areas: 'Reduce vehicle emissions intensities' and 'Reduce demand for carbon-intensive travel modes'.

The passenger transport monitoring map (**Figure 10.1.1**) illustrates how more specific pathway outcomes, enablers, and policies relate to these broader outcome areas.

Policy progress

- The Clean Car Discount policy came into force on 1 July 2021. Discounts for low and zero emissions vehicles and fees on higher emissions vehicles applied from 1 April 2022. This policy was discontinued from 31 December 2023. The payment of road user charges (RUCs) for EVs and plug-in hybrids (PHEVs) from 1 April 2024 and the discontinuation of the Clean Car Discount are likely to slow the shift to EVs and hybrids, because of the higher costs of ownership, compared to owning an ICE vehicle.
- The Clean Car Standard came into effect on 1 January 2023. Importers are charged for vehicles they import that have a CO_2 emissions value-to-weight ratio above a set target. Vehicles with values below the target earn credits. The values currently in regulations reduce from 145 gCO_2/km in 2023 to 63.3 gCO_2/km in 2027 for LPVs. For LCVs, they reduce from 218.3 gCO_2/km in 2023 to 87.2 gCO_2/km in 2027.[246] The settings were due to be reviewed in the first half of 2024.
- A national EV-charging strategy for Aotearoa New Zealand (2023–2035) was released in October 2023 by the Ministry of Transport and Ministry of Business, Innovation and Employment (MBIE). In April 2024, the Government announced 25 new high-speed EV-charging hubs along key routes between major urban areas as part of the plan to increase the number of public EV chargers from 1,200 in 2023 to 10,000 by 2030.[247]
- Changing government priorities mean there is a greater emphasis on the construction of 'roads of national and regional significance' and maintenance of existing roads. Some major public transport projects in Auckland and Wellington have been signalled in the draft Government Policy Statement on land transport released in March 2024, but the Auckland Light Rail and Let's Get Wellington Moving projects have had their central government funding withdrawn.[248]
- Specific planning to reduce VKT, including subnational targets, introduced in the first emissions reductions plan, has been stopped by the New Zealand Transport Agency.
- The draft Government Policy Statement on land transport 2024 indicates that 'time-of-use charging' on the most congested parts of the road network will be implemented. The draft signals its main objective is reducing congestion, rather than helping to shift people's travel to modes of transport that use less fossil fuels.

How these policies connect to climate change adaptation

Urban planning and design, and related work to improve transport options to support emissions reduction for passenger transport, can also support adaptation to climate change impacts.[249] For example, solutions that use elements of nature to support active transport (such as planting along walking and cycling paths) can be designed to also reduce flooding, improve air quality and provide cooling effects in urban areas.[250] Ensuring that there are a wide range of lower-carbon transport options available increases a community's resilience to climate-related events.

Policy scorecard: Reduce vehicle emissions intensities

This area focuses on achieving two outcomes:

- rapid uptake of zero emissions vehicles
- improve emissions intensity of ICE vehicles.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Significant risks	EB1 – No significant risks EB2 – Moderate risks	**Moderate risks**

Rationale for our scores

Main tools **Moderate risks**	The key policy tool to achieve a greater share of zero emissions vehicles is the Clean Car Standard,[251] following the discontinuation of the Clean Car Discount.[252] This reliance on the one policy poses some risks to the ongoing uptake of EVs. While the Clean Car Standard is a credible policy tool, it only came into effect in January 2023 and it is unclear how effective it will be in the absence of the Clean Car Discount. Ongoing monitoring and evaluation will be important to establish this. Although the rate of EV uptake has surpassed projections from the Ministry of Transport and the Commission to date, it is likely that this is mostly due to the Clean Car Discount. In support of this view, EV sales were down significantly in early 2024 from December 2023.[253] There is also a risk that the new RUCs for EVs and PHEVs[254] will discourage uptake of these vehicle types or encourage EV and PHEV owners to move back to ICE vehicles. The Sustainable Biofuels Obligation would have required fuel suppliers to reduce the total emissions of the fuels they supply by a set percentage each year by using biofuels (in blended or neat form).[255] Its discontinuation means there are currently no policies focused on encouraging low emissions fuels for use in ICE vehicles, as part of reducing emissions intensity.
Funding and finance **Moderate risks**	The removal of the Clean Car Discount discontinued NZ$301.8 million funding to support uptake of zero emissions light vehicles.[256] The funding for the Clean Car Standard is NZ$40.5 million over four years.[257] An increase in funding for EV-charging infrastructure has been announced by the Government, in addition to what was allocated in Budget 2023.[258]

Other barriers and enablers	Significant enablers such as the Clean Car Discount and Sustainable Biofuels Obligation have been removed while funding for EV-charging infrastructure has been increased.
Significant risks	A significant barrier to rapid uptake of EVs and hybrids is the upfront capital cost. It is likely that the removal of the Clean Car Discount will make EV purchase unaffordable for many New Zealanders, but it is unclear what impact this may have on EV sales in the longer term. The introduction of RUCs for EVs and PHEVs is likely to compound affordability issues for many New Zealanders, as running costs increase. Current plans do not adequately address access to EVs and hybrids for lower income households, reducing the possibility for them to buy or lease these types of vehicles. Many iwi/Māori live in rural areas and often need to travel long distances to get to their destination. Transport is important for Māori to connect to their whānau, haukāinga, and tūrangawaewae. Some Māori households are large or intergenerational and require larger vehicles. Enablers for iwi/Māori EV use can include chargers at marae, ensuring marae electricity supply is secure and sufficient to enable charging of EVs, regulating the use of smart chargers and/or partnering with electricity providers to develop low-cost options for supplying EV-charging infrastructure.[259]
Timeline	The timeline to deliver these outcomes in the first emissions budget period (2022–2025) is on track due to the rate of EV and hybrid uptake to date.
First emissions budget period – No significant risks **Second emissions budget period – Moderate risks**	There is some risk for achieving the second emissions budget (2026–2030), as the settings of the Clean Car Standard will be reviewed in the first half of 2024 and it is unclear whether the standard will enable sufficient uptake of EVs, hybrids and lower emissions ICE vehicles.[260]

Overall assessment

Moderate risks	Higher-than-expected sales mean the uptake of EVs and hybrids is on track for the first emissions budget period. However, there are risks for the second emissions budget period due to discontinuation of the Clean Car Discount and introduction of RUCs that may discourage sale of EVs and hybrids. There are also no current policy tools focused on reducing the emissions intensity of ICE vehicles. The Clean Car Standard is a credible policy tool to drive delivery of this outcome area. However, it is unclear how effective it will be in the absence of the Clean Car Discount while reliance on one policy poses a risk. An important enabler is the increase in funding for the development of EV-charging infrastructure.

Policy scorecard: Reduce demand for carbon-intensive travel modes

This area focuses on achieving two outcomes, to:

- reduce overall travel demand
- shift to low-carbon modes of travel.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Significant risks	Significant risks	Significant risks	EB1 – Significant risks EB2 – Insufficient	**Significant risks**

Rationale for our scores

Main tools **Significant risks**	The main policy tools to drive reductions in demand for carbon-intensive modes of travel are regulating for improved urban form; providing improved public and active transport options, through government direction and investment; and pricing tools, such as congestion charging. There are significant risks to increasing the shift to active and public transport, and decreasing the overall distance travelled on modes of transport that use more fossil fuels. Key policy tools such as programmes to reduce VKT have been discontinued, and the change to the Medium Density Residential Standards (MDRS) is likely to lead to less-compact urban development.[261] Current transport funding and investment plans do not align with the scale and pace of change needed. Recent decisions to reduce investment in public and active transport initiatives compound the effect of historical underinvestment. Time-of-use charging on congested roads has been signalled by the Government and can be a key policy tool to encourage shift to other modes of travel that use less fossil fuels. However, the intent of the policy is not clear and it does not yet have a credible plan for implementation.
Funding and finance **Significant risks**	There are significant uncertainties and risks around funding for active and public transport projects. The draft Government Policy Statement on land transport, released in March 2024, signals reductions in funding for public transport services and infrastructure, walking and cycling, traffic-calming measures and the rail network. If confirmed at the end of June 2024, this could lead to a reduction in public transport and walking and cycling projects, and to a decline in rail network performance. This will limit the shift to modes of travel that use less fossil fuel. Funding for public and active transport projects through the Climate Emergency Response Fund (CERF) has ceased.[262] Local authorities will struggle to replace this themselves, given other cost pressures, so it is unclear if and how these local projects will eventuate.

Other barriers and enablers **Significant risks**	The key enablers are accessible low emissions transport infrastructure and compact urban development. Funding changes are likely to create a barrier to the development of this infrastructure. The change to the Medium Density Residential Standards (MDRS) and the draft Government Policy Statement on land transport's named goal of unlocking access to greenfield land for housing development (outside urban centres) are likely to lead to less-compact urban development. Iwi/Māori can face more disadvantages around transport than other population groups do – this involves lack of travel options and transport costs that are more than they can reasonably afford, while disproportionate obligations may limit options for public transport, cycling and walking. It is also important to maintain accessible and affordable transportation options to spaces such as papakāinga, marae and wāhi tapu that hold special meaning within concepts of identity and maintaining wellbeing. Often the transport options provided to reach these important places are carbon intensive rather than low emissions.[263]
Timeline **First emissions budget period – Significant risks** **Second emissions budget period – Insufficient**	There are significant risks in meeting the first emissions budget (for 2022–2025) around emissions reductions for passenger transport due to historical underinvestment in public transport, walking and cycling and the rail network, and inadequate policies in place to address this under-investment. Major public transport projects in Aotearoa New Zealand are being established too slowly to have much impact on meeting the second emissions budget (for 2026–2030). Projects that would have significantly reduced demand for carbon-intensive travel modes, such as Auckland Light Rail and Let's Get Wellington Moving, have had central government funding withdrawn. There is evidence of some councils working to create infrastructure for low-carbon travel modes such as cycleways. This could be affected if the proposed funding changes in the Draft Government Policy Statement on land transport 2024 proceed.
Overall assessment	
Significant risks	Changing government priorities mean there is a risk that the current policy tools are insufficient to deliver the target set in the first emissions reduction plan to reduce VKT by 20% by 2035. There are significant risks to the shift to low-carbon modes of travel, from discontinued policy and changed direction in urban planning standards which is likely to sustain the use of existing transport modes. It is not clear if the time-of-use charging signalled by the new Government as a mechanism to reduce congestion will have the effect of shifting people's travel to low-carbon modes. Current transport funding and investment plans do not align with the scale and pace of change needed to achieve emissions reductions in passenger transport in line with emissions budgets. The Draft Government Policy Statement on land transport 2024 signals a shift from investment in public and active transport to strengthening the road network.

Areas for attention

Continued tightening of the Clean Car Standard

With the discontinuation of the Clean Car Discount, the Clean Car Standard is the primary policy tool for encouraging the uptake of low and zero emissions vehicles. Although a credible policy, it is unclear how effective it will be in the absence of the Clean Car Discount. Ongoing monitoring and evaluation would be useful to establish this. The settings for the Clean Car Standard are due to be reviewed during 2024. The review will need to ensure that the standard is continually tightened over time to ensure uptake of EVs is at the scale and pace required to meet future emissions budgets.

Monitoring and evaluating the impact of road user charges

RUCs have been introduced for EVs and PHEVs, but there is no clear signal on when a further move to RUCs would occur for petrol vehicles. The Motor Vehicle Industry Association has cautioned that current RUC rates paid by EVs create an inequity between RUC and the tax paid by petrol vehicles, which could discourage consumers from EV adoption, to the point where EV options could disappear from the market.[264] The RUC impacts the total cost of ownership of a vehicle, which includes running costs. While, to date, EVs have not reached price parity with ICE vehicles, they have been cheaper on a total cost-of-ownership basis.

Arrangements differ for different light vehicle types, but there is a risk that the new RUCs for EVs and PHEVs will discourage uptake of these vehicle types. Ongoing monitoring and evaluation of the impact of the RUCs would be useful to establish whether this is occurring.

Additional tools to facilitate increase in public and active transport

Current policy tools are insufficient to deliver the target to reduce the distance travelled by light vehicles set in the first emissions reduction plan. The decision to stop the design and implementation of VKT-reduction programmes means there is no clear plan to support delivery of the target. Current plans for transport investment reduce funding for public and active transport initiatives, while allowing local authorities to opt out of the MDRS is likely to lead to less-compact urban development. An evidence-based plan with confirmed funding sources will be important to demonstrate the scale and pace of change needed to achieve the shift to low-carbon transport that will reduce emissions in line with emissions budgets.

Development and uptake of low-carbon liquid fuels

There is a gap left by the discontinuation of the Sustainable Biofuels Obligation. Without other policy to encourage the development of low-carbon liquid fuels for light vehicle transport, it is unlikely that the carbon intensity of fuel used in the existing fleet will reduce. This places further reliance on the uptake of EVs to achieve the emissions budgets. The policy proposed in the National and New Zealand First coalition agreement relating to developing a plan for transitional low-carbon fuels may provide an option.[265]

New opportunities to reduce emissions

Part of the monitoring role of He Pou a Rangi Climate Change Commission (the Commission), under section 5ZK of the Climate Change Response Act 2002 (the Act), is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

- To date, the uptake of EVs and other more fuel-efficient vehicles has been faster than expected (when compared with the level of uptake projected in the Commission's 2022 demonstration path, which we use as a benchmark). This path broadly aligns with targets set out in the first emissions reduction plan, which targets a 30% fleet share of zero emissions vehicles by 2035.
- Using the EV uptake rate and the rate of improvement in fuel efficiency for internal combustion engines from the EB4 demonstration path illustrates the effect of a pathway that is more aligned with recent trends.
- A faster adoption pathway for EVs would reduce emissions by an additional 1.3 $MtCO_2e$ over the second emissions budget and 1.2 $MtCO_2e$ over the third emissions budget. Faster improvement in the emissions intensity shows reduced emissions of an additional 5.4 $MtCO_2e$ over the second emissions budget and 5.7 $MtCO_2e$ over the third emissions budget.
- These two areas highlight the opportunity to use additional policy tools which support the uptake of low emissions vehicles and zero emissions vehicles to decarbonise the light fleet more quickly.

10.2:
Te tūnuku utanga | Freight transport

This section focuses on the progress made to reduce emissions from freight transport. These emissions are created by the burning of fossil fuels by medium and heavy trucks, and rail and coastal shipping, as they operate in Aotearoa New Zealand's freight and supply chain system.

Reducing emissions from freight transport primarily involves:

- transitioning internal combustion engine (ICE) trucks to low or zero emissions alternatives
- increasing the use of low-carbon liquid fuels and increasing the share of freight carried by rail and coastal shipping that have lower emissions than road freight
- developing freight system efficiencies through new technologies and facilities such as integrated freight hubs

The level of emissions reductions in the Commission's 2022 demonstration path, which we use as a benchmark for assessing emissions reduction, suggests that freight emissions will need to decrease significantly. The first emissions reduction plan included a goal for freight sector emissions to reduce by 35% by 2035 (based on 2019 levels), to support meeting Aotearoa New Zealand's 2050 target. This will be challenging, as freight volumes are also projected to increase by approximately 20% in that timeframe.[266] Decarbonising the fleet of medium and heavy trucks presents the biggest opportunity for reducing emissions in the freight sector, as they deliver 93% of freight volumes and contribute around a quarter of total transport emissions.[267]

Coastal shipping and rail offer lower emissions modes of transport, and using them will be key to reducing freight emissions. These heavier modes of transport will also need to decarbonise over the longer term as new technologies and fuels become available.

Our assessment of how well emissions are tracking against emissions budgets looks at actions to reduce the intensity of freight emissions.

KEY POINTS FOR FREIGHT TRANSPORT

Progress to date

- Freight emissions fell by 3% from 2021 (4.1 $MtCO_2e$) to 2022 (3.9 $MtCO_2e$) due to a significant drop in coastal shipping emissions.
- Freight emissions are increasing from a low point in 2020 that was due to the impact of COVID-19.
- The emissions trajectory to 2022 is tracking lower than the Commission's 2022 demonstration path, but only by 0.2 $MtCO_2e$.
- Since 2020, the amount of freight carried by road on a per tonne-kilometre basis has increased while the freight carried by rail has declined to a level not seen since 2017.
- Heavy vehicle emissions in 2022 were 3.8 $MtCO_2e$. While some zero emissions vehicles have entered the fleet, there is not a clear and accelerating trend in uptake.
- The emissions intensity of trucks on a per kilometre basis has remained relatively flat since 2010.

Our assessment of policy

Scorecard summary for reducing vehicle emissions intensity for freight

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Significant risks	Moderate risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

Scorecard summary for reducing demand for carbon-intensive freight modes

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Significant risks	Significant risks	Moderate risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

- Overall, we assess that there are **significant risks** to current policies and plans delivering a reduction in emissions from freight.
- The main policy tools for increasing the uptake of zero emissions trucks are credible for building early adoption in the first emission budget period (2022-2025). These include the Clean Heavy Vehicle Grant scheme, coupled with the road user charges (RUC) exemption for electric heavy vehicles and the Low Emission Transport Fund. However, there is a need to overcome significant barriers including the upfront capital cost of zero emissions trucks, and to further unlock the level of emissions reductions required to achieve the second emissions budget (2026–2030) and third emissions budget (2031–2035).
- Implementation of the Sustainable Biofuels Obligation has been discontinued, which leaves a policy gap in the development of low-carbon liquid fuels.
- There is a lack of detail on what policy tools would shift freight on to rail and coastal shipping. Cancellation of the Inter-Island Resilient Connection (iReX) ferry project, and the discontinuation of the coastal shipping activity class in the Draft Government Policy Statement on land transport 2024 could further limit freight mode shift. There is also uncertainty about ongoing rail network funding. Budget 2024 provided funding to support KiwiRail to deliver the Rail Network Investment Programme for 2024-2027 but it was indicated that funding would not continue beyond 2027.

Areas for attention

High capital cost of purchasing, limited vehicle supply and lack of supporting infrastructure could slow the uptake of zero emissions heavy vehicles below the levels sufficient to meet future emissions budgets and the 2050 target.

Mode shift of freight on to rail and coastal shipping is likely to be limited under current settings without long-term funding. This will put more pressure on reducing heavy vehicle fleet emissions.

There is a policy gap in reducing the emissions intensity of the existing heavy vehicle fleet.

How we monitor freight transport emissions

As well as monitoring how much emissions have reduced, to assess if Aotearoa New Zealand is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for freight transport.

Annual gross freight emissions were 4 $MtCO_2e$ in 2022. This was 3% lower than emissions in 2021, but above the recent low of 3.9 $MtCO_2e$ in 2020 that is thought to be caused largely by the impact of COVID-19. The emissions trajectory to 2022 is tracking lower than the Commission's 2022 demonstration path by 0.2 $MtCO_2e$.

The drop-off in 2022 comes primarily from a 0.15 $MtCO_2e$ reduction in emissions from domestic shipping, possibly due to coastal shipping increasingly being served by internationally registered vessels. Rail also declined by 0.002 $MtCO_2e$ and heavy vehicle emissions grew by 0.028 $MtCO_2e$.

Freight emissions in 2022 were 5% of gross emissions and 10% of long-lived greenhouse gas emissions (other than biogenic methane).

Emissions from freight transport are created by the burning of fossil fuels by medium and heavy trucks, rail and coastal shipping as they operate in Aotearoa New Zealand's freight and supply chain system. These emissions can be reduced by increasing the efficiency of the freight system through the adoption of new technologies and facilities such as integrated freight hubs, transitioning from internal combustion engine (ICE) trucks to zero or low emissions alternatives, increasing the use of low-carbon liquid fuels, and increasing the share of freight carried by rail and coastal shipping that have lower emissions than road freight.

The freight transport monitoring map (**Figure 10.2.1**) reflects these goals and sets out pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (**Figure 10.2.3**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

*Figure 10.2.1: Freight transport monitoring map (see **Box B2.1** for legend)*

Monitoring map for freight transport – trucks, rail, and coastal shipping

Reduce emissions from freight transport by 35% by 2035 (relative to 2019) in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce demand for carbon-intensive freight transport
- Tonne-km and/or total vehicle-km travelled

Reduce emissions intensity of freight modes
- Average emissions intensity of freight transport (gCO_2/tonne-km)

Increase the share of low emissions modes (Shift)
- Share of tonne-km moved by rail and coastal shipping

Increase freight system efficiencies (Improve)
- More efficient use of freight movements (Tonne-km per vehicle-km)

Rapid uptake of zero emissions vehicles/ trains/vessels (Improve)
- ZEVs share of freight modes entering fleets
- ZEVs share of vehicle-km

Increase uptake of low carbon liquid fuels (Improve)
- Emissions intensity of fossil fuel freight transport (emissions per vehicle-km travelled)
- Market share of low-carbon liquid fuels

ENABLERS

Freight infrastructure
- Integrated freight hubs
- Investment in upgrading, renewal and maintenance of freight infrastructure
- Resilient freight networks and assets

Zero emission charging/ refueling infrastructure
- Heavy vehicle charging/ refueling infrastructure
- Infrastructure for electric rail and shipping
- Accessible supply of electricity *(see Electricity supply monitoring map)*

Supply of zero emission (ZE) freight options
- Availability of quality ZE options in different freight classes
- Capital cost of new and used ZE freight options

Sustainable low carbon liquid fuels
- Emissions intensity of fuels

Other enablers
- Number of key personnel
- Training and skills development
- Reliable, transparent and standardised data

POLICIES

Policies and regulation for low emissions options
- Health and safety for new vehicle and fuel types
- Road user charges and exemptions
- Land transport rules and regulations
- Vehicle emissions standards
- Renewable freight certificates

Strategies
- National Land Transport Programme
- New Zealand Rail Plan
- National and regional freight and/or supply chain plans
- National and regional hydrogen roadmaps
- EV Charging Infrastructure Strategy

Investment and incentives
- Coastal shipping funding
- Rail network funding
- Heavy vehicle grants
- Low Emission Transport Fund
- National Land Transport Fund

CONTEXTUAL FACTORS

Global technology advancement
- Battery technology, prices and supply chains
- Global development in train electrification
- Technology Readiness Level of zero emissions freight technologies
- ZE freight uptake in key markets

Greater coordination of international and domestic shipping operations
- Timing of routes for shipping (cost, convenience and docking availability)
- Time sensitive goods

Source: Commission analysis

Box 10.2.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

In the freight transport sector, filling the data gaps as described below would improve the monitoring of emissions from freight demand and types of vehicle fuel.

- Coastal shipping tonne-km per vessel data would enable reporting of freight by mode share. Shifting freight to less emissions intensive modes is a key pathway outcome.
- Improved data on vehicle fuel types would enable a more accurate division of heavy vehicle emissions. In particular, splitting buses off from other heavy vehicles would allow bus emissions to be captured in the passenger transport section. This is already done in some of the Ministry of Transport projections, but not published annually.

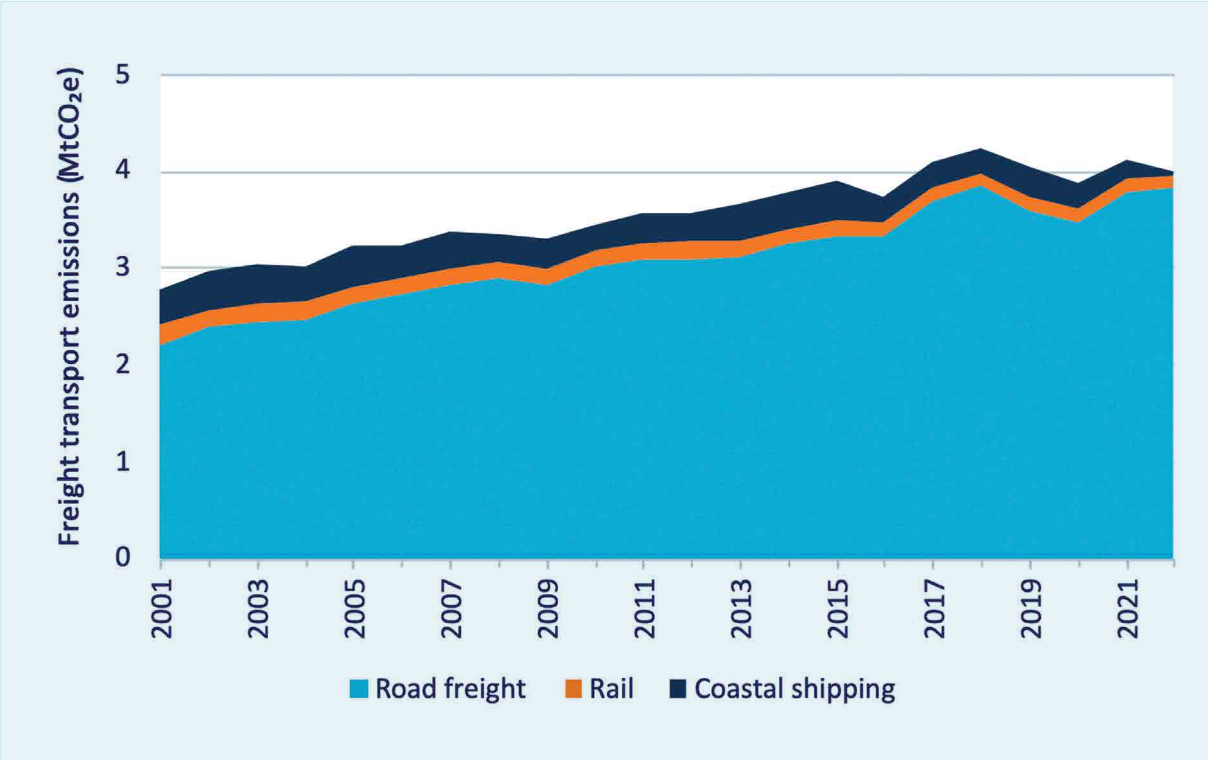
Progress in reducing freight sector emissions

Freight emissions increase from 2020 low point

Although gross freight emissions have increased from 2020, they fell by 3% (0.1 $MtCO_2e$) from 2021 (4.1 $MtCO_2e$) to 2022 (4.0 $MtCO_2e$). Freight emissions in 2022 are composed of heavy vehicles (medium and heavy trucks and buses make up 95%), rail (3%) and coastal shipping (1%) (**Figure 10.2.2**).

The main cause of the decline in freight emissions between 2021 and 2022 was a significant drop in coastal shipping emissions. These fell by 73% between 2021 (0.2 $MtCO_2e$) and 2022 (0.05 $MtCO_2e$). This corresponds with the closure of the Marsden Point Oil Refinery, which has meant that coastal shipping vessels no longer deliver oil to ports around Aotearoa New Zealand. However, the level of reduction in emissions implies other changes in the sector in 2022 beyond these vessels. Possible causes include shifting of coastal shipping activities from domestic to international vessels, or issues of data collection or categorisation.

Figure 10.2.2: Freight transport emissions to 2022



Source: New Zealand's GHG Inventory 1990–2022

Road freight increases while rail and coastal shipping declines

Since 2020, the amount of freight carried by road on a per tonne-kilometre basis has increased, while the freight carried by rail has declined to a level not seen since 2017.

Container movements is one source and this shows a significant decline in the tonnes of containerised goods moved by coastal shipping from 2017 to 2023 (**Figure 10.2.3**).

Small increase in zero emissions vehicles entering the fleet

The zero emissions share of the fleet has had a modest increase since 2020. In 2022 there was one hydrogen and 173 battery electric trucks registered in Aotearoa New Zealand (0.1% of the fleet). This is up from 93 battery electric vehicles and no hydrogen vehicles registered in 2020.[lxxviii] Note that hydrogen vehicles do not include flex fuel vehicles, which use hydrogen as well as fossil fuels in an ICE vehicle. While some zero emissions vehicles have entered the heavy vehicle fleet, there is not a clear and accelerating trend in uptake.

Emissions intensity of heavy vehicles has improved slightly

The emissions intensity of heavy vehicles on a per tonne-kilometre basis has improved from 139 grams of carbon dioxide equivalent per tonne kilometre (gCO_2e/tkm) in 2018 to 129 gCO_2e/tkm in 2022 (**Figure 10.2.3**). This indicates a slight improvement in the overall efficiency of road freight moved around Aotearoa New Zealand. This may have been achieved through improvements in vehicle efficiency or increasing logistical efficiency, such as reducing the number of trips by using one larger vehicle instead of two smaller vehicles.

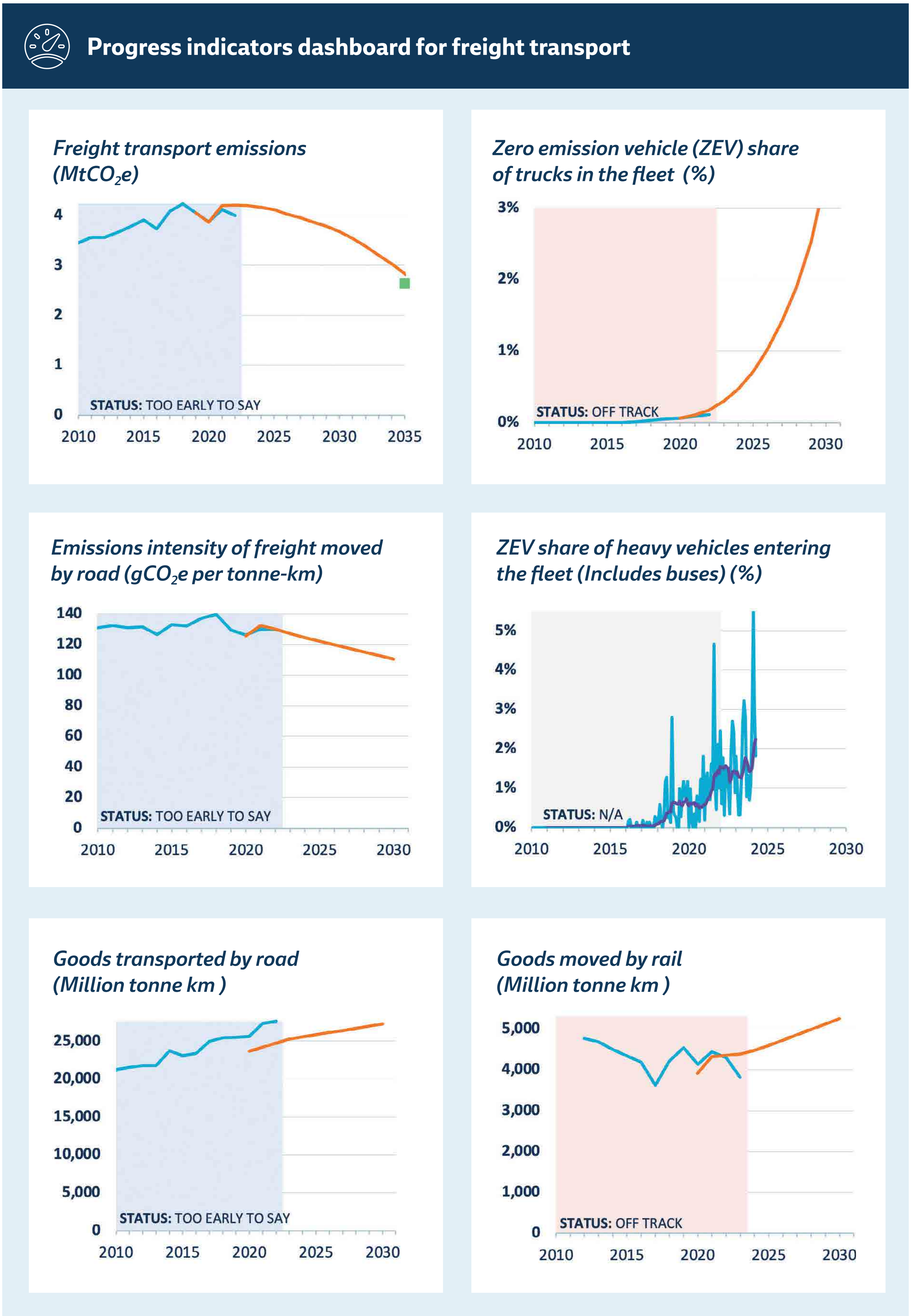
However, modes such as rail are considerably more efficient on a per tonne-kilometre basis. In 2022, the emissions intensity of rail on a per tonne-kilometre basis was 30 gCO_2e/km, which is four times less emissions intensive. The emissions intensity of rail, in general, has held a downward trajectory, declining 5 gCO_2e/km from 2015.

Freight emissions remain lower than the Commission's 2022 demonstration path

Freight emissions in 2022 are 0.2 $MtCO_2e$ below the Commission's 2022 demonstration path, which we use as a benchmark to assess emissions reduction progress. To achieve the 2035 targets set in the first emissions reduction plan, similar levels of emissions reductions to those seen between 2021 and 2022 will need to be maintained. The target is slightly below the Commission's 2022 demonstration path, which has freight emissions of 4.1 $MtCO_2e$ in 2025, 3.7 $MtCO_2e$ in 2030 and 2.8 $MtCO_2e$ in 2035 (**Figure 10.2.3**).

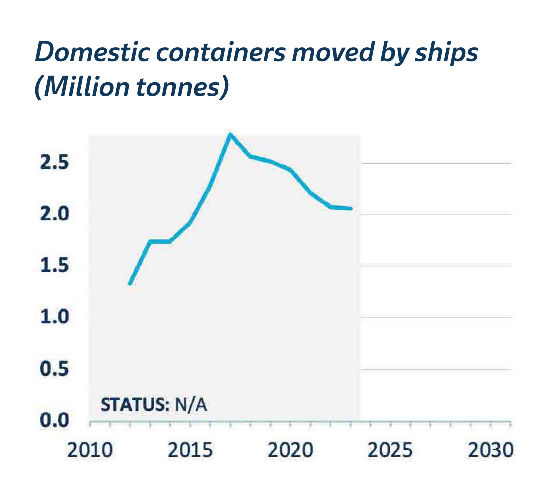
lxxviii. Ministry of Transport, Annual Motor Vehicle Fleet Statistics (2023)

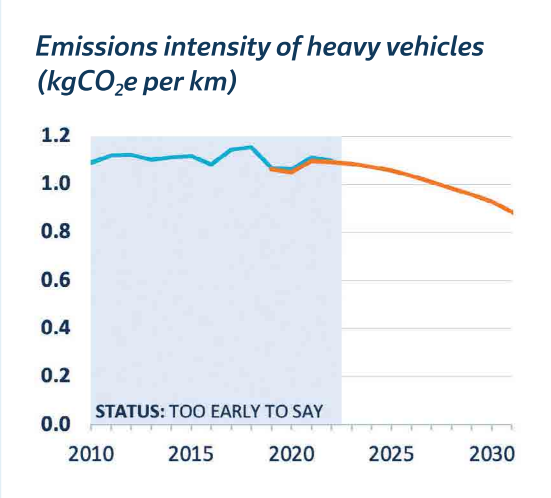
Figure 10.2.3: Progress indicators dashboard for freight transport



Please see the next page for the key

Progress indicators dashboard for freight transport





KEY

- Historic actual
- Commission's 2022 demonstration path
- Provisional data
- 12 month rolling average

Source: Commission analysis and GHG Inventory 1990–2022, Ministry of Transport, Annual Motor Vehicle Fleet Statistics (2022), Ministry of Transport Fleet statistics (monthly), Ministry of Transport Freight Information Gathering System

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by a scorecard (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for freight transport focuses on two outcome areas: 'Reduce vehicle emissions intensities' and 'Reduce demand for carbon-intensive travel modes'.

The freight transport monitoring map (Figure 10.2.1) illustrates how more specific pathway outcomes, enablers, and policies relate to these broader outcome areas.

Policy progress

- Some of the key initiatives to support the decarbonisation of freight set out in the Government's first emissions reduction plan have been completed. These include the completion of the Freight and Supply Chain Strategy, establishment of a Freight Decarbonisation Unit (although the unit has subsequently been disestablished, the Ministry of Transport advises the function continues at the Ministry), and implementation of the Clean Heavy Vehicle Grant scheme and Euro VI standard for heavy vehicles.[268]
- As well as the Freight and Supply Chain Strategy and Freight Decarbonisation Unit, initiatives to reduce demand for carbon intensive freight transport include the continued implementation of the NZ Rail Plan through the Rail Network Investment Programme,[269] and funding of a coastal shipping activity class through the 2021–2024 National Land Transport Programme (NLTP).[270]
- Upgrading of the rail network through the Rail Network Investment Programme is intended to improve network performance, providing a platform for growth in volumes of passengers and freight on rail. Opportunities for reducing carbon emissions in future programmes include the electrification of high-volume rail routes and alternative zero emissions propulsion systems, as the technology and necessary infrastructure develops.[271]

- Projects funded under the NLTP coastal shipping activity class will reduce emissions in the short term and are likely to help contribute to the outcome in the future by increasing coastal shipping capacity.[272]
- Although Budget 2024 provided NZ$200 million to support KiwiRail to deliver the Rail Network Investment Programme for 2024 to 2027,[273] the Draft Government Policy Statement on land transport 2024 signals a possible significant reduction in rail network funding from 2026 to 2027. If confirmed, regular maintenance of the rail network will not be possible, leading to a decline in network performance. This – in association with the cancellation of the project to replace the ageing Interislander ferries and upgrade port infrastructure (the iReX ferry project) and the discontinuation of the coastal shipping activity class in the Draft Government Policy Statement on land transport – is likely to further limit the shift of freight from aviation and road to rail and coastal shipping.[274]
- The gap left by the discontinuation of implementation of the Sustainable Biofuels Obligation means other policy will be needed for development of low-carbon liquid fuels for freight transport. The policy proposed in the National and New Zealand First coalition agreement relating to developing a plan for transitional low-carbon fuels may provide an option.[275]

How these policies connect to climate change adaptation

The Freight and Supply Chain Strategy notes that effects of climate change will get worse over time, which increases the risk of damaging Aotearoa New Zealand's freight and supply chain infrastructure, making it more expensive to maintain, fix and insure. Much of Aotearoa New Zealand's transport infrastructure is on the coast and needs to be fortified against sea level rises and coastal erosion. Some of it may even need to be moved. More flexibility needs to be built into Aotearoa New Zealand's supply chains to enable adaptation to these climate effects.[276]

The NZ Rail Plan notes that rail supports resilience in the transport network and can provide an alternative transport option for both goods and passengers in emergency situations. This was highlighted following the Kaikōura earthquake, where the rail line was reopened before State Highway 1 and was able to transport supplies needed to reinstate the road.[277]

Policy scorecard: Reduce vehicle emission intensity for freight

This outcome area covers three outcomes:

- increase freight system efficiencies
- enable rapid uptake of zero emissions vehicles/trains/ships
- increase uptake of low-carbon liquid fuels.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Significant risks	Moderate risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

Rationale for our scores

Main tools **Moderate risks**	The main policy tools are the Clean Heavy Vehicle Grant scheme,[278] coupled with the road user charges (RUC) exemption for electric heavy vehicles[279] and the Low Emission Transport Fund. [280] These make up a credible policy 'package' for building early adoption of low and zero emissions heavy vehicles in the first emissions budget period (2022-2025).[281] Apart from these initiatives, there are no other distinct policies to drive freight emissions reductions, noting that the Ministry of Transport and NZ Transport Agency are to complete scoping in 2024 of a review of the regulatory system to better enable zero emissions heavy vehicles to operate.
Funding and finance **Significant risks**	The Clean Heavy Vehicle Grant scheme has budgeted funding of NZ$30 million up to 2025/26.[282] Budget 2024 stopped funding for the Low Emissions Transport Fund Freight Decarbonisation Grants programme, administered by the Energy Efficiency and Conservation Authority (EECA).[283] It is unclear whether funding for the Clean Heavy Vehicle Grant scheme will continue beyond the 2025/26 financial year. Additional funding will be required to scale up initiatives to levels needed to meet the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035).

Other barriers and enablers **Moderate risks**	Key enablers are zero emissions charging/refuelling infrastructure, supply of zero emissions freight vehicles/trains/ships and zero emissions and low-carbon liquid fuels. The key initiatives in the Government's first emissions reduction plan consider some of the enablers, although some barriers relating to heavy vehicle charging and low-carbon liquid fuels remain. Of particular importance is progressing work on heavy vehicle charging, which is a focus of the EV Charging Strategy that was released in October 2023.[284] However, the unclear status of the current actions for EV charging of heavy vehicles in the strategy mean there is a risk that these initiatives will be slower to develop and implement. Many Māori businesses operate in the agriculture, forestry, seafood, and food-processing sectors, which rely heavily on the freight and supply chain system to transport goods to markets in Aotearoa New Zealand and abroad.[285] It is unclear whether there are any specific barriers/enablers for iwi/Māori related to decarbonising freight.
Timeline **First emissions budget period – Moderate risks** **Second emissions budget period – Significant risks**	There were no detailed timelines in the Government's first emissions reduction plan for the key initiatives to reduce emissions from freight transport. The Ministry of Transport's Decarbonising Transport Action Plan 2022–2025 sets out yearly milestones for each of the actions. Except for the completed actions, most milestones will end in 2025.[286] More detailed timelines are required to assess when actions will be achieved, and progress made towards achieving emissions budget outcomes. Although the main policy tools are credible for building early adoption in the first emissions budget period (2020-2025), there is some risk from unclear future funding commitments. Due to the scale of emissions reductions required from the freight sector in the second emissions budget period (2026–2030) and third emissions budget period (2031–2035), further supporting policies and plans and additional funding will be critical to scale up the uptake of low and zero emissions trucks. Without this, there is risk that the uptake to the levels needed to meet the second emissions budget will not be reached.
Overall assessment	
Significant risks	The main policy tools are credible for building early adoption in the first emissions budget period (2020–2025). However, further supporting policies, more detailed evidence-based planning and confirmed funding sources will be critical to scale these initiatives up to levels needed to reduce the emissions intensity of freight over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

Policy scorecard: Reduce demand for carbon-intensive freight transport

This area focuses on two outcomes:

- increasing the share of low emissions freight transport modes (rail and coastal shipping)
- increasing freight system efficiencies.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Significant risks	Significant risks	Moderate risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

Rationale for our scores

Main tools **Significant risks**	The main policy tools are the Freight and Supply Chain Strategy,[287] NZ Rail Plan,[288] supporting coastal shipping,[289] and establishing a decarbonisation unit[290] and renewable freight certificates. The decarbonisation unit has been disestablished, though the Ministry of Transport advises that the function remains at the Ministry. The Renewable Freight Certificate project is a credible policy tool but requires further detailed demand assessment and the confirmation of system details before it can be considered feasible.[291] The other policy tools do not provide sufficient detail to adequately assess their effectiveness in optimising the freight network and increasing the share of rail and coastal shipping.
Funding and finance **Significant risks**	It is unclear if funding levels are sufficient, due to a lack of implementation detail for the key policy tools. Although Budget 2024 provided funding to support KiwiRail to deliver the Rail Network Investment Programme for 2024 to 2027,[292] the Draft Government Policy Statement on land transport 2024 signals a possible significant reduction in rail network funding from 2026/27.[293] If confirmed, regular maintenance of the rail network will not be possible, leading to a decline in network performance. This – in association with the cancellation of the iReX ferry project and the discontinuation of the coastal shipping activity class in the Draft Government Policy Statement on land transport 2024 – could further limit the shift of freight from road to rail and coastal shipping. Funding allocated through government agency baselines risks being reallocated as government priorities change. This may put the development of the Renewable Freight Certificate project and implementation of the Freight and Supply Chain Strategy at risk

Other barriers and enablers **Moderate risks**	The main enabler is key freight infrastructure – particularly the infrastructure required to facilitate the movement of freight between trucks, rail and coastal shipping such as integrated freight hubs. The other relevant enabler is workers and skills, noting that there are already shortages in these areas and that truck/train drivers, ship captains and crew, mechanics, engineers and electricians with the right skills and experience will be needed for the transition. The Freight and Supply Chain Strategy and NZ Rail Plan identify the main enablers and barriers (such as data availability and sharing, and workforce challenges) but there are some gaps in the actions to address these, which indicates a risk for delivery.
Timeline **First emissions budget period – Moderate risks** **Second emissions budget period – Significant risks**	Although there is not a detailed plan with actions and timelines, the Freight and Supply Strategy clearly sets out the issues associated with network optimisation and increasing the share of freight carried by rail and coastal shipping while providing a high-level roadmap.[294] It is also intended that the strategy will launch a second set of actions in 2024 that will be a more substantive work programme.[295] The NZ Rail Network Investment Programme contains actions to set the platform for increasing the share of freight carried by rail and notes future opportunities for electrification.[296] Although the main policy tools are likely to begin the process of providing the groundwork for increasing the share of freight carried by rail and coastal shipping in the first emissions budget period (2020–2025), the funding is uncertain. More detailed plans and confirmed funding will be critical to make progress towards achieving emissions budget outcomes. Without these, there is significant risk that the uptake in freight carried by rail and coastal shipping needed to meet the second emissions budget (for 2026–2030) will not be achieved.
Overall assessment	
Significant risks	The main policy tools do not provide sufficient detail for their effectiveness to be adequately assessed. The exception is the Renewable Freight Certificate project, which requires further detailed assessment before it can be considered feasible. It is unclear if funding levels are sufficient due to a lack of detail about the implementation of key initiatives. Reallocation of government agency baselines may put implementation of the Renewable Freight Certificate project and Freight and Supply Chain Strategy at risk. The possible significant reduction in rail network funding from 2026/27, along with the cancellation of the iReX ferry project and discontinuation of the coastal shipping activity class in the Draft Government Policy Statement on land transport 2024, could further limit the shift of freight from road to rail and coastal shipping. More detailed plans and confirmed funding will be required to make progress towards achieving emissions budget outcomes.

Areas for attention

Continuation of tools to address capital cost barriers

The Clean Heavy Vehicle Grant scheme, coupled with the RUC exemption, make up a credible policy package for encouraging freight businesses to invest in zero emissions heavy vehicles. However, it is unclear if current funding of these initiatives will continue. Without continued funding that is increased over time in association with the development of detailed plans, it will be challenging to increase uptake of zero emissions heavy vehicles to the levels needed to meet future emissions budgets and targets.

Inclusion of heavy vehicles in electric vehicle charging strategies

Apart from the policy package described above, there are no other clear policies to drive freight emissions reductions. It will be important to progress actions for EV charging of heavy vehicles in the EV Charging Strategy and complete the scoping of the review of the regulatory system to better enable zero emissions heavy vehicles to operate.

Coherent policies and appropriate funding to shift to lower emissions freight modes

Under the Commission's 2022 demonstration path, freight volumes are anticipated to increase 18% by 2030 relative to 2019. One of the ways to decarbonise freight is to move goods by rail rather than trucks. The only rail-enabled ferry currently is the *Aratere*, which can carry a maximum of 27 sixty-foot equivalent wagons per sailing. This limits the amount of freight that can be moved by rail across the Cook Strait. By comparison, the two proposed rail-enabled ships were expected to carry 40 sixty-foot equivalent wagons per vessel on up to three return sailings each per day,[297] which would have unlocked more rail freight capacity.

Although the Freight and Supply Chain Strategy and NZ Rail Plan have been completed and the Renewable Freight Certificate project is a credible policy tool, there is not sufficient detail to assess their effectiveness. Further, current plans for transport investment will reduce funding for the rail network, while the discontinuation of the coastal shipping activity class in the Draft Government Policy Statement on land transport 2024 is likely to further limit the shift of freight from road to rail and coastal shipping.

The development of a cohesive plan that includes evidence-based actions, associated timeframes and appropriate funding will be important to ensure optimisation of the freight network and a further shift of freight onto rail and coastal shipping.

10.3: Rererangi | Aviation

This section focuses on the progress made to reduce greenhouse gas emissions from domestic aviation. These emissions are created by the burning of aviation fuel during flights across Aotearoa New Zealand.

Reducing emissions from domestic aviation primarily involves:

- increasing the use of electric aircraft
- improvements in efficiency
- increasing the use of sustainable aviation fuel (SAF).

Domestic aviation is a challenging sector to decarbonise. While it is expected that electric aircraft will be operational by 2030 for short-distance regional flights, battery weight means they are not currently expected to be useable for longer flights such as between Auckland and Wellington.[298] Therefore, within the second emissions budget period (2026–2030), the biggest opportunity for reducing emissions is from the use of SAF. In the Commission's 2022 demonstration path, which we use as a benchmark for assessing emissions reduction progress, it is assumed that the development of SAF can displace 5% of aviation fuel use by 2035.[299]

Our assessment of how well emissions are tracking towards meeting the emissions budgets looks at actions to reduce the intensity of domestic aviation emissions.

KEY POINTS FOR AVIATION

Progress to date

- Gross emissions from domestic aviation in 2022 were 1 $MtCO_2e$. Emissions in 2022 grew by 24% (0.2 $MtCO_2e$) from 2021 (0.8 $MtCO_2e$). Provisional emissions for 2023 indicate further growth of 24% from 2022, with aviation sector emissions reaching 1.3 $MtCO_2e$.
- Recent trends have been dominated by a recovery in demand after the effects of COVID-19. Domestic aviation data shows emissions increasing from a low point in 2020 with no clear sign of declining passenger air travel. This is likely to also mean there is no clear sign of emissions reductions as a result.
- Changes observed to date are broadly on track with the Commission's 2022 demonstration path.

Our assessment of policy

Scorecard summary for reducing domestic aviation emissions intensity

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Significant risks	Significant risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

- We assess that there are significant risks to current policies and plans delivering a reduction in aviation emissions intensity.
- A sustainable aviation fuel (SAF) mandate is a credible tool. However, due to current uncertainty around its development, timelines and funding sources, there is a risk that the mandate may not progress.
- A delay or discontinuation of a SAF mandate will impact on the ability to achieve emissions reductions in the second emissions budget period (2026–2030) and third emission budget period (2031–2035).

Areas for attention

- Reducing the emissions intensity of aviation will be difficult without addressing barriers to the increased use of SAF. A SAF mandate is at the early stage of development. Other potential opportunities include regulatory amendments to make building the infrastructure for alternative fuels easier, and upgrades to the electricity network for better ground power options for aircraft at airports.

How we monitor aviation emissions

As well as monitoring how much emissions have reduced, to assess if Aotearoa New Zealand is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for domestic aviation.

In 2022, gross emissions from domestic aviation were 1 $MtCO_2e$. This was 1.3% of gross emissions and 2.5% of gross long-lived greenhouse gas emissions (other than biogenic methane).

Emissions from domestic aviation are created by the burning of aviation fuel during flights across Aotearoa New Zealand. These emissions can be reduced through an increase in the use of electric planes for short-distance regional flights, improvements in efficiency, and the increased use of SAF for flights between the main urban centres.

The aviation monitoring map (Figure 10.3.1) reflects these goals and sets out pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (Figure 10.3.2) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

*Figure 10.3.1: Aviation monitoring map (see **Box B2.1** for legend)*

Monitoring map for aviation

Reduce domestic aviation emissions by 3% by 2035 (relative to 2019) in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce aviation emissions intensity
- Average emissions intensity per passenger kilometre

Reduce demand for aviation
- Passenger kilometres travelled

Improve efficiency
- Fuel use per passenger kilometre

Improve uptake of low emissions aircraft
- Share of passenger kilometres on low emissions aircrafts (electric and hydrogen)
- Share of zero or low emissions aircraft entering fleet

Improve use of sustainable aviation fuels (SAF)
- Use of SAF

ENABLERS

Innovation
- Trials of low or zero emissions aircrafts
- Trials of SAF

Infrastructure
- Ground power availability at airports *(see Electricity supply monitoring map)*

Sustainable aviation fuel
- SAF domestic production capacity

Alternatives to flying
- Reduced business flights due to increased virtual meetings
- Inter-regional public transport options are reliable and affordable

Public attitudes
- Public surveys on attitudes towards flying and alternatives

POLICIES

Regulations
- Sustainable aviation fuel (SAF) mandate
- Enabling regulations for use of sustainable aviation fuel
- Enabling regulations for use of hydrogen or renewable energy-SAF
- Safety regulations and approval of new aircraft and drones

Funding and finance
- Aviation levy
- Funding for low emissions fuels
- Funding for aircraft
- Funding for infrastructure

Collaboration and strategic approaches
- Tourism industry policy and action plans
- H2 Consortium
- SAF Consortium

CONTEXTUAL FACTORS

Costs
- Oil price
- Cost of SAF production
- Cost of travel for passengers including government subsidies and levies

Technology advancements
- More efficient aircraft design
- Technology readiness levels of low and zero emissions aircrafts

International market
- Global uptake of SAF

Source: Commission analysis

Box 10.3.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

For the aviation sector, the following data for measuring the reduction of overall travel demand are collected but not freely available:

- commercial and passenger kilometres travelled at a national level
- freight tonne-kilometres transported at a national level.

These data would enable an improved calculation of the efficiency and intensity of domestic aviation in association with national energy and emissions statistics.

Progress in reducing aviation sector emissions

Gross aviation emissions grew in 2022 by 24% (0.2 $MtCO_2e$) from 2021 (0.8 $MtCO_2e$). Provisional emissions for 2023 indicate further growth of 24% from 2022 with aviation sector emissions reaching 1.3 $MtCO_2e$ (**Figure 10.3.2**).

Recent trends have been dominated by a recovery in demand from the impact of COVID-19 in 2020.

From the low point in 2020, the number of domestic aviation flights per year are nearly back to the levels of 2018, when there were 350,000 flights. These domestic flights include passenger and freight but exclude training, commercial, adventure, military and agricultural flights (**Figure 10.3.2**).

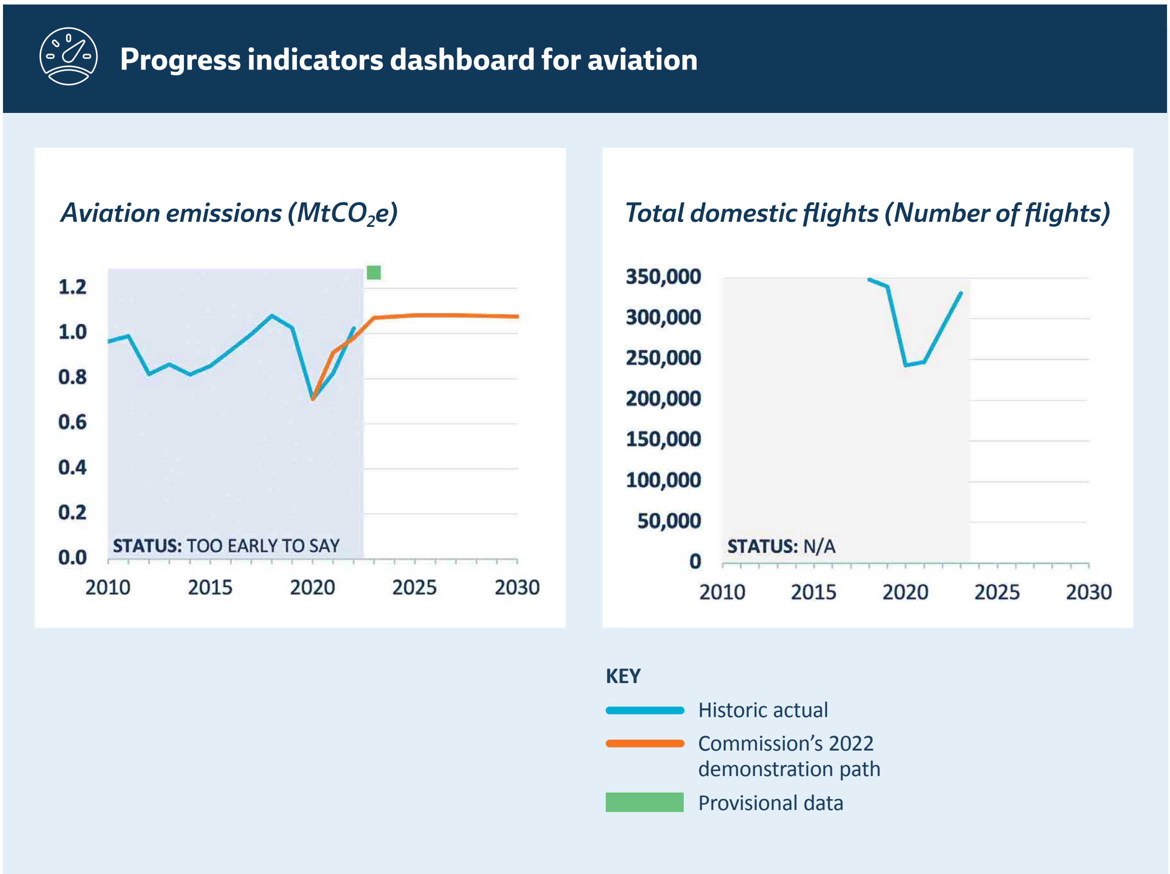
Alongside increases in the number of flights, data also show emissions have increased by 0.3 $MtCO_2e$ from a recent historical low in 2020 (due to COVID-19). This is likely to also mean there is no clear sign of emissions reductions as a result.

Comparing emissions and the number of flights shows that emissions per flight are now higher than before COVID-19. Analysis of emissions per flight is of limited usefulness in assessing progress, because flights may be carrying more passengers or travelling longer distances. Key missing data are aviation activity on a passenger kilometre and freight kilometre basis. Tracking this data would enable an improved calculation of the emissions intensity of domestic aviation.

Between 2020 and 2023, both the Commission's 2022 demonstration path (which we use as a benchmark for assessing emissions reduction progress) and actual emissions show a growing trend. However, the aviation sector emissions have been increasing at a faster rate, reaching 1.3 $MtCO_2e$ by 2023, which is 0.2 $MtCO_2e$ higher than the demonstration path (**Figure 10.3.2**).

From 2023 onwards, emissions in the demonstration path are relatively flat, reaching 1.1 $MtCO_2e$ in 2025, holding steady at the same level to 2030, then reducing slowly after 2030 as zero emissions aircraft become operational for short-distance flights and there is increasing use of low-carbon liquid fuels. As a result of these changes, emissions fall below 1 $MtCO_2e$ by 2035.

Figure 10.3.2: Progress indicators dashboard for aviation



Source: Commission analysis, New Zealand's GHG Inventory, Civil Aviation Authority

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by a scorecard (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

Our policy assessment for aviation focuses on the outcome area: 'Reduce domestic aviation emissions intensity'.

The aviation monitoring map (**Figure 10.3.1**) illustrates how more specific pathway outcomes, enablers, and policies relate to these broader outcome areas.

Policy progress

- The Government's first emissions reduction plan set out three key initiatives for reducing aviation emissions:
  - implement a SAF mandate
  - establish a public–private leadership body focused on decarbonising domestic aviation
  - develop specific emissions reduction targets in line with Aotearoa New Zealand's 2050 target.
- A leadership body called Sustainable Aviation Aotearoa (SAA) has been established with three workstreams: SAF; zero emissions aircraft; and strategy, including regulation, infrastructure, and developing aviation emissions targets. The status and timelines for the development of these targets are currently unclear.[300]
- While the Sustainable Biofuels Obligation has been discontinued, the analysis for a SAF mandate is continuing, with MBIE and the Ministry of Transport to develop the settings of the mandate. Two studies to determine the feasibility of producing SAF in Aotearoa New Zealand are due to be completed mid-2024. Although separate from the SAF mandate work, this research may help inform the mandate settings.[301]
- The policy proposed in the National and New Zealand First coalition agreement relating to developing a plan for transitional low-carbon fuels may help facilitate the development of the SAF mandate.[302]
- Potential other opportunities include changes to the Resource Management Act 1991 (RMA) to make building the infrastructure for alternative fuels easier, and upgrades to the electricity network for better ground power options for aircraft at airports. This will require skills and training for the workers involved, including ground staff at airports and fuel production sites, as well as engineers and mechanics.

How these policies connect to climate change adaptation

Actions to reduce emissions from domestic aviation can be designed to also support adaptation efforts. For example, aviation infrastructure such as airports can be enhanced to withstand extreme weather impacts, by using renewable energy sources to provide more resilient power options.

Policy scorecard: Reduce domestic aviation emissions intensity

This area focuses on three outcomes:

- aircraft efficiency
- uptake of low emissions aircraft
- use of SAF.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Significant risks	Significant risks	EB1 – Moderate risks EB2 – Significant risks	**Significant risks**

Rationale for our scores

Main tools **Moderate risks**	Of the three key initiatives (SAA working group, targets, SAF mandate), the implementation of a SAF mandate is likely to make a significant impact on reducing domestic aviation emissions, if designed correctly and implemented effectively. However, uncertainty around the status of its development means there is a risk that the SAF mandate may not progress.
Funding and finance **Significant risks**	It is unclear how the key initiatives will be funded. There is no clear funding source for the development of the SAF mandate. It is assumed that funding to develop the aviation targets and support the continuation of SAA will come from the lead agencies – the Ministry of Transport and MBIE. There is uncertainty surrounding ongoing funding, as government agencies look to reduce spend in areas that are not considered to be a priority.
Other barriers and enablers **Significant risks**	Key enablers for reducing aviation emissions are innovation (trials of low and zero emissions aircraft and SAF), infrastructure (ground power availability at airports) and domestic production capacity of SAF in Aotearoa New Zealand. The key initiatives could partially address the identified enablers. SAA could provide advice on improving efficiency and the uptake of low emissions aircraft. The use of SAF could be progressed by the completion of the SAF feasibility studies and development of the SAF mandate. However, stakeholder engagement on whether international shipping and aviation should be included in the 2050 target has revealed that there is a gap in supporting policies that are required for a SAF mandate to work effectively (for example, funding to establish domestic production of alternative fuels, or a subsidy on use of SAF). The production of SAF in Aotearoa New Zealand may have positive economic impacts for iwi/Māori who have strong interests in forestry and agriculture. A transition to alternative fuels could present a significant opportunity for that part of the Māori economy, with potential benefits from increased demand for the source materials, such as wood waste, that can be used to make fuel.[303]

Other barriers and enablers (continued) **Significant risks**	Overall, the key initiatives for this outcome area have not progressed enough to assess the extent barriers and enablers have been addressed or how much of a risk this presents.
Timeline **First emissions budget period – Moderate risks** **Second and third emissions budget – Significant risks**	There are no timelines in the Government's first emissions reduction plan for the key initiatives to reduce domestic aviation emissions. Limited timelines in the Ministry of Transport's Decarbonising Transport Action Plan 2022–2025 indicate that the target and SAF mandate development are behind schedule.[304] This delay means there is a risk that this foundational work will not be complete by the end of the first emissions budget period in 2025. This is likely to delay the development of SAF in the second emissions budget period (2026–2030), when the biggest opportunity for reducing aviation emissions is likely to come from drop-in biofuels as a component of aviation fuels.[305] The introduction of zero or low emissions aircraft is anticipated in Aotearoa New Zealand during the third emissions budget period (2031–2035). It will be important to develop regulations to enable this during the second emissions budget period, but delays in the first period are likely to delay this work.[306]
Overall assessment	
Significant risks	A SAF mandate is a credible tool to achieve significant reductions in domestic aviation emissions. However, uncertainty around its current status indicates there is a risk that the development of the SAF mandate may not progress. There is also an absence of an evidence-based plan, including associated timelines and confirmed funding sources, that demonstrates how key initiatives will lead to a reduction in aviation emissions over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

Areas for attention

Delay in implementation of a Sustainable Aviation Fuels mandate

Of the three key initiatives to reduce domestic aviation emissions, the implementation of a SAF mandate is likely to make a significant impact by assisting in the transition to low-carbon fuels. However, the mandate is at an early stage of development and at risk from uncertainty about its status, and it has no clear funding source. A delay or discontinuation of policies to increase the use of SAF could impact on the ability to achieve emissions reductions from aviation in the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

A cohesive, evidence-based plan

The SAA leadership body has been established to provide advice on zero emissions aircraft, SAF and changes to policy and regulatory settings to enable and support aviation emissions reductions. It will be important for the SAA's work to contribute to the development of a cohesive, evidence-based plan that includes associated timelines and confirmed funding sources. Without it, there is a risk that reductions in aviation emissions will be limited over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

Whenua | Land

This chapter looks at greenhouse gas emissions in two areas: agriculture and forests.

This assessment:

- examines progress on implementing policies intended to drive emissions reductions
- looks at whether and how those policies connect to climate change adaptation
- tracks changes in emissions to date, alongside other notable sector trends.

We use policy scorecards to assess the strength of emissions reduction policies and plans to drive change in each sector, as described in *Chapter 2: Our approach*. From the policy scorecards, we identified areas for attention where gaps in the suite of policies for each sector could create risks for meeting emissions budgets or where new opportunities for emissions reductions could be pursued.

11.1: Ahuwhenua | Agriculture

This section is about agricultural emissions, which come mainly from the farming of sheep, beef and dairy cattle, deer, arable crops, and horticulture. Agriculture is a major component of the Aotearoa New Zealand economy. The food and fibre sector export revenue was NZ$57.4 billion in the year 1 July 2022 to 30 June 2023, making up around 82% of Aotearoa New Zealand's merchandise exports.[307]

More than half (53%) of Aotearoa New Zealand's gross emissions of greenhouse gases come from agriculture, and the sector contributes around 91% of total biogenic methane emissions.[308] Greenhouse gas emissions from agriculture can be reduced by changing on-farm practices to make farm systems more efficient, adopting low emissions technology such as urease inhibitors, and transitioning to lower emissions land uses such as horticulture and arable farming.

Achieving emissions reductions in the agriculture sector will see it play its part in Aotearoa New Zealand meeting the 2030 biogenic methane component of the 2050 target, which coincides with the end of the second emissions budget period (2026–2030).

KEY POINTS FOR AGRICULTURE

Progress to date

- Emissions from agriculture are decreasing. The latest data from New Zealand's Greenhouse Gas Inventory (GHG Inventory), published in 2024, show that total agricultural emissions reduced from 42.9 $MtCO_2e$ in 2020 to 41.7 $MtCO_2e$ in 2022, a reduction of 2.7%. Agricultural emissions most recently peaked at 43.3 $MtCO_2e$ in 2014, corresponding with a peak in overall cattle numbers.
- Biogenic methane emissions from agriculture have maintained a recent downward trend, falling by 1.6% (0.02 $MtCH_4$) from 1.25 $MtCH_4$ in 2019 to 1.23 $MtCH_4$ in 2022.
- Land-use area for sheep and beef farming has declined by 18.7% (1.7 million hectares (Mha)) from 9.2 Mha in 2010 to 7.5 Mha in 2022, with a corresponding decrease of 15.4% in stock units (8.1 million) over the same period.[lxxix] Dairy farming area has decreased by 5.5% (0.1 Mha) from 1.76 Mha in 2017 to 1.66 Mha in 2022, with a 9.1% drop in total dairy cattle (0.6 million animals) during this time. For 2022, the area for sheep and beef farming, and dairy farming, is below the numbers modelled in the Commission's 2022 demonstration path, which aligns to the emissions budgets set by Government.
- Possible contributing factors to these reductions in agricultural emissions include land-use change from sheep and beef farming to forestry, and economic and industry conditions such as high fertiliser prices and low lamb prices. Beef + Lamb New Zealand's data show that farm profitability fell 32% in the 2022/23 season and is forecast to fall by 31% for the 2023/24 season.[309] Reduced use of synthetic nitrogen fertiliser has likely had a smaller impact than these other factors.
- The amount of nitrogen fertiliser used on farms has dropped by 15% from its peak of 470 million kg in 2020 to 399 million kg in 2022. Provisional data from the Fertiliser Association of New Zealand[lxxx] indicate a further drop of close to 8% in nitrogen fertiliser used in 2023, relative to the previous year.[310] While the decrease in nitrogen fertiliser use has likely been due mainly to high fertiliser prices driven by global events, it demonstrates the potential for farmers to respond to price signals and find efficiencies. We do not know yet to what extent the reductions will be sustained or whether usage might increase again as fertiliser prices return to lower levels.
- Urease inhibitor[lxxxi] use is currently the only low emissions technology that is accounted for in the GHG Inventory published in 2024. Use of urea coated with urease inhibitor is tracking similar to that modelled in the Commission's 2022 demonstration path. In 2022, 45% (138 million kg N) of all urea fertiliser sold was coated with urease inhibitor – a rapid increase since 2010, when urease inhibitor was only used in 7% (19.5 million kg N) of urea fertiliser.

lxxix. Animal numbers are expressed as a weighted average of sheep and beef numbers, based on approximate relative feed intake – one beef cattle is the equivalent of five sheep. A stock unit is defined as an animal with an intake of 6,000 megajoules of metabolisable energy intake per year.

lxxx. Provisional data supplied to the Commission by the Fertiliser Association of New Zealand on request.

lxxxi. Urease inhibitors reduce losses of ammonia (through volatilisation) from urea use and maximise nitrogen available for plant uptake, resulting in small reductions in nitrous oxide emissions. It also means that less nitrogen needs to be used, which in turn leads to less nitrous oxide being emitted.

- Provisional data from the Fertiliser Association of New Zealand indicated uptake of urease-inhibitor-coated urea has increased further in 2023, to 60% of all urea sold. Between 2020 and 2022, the direct emissions from nitrogen fertiliser use have reduced by 30% (0.42 $MtCO_2e$) from 1.38 $MtCO_2e$ to 0.96 $MtCO_2e$. The direct effect of urease inhibitor use is small; we estimate its use in 2022 saved 0.03 $MtCO_2e$, or less than 0.1% of total agricultural emissions in that year.

Our assessment of policy

Scorecard summary for reducing emissions from farming

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
EB1 – Moderate risks	Moderate risks	EB1 – Moderate risks	EB1 – Moderate risks	**Significant risks**
EB2+ – Significant risks		EB2+ – Significant risks	EB2+ – Insufficient	

Scorecard summary for transitioning to lower emissions land uses

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	EB1 – Moderate risks	**Significant risks**
			EB2+ – Insufficient	

- The Government is introducing legislation amending the Climate Change Response Act 2002 (the Act) to keep agriculture out of the NZ ETS. He Waka Eke Noa – Primary Sector Climate Action Partnership (He Waka Eke Noa) has been disestablished, and the Government will engage directly with levy bodies and sector organisations that represent the pastoral sector.[311]
- Delaying the implementation of an emissions pricing scheme for agriculture would likely have a small impact on the agriculture sector's ability to meet its subtarget from the first emissions budget (from 2020–2025). However, we assess this would result in **significant risks** of not meeting the subtargets of subsequent emissions budgets, and the 2030 and 2050 biogenic methane components of the 2050 target.
- Land-use change – from sheep and beef farming to forestry – is currently being driven in part by the NZ ETS and in part by ongoing declines in profitability in the sheep and beef industry. Recently, policy uncertainty appears to be limiting the effect of the NZ ETS emissions price incentive for afforestation, as indicated by feedback from stakeholder engagement and the 2023 Afforestation and Deforestation Intentions Survey.
- Budget 2024 committed NZ$400 million over the following four years to fund research and development for on-farm emissions reduction tools and technologies.[312] Private sector partners have also committed around NZ$96 million under AgriZero^{NZ}, the government-private sector joint venture.[313] An additional NZ$50.5 million funding for the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) will be invested over the next five years in projects to find solutions to reduce the sector's emissions.[314] We assess that, beyond current commitments, there are moderate risks to research and development funding, as the long-term funding plans are unclear.
- The Government has announced that a process to develop new regulation to replace the National Policy Statement for Freshwater Management 2020 (NPS-FM) is expected to take 18 to 24 months.[315] This delay risks lowering the expected emissions reduction co-benefits from freshwater regulations over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).
- Due to the delays to implementing policies to reduce agricultural emissions and uncertain timelines, we assess there is moderate risk for meeting the first emissions budget (for 2020–2025) and insufficient plans to meet subsequent emissions budgets.

Areas for attention

- The absence of a confirmed emissions pricing system or alternative policy measures that will incentivise reductions in agricultural emissions creates a risk of the country not being on track to meet the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035) and the biogenic methane components of the 2050 target.
- Enabling regulations and securing long-term funding for research and development are important to supporting commercialisation of mitigation technologies.

- Well-designed extension and advisory services will support producers to understand where the emissions are generated in their systems and which mitigations will help reduce them. We assess that there is a still a gap in extension and advisory services that support farmers with the tools to make farming systems changes.
- There are complexities around Māori collective land ownership structures and governance that affect the ability of these landowners to raise capital that would enable on-farm practice changes, implementing on-farm mitigations, or changing land use. Support for Māori farm businesses would help them to reduce on-farm emissions and transition to low emissions land uses.
- Support for farmer catchment groups could result in further improvements in land management practices that could reduce on-farm emissions.
- Leveraging the national adaptation plan action on improving water availability and security could help to enable increased land use diversification and likely result in increased emissions reduction.

New opportunities to reduce emissions[lxxxii]

- AgriZero[NZ] is investing in developing methane reducing tools suited to Aotearoa New Zealand's pasture-based systems. The goal of AgriZero[NZ], to support a 30% reduction in agricultural emissions by 2030 and driving towards 'near zero' by 2040 while maintaining productivity, could help drive emissions reductions beyond legislated targets.
- Aotearoa New Zealand-based milk and meat processors are responding to demand from large multinational customers (e.g. Nestlé and Mars) seeking to reduce emissions across their supply chains. This may result in additional incentive to reduce emissions. Government can leverage such initiatives through partnerships with industry.
- Initiatives such as the Net Zero Banking Alliance (NZBA), targeting to transition some banks' lending portfolios to net zero emissions by 2050, are an opportunity to use sustainable finance to assist farmers in reducing agricultural emissions.

lxxxii. Section 5ZK of the Act directs the Commission to consider new opportunities to reduce emissions, as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path, or that show potential for greater reductions than previously assumed, based on new evidence.

How we monitor agricultural emissions

As well as monitoring how much emissions have reduced, to assess if Aotearoa New Zealand is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for agriculture.

In 2022, total gross agricultural emissions were 41.7 $MtCO_2e$, making up 53% of Aotearoa New Zealand's gross emissions. Biogenic methane emissions from agriculture were 1.23 $MtCH_4$ (34.4 $MtCO_2e$) in 2022, making up 91% of total biogenic methane emissions. Nitrous oxide and carbon dioxide emissions from agriculture were 7.3 $MtCO_2e$, making up 18% of total long-lived greenhouse gas emissions (other than biogenic methane).

In the Commission's 2022 demonstration path, which we use as a benchmark to assess progress in emissions reduction, total emissions from agriculture fall by 6% by 2025, 10% by 2030 and 14% by 2035, relative to emissions in 2017.[lxxxiii] Meeting the 2030 biogenic methane component of Aotearoa New Zealand's 2050 target requires total biogenic methane emissions from agriculture and waste to reduce by at least 10% by 2030, relative to 2017 levels.

The greenhouse gases emitted by the agricultural sector are methane, nitrous oxide and carbon dioxide. Methane is mainly produced by livestock and from effluent. Nitrous oxide comes from livestock, nitrogen fertiliser use, and soils. Carbon dioxide is produced from liming and urea fertiliser application. Agricultural emissions can be reduced by changing on-farm practices to make farm systems more efficient; adopting low emissions technology, such as urease inhibitors; and transitioning to lower emissions land uses, such as horticulture and arable farming.

The agriculture monitoring map (**Figure 11.1.1**) reflects these goals and sets out the pathway outcomes, enablers, and current policies that will contribute to achieving them. Progress indicators (**Figure 11.1.4**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

Box 11.1.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

For agriculture, there are two gaps in the data for measuring.

- No data are available on actual uptake of low emissions technology such as low-methane genetics. Collecting this data would enable monitoring of the impact of this technology on emissions reduction.
- Currently only urease inhibitors are accounted for in the GHG Inventory. Accounting for all available low emissions technology would improve the accuracy of calculations of agriculture emissions.

Progress in reducing agriculture emissions

Agricultural emissions have fallen since 2020

Emissions data for 2022 show there has been 1.4% (0.6 $MtCO_2e$) decrease in total agricultural emissions from 2021 to 2022, falling from 42.3 $MtCO_2e$ to 41.7 $MtCO_2e$. Between 2020 and 2022 there was a 2.7% decrease, with total agricultural emissions dropping 1.2 $MtCO_2e$ from 42.9 $MtCO_2e$ in 2020 (**Figure 11.1.2**).

lxxxiii. We present these changes as percentage reductions here, due to methodological changes in New Zealand's GHG Inventory.

*Figure 11.1.1: Agriculture monitoring map (see **Box B2.1** for legend)*

Monitoring map for agriculture

Total agricultural emissions reduce by 13% by 2035 (relative to 2021)Biogenic methane target: Agricultural methane emissions reduce by 10% by 2030 relative to 2017 in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce emissions from farming

- Emissions per hectare by activity (dairy, sheep and beef farming, other livestock farming, horticulture, arable)
- Production and emissions intensity of production
- Stock numbers

Transition to lower emissions land uses

- Land use by activity (dairy farming, sheep and beef farming, other livestock farming, horticulture, arable)

Adopting low emissions technologies

- Percentage of farms adopting low emissions technologies
- Average real-world efficacy of technologies adopted

Changes to farm practices

- Stocking rates
- Animal productivity
- Nitrogen fertiliser use
- Use of low emissions feed
- Precision application of fertiliser and irrigation

Land use change

- Area converted to/from forest (*see also Forests monitoring map*)
- Area converted to/from horticulture and arable crops
- Other changes in farm area

ENABLERS

Research and development

- Research, development, and demonstration (RD&D) investment in emissions reduction technology
- Technology pipeline by readiness level

On-farm support and skills

- Climate-focused farm planning and extension services
- Access to skilled labour
- Upskilling and growing pipeline of skilled advisors
- Māori agribusiness extension services

Partnership with iwi/Māori

- Māori access to capital
- Transitional assistance
- Governance and revenue cycling
- Māori collectives

Funding and finance

- Private sector lending
- Government-backed funding and financing

Supply chains and market access

- Infrastructure for low emissions land uses
- Markets for higher-value products
- Partnerships across supply and value chains

Data and digital connectivity

- Percentage of farms measuring/reporting emissions
- Percentage of farms with broadband/fibre connection
- Percentage of farmers using climate smart applications

POLICIES

- Support producers to make changes
- Agricultural emissions pricing
- Accelerate new mitigations through investment in RD&D on agricultural emissions reduction technology

- Resource Management Act and national policy direction
- Essential freshwater policies and regulation
- Environmental and food safety regulation
- Integrated farm planning
- New Zealand Emissions Trading Scheme

- Te Tiriti o Waitangi/The Treaty of Waitangi principles

- Ring-fenced resources
- Te Ture Whenua Māori Act

- Local government consenting regulations
- Water availability and security
- National Policy Statement on Highly Productive Land

CONTEXTUAL FACTORS

Food demand and prices

- Consumption of meat and plant-based foods
- Food waste (see *Waste monitoring map*)
- Commodity prices
- Premium prices for low emissions products

Market pressures/ Access to capital

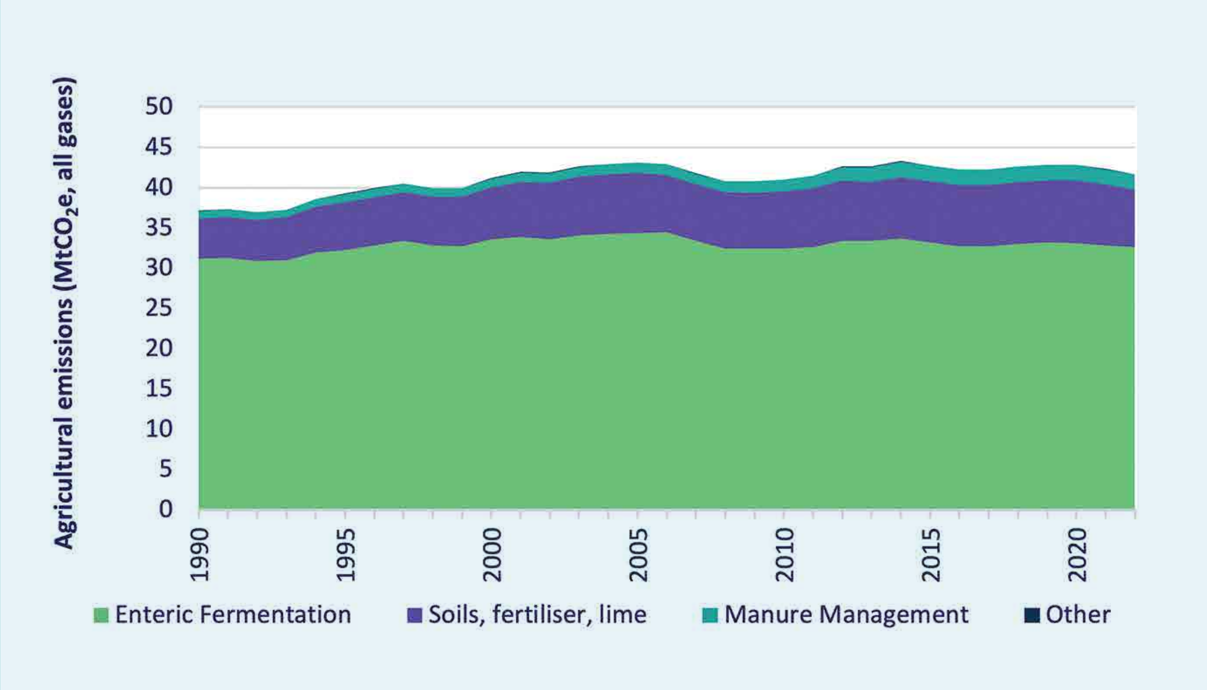
- Consumer demand for sustainable food products
- Retailer procurement policies and standards
- Scope 3 (supply chain) emissions targets
- Mandatory climate-related disclosures

International technology and innovation

- Technology adoption in other countries
- Alternative protein sources

Source: Commission analysis

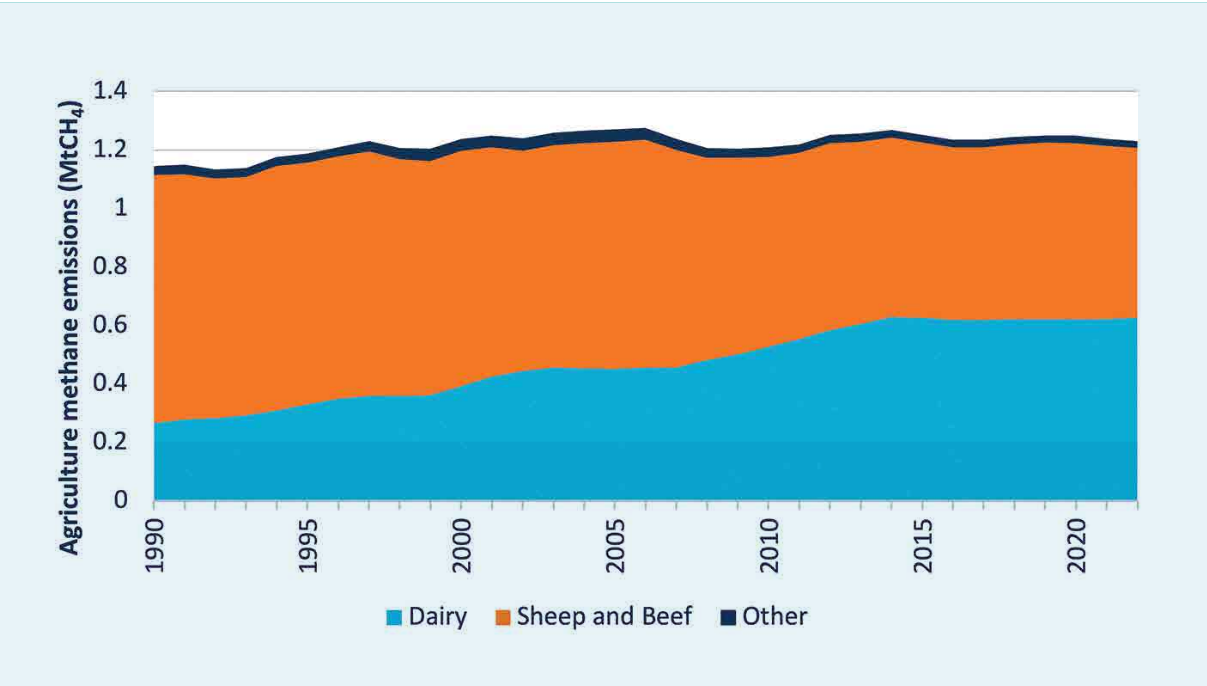
Figure 11.1.2: Agricultural emissions to 2022



Source: Commission analysis, New Zealand's GHG Inventory 1990-2022

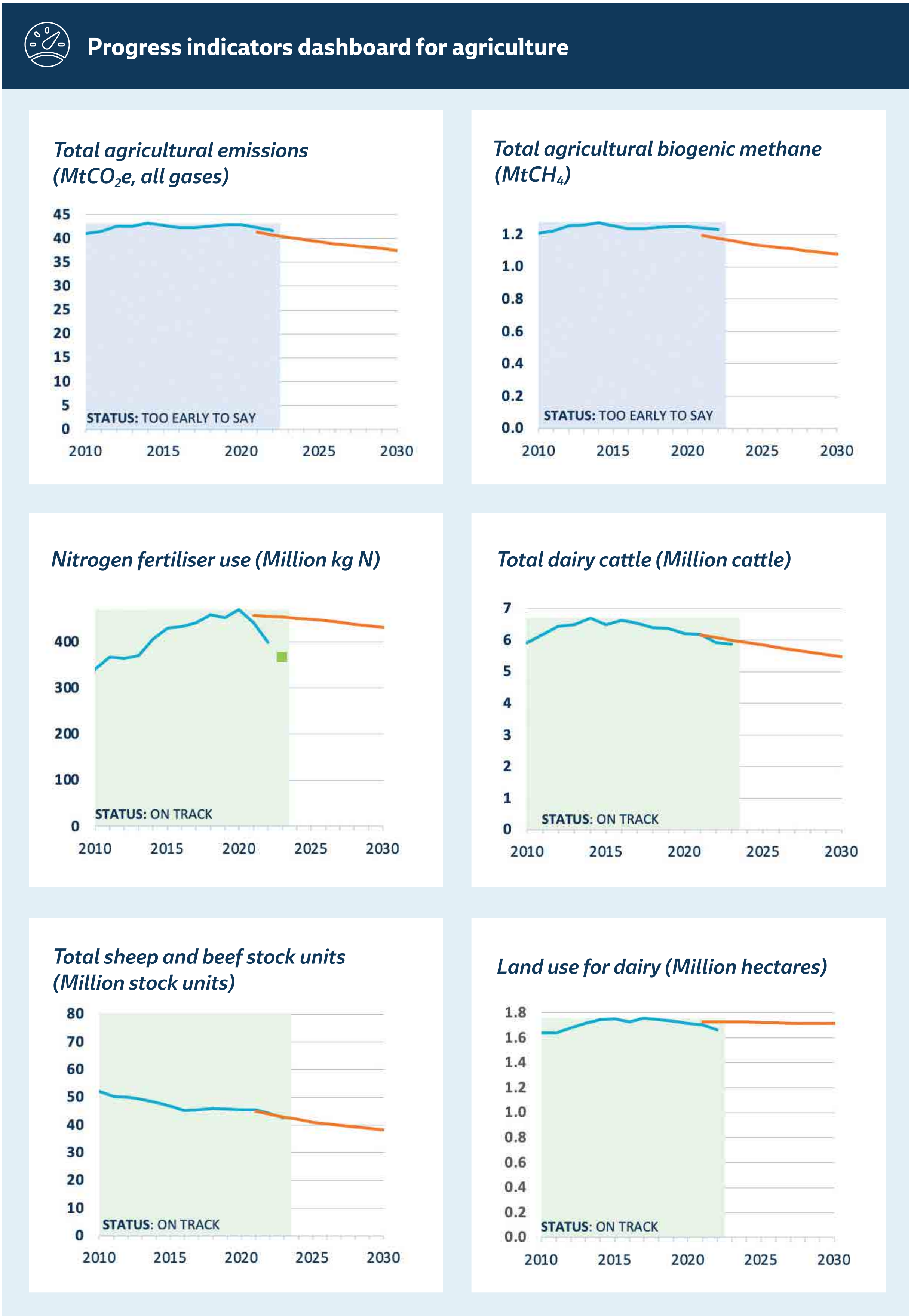
Biogenic methane emissions from agriculture have maintained a recent downward trend (**Figure 11.1.3**), falling 0.6% (0.1 $MtCH_4$) from 1.24 $MtCH_4$ in 2021 to 1.23 $MtCH_4$ in 2022. Since 2019, these emissions have decreased from 1.25 $MtCH_4$, a 1.6% fall.

Figure 11.1.3: Agricultural biogenic methane emissions to 2022



Source: Commission analysis, New Zealand's GHG Inventory 1990-2022

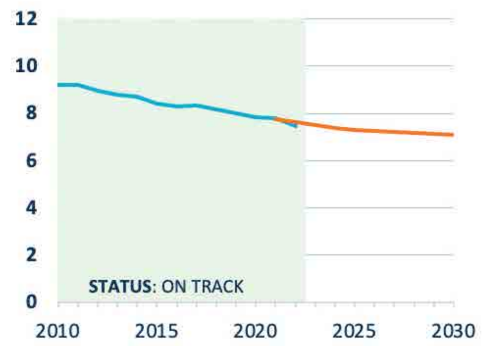
Figure 11.1.4: Progress indicators dashboard for agriculture



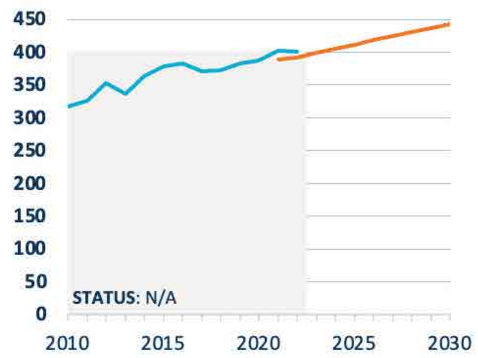
Please see the next page for the key

Progress indicators dashboard for agriculture

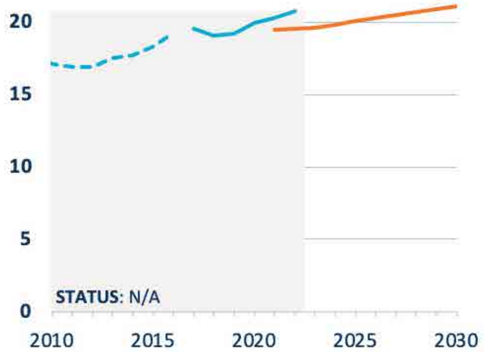
Land use for sheep & beef (Million hectares)



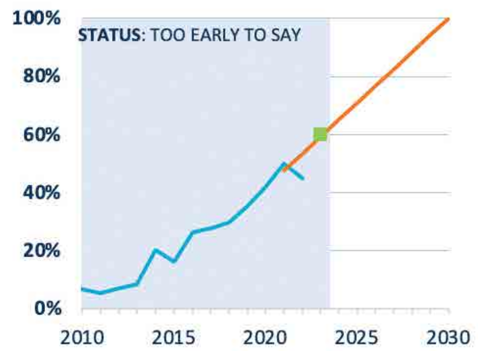
Animal productivity – dairy (kg milksolids/cow)



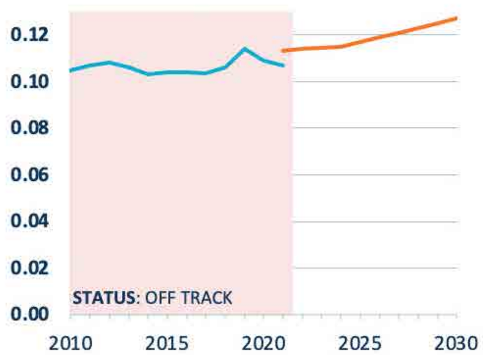
Animal productivity – sheep & beef (kg meat/stock unit)



Urease inhibitor use (% of urea sold)



Land use for horticulture (Million hectares)



KEY

- Historic actual
- Commission's 2022 demonstration path
- Historic estimate*
- Provisional data

* Method of calculation was adjusted from 2017 onwards where beef and dairy cattle were disaggregated from the national slaughter statistics

Source: Commission analysis, New Zealand's GHG Inventory 1990-2022, Dairy Industry Statistics New Zealand, Fertiliser Association, Ministry for Primary Industries (MPI), Stats NZ

Land-use change and falling livestock numbers are key drivers of emissions reductions

The amount of land being used for sheep and beef farming has declined by 18.7% (1.7 Mha) from 9.2 Mha in 2010 to 7.5 Mha in 2022, with this land going into forestry. There has been a corresponding decrease of 15.4% in stock units (8.1 million) over the same period.[lxxxiv] Dairy farming area has decreased by 5.5% (0.1 Mha) from 1.76 Mha in 2017 to 1.66 Mha in 2022, with a 9.1% drop in total dairy cattle (0.6 million animals) during this time. These indicators are tracking below the numbers modelled in the Commission's 2022 demonstration path.

Long-term animal productivity has increased

Meat productivity per stock unit has gone up from 17 kg meat/stock unit to 21 kg meat/stock unit over the period 2010 to 2022. Milk solids (ms) productivity per cow has increased from 318 kg ms/cow in 2010 to 400 kg ms/cow in 2022.[lxxxv] These gains have been driven largely by genetic improvements and increased on-farm efficiencies from feed and fertiliser use.

Nitrogen fertiliser use has come down while urease inhibitor use has been going up

The amount of nitrogen fertiliser used on farms has dropped by 15% from its peak of 470 million kg in 2020 to 399 million kg in 2022.[lxxxvi] Provisional data from the Fertiliser Association of New Zealand indicate a further drop of close to 8% in nitrogen fertiliser used in 2023 relative to the previous year.[316] While the decrease in nitrogen fertiliser use is likely mainly due to high fertiliser prices driven by global events, it demonstrates the potential for farmers to respond to price signals and find efficiencies. We do not know yet to what extent the reductions will be sustained or whether usage might increase again as fertiliser prices return to lower levels.

Urease inhibitor use is currently the only low emissions technology that is accounted for in New Zealand's GHG Inventory published in 2024. Use of urea coated with urease inhibitor is tracking similar to that modelled in the Commission's 2022 demonstration path. In 2022, 45% (138 million kg N) of all urea fertiliser sold was coated with urease inhibitor – a rapid increase since 2010, where urease inhibitor was only used in 7% (19.5 million kg N) of urea fertiliser. Provisional data from the Fertiliser Association of New Zealand indicated uptake of urease-inhibitor-coated urea has increased further in 2023, to 60% of all urea sold.[317] Between 2020 and 2022, the direct emissions from nitrogen fertiliser use have reduced by 30% (0.42 $MtCO_2e$) from 1.38 $MtCO_2e$ to 0.96 $MtCO_2e$. The direct effect of urease inhibitor use is small; we estimate its use in 2022 saved 0.03 $MtCO_2e$, or less than 0.1% of total agricultural emissions in that year.

The wider economic and policy environment has likely contributed to emissions reductions

Possible contributing factors to these reductions in agricultural emissions include land-use change from sheep and beef farming to forestry, and economic and industry conditions such as high fertiliser prices and low lamb prices. Beef + Lamb New Zealand's data show that farm profitability fell 32% in the 2022/23 season and is forecast to fall by 31% for the 2023/24 season.[318] Reduced use of synthetic nitrogen fertiliser has likely had a smaller impact than these other factors.[319]

lxxxiv. These livestock numbers are sourced from Stats NZ's Agricultural production statistics released on 3 May 2024. This release included revisions to the previously estimated livestock numbers for 2022 used in New Zealand's Greenhouse Gas Inventory 1990–2022. We expect these updated estimates to be reflected in the next edition of the GHG Inventory.

lxxxv. Commission analysis based on animal numbers, slaughter statistics and milk production in Stats NZ's Infoshare and LIC's New Zealand Dairy Statistics 2022–2023.

lxxxvi. This 2022 quantity is higher than reported in New Zealand's Greenhouse Gas Inventory 1990–2022, which relied on older data. We expect this updated data to be reflected in the next edition of the GHG Inventory.

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by scorecards for each outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

This policy assessment for agriculture focuses on two outcome areas: 'Reduce emissions from farming' and 'Transition to lower emissions land uses'.

The agriculture monitoring map (**Figure 11.1.1**) illustrates how more specific pathway outcomes, enablers, and policies relate to these broader outcome areas.

Policy progress

Agricultural emissions pricing

- In December 2022, to meet the requirements of section 215 of the Act, the Minister of Climate Change and the Minister of Agriculture released a report on pricing agricultural emissions.[320] The report outlined a system to put a price on emissions from agricultural activities as an alternative to the NZ ETS, including:
  - a proposal for a farm-level split-gas levy for agricultural emissions that would price emissions from biogenic methane and emissions from nitrous oxide (including from fertiliser) separately, with the legal point of responsibility with the business owner
  - availability of payments as incentives to reward the uptake of emissions reducing technologies and the eligible removal and storage of carbon dioxide
  - reform of the NZ ETS and exploration of options for expanding the NZ ETS to include additional carbon dioxide removal opportunities such as on-farm vegetation.
- In August 2023, the Government announced its final plan for pricing agricultural emissions through a farm-level split-gas levy. Under this plan, emissions pricing was set to commence in October of 2025, with mandatory reporting of on-farm emissions to begin in October of 2024.
- In October 2023, legislation was amended to push out the farm-level NZ ETS backstop from 2025 to 2027. The backstop is in the legislation to get agriculture into the NZ ETS, should an alternative emissions pricing scheme not be in place by then. The processor-level NZ ETS backstop will remain in place as set out in the Act, until an alternative system has been implemented. The National Party's plan to reduce agricultural emissions has an action to price on-farm emissions by 2030.[321]
- In the Government's Action Plan (1 April to 30 June 2024), the Government made commitments to:[322]
  - finalise policy to keep agriculture out of the NZ ETS
  - commence an independent review of the science of methane and of the biogenic methane components of the 2050 targets for consistency with 'no additional warming' from agricultural methane emissions.
- The Government announced in June 2024 that it will introduce legislation amending the Act, to keep agriculture out of the NZ ETS. He Waka Eke Noa has been disestablished, and the Government will engage directly with levy bodies and sector organisations that represent the pastoral sector.[323] The Government is yet to release any details on its intended alternative pricing system and how it compares to previous proposals developed under He Waka Eke Noa.

Projected impact of recent government policies on emissions reduction

- In March 2024, Ministry for Primary Industries (MPI) and Ministry for the Environment (MfE) produced a Regulatory Impact Statement (RIS) on amending the Climate Change Response Act 2002 in respect of NZ ETS agricultural obligations.[324] The RIS suggests that in the absence of an alternative agriculture emissions pricing system or any other interventions from the Government to reduce emissions in the agricultural sector, there is a significant risk of not meeting the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035), and the 2030 biogenic methane component of the 2050 target.

Research, development and deployment of emissions reduction technologies

- In May 2022, the Government established a new Centre for Climate Action on Agricultural Emissions, with the purpose of accelerating the research, development, and commercialisation of tools and technologies to reduce agricultural emissions. Budget 2022 allocated NZ$338.7 million to the centre over the next four years. The centre has two key components: AgriZero[NZ] (a joint venture between the Government and the private sector) and the NZAGRC. Budget 2024 committed NZ$400 million over the following four years to fund research and development for on-farm emissions reduction tools and technologies.[325] An additional NZ$50.5 million funding for NZAGRC will be invested over the next five years in projects to find solutions to reduce the sector's emissions.[326]
- AgriZero[NZ] is a 50:50 long-term partnership between Government and industry partners (ANZCO Foods, Fonterra, Rabobank, Ravensdown, Silver Fern Farms, Synlait, ASB, ANZ Bank, Bank of New Zealand (BNZ) and the a2 Milk Company). The goal is to support a 30% reduction in agricultural emissions by 2030 and drive towards 'near zero' by 2040, while maintaining productivity. The joint venture aims to undertake targeted investments and actions to accelerate the development, commercialisation, and adoption of effective and affordable solutions for farmers to significantly reduce biogenic methane and nitrous oxide emissions. A total of NZ$191 million is planned to be invested over the first four years.[327]
- To date, AgriZero[NZ] has committed over NZ$29 million to accelerate development of emissions reduction tools for farmers. Key investment areas include development of a methane vaccine, funding for a methane inhibiting bolus,[lxxxvii,328] novel probiotics, low emissions pasture, and construction of a greenhouse gas testing facility.
- The Government joined the International Enteric Fermentation Research and Development Accelerator project (contributing NZ$8 million over three years) which will leverage benefits of up to NZ$300 million of international investment.[329]
- As of June 2023, MPI had approved 31 applications for research and development trials of inhibitor products.
- The Environmental Protection Authority (EPA) approved an application to import or manufacture 3-NOP (a feed additive to reduce methane emissions in livestock). 3-NOP, marketed as Bovaer overseas, is the first methane inhibitor to be approved by the EPA in Aotearoa New Zealand. The manufacturer, DSM Nutritional Products Ltd (DSM), claims 3-NOP reduces methane emissions in ruminant animals by 30%. Before 3-NOP can be used on farms in Aotearoa New Zealand, it will also need to be assessed and approved for food safety and animal welfare by MPI, which has yet to receive an application from DSM.[330]

Global methane reduction pledge

- In November 2021, at the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow, the Government signed up to the Global Methane Pledge, committing to a collective global target to reduce methane emissions by at least 30% from 2020 levels by 2030.[331] The pledge is not a binding commitment and does not impose any legal obligations.

How these policies connect to climate change adaptation

The policy actions for the two outcome areas do not explicitly reference any linkage with actions in Aotearoa New Zealand's first national adaptation plan. There are risks to agriculture productivity and output due to changing rainfall, water availability, temperature, seasonality, climate extremes, and the distribution of pests and diseases. There could also be opportunities for increased productivity in some locations due to a longer growing season, less frost and higher rainfall.[332] Linking agricultural emissions reduction and adaptation policies would better inform actions such as land-use change to deliver good outcomes for both climate change mitigation and adaptation.

lxxxvii. A bolus is like a large capsule which sits in a ruminant animal's stomach and continuously releases, at a slow pace, an optimal dose of a methane inhibitor.

Policy scorecard: Reduce emissions from farming

This outcome area focuses on:

- adopting low emissions technologies
- changes to farm practices.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
EB1 – Moderate risks	Moderate risks	EB1 – Moderate risks	EB1 – Moderate risks	**Significant risks**
EB2+ – Significant risks		EB2+ – Significant risks	EB2+ – Insufficient	

Rationale for our scores

Main tools **First emissions budget – Moderate risks** **Second and third emissions budget – Significant risks**	Our assessment finds the main policy tools available to Government to drive the reduction of on-farm emissions are: • agricultural emissions pricing • government investment in accelerating new mitigation technologies • support for producers to make on-farm changes • partnering with iwi/Māori to enable Māori-led solutions • essential freshwater regulations, which are expected to drive improvements in water quality through reduced nutrient losses with emissions reduction co-benefits. When the first emissions reduction plan was released in May 2022, agricultural emissions were set to be priced by 1 January 2025. In principle, agricultural emissions pricing, complemented by other policies, is a credible tool for incentivising gross emissions reductions while maintaining productivity. The National Party's plan to reduce agricultural emissions has an action to price on-farm emissions by 2030. No decision has been made on any details of an alternative agricultural emissions pricing scheme. However, the Government has recently announced a plan to finalise policy to keep agriculture out of the NZ ETS. Delaying emissions pricing will likely have only a small impact on the agriculture sector's contribution to the first emissions budget (for 2020–2025), as this policy was not expected to be in effect in time to make a significant impact. However, the Government's projections suggest that, without agricultural emissions pricing, there will be significant risks of not meeting subsequent emissions budgets and the 2030 and 2050 biogenic methane components of the 2050 target.

Main tools (continued) **First emissions budget – Moderate risks** **Second and third emissions budget – Significant risks**	We assess that with any agricultural emissions pricing scheme, there is the potential for moderate risks to remain, including: • unavailability of on-farm mitigation technologies • no current scientifically robust estimates of on-farm sequestration (carbon dioxide removal by on-farm vegetation) outside the NZ ETS • price settings that may not incentivise the emissions reductions needed to meet emissions budgets or the biogenic methane components of the 2050 target. The coalition agreement between the National Party and the New Zealand First Party agrees to progress policies to:[233] • incentivise the uptake of 'emissions reduction mitigations', such as low-methane genetics and low-methane-producing animal feed • liberalise genetic engineering laws while ensuring strong protections for human health and the environment. A risk associated with research and development is that there is no guarantee of successfully developing new emissions reduction technologies that are appropriate for Aotearoa New Zealand's pastoral farming systems. If attempts to develop these technologies fail, it is unclear what other plan would help deliver emissions reductions. Our view is that there are moderate risks to delivering support for producers to accelerate uptake of emissions reduction technologies. We assess that extension and advisory services that support farmers with the tools to make farming systems changes are still lacking. Support services that are co-designed, coordinated, and implemented in partnership with iwi/Māori, and developed in collaboration with industry, would be required to help farmers and growers reduce on-farm emissions.
Funding and finance **Moderate risks**	Funding is needed for: • setting up structures for an agricultural emissions pricing mechanism • research and development of mitigation technology • Centre for Climate Action on Agricultural Emissions • MPI's on-farm support team • Māori Agribusiness Extension programmes • supporting the on-farm uptake of emissions reduction technologies. There is reasonable certainty in short-term funding from allocated and committed funds from the CERF. However, the implications of the return of uncommitted funding from the CERF is unclear at this stage. Current funding commitment for AgriZero^{NZ} is for four years. The uncertainty around a long-term plan for research and development funding poses moderate risks to the delivery of emissions reduction technologies.

Other barriers and enablers **First emissions budget – Moderate risks** **Second and third emissions budget – Significant risks**	Important enablers in this area include knowledge and skills for adoption of low emissions technologies and practices, and government-private sector partnerships including: • Government-Primary Sector Climate Action partnership • government-private sector research and development joint ventures • partnerships with the private sector to improve digital connectivity and sustainable finance. Other key barriers include the likely distributional impacts from agricultural emissions pricing, especially for the sheep and beef sector and iwi/Māori, and restrictive regulatory pathways, such as the Agricultural Compounds and Veterinary Medicines Act 1997, for approving new emissions mitigation technologies. Uncertainty around the long-term funding for government-private sector partnerships poses moderate risks to the effectiveness of the main policy tools listed in the section above. Lack of detail on the plans to address these barriers is a significant risk for the agriculture sector's ability to contribute to meeting the second emissions budget (for 2026–2030) and beyond.
Timeline **First emissions budget – Moderate risks** **Second and third emissions budget – Insufficient**	• No decision or announcement has been made on the details of any alternative agricultural emissions pricing mechanism. • The agriculture sector subtargets for the first three emissions budgets were set with an assumption that essential freshwater regulations would deliver some on-farm emissions reductions. The Government recently announced a plan to replace the NPS-FM. The process to produce new regulation is expected to take 18 to 24 months. It is unclear how these changes will impact emissions reduction co-benefits from freshwater regulations.
Overall assessment	
Significant risks	Delaying the implementation of an emissions pricing scheme will likely have a small impact on the agriculture sector's contribution to meeting the first emissions budget. However, we assess that there are significant risks of not meeting subsequent emissions budgets and the 2030 and 2050 biogenic methane components of the 2050 target. The Government's plan to replace the NPS-FM could potentially reduce the emissions reduction co-benefits from freshwater regulations. The risk of these changes is likely to be minimal for the first emissions budget, and implications on subsequent budgets are uncertain in the absence of further details. The implications of the redirection of the funds from the CERF are unclear at this stage.

Policy scorecard: Transition to lower emissions land uses

This outcome area focuses on:

- land-use change to lower emissions farming systems such as horticulture and arable farming (land-use change to forest is covered in detail in *Chapter 11.2: Forests*).

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	EB1 – Moderate risks EB2+ – Insufficient	**Significant risks**

Rationale for our scores

Main tools **Moderate risks**	According to our assessment, the main policy tools to drive transitioning to lower emissions land uses are regulation, land-use change driven by the NZ ETS, and targeted funding initiatives. The Resource Management Act 1991 (RMA) in some cases imposes requirements for a resource consent for some types of land-use change and related activities. The Government has set a plan to have RMA replacement legislation passed into law by the end of 2025. Our assessment is that this carries moderate risks because, until there is a detailed plan, we are unable to determine the implications of new legislation on land-use change. Essential freshwater regulations and policies (the NPS-FM and the National Environmental Standards for Freshwater) are expected to drive improvements in water quality through reduced nutrient losses. Land-use change to farming systems with low nutrient losses would also have emissions reduction co-benefits. Land-use change from sheep and beef farming to forestry is currently being driven in part by the NZ ETS and also by changes in the sheep and beef industry economics. However, policy uncertainty about the NZ ETS as well as other factors (such as changes to local government regulations) appears to be limiting the effect of the NZ ETS emissions price incentive for afforestation, as indicated by feedback from stakeholder engagement and the *2023 Afforestation and Deforestation Intentions Survey*.[334] For more detail, see *Chapter 6: New Zealand Emissions Trading Scheme.* Government funding will support producers to transition to low emissions land use and systems, through initiatives such as: • Sustainable Food and Fibre Futures Fund[335] • Integrated Farm Plans • research and development for areas such as food and fibre science and mātauranga Māori • sustainable finance for on-farm sustainability outcomes.

Main tools (continued) **Moderate risks**	Funding sustainable land-use initiatives is a credible and suitable tool for transitioning to lower emissions land uses. However, it is unclear how some of these initiatives are going to progress in light of the halting of industry transformation plans (ITPs).[336] Our overall assessment is that, while the main policies are credible instruments to reduce gross emissions, there are some notable risks arising from RMA reform, regulatory uncertainty about the NZ ETS, halting of ITPs, and planned replacement of current freshwater regulations.
Funding and finance **Moderate risks**	Investment is needed to help support sustainable land-use initiatives. Budget 2021 allocated NZ$37 million over four years to expand tools and support farmers to meet current and future market requirements and environmental regulations. [337] In the first emissions reduction plan, the Government committed to continue investing around NZ$40 million per year into the Sustainable Food and Fibre Futures Fund. The majority of historical and current sustainable land-use funding from regional and central government agencies has tended to focus on freshwater and, more recently, biodiversity. The Integrated Farm Plans programme (MPI) was meant to integrate across freshwater and greenhouse gas emissions but seems to have stalled. The implications of returning uncommitted CERF funding are not clear at this stage.
Other barriers and enablers **Moderate risks**	Important enablers in this outcome area include an efficient consenting regime and enhancing supply chains and market access. This includes setting up of appropriate infrastructure such as processing facilities, locking in markets for higher-value products, and establishing partnerships across supply and value chains. The Government working in partnership with iwi/Māori will help ensure actions are informed by te ao Māori. Critical barriers include: • water availability and security • lack of appropriate skills • lack of labour • lack of data, information and tools to support decision-making on land-use change and diversification • general access to effective extension and advisory services • mainstream models of agricultural education, training and advisory services being not fit for purpose for iwi/Māori needs • lack of ability to secure debt over land owned by Māori collectives • complexities around administering land owned by Māori collectives, which can affect the ability to make decisions. Plans address most of the barriers and enablers identified, but there are some risks arising from the Government's decision to stop work on the ITP programme (Food and Beverage, AgriTech, and Horticulture Technology Catalyst) and return uncommitted funding. Implications for future funding are unclear. There is a lack of clarity and certainty over the role that the Government sees the NZ ETS playing in driving gross and net emissions reductions.

Timeline	The replacement legislation for the RMA has been repealed, and new legislation is expected to be in place by the end of 2025.
First emissions budget – Moderate risks **Second and third emissions budget – Insufficient**	A process to develop new regulation to replace the NPS-FM is expected to take 18 to 24 months. This delay risks lowering the expected emissions reduction co-benefits from freshwater regulations over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035). It is unclear what the Government's alternative plan is, after stopping the NZ ETS review. Due to the delays and uncertain timelines, we assess some risk for the first emissions budget (for 2020–2025) and insufficient plans for subsequent emissions budgets.
Overall assessment	
Significant risks	The plan to replace the NPS-FM could potentially reduce the emissions reduction co-benefits from freshwater regulations. These co-benefits were anticipated when the first, second and third emissions budgets were set. The uncertainty around new replacement RMA legislation could significantly impact land-use change.

Areas for attention

An agricultural emissions pricing scheme is delayed

In Budget 2024, funding held in contingency for the development of an agricultural emissions pricing system has been reduced to approximately NZ$12 million over the next four years, resulting in a total reduction of about NZ$164.5 million for this initiative over four years.[338] Delaying implementing an emissions pricing scheme will likely have a small impact on the agriculture sector's contribution to meeting the first emissions budget. However, we assess that there are significant risks of not meeting subsequent emissions budgets, and the 2030 and 2050 biogenic methane components of the 2050 target.

Regulatory uncertainty can delay emissions reduction

The Government has announced that a process to develop new regulation to replace the NPS-FM is expected to take 18 to 24 months. This delay risks lowering the expected emissions reduction co-benefits from freshwater regulations over the second emissions budget period (2026–2030) and third emissions budget period (2031–2035).

The replacement legislation for the RMA has been repealed, and there is uncertainty on what form new legislation will take.

Funding mechanisms to commercialise technologies and make land-use decisions

Restrictive regulation, such as barriers in the Agricultural Compounds and Veterinary Medicines Act 1997,[339] and uncertain future research and development funding could delay commercial availability of mitigation technology. The Ministry for Regulation is developing terms of reference and a timetable for a regulatory review on the approval process for new agricultural and horticultural products.[340] There is a risk that investment in research and development could still fail to deliver enough cost-effective emissions reduction solutions to be able to meet the 2030 and 2050 biogenic methane components of the 2050 target.

In the 2023 mini-Budget, the remaining funding from the CERF was returned to the government. As CERF funding has been discontinued, there is uncertainty about funding for programmes such as accelerating development of agricultural greenhouse gas mitigations, approaches based on mātauranga Māori for agricultural emissions reduction, and planned expansion of On Farm Support services by MPI.[341]

There are complexities around ownership structures and governance for Māori collectively owned land that affect the ability of these landowners to raise capital that would enable changing on-farm practices, implementing on-farm mitigations, or changing land use. Some assistance may be needed for Māori farm businesses to help them to reduce on-farm emissions and transition to low emissions land uses.

New opportunities to reduce emissions

Part of the Commission's monitoring role, under section 5ZK of the Act, is to highlight potential new sources of emissions reductions, or areas where ambition could be increased.

- Aotearoa New Zealand-based milk and meat processors are responding to demand from large multinational customers (such as Nestlé and Mars) seeking to reduce emissions across their supply chains. Fonterra has set an on-farm emissions intensity reduction target of 30% below 2018 levels by 2030. This may result in additional incentive to reduce emissions. The Government can leverage such initiatives through partnerships with industry.
- Well-designed information campaigns and extension programmes can be developed, to support producers to understand where the emissions are generated in their systems and which mitigations will help reduce them. A wide range of organisations and networks can be used to raise awareness of such information and programmes, including the On Farm Support networks. With evidence-based information and extension support, producers can be more confident about making changes and applying the appropriate mitigations for their systems. Reductions in emissions will take time to flow through systems.
- Government support for farmer catchment groups could potentially result in further improvements in land-management practices that could reduce emissions. In August 2023, the Government invested a further NZ$9.1 million to support catchment group projects.[342]
- Leveraging the national adaptation plan action on improving water availability and security (Action 6.6) should enable increased land-use diversification and likely result in increased emissions reduction.
- Initiatives such as the Net Zero Banking Alliance (NZBA), targeting to transition some banks' lending portfolios to net zero emissions by 2050, are an opportunity to use sustainable finance to assist farmers in reducing agricultural emissions. For example, the Bank of New Zealand was one of the first banks to set emissions reduction targets under the NZBA.[343]
- The goal of AgriZero^{NZ}, to support a 30% reduction in agricultural emissions by 2030 and drive towards 'near zero' by 2040, while maintaining productivity, could incentivise further emissions reductions beyond legislated targets.

Box 11.1.2: Other government policies that could affect agricultural emissions

The Government's Action Plan for New Zealand (1 April to 30 June 2024) contains some policies that could affect agricultural emissions, including actions to:[344]

- introduce legislation to amend the RMA, to clarify application of NPS-FM in relation to individual consents for freshwater and to extend marine farm consents
- finalise policy to keep agriculture out of the NZ ETS
- commence an independent review of the methane science and targets for consistency with no additional warming from agricultural methane emissions.

A Bill to amend the RMA will also include changes to repeal intensive winter grazing regulations.[345]

11.2: Ngāhere | Forests

This section focuses on greenhouse gas emissions and removals by forests. The forestry sector is different from others because forests remove carbon dioxide from the atmosphere as they grow, as well as being a source of carbon dioxide emissions when trees are cut down.

In Aotearoa New Zealand, the forestry sector contributes net removals overall, which means net emissions are lower than gross emissions. Increasing the net removals by forests is a key component of reducing Aotearoa New Zealand's net emissions to meet the emissions budgets and the 2050 target.

Estimating and accounting for emissions and removals by forests is complex and multiple approaches exist. The emissions budgets and 2050 target use the same accounting method for forests emissions and removals as determined by the Government for New Zealand's first nationally determined contribution (NDC) under the Paris Agreement, referred to as 'target accounting'.[346] Further explanation is provided in Box 11.2.1.

Net removals by forests can be increased through afforestation (when new forests are established on land previously used for other purposes) and through curbing deforestation (when forest land is cleared and converted to other uses). There is also potential for some forest management activities to increase and protect carbon storage in existing forests.

Establishing new forests will have a changing effect on net emissions over decades to centuries, depending on factors such as the type of forests and how they are managed. There are also risks to the permanence or durability of the carbon stored in forests. For this reason, it is important to take a long-term view to 2050 and beyond when assessing progress towards meeting emissions budgets and the 2050 target.

Forests also play an important role in the bioeconomy and can help in reducing emissions in other sectors such as industry. Progress made in advancing the bioeconomy is discussed in *Chapter 5: Policies, systems and tools*.

KEY POINTS FOR FORESTS

Progress to date

- Net removals by forests fell from 7 $MtCO_2e$ in 2021 to 6.2 $MtCO_2e$ in 2022, according to the latest government projections under target accounting. Net removals are projected to fall again to 5.7 $MtCO_2e$ in 2023. This continues a long-term declining trend in removals, caused by rates of afforestation having fallen from high levels in the 1990s to lower levels since the early 2000s. An increase in afforestation since 2019 has yet to reverse this trend as new forests contribute minimal removals over their first five years.
- There has been strong afforestation activity in recent years. Exotic afforestation is estimated to have increased from around 45,000 hectares in 2021 to nearly 70,000 hectares in 2022. Early estimates for 2023 suggest planting of 68,500 hectares.[347] Native afforestation is estimated to have increased from around 3,900 hectares in 2021 to 6,900 hectares in 2022, and early estimates suggest 7,800 hectares were planted in 2023.[348]
- In 2022, approximately 4,000 hectares of forest land are estimated to have been deforested and converted to other land uses, primarily grassland. This is a provisional estimate informed by the most recent national land-use map (to 2020) and survey information. Overall, deforestation has been decreasing since 2013, though it continues in all forest types. The largest area of deforestation is occurring in exotic forests planted since 1989, which do not face any disincentive to deforestation if they are not registered in the New Zealand Emissions Trading Scheme (NZ ETS).

Our assessment of policy

Scorecard summary for increasing net removals by forests

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	EB1 – Significant risks	**EB1 – Significant risks**
			EB2 & EB3 – Moderate risks	**EB2 & EB3 – Moderate risks**

- Overall, we assess there are **significant risks** to the forestry sector achieving the benchmark level of net removals in the first emissions budget (for 2022–2025), and **moderate risks** for the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035). For the first emissions budget, this is because the high levels of afforestation since 2021 cause an initial increase in emissions (due to the loss of biomass carbon from clearing land for planting),[349] and there is further risk of deforestation emissions exceeding benchmark levels. For the second emissions budget, while high levels of afforestation to date likely lock in sufficient removals, deforestation levels pose risk to achieving the net removals outcome if these are not reduced. For the third emissions budget, current uncertainty about future afforestation intentions also indicates some risk to sufficient removals if planting were to fall significantly for the next few years.
- The NZ ETS can provide a strong economic incentive for planting fast-growing forests. Experience to date shows the NZ ETS has been effective at driving increased planting of exotic forests, and at discouraging deforestation of the forests covered by the scheme. However, there are currently some risks to it delivering enough afforestation over the next few years, due to policy uncertainty and the presence in the scheme of a large number of surplus New Zealand Units (NZUs) – the unit of trade in the NZ ETS. The NZ ETS is also less effective at incentivising native afforestation and regeneration due to the higher establishment costs and slower return on investment.
- Sector activity is not wholly aligned with the aim stated in the first emissions reduction plan to meet targets via increased levels of native afforestation and restoration with less reliance on exotic afforestation. Funding programmes for native afforestation (such as through the One Billion Trees programme) have been successful but have been discontinued, which is likely to see native afforestation levels reduce.

Areas for attention

- There is currently high uncertainty around afforestation levels for 2025 and beyond, influenced by policy uncertainty around the NZ ETS and wider policies affecting the forestry sector.
- The aim stated in the first emissions reduction plan to increase levels of native afforestation with less reliance on exotic afforestation is unlikely to be delivered without further policy to incentivise native afforestation. Lower levels of native permanent afforestation have consequences for building a long-term, durable, resilient land-based carbon sink needed to meet and sustain the 2050 target.
- Controlling and reducing deforestation is an important factor in meeting emissions budgets. There are particular risks around deforestation of post-1989 forests not registered in the NZ ETS.
- Improved mapping and carbon sequestration modelling of forest types (disaggregating the 'natural regeneration and native planting' category) will improve understanding and outlooks of net afforestation.
- There is uncertainty about the real effects on achieving the emissions budgets and target of major events, such as Cyclone Gabrielle and the storm series of 2023. Further understanding and transparency about the extent to which accounting methods affect if and how major storms affect target accounting results will assist in future monitoring of this issue.

Accounting for emissions and removals by forests

Aotearoa New Zealand applies a specific accounting approach to the forestry sector in its emissions budgets and NDC under the Paris Agreement, referred to as target accounting. He Pou a Rangi Climate Change Commission (the Commission) is required to monitor progress towards meeting emissions budgets according to these accounting rules. An explanation of the target accounting approach is provided in Box 11.2.1.

Official estimates of net removals by forests under target accounting will be published in Aotearoa New Zealand's *Biennial Transparency Reports* under the Paris Agreement, the first of which is due by 31 December 2024. They will also be reported annually in the Greenhouse Gas (GHG) Inventory from 2025. However, New Zealand's GHG Inventory published in 2024 does not include any target accounting data. For this year's report, we have instead had to rely on the latest government projections for net removals by forests under target accounting, which were published in 2023.

Box 11.2.1: Accounting for emissions and removals by forests in Aotearoa New Zealand's emissions budgets

The emissions and removals by forests that count toward meeting emissions budgets are based on an accounting approach known as 'target accounting'. This approach does not count all emissions and removals by forests, but focuses on a sub-set of activities and land uses which are most affected by human activities.

Target accounting includes all gross emissions but only a subset of emissions and removals from forests and other land use – 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[lxxxviii] (such as forest planting in the 1970s and 1980s) that continue to result in emissions and removals today.

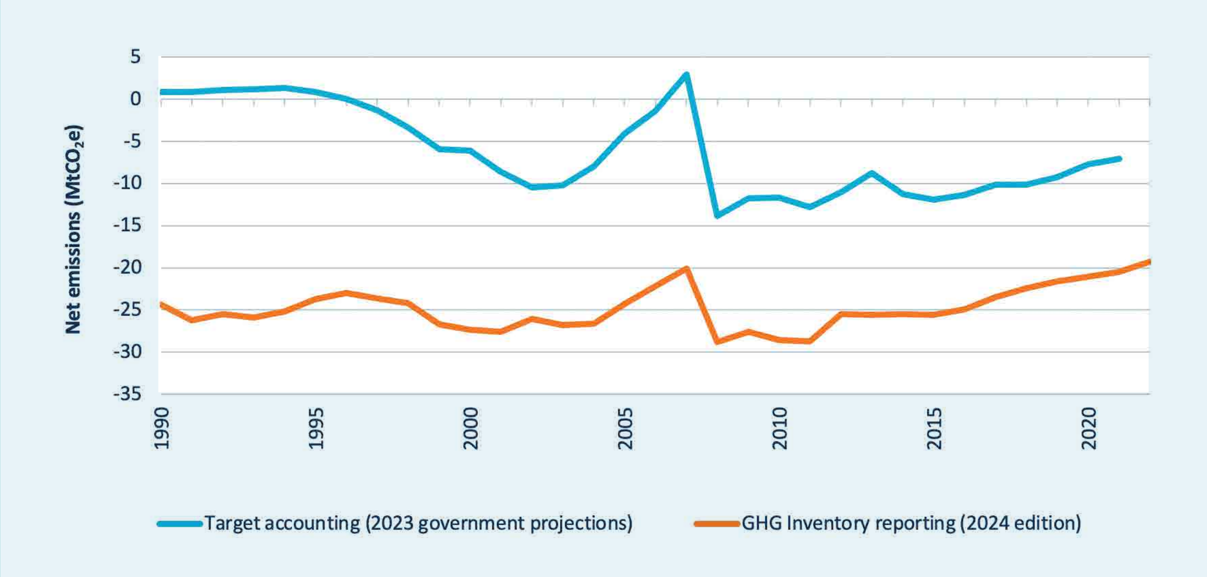
It also applies an averaging approach to production forests to smooth out emissions and removals over harvest cycles.

The other accounting approach, applied in New Zealand's GHG Inventory, is land-based accounting. This aims to cover all emissions and removals from soil, trees, plants, biomass, and wood products. This approach better reflects the flow of emissions and removals into the atmosphere, but it includes changes in emissions which are not the result of human activities.

Figure 11.2.1 shows the level of net emissions from forests and other land uses under both the target accounting and GHG Inventory approach.

lxxxviii. Post-1989 forests are those established after 31 December 1989. Pre-1990 forests are those established before 1 January 1990. These classifications are due to the 1990 base year agreed to in the Kyoto Protocol. Emissions from deforestation are counted for all forests, but removals from afforestation and reforestation are only counted for post-1989 forests. Forest management aims to track the impact on emissions from changed management of pre-1990 forests.

Figure 11.2.1: Net emissions from the forestry sector under the target accounting approach and GHG Inventory reporting approach



Source: 2023 government emissions projections,[350] New Zealand's GHG Inventory 1990–2022

How we monitor forest carbon removals

In addition to monitoring how much emissions have reduced, to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action on future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for the forestry sector.

Net removals by forests under target accounting in 2022 are projected to be 6.2 $MtCO_2e$, according to the latest government projections. This is equal to around 8.6% of Aotearoa New Zealand's gross emissions in 2022, and 15% of emissions of long-lived gases (gases other than biogenic methane).

In the Commission's 2022 demonstration path, which we use as a benchmark to assess progress in emissions reduction, net removals by forests increase to 6.8 $MtCO_2e$ by 2025, 14.1 $MtCO_2e$ by 2030, and 18.5 $MtCO_2e$ by 2035. The net zero component of the 2050 target requires residual gross emissions of long-lived gases to be balanced out by removals in 2050 and beyond.

Net removals by forests can mainly be increased through afforestation (when new forests are established on land previously used for other purposes) and through curbing emissions from deforestation (when forest land is cleared and converted to other uses).[lxxxix]

Management practices for existing forests (forest management) may also lead to more emissions or removals than would have otherwise occurred. In production forests, this includes the type of harvested wood products produced, which can affect the net amount of carbon removal and its durability.[xc]

The forests monitoring map (**Figure 11.2.2**) reflects these different ways of increasing net removals by forests. The map sets out pathway outcomes, along with enablers and current policies that contribute to achieving them. Progress indicators (**Figure 11.2.3**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

lxxxix. Under target accounting, all of the carbon stored in the forest is assumed to be released to the atmosphere immediately when deforestation occurs.

xc. Emissions from wood harvesting and processing are covered under the industry sector. See *Chapter 9: Energy and industry* for more information.

*Figure 11.2.2: Forests monitoring map (see **Box B2.1** for legend)*

Monitoring map for forests

Net CO_2 removals by forests increase to 19 $MtCO_2$/year by 2035 in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce emissions from deforestation
- Net CO_2 emissions from deforestation by forest type

Increase removals through afforestation
- Net CO_2 removals from afforestation by forest type

Reduce emissions and increase removals through forest management
- Net CO_2 removals from existing forests, relative to forest management reference level

Reduce deforestation
- Annual deforestation area by forest type and age class

Afforestation
- Annual afforestation area by forest type (species and management regime, i.e. production or permanent)

Carbon sequestration rates
- Carbon sequestration rates by forest type and age class (yield tables)
- Long-term average carbon stocks

Forest management practices
- Managed area by forest type
- Annual area harvested by forest type and age class
- Average rotation length for production forests

Harvested wood products
- HWP production by product type
- Product lifetimes

ENABLERS

Supply chains
- Seedling availability
- Nursery capacity

Workforce and skills
- Workers to plant and manage forests
- Investment in skills & training
- Community group activity in reforestation

Social licence
- Public attitudes towards forestry
- Environmental management
- Health and safety management

Research and development
- Robust long-term measurement and monitoring
- Improved genetics
- Research into seedling propagation, establishment, productivity, viability, adaptability
- Reducing native forest establishment costs
- New uses for biomass

Demand for wood products
- Use of wood in buildings
- Use of biomass for energy
- Domestic wood processing capacity and capability

Funding and finance
- Public funding support

Partnership with iwi/Māori
- Iwi/Māori involvement in decisions affecting their land
- Māori forest land ownership

POLICIES

National-level policy and regulation
- Emissions pricing (NZ ETS)
- Carbon accounting rules
- Resource Management Act and national policy statements
- Forestry industry regulations
- Overseas Investment Office settings

Funding and finance
- Erosion control programmes
- Funding for tree planting and sustainable forestry
- Funding to create jobs and support economic development through environmental management

Strategy and planning
- National Adaptation Plan
- Regional and district plans
- Pest management plans

Other policies to enable success
- Central and local government procurement rules

CONTEXTUAL FACTORS

Demand and prices
- Carbon and forestry product prices and forecasts
- Demand for forestry sector products
- Voluntary carbon markets

International context
- Corporate offsetting and carbon dioxide removal policies and initiatives

Climate change impacts
- Climate change impacts on forests

Source: Commission analysis

Box 11.2.2: Data gaps

Our assessment of emissions reductions and removals in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development. In addition, ongoing data compilation and assessments can allow for updated understanding of the carbon removal potential of ecological restoration and indigenous forests to inform the type of reforestation and afforestation that can facilitate reaching emissions budgets and targets.

- **Long-term monitoring of existing forests to monitor carbon stock maintenance and changes.** This is needed to understand long-term forest carbon removals and how to account and report for forest management.
- **Disaggregating 'natural regeneration and native planting' mapping and carbon removal estimates into sub-categories** (for example, indigenous regeneration, wilding pines, and indigenous tall forest planting). This will improve understanding and reporting of the role of native afforestation and regeneration in carbon removals.
- **Afforestation/restoration success.** Long-term monitoring is needed to understand the success rate of afforestation and regeneration efforts and their resulting carbon removals.

Progress in increasing net carbon removals by forests

Net removals by forests reduced in 2022

Based on the latest government projections, net removals by forests under target accounting fell from 7.0 $MtCO_2e$ in 2021 to 6.2 $MtCO_2e$ in 2022. Net removals are projected to fall again to 5.7 $MtCO_2e$ in 2023.

This continues a long-term declining trend in removals, caused by rates of afforestation having fallen from high levels in the 1990s to lower levels since the early 2000s. An increase in afforestation since 2019 has yet to reverse this trend, as new forests contribute minimal removals over their first five years.

Increased levels of exotic and native afforestation occurred in 2022

The increasing rate of exotic afforestation since 2019 continued in 2022. New Zealand's GHG Inventory published in 2024 estimates that approximately 45,000 hectares of new exotic forests were planted in 2021, rising to nearly 70,000 hectares in 2022.[xci,351]

Native afforestation also increased in 2022 to an estimated 6,900 hectares. This was up from an estimated 3,900 hectares in 2021. The rate of native afforestation over the last five years averaged around 5,000 hectares per year, more than double what it had been over the previous ten years. This was likely supported by incentives through the One Billion Trees programme launched in 2018.

xci. In New Zealand's GHG Inventory published in 2024, afforestation and deforestation figures for 2021 and 2022 are provisional estimates. Figures up to 2020 are based on land mapping.

Deforestation levels have reduced but continue, with uncertainty in recent years

Over the last five years, total estimated deforestation has ranged from approximately 4,000 to 6,000 hectares per year. Deforestation figures for 2021 and 2022 in the GHG Inventory published in 2024 are provisional estimates informed by the most recent land-use map (currently through 2020) and survey information.

Mapped deforestation levels increased in 2020 after a drop in 2019, particularly for post-1989 exotic forests. In 2022, approximately 4,000 hectares of forest land are estimated to have been deforested and converted to other land uses, primarily grassland.

Overall, deforestation has been decreasing since 2013, though it continues in all forest types. The largest area of deforestation is occurring in exotic forests planted since 1989, which do not face any disincentive to deforestation if they are not registered in the NZ ETS.

High levels of exotic and native afforestation continued in 2023 based on survey data

MPI conducts an annual *Afforestation and Deforestation Intentions Survey*. Based on the 2023 survey, high levels of exotic afforestation were expected to continue in 2023, with an estimated 68,500 hectares of exotic plantation forests planted.[352] The survey estimates native afforestation in 2023 as 7,800 hectares, about half of which was reversion and 18% planted tall forest.[xcii,353]

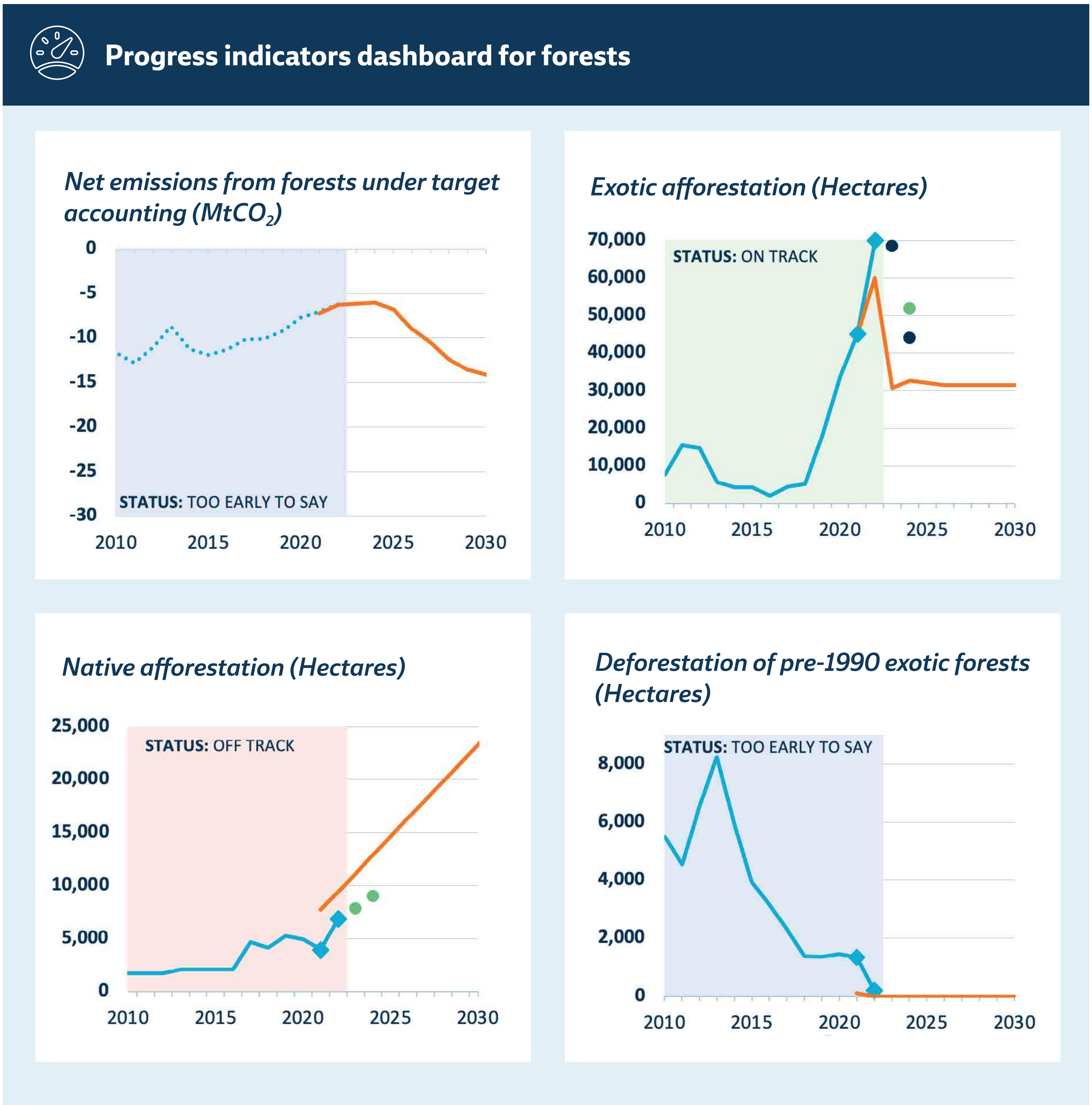
Afforestation levels have so far exceeded levels in the demonstration path, but deforestation levels likely have too

Overall, estimated afforestation levels up to 2023 have been higher than in the Commission's 2022 demonstration path, which we use as a benchmark to assess progress. This afforestation has come primarily from exotic forests (Figure 11.2.3). Substantial levels of removals for the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035) are already locked in, due to the high level of planting to date.

However, estimated deforestation levels in 2022 are also higher than in the demonstration path, which means higher emissions in the short term. As noted above, these deforestation figures are provisional estimates and are subject to significant uncertainty.

xcii. 'Indigenous afforestation' estimates and intentions comprise a combination of planted tall forest, planted manuka, and reversion.

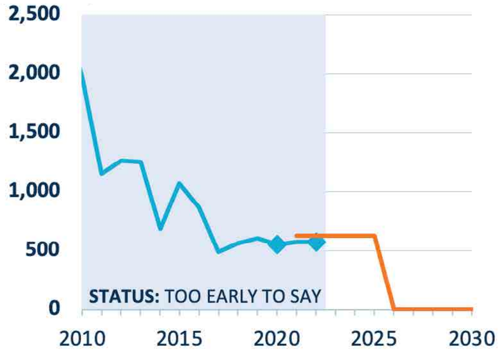
Figure 11.2.3: Progress indicators dashboard for forests



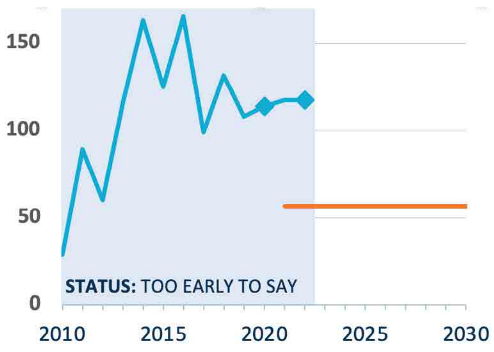
Progress indicators dashboard for forests

Deforestation of post-1989 exotic forests (Hectares)

Deforestation of pre-1990 native forests (Hectares)



Deforestation of post-1989 native forests (Hectares)



KEY

- Historic (2023 government projections)
- Historic actual
- Provisional actual
- Commission's 2022 demonstration path
- Intended planting (surveyed)
- Confirmed planting (surveyed)

Source: GHG Inventory 1990–2022, Afforestation and Deforestation Intentions Survey[354]

Policy assessment

This section provides a summary of the analysis of policy progress in this sector, followed by a policy scorecard for the outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to the policy scorecard framework and information on the criteria and scoring methodology.

The policy assessment for forestry focuses on the outcome area: 'Increase net removals by forests through afforestation and reducing deforestation'. It also touches on the role of forest management and harvested wood products.

Policy progress

- The *Forestry and Wood Processing Industry Transformation Plan* (Forestry ITP) was released in 2022, but this work has since been discontinued in line with new government priorities.[355] The Forestry ITP was focused on shifting the industry from producing commodity resources by increasing domestic processing, with the aim of generating high value jobs and low-carbon products in Aotearoa New Zealand. The Forestry ITP covered the entire forestry and wood processing supply chain.
- There has been limited progress on the two related actions in the first emissions reduction plan of ensuring regulatory settings deliver the "right type and scale of forests, in the right place" (Action 14.1.1), and of adjusting the NZ ETS to drive a balance of gross and net emissions reductions (Action 5.2.1).
- An NZ ETS review looking at its role in driving gross emissions reductions and removals by forests was started in mid-2023 but the review was stopped in December 2023.[356] The Government has since indicated an intention to develop land-use policy to introduce limits on newly planted forests on converted farmland from entering into the NZ ETS. Details are not yet available about this policy to understand how it could affect rates of forest planting and the forestry contribution to meeting emissions budgets and the 2050 target.
- The National Environmental Standards for Commercial Forestry (NES-CF)[357] were finalised in November 2023. As of 3 November 2023, the NES-CF amends the National Environmental Standards for Plantation Forestry 2017, to provide nationally consistent regulations to manage the environmental effects of forestry. This includes both plantation forestry and exotic continuous canopy cover forestry.
- The post-Cyclone Gabrielle Ministerial Inquiry into Land Use was conducted.[358] The Government is now progressing action in two phases: near-term actions that reduce risk, and longer-term actions to build resilience. The latter includes actions to improve forest management, including consenting and compliance, monitoring, and evaluation functions.

How these policies connect to climate change adaptation

Policy to support carbon removals by forests does not currently explicitly factor in the risks and impacts of climate change. The research sector has raised concerns that the focus has been on mitigation at the expense of adaptation.

In addition, increasingly the international science community questions the use of non-native monoculture plantations as a carbon removal mechanism. The Intergovernmental Panel on Climate Change (IPCC) considers large-scale non-native monoculture plantations among the "worst practices and negative adaptation trade-offs" for temperate forests.[359] This is due to their potential negative effects on biodiversity and susceptibility to pests and disease, and their lack of resilience to climate change.[360] In this regard, the NZ ETS in its current form does not support or consider adaptation, nor its relationship to the durability of carbon removals.

Policy scorecard: Increase net removals by forests

This outcome area encompasses pathway outcomes of:

- afforestation
- reduced deforestation.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	EB1 – Significant risks	**EB1 – Significant risks**
			EB2 & EB3 – Moderate risks	**EB2 & EB3 – Moderate risks**

Overall assessment

Main tools	The main policy tools to increase net removals by forests have been the NZ ETS and grants for afforestation.
Moderate risks	The NZ ETS can provide a strong economic incentive for planting fast-growing forests. Recent experience shows that the NZ ETS has contributed to a rapid increase in exotic afforestation at relatively low emissions prices (between around NZ$25 and NZ$75). Deforestation levels have also fallen significantly in response to increased emissions prices. However, there are currently some risks to whether the NZ ETS will continue to drive afforestation and deliver sufficient removals for meeting emissions budgets. • Market confidence has been negatively affected by uncertainty about potential changes to NZ ETS rules. The latest survey of foresters' planting intentions shows significant uncertainty about intended planting beyond 2024.[361] • The existing surplus of units in the NZ ETS – if not addressed through changes to the NZ ETS unit limit settings – could lead to less investment in new forests, as existing unit supply could be sufficient for emitters' needs. These issues are discussed in greater detail in *Chapter 6: New Zealand Emissions Trading Scheme*. The NZ ETS is also less effective at incentivising native afforestation and regeneration due to the higher establishment costs and slower return on investment. Previous grant schemes, such as those offered through the One Billion Trees programme, have been effective, but have not been taken forward. The current policy approach is therefore likely to primarily encourage exotic afforestation while native afforestation is likely to reduce.

Main tools (continued) **Moderate risks**	Finally, while the NZ ETS provides a disincentive to deforestation, this does not apply to forests not covered by the scheme. This includes a significant portion of exotic forests planted in the 1990s whose owners have chosen not to register into the NZ ETS. This also includes pre-1990 native forests, for which an action in the emissions reduction plan to explore measures to reduce deforestation has been placed on hold. Overall, we assess there are moderate risks to the ability of the main policy tools to deliver the level of removals in the Commission's 2022 demonstration path, which we use as a benchmark to assess emissions reduction progress.
Funding and finance **Moderate risks**	The main tool to direct private finance to support forest carbon removals is the NZ ETS. Emitters' demand for units for compliance, combined with the low costs of generating units from exotic forests, means that the NZ ETS has delivered finance for exotic forest planting in recent years. However, current issues with the NZ ETS discussed above, as well as wider regulatory uncertainty around forestry (such as changes to foreign investment rules and local government regulations), create risks for investor confidence and have potential to hinder the flow of private finance. There is support from a wide range of stakeholders for scaling up native afforestation and restoration, but finance is a critical barrier. Proceeds from carbon alone are typically not sufficient to provide a commercial return, and do not reflect the wider benefits native forests can provide to biodiversity and climate resilience. Private finance is unlikely to be mobilised at scale without greater public funding support. This includes investment into research and development into indigenous species, akin to the government-funded research and investment programme in exotic forestry around the turn of the 20th century. We assess moderate risks around funding and finance due to current policy uncertainty and gaps in funding support for native afforestation.
Other barriers and enablers **Moderate risks**	Important enablers in this area include social licence, partnership with iwi/Māori, supply chains, research and development, and market demand. The first emissions reduction plan included a number of actions to address barriers and enablers, such as research into reducing the cost of native afforestation and investigating options to address supply chain barriers. However, we assess that there are some risks because not all barriers and enablers are addressed, outcomes of proposed work are still to be determined, and the status and funding of some actions are uncertain. For example, the stopping of work on the Forestry ITP leaves a gap to addressing enablers such as increased domestic use of wood products and investment in skills and training. Plans also give little attention to risks associated with climate change and natural disturbance.

Timeline **First emissions budget – Significant risks** **Second and third emissions budgets – Moderate risks**	There is currently no clear timeline or process for signalled policy changes to the NZ ETS. Several actions from the first emissions reduction plan have also been placed on hold. The timing of emissions and removals from forest activities poses issues for specific budget periods. Planting a new exotic forest causes an initial carbon loss due to clearing of existing biomass and a decrease in soil carbon, which takes around four years before it 'pays back'.[362] This means the high rate of planting since 2021 will actually increase emissions in the first emissions budget period (2022–2025) but deliver removals beyond that. Forest owner decision-making, particularly deforestation, could affect any budget period, as can (and have) natural disturbances and climate impacts. This poses particular risk for the first emissions budget, due to the lack of a buffer to absorb additional emissions and lack of time to respond through policy.
Overall assessment	
First emissions budget – Significant risks **Second and third emissions budgets – Moderate risks**	Overall, we assess there are significant risks to the forestry sector achieving the benchmark level of net removals in the first emissions budget (for 2022–2025), and moderate risks for the second emissions budget (for 2026–2030) and third emissions budget (for 2031–2035). While high levels of afforestation up to 2024 already lock in sufficient removals for the second emissions budget period, deforestation levels pose risk to achieving the net removals outcome across all emissions budgets if these are not reduced. Current uncertainty about future afforestation intentions also indicates some risks to delivering sufficient removals in the third emissions budget period, if planting were to fall significantly for the next few years.

Forest management

Reducing emissions and increasing removals through forest management is one of the pathway outcomes that could contribute to increased net removals from forests. We have not done a policy scorecard on this outcome for this first report but have summarised actions and implementation from the first emissions reduction plan.

Currently, there is insufficient information for any quantitative assessment on forest management, and neither the Commission's 2022 demonstration path nor the government projections assume any contribution from this to meeting emissions budgets. The Government is yet to publish sufficient detail on how it will account for emissions and removals from forest management, including the setting of a reference level. Further information is expected to be provided in New Zealand's first Biennial Transparency Report under the Paris Agreement, to be published by 31 December 2024. This could be considered in future monitoring.

Native forests are significant carbon stores. They are estimated to hold about 1.8 billion tonnes of carbon.[363]

Some forest management activities may increase carbon removal and storage and protect carbon stocks in the long term, particularly in regenerating forest and successional vegetation.

The first emissions reduction plan contained a focus area to 'Maintain existing forests', with two associated actions:

- Explore measures to reduce deforestation of pre-1990 native forests (Action 14.3.1)
- Maintain and increase carbon stocks in pre-1990 forests (Action 14.3.2)

The first action – which was seeking to continue to monitor the deforestation of pre-1990 native forests and to explore how to address the Commission's recommendation to improve and enforce measures to reduce deforestation of pre-1990 native forests – is on hold, due to other priorities (as mentioned in the scorecard table). The second action, which includes research to investigate forest management activities that will increase carbon sequestration in pre-1990 forests, has made some progress. MPI reports that it has undertaken initial engagements with some stakeholders, but more time is being allowed to gather the insights needed, specifically from tangata whenua.

Harvested wood products

Harvested wood products are products made from timber, such as furniture or the framing for buildings. Wood products can prolong the storage of carbon after harvest, which increases the long-term average carbon stock of forests in target accounting. They can also act as a substitute for products or processes in other sectors with higher embodied emissions such as steel or concrete.

The first emissions reduction plan contained a focus area to 'Grow the forestry and wood processing industry to deliver more value from low-carbon products'.[364]

Important enablers in this area include development of the wood processing industry. This was previously driven by work surrounding the Forestry ITP. It is not clear whether or in what form this work programme will continue.

Box 11.2.3: Looking towards the 2050 target

The Climate Change Response Act 2002 (the Act) directs the Commission to assess progress towards meeting emissions budgets and the 2050 target. Establishing new forests will have a changing effect on net emissions over decades to centuries, depending on factors such as the type of forests and how they are managed. There are also risks to the permanence or durability of the carbon stored in forests. For this reason, it is important to consider the longer-term implications and risks when assessing progress and policies in the forestry sector.

The NZ ETS in its current form is capable of driving the removals needed for meeting the emissions budgets (though our assessment does highlight risks to this). However, the mix of planting that this is likely to drive is skewed towards exotic production forests, which do not provide a long-term carbon sink.

Production forests planted today will have ceased contributing removals by 2050 under the 'averaging' rules applied in target accounting. Continual planting of new land is required to maintain a carbon sink from production forests. Monoculture exotic forests also carry wider risks to being a durable store of carbon.

Further attention to supporting and incentivising permanent native afforestation would provide more long-term, durable, and diverse removals options. This can lead to a more resilient and less risky portfolio of removals to meet and sustain the 2050 target, and can help maximise wider environmental benefits.

A sustainable pace of exotic afforestation, which manages environmental risks and impacts on local communities, is also important to meeting and sustaining the 2050 target.

Areas for attention

Maintaining afforestation

Intended afforestation levels for 2025 and beyond have fallen significantly, influenced by policy uncertainty around the NZ ETS and wider policies affecting the forestry sector.

The aim stated in the first emissions reduction plan to increase levels of native afforestation with less reliance on exotic afforestation is unlikely to be delivered without further policy to incentivise native afforestation – for example, building on the results of the One Billion Trees programme. Lower levels of native permanent afforestation have consequences for building a long-term, durable, resilient land-based carbon sink.

Managing deforestation

Controlling and reducing deforestation is an important factor in meeting emissions budgets.

There are particular risks around deforestation of post-1989 forests not registered in the NZ ETS, which face no disincentive.

Measuring and accounting for net carbon storage

Improved mapping and carbon sequestration modelling of forest types (disaggregating the 'natural regeneration and native planting' category) will improve understanding and outlooks of net afforestation.

There is uncertainty about the real effects on emissions budgets and targets of major events, such as Cyclone Gabrielle and the storm series of 2023. The issues are broader than transparency around natural disturbance provisions, including the long-term consequences of storm damage to land.

Specific barriers or enablers for iwi/Māori

- Under the first emissions reduction plan, Action 14.4.3 specifically attended to working with Māori on their aspirations and priorities, as did specific activities in Action 14.1.3 to enhance forestry planning and advisory services, and in Action 14.2.3 to encourage greater levels of native afforestation over the long term (though this action has been put on hold).
- MPI had a standing series of engagements for Māori forestry and the NZ ETS in 2023, to connect about the NZ ETS and opportunities for Māori forestry.[365]
- Māori land ownership and tenure create challenges for making land-use decisions. For example, often land held by Māori is managed either by 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. It is not until these agreements end that Māori landowners can take on the management responsibilities for their forests, meaning they can make decisions on their own whenua – including whether it is viable to plant permanent forests.[366]
- Complexities about collective land ownership also can limit access to finance to enable land-use and business decisions. Māori landowners with limited access to capital or other land resources would find it difficult to make use of offsetting provisions in the NZ ETS, which allow pre-1990 forest land to be deforested without a unit surrender liability if an equivalent forest is planted elsewhere.[367] On the other hand, some have noted that a lower level of indebtedness is an advantage for Māori collective land ownership. Still, there can be risk aversion in land-use decision-making due to history of land loss and recovery.
- Māori have interests in forest restoration/regeneration and/or production forestry. Land use provides livelihoods, alongside carbon sequestration, and a cultural imperative to practise kaitiakitanga and tikanga.

New opportunities to reduce emissions

Part of the Commission's monitoring role, under section 5ZK of the Act, is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

Broadening carbon removals to other categories of land is under review. Care must be taken for this to be done in a robust way, prioritising additionality and permanence (durability). In our advice on the second emissions reduction plan,[368] the Commission has highlighted that the NZ ETS may not be the most appropriate policy tool for encouraging these removals, and that bringing them into the NZ ETS risks undermining that tool's achievement of gross emissions reductions.

Box 11.2.4: Other government policies that could affect the forestry sector

Proposed or signalled government activities to attend to cyclone and flood recovery efforts, including any regional requirements, may affect the forestry sector. New approaches to the reforms of the Resource Management Act 1991, insofar as they are the major natural resource management policy, may also affect both land use and forest practices.

WĀHANGA 12 | CHAPTER 12

Ngā para me ngā haurehu haukōwhai | Waste and fluorinated gases

This chapter looks at greenhouse gas emissions in two areas: waste and fluorinated gases.

This assessment:

- examines progress on implementing policies intended to drive emissions reductions
- looks at whether and how those policies connect to climate change adaptation
- tracks changes in emissions to date, alongside other notable sector trends.

We use policy scorecards to assess the strength of emissions reduction policies and plans to drive change in each sector, as described in *Chapter 2: Our approach*. From the policy scorecards, we identified areas for attention where gaps in the suite of policies for each sector could create risks for meeting emissions budgets or where new opportunities for emissions reductions could be pursued.

12.1: Para | Waste

This section focuses on greenhouse gas emissions from waste disposal in Aotearoa New Zealand. These emissions are primarily methane and come mostly from disposal of organic waste to landfills. Smaller quantities of emissions come from wastewater treatment, burning of solid waste, and biological treatment such as composting. The Government's first emissions reduction plan focused on reducing waste emissions by reducing the amount of organic waste sent to landfill and expanding landfill gas capture systems.

As context, 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.[369]

Reducing the volume of material that goes to waste is also part of emissions reduction. The importance of a circular economy to reducing emissions, including embodied emissions, is discussed in *Chapter 5: Policies, systems and tools*.

KEY POINTS FOR WASTE

Progress to date

- Total waste emissions fell by 1.5% (0.05 $MtCO_2e$) in 2022. This continues a long-term trend of emissions reductions from waste.
- Emissions reductions have been mainly driven by improvements in the management of solid waste and the National Environmental Standards for Air Quality, introduced in 2004.[370] These standards introduced requirements for large landfills to collect methane emissions and either flare it or use it as a fuel to produce energy. The ongoing fall in emissions also reflects the gradual decay of waste historically disposed in landfills without gas capture systems, including those that have closed.
- There remains uncertainty over the accuracy of landfill emissions estimates in Aotearoa New Zealand. In 2023, a United Nations Framework Convention on Climate Change (UNFCCC) review of waste sector Greenhouse Gas Inventory (GHG Inventory) reporting found that national reporting was not in accordance with the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines. In line with the review, unless more evidenced landfill gas measurements are provided, it may be appropriate to reduce the assumed levels of landfill gas recovery.[371] Should this be the case, increased waste sector emission outputs would impact the achievement of emissions budgets.

Our assessment of policy

Scorecard summary for reducing methane from landfill through improving and expanding landfill gas capture

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

Scorecard summary for reducing methane from landfill through reducing organic waste disposal to landfill

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

- The 2023 Waste Strategy provides useful target benchmarks relevant to monitoring against the emissions reduction plans. These targets relate to reducing waste generation, increasing waste diversion, and biogenic methane emissions reduction.
- The implementation of emissions reduction plan policy to enable household-level organic waste diversion will help contribute to the achievement of the Waste Strategy target to reduce waste material requiring final disposal by 30% per person by 2030. However, there remain **moderate risks** associated with the delivery of organic waste diversion infrastructure across the broader organic waste stream, as well as risks associated with the establishment of legislation necessary to achieve high levels of organic waste diversion.
- We assess that there are **moderate risks** to achieving necessary levels of landfill gas capture to meet the Waste Strategy's target of 30% biogenic methane emissions reduction between 2020 and 2030.
- We also consider that there are moderate risks associated with the policy timeline that seeks the installation of landfill gas capture at municipal landfills[xciii] by 31 December 2026.

Areas for attention

- The installation of landfill gas capture systems at non-municipal landfill sites would further enable emissions reductions. If this does not happen, achieving the benchmark level of emissions reductions in the Commission's 2022 demonstration path, which we use as a benchmark to assess emissions reduction progress, could only be achieved through improving the efficiency of municipal landfill gas capture systems, increased waste avoidance across the economy, and enhanced waste diversion away from landfills.
- A strategic waste and resource recovery infrastructure plan could be established to address all spectrums of the waste stream, including commercial and industrial waste. A strategic infrastructure plan could provide a foundation for monitoring the efficiency of the investment spend. It would also inform subsequent waste and resource recovery infrastructure asset and investment plans.
- Strategic waste and resource recovery planning would benefit from applying a circular economy lens.
- There remains uncertainty around current emissions estimates. In 2023, a UNFCCC review of waste sector reporting in New Zealand's GHG Inventory found that this was not in accordance with the 2006 IPCC Guidelines.

xciii. A 'municipal landfill' (otherwise known as a Class 1 landfill) is a facility that accepts household waste for disposal, among other wastes. For further information about landfill classes see the WasteMINZ 2018 Technical Guidelines for Disposal to Land.

How we monitor waste emissions

As well as monitoring how much emissions have reduced, to assess if the country is on track to meet emissions budgets, we also assess the likely effect of government action for future emissions budget periods (see *Chapter 2: Our approach*). This section outlines the key areas we have considered for the waste sector.

In 2022, gross emissions from the waste sector were 3.49 $MtCO_2e$, making up 4.5% of Aotearoa New Zealand's gross emissions. Waste emissions are primarily methane (93.3% of the total emissions in CO_2e), with the remainder from the long-lived greenhouse gases carbon dioxide and nitrous oxide. Methane emissions from waste were 0.12 $MtCH_4$ in 2022, making up 8.5% of biogenic methane emissions.

Aotearoa New Zealand's waste emissions come mostly from disposal of organic waste to landfills (81.3% of total emissions). Smaller quantities of emissions come from wastewater treatment (11.3%), the incineration[xciv] and burning of solid waste (5.1%), and biological treatment such as composting (2.2%).

In the Commission's 2022 demonstration path, waste emissions fall to 3.3 $MtCO_2e$ by 2025 and 2.4 $MtCO_2e$ by 2035.

In addition to waste avoidance, the primary ways waste emissions can be reduced are through:

- reducing the amount of organic waste sent to landfill (either through reducing the amount of waste created, or through the diversion of material away from landfill using lower-emissions treatment options, such as composting or anaerobic digestion)
- increasing application and efficiency of landfill gas capture systems.

The waste monitoring map (**Figure 12.1.1**) reflects these options and sets out the pathway outcomes, enablers, and current policies that will contribute to reducing waste emissions. Progress indicators (**Figure 12.1.3**) help us track progress towards goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

The monitoring map also shows ways emissions from waste incineration and wastewater emissions could be reduced. These pathways were not addressed in the first emissions reduction plan, so are not currently monitored by the Commission. However, they are recognised in our monitoring framework as important elements of a complete response to waste emissions reduction.

Action to reduce the 'embodied emissions' that result from manufacture and use of materials or products is also an essential part of reducing emissions – but has not been monitored for this section. Embodied emissions are the sum of emissions involved in making a product and are sometimes termed the 'carbon footprint'. See *Chapter 5: Policies, systems and tools* for discussion of progress made in the actions towards a more circular economy and bioeconomy, as outlined in the Government's first emissions reduction plan.

xciv. Incineration is a form of thermal waste-to-energy technology. Waste-to-energy 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 (for further information see Ministry for the Environment (2020) A waste to energy guide for New Zealand).

*Figure 12.1.1: Waste monitoring map (see **Box B2.1** for legend)*

Monitoring map for waste

Total waste emissions reduce by 33% by 2035 (relative to 2021)
Biogenic methane target: Waste methane emissions reduce by 10% by 2030 relative to 2017 in line with the benchmark level under the Commission's 2022 demonstration path

PATHWAY OUTCOMES

Reduce emissions from solid waste disposal
- Methane emissions by landfill type
- Emissions from biological treatment

Reduce emissions from burning waste
- Emissions from open burning and incineration

Reduce emissions from wastewater
- Emissions from wastewater treatment and discharge

Improve and expand landfill gas capture
- Infrastructure coverage at landfills
- Landfill gas capture rates
- Amount of gas flared vs converted to energy

Reduce organic waste sent to landfill
- Tonnes sent to landfill from all sources

Reduce burning of non-organic waste
- Volume of waste burnt

Wastewater improvements
- Reduction in number of open ponds
- Reduction in volume of sludge disposed to landfill

Waste diversion
- Food waste diversion
- Food waste rescue
- Recycling of paper and cardboard (fibre)
- Wood waste reuse

Reduce waste generation at source
- Waste arisings – household, commercial, industrial, agricultural
- Food waste reduction
- Construction wood waste reduction
- Resource efficiency (*see Industry monitoring map*)

ENABLERS

Services and infrastructure
- Investment in new infrastructure and resource recovery service delivery
- Access to diversion services and resource recovery facilities
- Capacity of diversion infrastructure (recycling, composting, anaerobic digestion facilities)

Local Regulation
- Territorial Authority level regulation to restrict or prohibit organic waste disposal to landfill

Behaviour change to reduce waste
- Effective use of diversion and resource recovery services

Research and development
- Increased or optimised landfill gas capture
- Wastewater emissions reductions for Local Authorities
- Methods to increase the accuracy of emissions factors

Reliable and transparent data
- Uncertainty levels in New Zealand's Greenhouse Gas Inventory emissions estimates
- Percentage of landfills using a unique emissions factor
- Higher quality activity data
- Compliance with Waste Disposal Levy info and reporting requirements
- Establish baseline for wastewater emissions

POLICIES

Financial mechanisms
- Waste Disposal Levy
- Waste Minimisation Fund

National-level policy and regulation
- Organic waste landfill restrictions
- Effective regulatory enforcement
- Waste hierarchy consideration is enshrined in legislation
- Regulated product stewardship schemes
- New Zealand Emissions Trading Scheme

National-level strategy and planning
- Strategic waste infrastructure planning

CONTEXTUAL FACTORS

International context
- Access to offshore recycling services necessary to enable the recycling of products in Aotearoa New Zealand

Source: Commission analysis

Box 12.1.1: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

- There remains a gap in the data for emissions from waste. While there is now improved waste tonnage information for municipal landfills across the country, there are still waste tonnage and composition gaps in data for non-municipal landfills – including landfills on farms, and closed landfills that may still be emitting gases.
- There is also uncertainty about the rate of landfill gas capture occurring at landfills. The Government currently assumes a 68% landfill gas recovery rate for open landfills, and 52% recovery rate for closed landfills. Government projections further assume that this landfill gas capture efficiency rate could increase from 68%, to a range of 71.75% to 73.5%. However, these assumptions may require review.

  In 2022, an independent UNFCCC review team undertook a periodic review of New Zealand's GHG Inventory submission. The team found the methodology underlying the two assumed recovery rates (68% and 52%) was not in accordance with the 2006 IPCC Guidelines. If no measurement data are available, it is possible that a default recovery of 20% would be more appropriate for the part of the waste where methane is collected.[372] While the Ministry for the Environment is continuing to look into how this can be addressed, it highlights a level of uncertainty and the lack of transparency related to gas capture effectiveness in Aotearoa New Zealand.

Progress in reducing waste emissions

In 2022, methane emissions from waste were 0.12 $MtCO_2e$, making up 8.6% of biogenic methane emissions

In 2022, total gross emissions from the waste sector were 3.49 $MtCO_2e$, representing 4.5% of gross emissions for Aotearoa New Zealand. Waste emissions are primarily methane (93.3% of the total emissions in CO_2e), with the remainder from the long-lived greenhouse gases carbon dioxide and nitrous oxide. Methane emissions from waste were 0.12 $MtCO_2e$ in 2022, making up 8.6% of biogenic methane emissions.

Waste emissions reduced by 1.6% between 2021 and 2022

The GHG Inventory reporting also indicates the total emissions from solid waste disposal fell by 1.6% (0.05 $MtCO_2e$) between 2021 and 2022. At municipal landfills, the reduction was 3% (0.03 $MtCO_2e$).

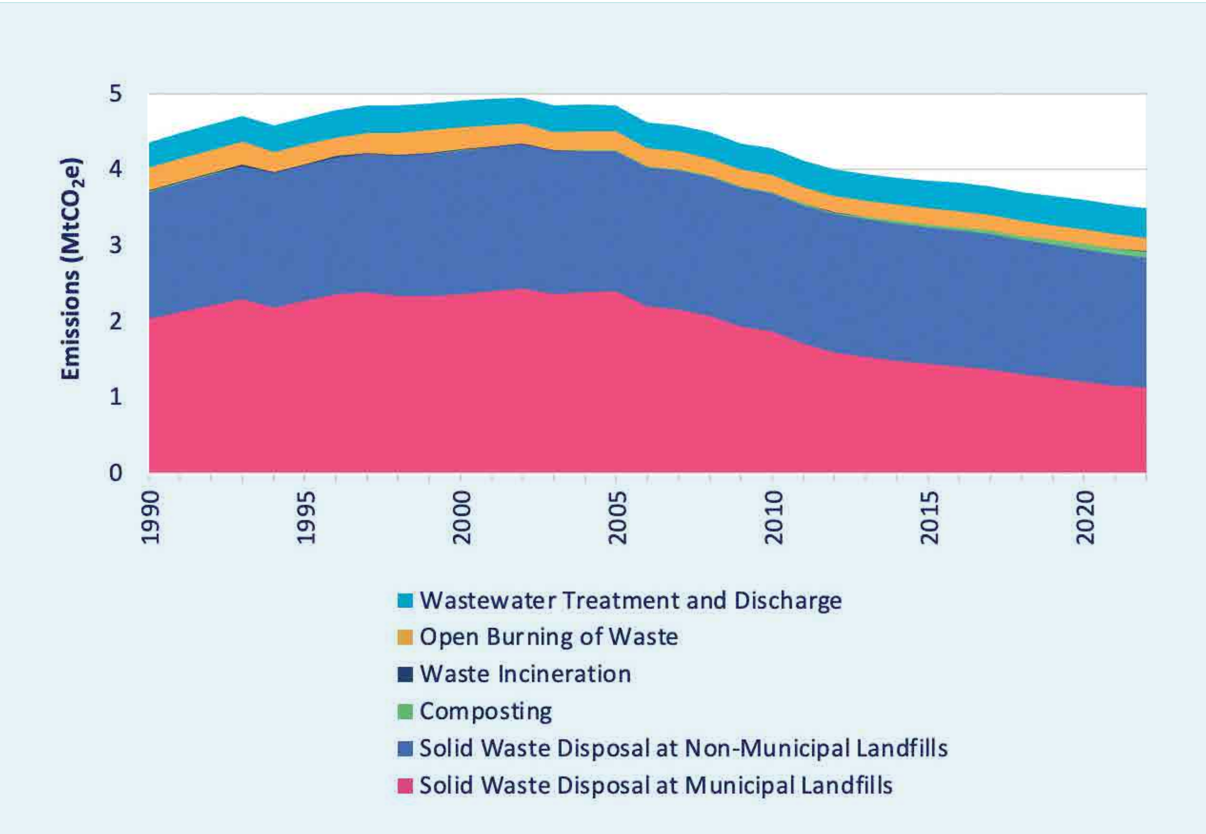
Annual waste emissions have reduced by almost a quarter since 1990

GHG Inventory data indicate emissions from solid waste have decreased 23.4% since 1990, with emissions steadily reducing since 2004. This was driven by improvements in the management of solid waste and as a result of the introduction of National Environmental Standards for Air Quality in 2004. These national standards introduced requirements for large landfills to collect greenhouse gas emissions and either flare or use the emissions as a fuel to produce energy.

Review of landfill gas capture estimates may affect emissions reduction figures

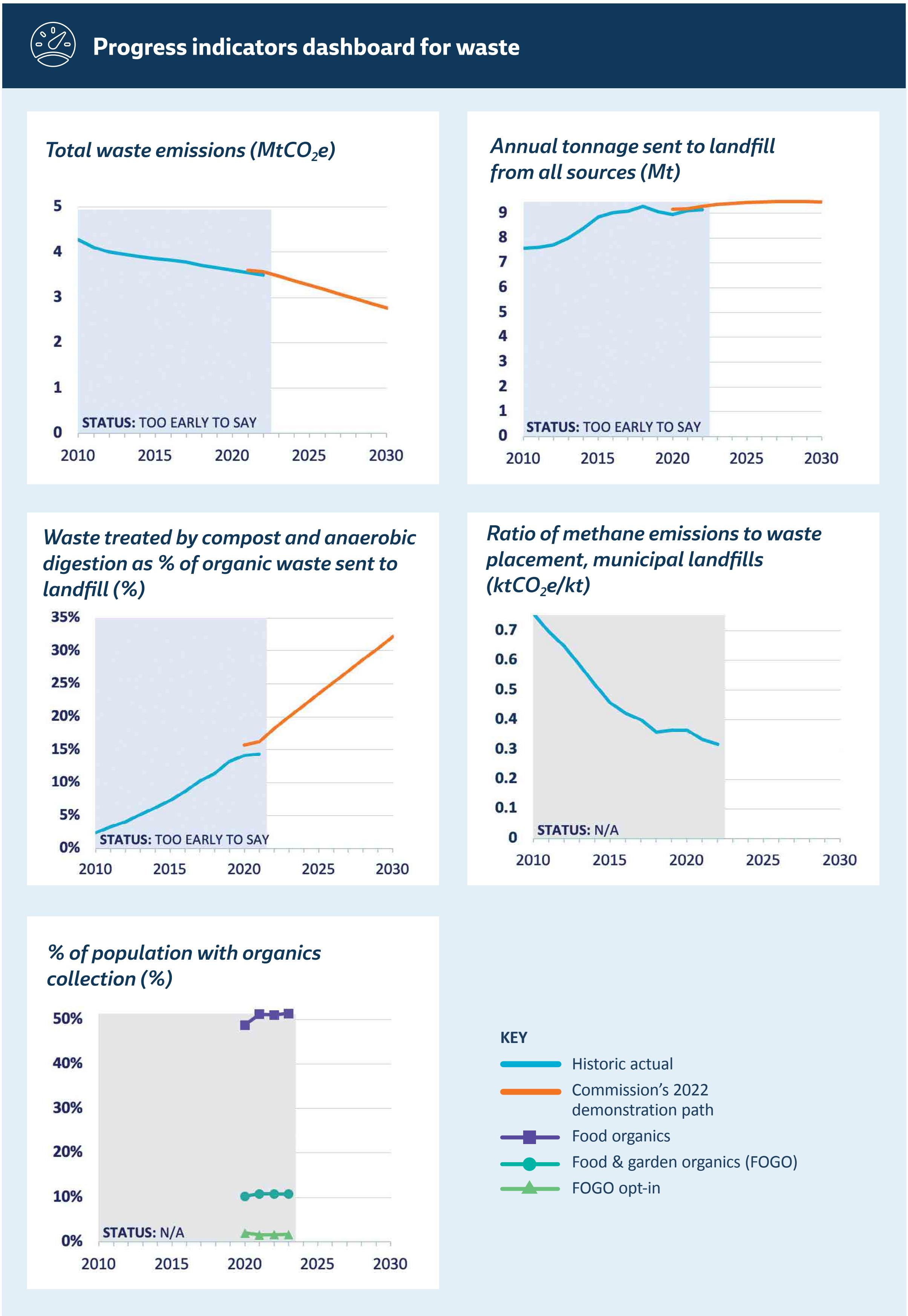
The 2023 UNFCCC review of GHG Inventory reporting of waste emissions in this country raised issues with the reporting (Box 12.1.1). If it is not possible to strengthen the evidence base for the existing calculations, it may be necessary to reduce the estimated level of emissions capture at landfills. That could affect overall figures for emissions reduction achieved.

Figure 12.1.2: Waste emissions to 2022



Source: New Zealand's GHG Inventory published in 2024

Figure 12.1.3: Progress indicators dashboard for waste



Source: New Zealand's GHG Inventory published in 2024

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by scorecards for each outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

This policy assessment focuses on two outcome areas: 'Reduce organic waste sent to landfill' and 'Improve and expand landfill gas capture'. Within this assessment, we refer to the high-level 2023 Waste Strategy target benchmarks for monitoring consideration, given the high-level nature of quantifiable waste emissions reduction goals in the first emissions reduction plan. The Waste Strategy targets relate to reducing waste generation, increasing waste diversion away from landfill, and reducing biogenic methane emissions. We also anticipate future monitoring will expand to address the emissions from waste incineration and wastewater.

Policy progress

- The release of the 2023 Waste Strategy was significant, because it set targets to support the achievement of a low waste and low emissions society over the next three decades. We recognise these Waste Strategy targets as relevant emissions reduction monitoring considerations.[373]
- The Waste Strategy's 30% biogenic methane emissions reduction target from waste aligns with the Commission's 2022 demonstration path, which also assumes a 30% decrease of methane gas from municipal landfills by 2030. Nevertheless, the ability to achieve this reduction without landfill gas capture installation at non-muncipal fill sites remains uncertain.
- The Commission's 2022 demonstration path assumes a 32% reduction of methane emissions from non-municipal fill sites between 2020 and 2030. For context, this 32% decrease in methane generated from non-municipal fills sites would equate to a reduction of 0.01 Mt CO_2e of methane within the 10-year period.
- While the first emissions reduction plan established a clear intent to regulate the requirement of landfill gas capture at all municipal landfills, the timeline for achieving this outcome remains uncertain.

- The ongoing implementation of emissions reduction plan policies to enable the diversion of household-level organic waste is an important first step for reducing organic waste diversion.
- The opening of the Ecogas Reporoa Food Waste (Organics) Processing Facility, in 2022, has been a milestone for the waste and resource recovery sector in Aotearoa New Zealand. This facility produces and distributes 200 tonnes of nitrogen in the form of biofertiliser per year from the anaerobic digestion of 75,000 tonnes of organic waste from Auckland. Additionally, the plant is estimated to produce 185 terajoules (TJ) of biogas energy per year, displacing fossil gas in the energy sector.[374]
- In terms of reducing waste to landfill, our analysis also suggests that the Waste Strategy target to reduce waste material requiring final disposal by 30% per person has the potential to exceed the level of waste reduction change anticipated within the Commission's 2022 demonstration path modelling. Similarly, the Waste Strategy target to reduce the amount of material entering the waste management system by 10% per person exceeds the assumptions contained in the Commission's 2022 demonstration path. However, as these waste reduction and avoidance goals are not specific to the type of waste material (that is, to organic or non-organic waste),[xcv] the potential emissions impacts from these reductions remain uncertain.

How these policies connect to climate change adaptation

Opportunities exist to promote climate change adaptation while reducing emissions from waste. For example, promoting social capital–focused resource-recovery initiatives will reduce emissions and help support community resilience.

New resource-recovery assets should also be located in areas where they will be resilient to climate change, and where they can promote resource equity for communities.

Increasing the level of monitoring of operational and closed landfills may also be appropriate in response to changing climate conditions, helping to identify landfills in need to remedial attention and reducing risk for communities, while helping to improve emissions data.

xcv. Non-organic waste is more inert and not biologically reactive. This means that it will not decompose, or only at a very slow rate (examples include sand or concrete).

Policy scorecard: Reducing methane from landfill through improving and expanding landfill gas capture

This outcome area is focused on reducing methane from landfill through the pathway of improving and expanding landfill gas capture.

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.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

Rationale for our scores

Main tools **Moderate risks**	Currently the main emissions reduction plan tool for achieving this outcome is a requirement to install landfill gas capture systems at all municipal landfills by 31 December 2026. We estimate that enacting this would reduce emissions by up to 0.7 $MtCO_2e$ over the second emissions budget period (2026–2030). This amounts to around half the benchmark level of emissions reductions from additional landfill gas capture in the Commission's 2022 demonstration path. However, it does not address the matter of landfill gas capture efficiency, or the uncertainty as to whether the methane reduction target can be reached without landfill gas capture installation at non-municipal fill sites. The timeline for the achievement of landfill gas expansion at municipal landfills also remains uncertain.
Funding and finance **Moderate risks**	The requirement for landfills to privately finance the establishment of expanded landfill gas capture is a credible means of funding this action. However, it may result in the closure of smaller landfills if they are no longer viable. This has the potential to result in a larger portion of landfills being owned by the private sector, and has the potential to impact smaller councils and residents.
Other barriers and enablers **Moderate risks**	The installation of landfill gas capture systems at non-municipal fill sites and closed landfills would be an enabler for emissions reduction. Opportunities to further incentivise high-performance landfill gas capture also exist. Understanding the impact of the phase-out of organic waste disposal to landfill on the effectiveness of gas-capture systems also needs to be addressed.

Timeline **Moderate risks**	While the emissions reduction plan establishes a clear intent to regulate the requirement of landfill gas capture at all municipal landfills, the pathway to achieve this outcome remains uncertain. Even if legislation could be enacted in the next two years, there may not be enough time for municipal landfill to install landfill gas-capture infrastructure within this time.

Overall assessment

Moderate risks	Overall, some adjustment to the plans may be needed to mitigate uncertainties and delivery risks. In summary, the first emissions reduction plan action requiring all municipal (Class 1) landfills to have landfill gas capture systems in place by 31 December 2026 is one way to expand landfill gas capture. However, currently it is unclear how 100% landfill gas-capture infrastructure establishment will be achieved by 2026. If appropriate legislation could be established within the next two years, this may not allow adequate time for municipal landfill operators to install appropriate infrastructure within that time. It also remains unclear whether the Government will move to require landfill gas implementation at non-municipal landfills in the future. If this does not happen, achieving the benchmark level of emissions reductions in the Commission's 2022 demonstration path could only be achieved through improving the efficiency of gas-capture systems at municipal landfills, increased waste avoidance across the economy, and enhanced waste diversion away from landfills. As the level of landfill gas capture being achieved in Aotearoa New Zealand remains uncertain, this results in moderate risks for achievement of the policy in the first emissions reduction plan. We previously recommended setting a date by which high-performance gas-capture systems are mandated for all landfills that accept organic waste. This exists as outstanding opportunity for waste sector emissions reduction, and one which we will continue to monitor.

Policy scorecard: Reducing methane from landfill through reducing organic waste disposal to landfill

This outcome area is focused on reducing methane from landfill through the pathway of reducing organic waste sent to landfill, as a primary pathway for emissions reduction. The first emissions reduction plan proposed that this be achieved through enabling the separation of organic waste and investing in organic waste-processing facilities. The Government is also investigating a 2030 ban or a limit applied to disposal of organic waste to landfill.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
Moderate risks	Moderate risks	Moderate risks	Moderate risks	**Moderate risks**

Rationale for our scores

Main tools **Moderate risks**	The implementation of organic waste-reduction policies from the first emissions reduction plan will be an important first step towards enabling the diversion of organic waste and reducing emissions. This includes improving household kerbside collection of food and garden waste, and investing in organic material resource recovery. These actions primarily focus on the diversion of household organic waste and construction and demolition waste. Beyond household-level organic waste, it remains unclear how high levels of organic waste diversion will be achieved. Delays in the commission of infrastructure, the lack of transparency related to strategic resource recovery planning, and delays in the review of the Waste Minimisation Act 2023 all pose risks to the achievement of targets in the Waste Strategy 2023.
Funding and finance **Moderate risks**	Most waste minimisation funding comes from the Waste Minimisation Fund. Due to the important community-focused waste-reduction work undertaken by territorial authorities, it will be important for councils to maintain access to this fund. It provides councils the ability to deliver local waste-minimisation solutions that can be effective in promoting community-level resilience over the longer term. As councils are enabled to become more effective through funding level increases, so too should the level of scrutiny, transparency and responsibilities relating to the funding spend. As part of Budget 2024 decisions, the Government has announced revenue from the waste disposal levy will be spent on a wider range of projects supporting the environment and climate change mitigation and adaptation, in addition to minimising waste. On 31 May 2024, the Government also agreed to a second phase of waste disposal levy rate increases.

Funding and finance (continued) **Moderate risks**	The increase in the waste disposal levy is in line with the Commission's 2023 advice to the Government on the second emissions reduction plan.[375] Planning and investing in expanded resource-recovery facilities will also be necessary, to enable increased levels of waste diversion. As the cost of waste disposal increases, the cost of waste-diversion services should remain feasible to incentivise resource recovery. The absence of a long-term waste and resource-recovery infrastructure plan limits the ability to monitor the effectiveness of funding investment to support the diversion of organic waste. Although waste and resource recovery action and investment planning will identify infrastructure priorities at five-year intervals, this planning would benefit from the guidance of a long-term waste and resource-recovery infrastructure plan. While the level of avoided emissions can be calculated relative to the level of investment committed, ensuring the investment efficiency relative to infrastructure type, location, and scale is not currently addressed.
Other barriers and enablers **Moderate risks**	A range of barriers and enablers for reducing emissions from waste currently remain unaddressed. We recently identified opportunities to address barriers in our 2023 advice to the Government on the second emissions reduction plan,[376] such as establishing a more strategic approach to food rescue sector resourcing. The consideration of the end market for organic products will be important when planning for new resource-recovery facilities. Regulatory enforcement of waste-diversion standards and requirements will also be necessary.
Timeline **Moderate risks**	A lack of detailed action and planning across the waste stream, together with delays in the establishment of waste and resource-recovery infrastructure, create risks for the target achievement.

Overall assessment

Moderate risks	Some adjustment to plans may be needed, to mitigate uncertainties and delivery risks.

Areas for attention

Waste and resource-recovery infrastructure planning remains ambiguous

Strategic waste and resource-recovery infrastructure planning that addresses all spectrums of the waste stream, including commercial and industrial organic waste remains outstanding. We identified the benefit of his planning having a circular economy lens and feeding into the development of the Circular Economy Strategy, in our 2023 advice to the Government on the second emissions reduction plan.[377] Actions relating to construction and demolition waste reduction currently contain a high degree of ambiguity, and further clarity and commitment regarding these actions would be beneficial.

Opportunities to address current inequities for iwi/Māori

To help address current inequities that may limit the ability of iwi/Māori groups to apply and effectively compete for Waste Disposal Levy funding, there is an opportunity to establish a proportion of contestable Waste Minimisation Funds for initiatives led by iwi/Māori.

New opportunities to reduce emissions

Part of the Commission's monitoring role, under section 5ZK of the Climate Change Response Act 2002 (the Act), is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

- The matter of optimal landfill gas efficiency remains unaddressed.[xcvi] The installation of high-performance landfill gas capture at landfills has the potential to enhance the effectiveness and efficiency of gas-capture infrastructure at landfills that have recently accepted organic waste. As context, a package of emissions pricing and regulation is currently applied to reduce biogenic methane emissions at landfills. Emissions are priced via the New Zealand Emissions Trading Scheme (NZ ETS), and the Waste Disposal Levy[xcvii] encourages the reduction of waste going to municipal landfills, which further lowers emissions. Disposal facility operators are obliged to report their emissions and surrender New Zealand Units under the NZ ETS. Operators of disposal facilities are mandatory NZ ETS participants. However, as cost of NZ ETS emissions obligations from landfills are passed from the landfill owner to the person paying landfill disposal charges when disposing their waste, it does not necessarily act to incentivise investment in more effective landfill gas capture infrastructure.
- Councils have the opportunity to become more effective in reducing the emissions from waste through the provision of increased Waste Disposal Levy funding. Funding spend increases should align with strategic emissions reduction plan goals.
- Promoting circular solutions for the management of organic agricultural waste exists as an opportunity to reduce emissions from waste in Aotearoa New Zealand.

xcvi. See the Commission's 2023 Advice on the direction of policy for the Government's second emissions reduction plan, p. 332.

xcvii. On 1 July 2009, the Waste Disposal Levy came into effect, adding NZ$10 per tonne to the cost of landfill disposal at sites that accept household solid waste. This levy is collected and managed by the Ministry for the Environment, which distributes half of the revenue collected to territorial authorities on a population basis. The other half is managed by the Ministry as a central contestable fund for waste minimisation initiatives. The levy for Class 1/municipal landfills is currently set at NZ$60 (as at 1 July 2024). The Minimisation (Waste Disposal Levy) Amendment Act (2024) would see further increases to this levy rate up to NZ$75 per tonne in 2027.

Box 12.1.2: Other government policies that could affect waste emissions

It will be important to ensure that any new policy related to thermal waste-to-energy does not contradict Waste Strategy goals or undermine the achievement of emissions reduction targets.[xcviii]

Thermal waste-to-energy technology 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. When using non-renewable feedstocks, thermal waste-to-energy can undermine waste reduction and recycling goals and displace the use and advancement of alternative renewable electricity generation options.

xcviii. See the Commission's 2023 Advice on the direction of policy for the Government's second emissions reduction plan.

12.2: Haurehu haukōwhai | Fluorinated gases

Fluorinated gases (f-gases) are a class of fluorine-containing compounds that are gases at ambient temperatures. F-gases are highly potent greenhouse gases. Types of f-gases used within Aotearoa New Zealand include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

HFCs and PFCs are used in many products, including refrigeration and air conditioning equipment. Emissions occur when the gases are released to the atmosphere during operation, or when the equipment is disposed of without being degassed.[378] PFCs are also emitted as a result of anode effects in aluminium smelting. SF_6 is used in the electricity distribution sector and for small-scale medical and scientific applications. Aotearoa New Zealand does not manufacture any of these f-gases, requiring the importation of all these gases.

As HFCs comprise around 95% of f-gas emissions, our monitoring assessment focuses on policies to reduce emissions from HFCs.

KEY POINTS FOR F-GASES

Progress to date

- New Zealand's Greenhouse Gas Inventory (GHG Inventory), published in 2024, reports that emissions from HFCs fell by 5.5% (0.087 $MtCO_2e$) between 2021 and 2022. The fall in 2022 follows a larger upward spike in 2021 where HFC emissions jumped 18% (0.24 $MtCO_2e$) from 2020. This spike reflects a surge in heat pump sales in 2021 and 2022, which is assumed to have been accompanied by early retirement of older heat pump units, causing higher emissions from disposal.[379]
- According to GHG Inventory data, up until 2020, emissions from HFCs had continually increased since they were first introduced in Aotearoa New Zealand in 1992. However, the rate of emissions growth fell steadily over this time.
- Imports of HFCs into Aotearoa New Zealand in bulk and in pre-charged equipment continued to fall in 2022, having peaked in 2016.
- New Zealand GHG Inventory data indicate that the estimated quantity of f-gases recovered from products at disposal increased to a new high in 2022, totalling 0.169 $MtCO_2e$, or around 11% of total f-gas emissions in 2022.
- Due to the significant fluctuations and revision of emissions estimates over recent years, it is currently too early to know how emissions from f-gases are tracking against the Commission's 2022 demonstration path, which we use as a benchmark to assess emissions reduction progress.

Our assessment of policy

Scorecard summary for reducing HFC emissions

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	No significant risks	No significant risks	Moderate risks	**Moderate risks**

- Overall, our analysis suggests that policy settings in the first emissions reduction plan align with the benchmark level of HFC emissions reductions in the Commission's 2022 demonstration path.
- Regulated product stewardship for refrigerants, standards for training and accreditation for handling f-gases, and the establishment of prohibitions on f-gases where low-global warming potential (GWP) alternatives are available, will collectively contribute to long-term reductions of HFCs.
- The New Zealand Emissions Trading Scheme (NZ ETS) has proven to be effective in stimulating action to achieve HFC export and destruction.
- Delivery of policy from the first emissions reduction plan remains at risk due to the pending nature of regulated product stewardship for refrigerants, as well as the ongoing need for standards for training and accreditation for handling f-gases.

Areas for attention

- Implementing regulated product stewardship for refrigerants and introducing standards for training and accreditation for handling f-gases remain important initiatives to be advanced.
- The limited uptake of readily available low-GWP f-gas alternatives in Aotearoa New Zealand may impact the effectiveness of HFC phase-down efforts over the longer term. Promoting the uptake of low-GWP f-gas alternatives would be beneficial for emissions reductions.

New opportunities to reduce emissions[xcix]

- Greater reductions in emissions of f-gases could be made through training and accreditation for refrigerant handlers and prohibitions on high-GWP gases.

xcix. Section 5ZK of the Climate Change Response Act 2002 directs the Commission to consider new opportunities to reduce emissions, as part of our assessment. We have focused on identifying options that were not included in the Commission's 2022 demonstration path, or that show potential for greater reductions than previously assumed, based on new evidence.

How we monitor emissions from fluorinated gases

According to data from the New Zealand GHG Inventory published in 2024, in 2022 the total emissions from f-gases in Aotearoa New Zealand were 1.57 $MtCO_2e$. This was 2% of gross emissions, and 3.9% of long-lived greenhouse gases (other than biogenic methane).[c] In the Commission's 2022 demonstration path, emissions from f-gases remain at a similar level to 2025 before falling, reaching 1.13 $MtCO_2e$ in 2035.

In 2022, the types of gases imported include HFCs (95.6%), PFCs (3.2%) and SF_6 (1.2%). As HFCs comprise the majority of f-gas emissions, this monitoring assessment focuses on reducing HFCs.

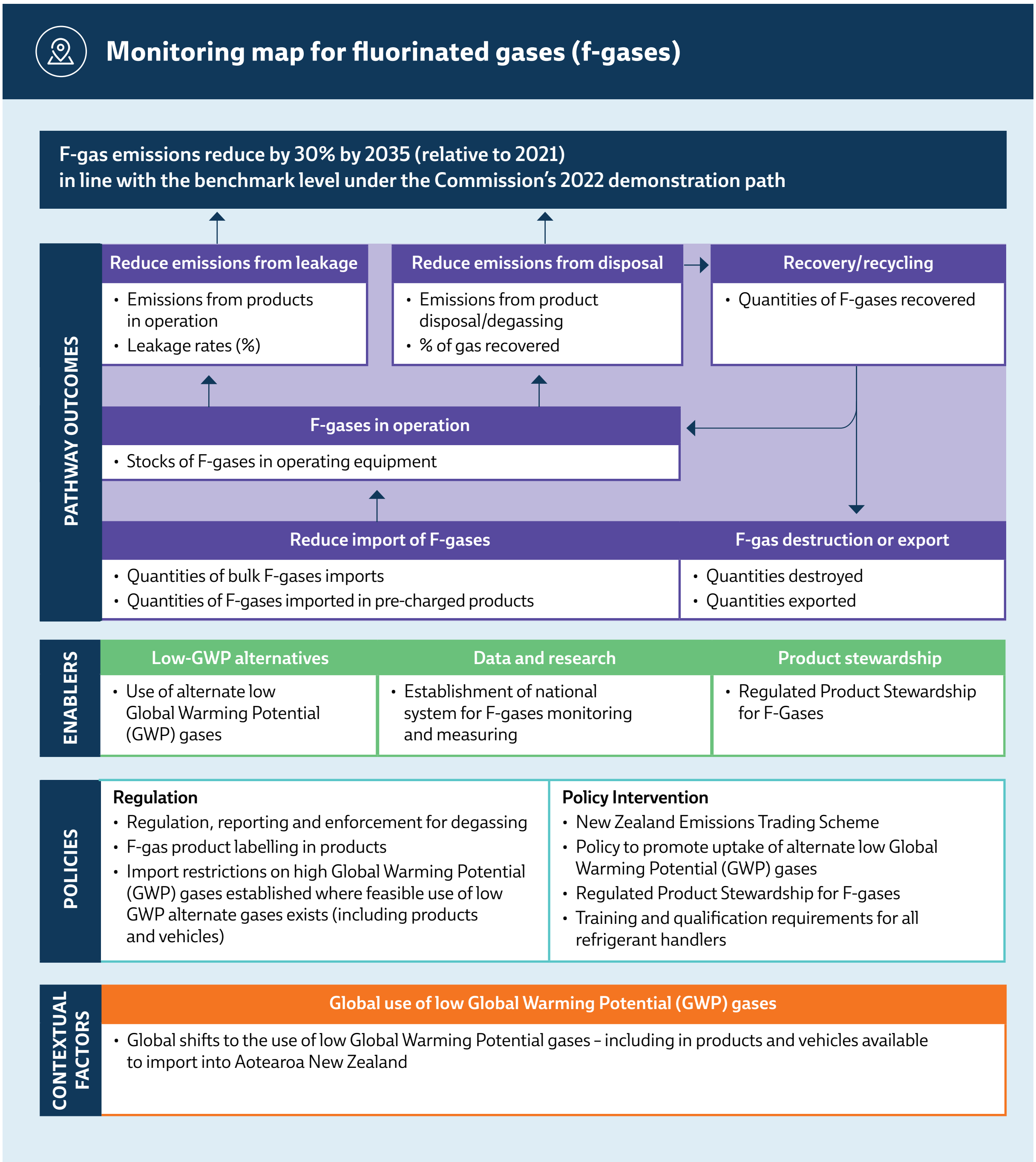
Emissions from HFCs occur when the gases are released to the atmosphere during operation or when the equipment is disposed of without being degassed. Each gas has a GWP value, which is set by how much it affects the atmosphere when released.

Importers of bulk HFCs and PFCs and users of SF_6 have reporting and surrender obligations under the NZ ETS. Importers of HFC and PFC in goods and motor vehicles are not required to be participants in the NZ ETS, but they do face a carbon price through the Synthetic Greenhouse Gas Levy.

Reducing the import, use, leakage and release of HFCs is the primary pathway for reducing f-gas emissions in Aotearoa New Zealand. The f-gases monitoring map (**Figure 12.2.1**) sets out the outcomes, enablers, and current policies that will contribute to reducing HFC emissions. Progress indicators (**Figure 12.2.5**) help us track progress towards these goals and pathway outcomes. See *Chapter 2: Our approach* for an explanation of the monitoring map concept and indicators.

c. While some f-gases have relatively short atmospheric lifetimes, they are included with long-lived gases in Aotearoa New Zealand's 2050 target.

*Figure 12.2.1: F-gases monitoring map (see **Box B2.1** for legend)*



Source: Commission analysis

Box 12.2.2: Data gaps

Our assessment of emissions reductions in this sector shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood.

Data collection and reporting could be improved to support monitoring of emissions reduction. Improved data can also strengthen public and private decision-making and policy development.

Ambiguity exists around f-gas emissions data in Aotearoa New Zealand, with data quality being an issue to be addressed. Improved data relating to levels of leakage, degassing rates for heat pumps and motor vehicles upon disposal, and recycling for use, would beneficially inform future analysis and policy intervention.

Progress in reducing f-gas emissions

Since 1990 emissions from HFCs have steadily increased in Aotearoa New Zealand

Since 1990, the use of HFC refrigerants has increased in industrial and household refrigeration and air conditioning systems as a result of HFC refrigerants replacing the use of ozone-depleting substances.[380]

The phase-down of the bulk HFC imports commenced in 2020 and will continue to 2036

In accordance with the Ozone Layer Protection Amendment Regulations 2018, limits for the bulk import of HFCs came into effect in 2020. This phase-down will remain ongoing until 2036, resulting in an 80% decrease on HFC imports over this period.

Between 2021 and 2022 emissions from HFCS reduced by 5.5%

New Zealand's GHG Inventory reporting shows HFC emissions reached a peak in 2021, dropping 5.5% (0.087 $MtCO_2e$) between 2021 and 2022 (Figure 12.2.2).

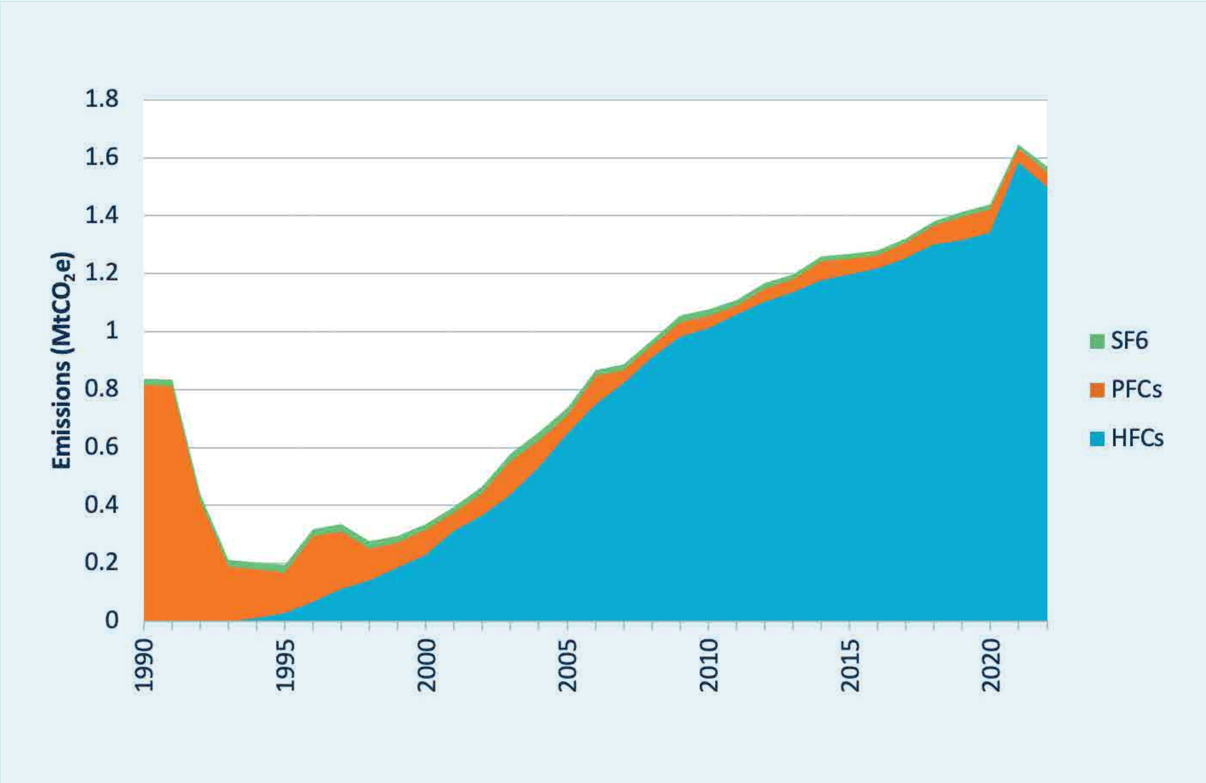
Refrigeration and air conditioning contributed to 95% of HFC emissions in 2022

Refrigeration and air conditioning contributed to 95% of HFC emissions in 2022. For the activity source of these emissions, see Figure 12.2.3. Additionally, imports of HFCs into Aotearoa New Zealand in bulk and in pre-charged equipment continued to fall in 2022, having peaked in 2016 (see Figure 12.2.5).

Too early to know how emissions from f-gases are tracking

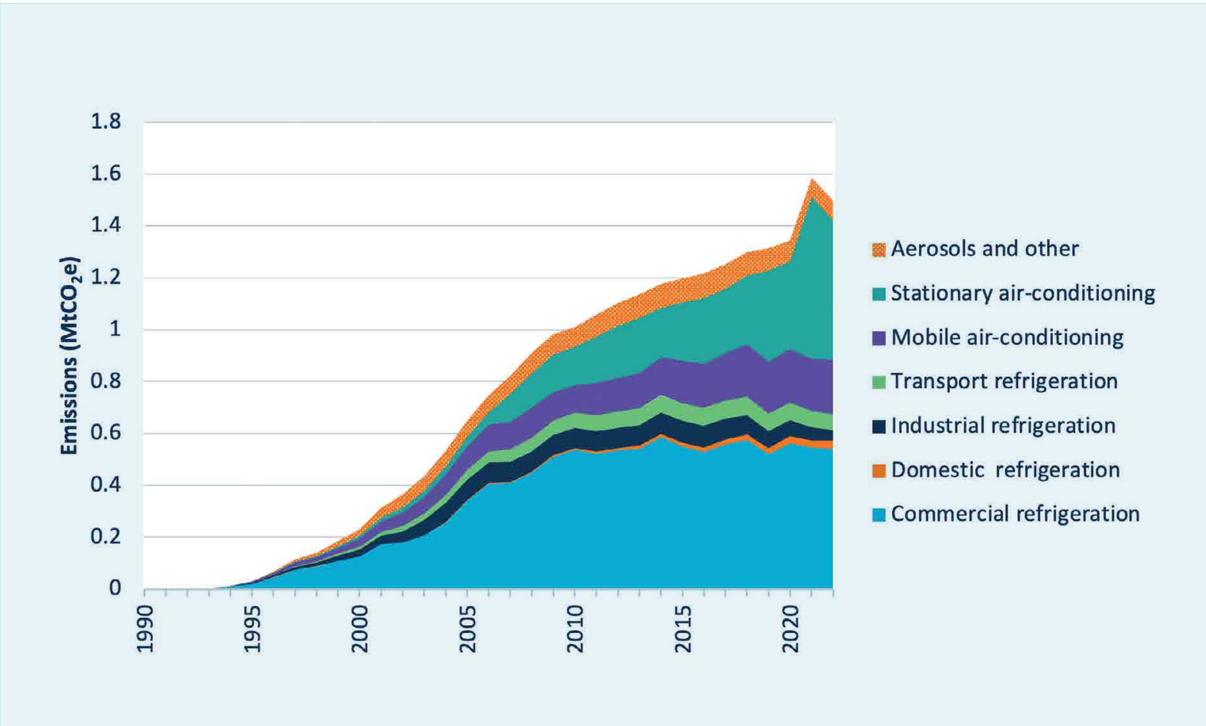
Due to the significant fluctuations and revision of emissions estimates over recent years, it is currently too early to know how emissions from f-gases are tracking against the Commission's 2022 demonstration path. Nevertheless, New Zealand GHG Inventory data do suggest that the estimated quantity of f-gases recovered from products at disposal increased to a new high in 2022, totalling 0.169 $MtCO_2e$, or around 11% of the total f-gas emissions in 2022.

Figure 12.2.2: F-gas emissions from 1990 to 2022



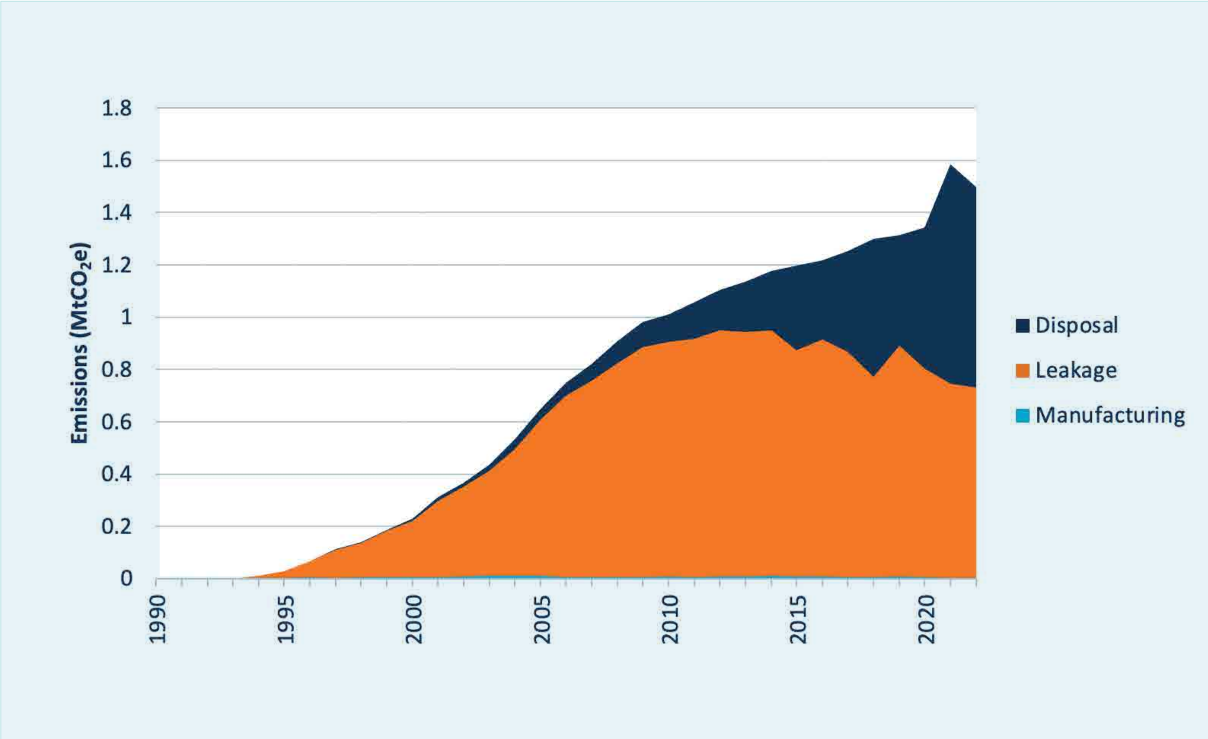
Source: New Zealand GHG Inventory published in 2024

Figure 12.2.3: Breakdown of HFC emissions by activity from 1990 to 2022



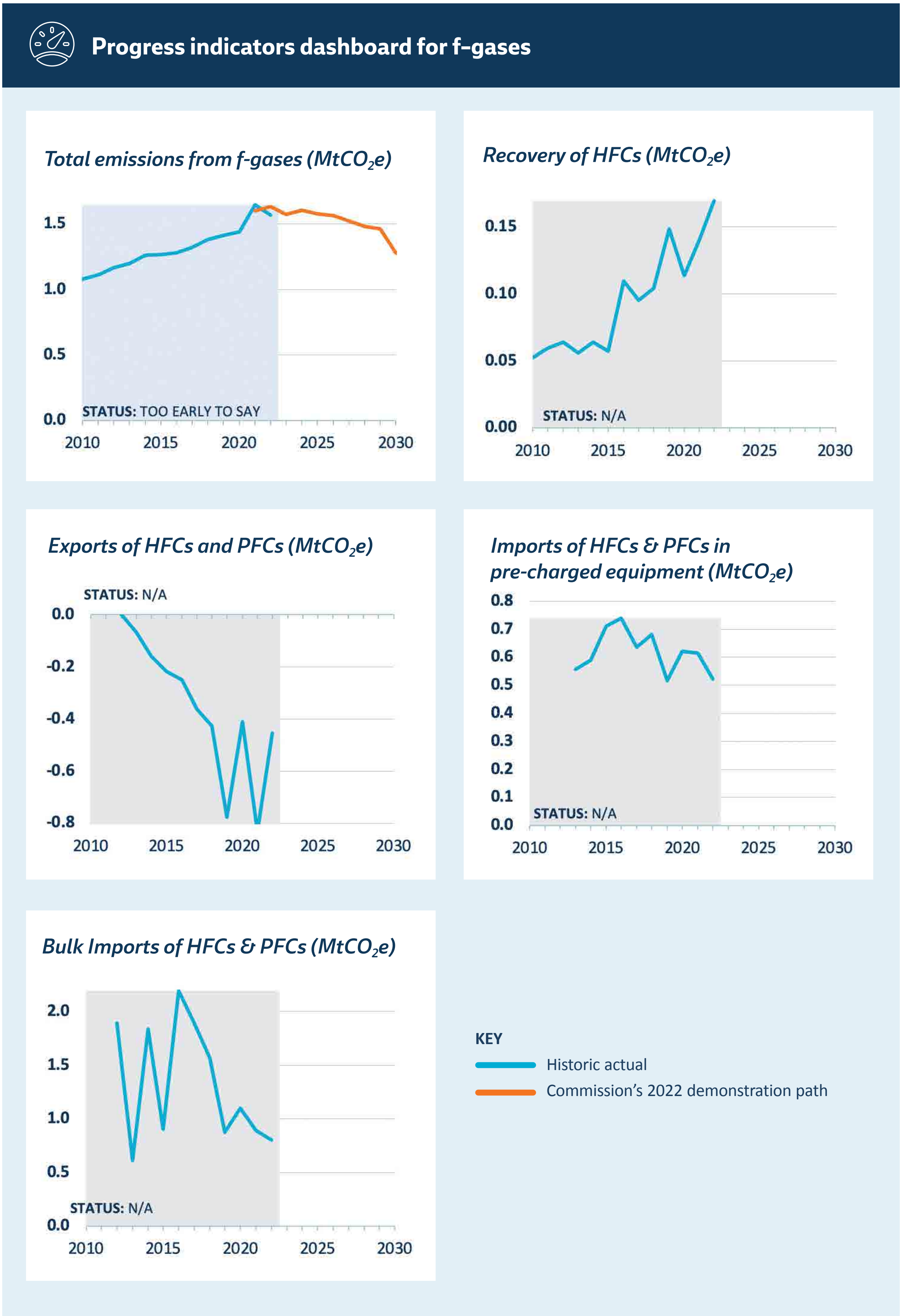
Source: New Zealand GHG Inventory published in 2024

Figure 12.2.4: Release of HFCs from product manufacturing, leakage and disposal from 1990 to 2022



Source: New Zealand GHG Inventory published in 2024

Figure 12.2.5: Progress indicators dashboard for f-gases



Source: New Zealand GHG Inventory published in 2024, Environmental Protection Authority data

Policy assessment

This section provides a summary of our analysis of policy progress for emissions reduction in this sector, followed by scorecards for each outcome area (and the supporting rationale). See *Chapter 2: Our approach* for an introduction to our policy scorecard framework and information on the criteria and scoring methodology.

This policy assessment focuses on the outcome area of 'Reducing emissions from HFCs'. The f-gases monitoring map (Figure 12.2.1) illustrates how more specific pathway outcomes, enablers, and policies relate to this broader outcome area.

Policy progress

HFC policy settings align with the Commission's 2022 demonstration path. However, policy delivery remains at risk as a mandatory system of product stewardship for refrigerants is considered necessary for the achievement of the Commission's 2022 demonstration path and has not yet been established.

- Ensuring there are standards for the training and qualification development for all refrigerant handlers is important for reducing f-gas leakage.
- Aotearoa New Zealand's first and only refrigerant waste management destruction facility – the Kawerau F-Gas Destruction Facility – is currently under construction. This facility was commissioned by the Recovery Trust (or Refrigerant Recovery New Zealand/ Cool Safe) and funded through the sale of NZ ETS units acquired for exporting f-gases for destruction. The Cool-Safe programme has a goal of reducing greenhouse gas emissions from the refrigerants industry by 90% by 2035. The destruction facility will have the capacity to destroy up to 100 tonnes of gases annually.[381]
- In 2022, the Ministry for the Environment undertook public consultation on a proposal to control imports of pre-charged equipment containing high Global Warming Potential f-gases and to investigate prohibiting f-gases where low Global Warming Potential alternatives are available.[382] No further progress has been made to address these emissions reduction plan actions.

Policy scorecard: Reducing emissions from HFCs

This outcome area focuses on reducing:

- the bulk imports of HFCs
- HFCs imported in products
- the leakage of gases over a product's lifetime
- the illegal venting of emissions at the time of disposal
- emissions, through onshore and offshore destruction.

Scorecard summary

Main tools	Funding & finance	Barriers & enablers	Timeline	Overall assessment
No significant risks	No significant risks	No significant risks	Moderate risks	**Moderate risks**

Rationale for our scores

Main tools **No significant risks**	The primary policy settings, including legislative HFC restrictions and NZ ETS pricing, are aligned with the delivery of the benchmark level of emissions reductions in the Commission's 2022 demonstration path. However, the implementation of mandatory product stewardship for refrigerants remains necessary to achieve the reductions anticipated in the Commission's 2022 demonstration path.
Funding and finance **No significant risks**	Overall, the effectiveness of the NZ ETS pricing is proving effective in stimulating action to achieve f-gas destruction. The Government's funding and finance pathway to achieve f-gas reduction is therefore considered credible. Despite the effectiveness of these policy tools, lower-income households may need additional assistance to transition away from HFCs, particularly if equipment needs to be replaced.
Other barriers and enablers **No significant risks**	The first emissions reduction plan considered the key enablers and addresses the key barriers that may limit the achievement of the first emissions budget subtarget for f-gases. However, increasing the awareness and knowledge to enable further uptake of alternatives with lower GWP would be beneficial. The first emissions reduction plan also noted that the cost of switching to refrigerants with lower GWP may be prohibitive for some businesses and consumers, which poses a barrier to proposed constraints on imports. This warrants further attention.

Timeline **Moderate risks**	Risks remain around timing and a roadmap for future decisions and policy development for HFCs. This is as a result of the implementation of the following actions remaining outstanding: • Introduction of mandatory product stewardship for refrigerants (Action 16.4). • Provision of training and accreditation for handling alternative gases, alongside training and qualification requirements for all refrigerant handlers (Actions 16.1 and 16.4).
Overall assessment	
Moderate risks	For the reasons addressed above, implementation adjustments may be necessary to mitigate risks associated with delayed delivery of f-gas policy from the first emissions reduction plan.

Areas for attention

Regulated product stewardship alongside training and accreditation are enablers for emissions reduction

Implementing regulated product stewardship for refrigerants, together with the provision of training and accreditation for handling alternative gases, alongside training and qualification requirements for all refrigerant handlers (Actions 16.1 and 16.4), remain important initiatives to be advanced.

Increasing availability and uptake of low-GWP alternatives

The limited uptake of readily available low-GWP f-gas alternatives in Aotearoa New Zealand may impact the effectiveness of HFC phase-down efforts over the longer term. Promoting the uptake of low-GWP fluorinated gas alternatives would be beneficial for emissions reductions.

New opportunities to reduce emissions

Part of the Commission's monitoring role, under section 5ZK of the Climate Change Response Act 2002 (the Act), is to highlight potential new sources of emissions reductions or areas where ambition could be increased.

The Commission's 2022 demonstration path factors in the reduction of f-gas emissions in line with the Ozone Layer Protection Amendment Regulations 2018, and the implementation of a mandatory product stewardship scheme for refrigerants. Beyond these policy measures, the provision of training and qualification requirements for all refrigerant handlers exist as opportunities to reduce the emissions through reducing f-gas leakage (Figure 12.2.4). Prohibitions on f-gases where low-GWP alternatives are available would also support long-term reductions of HFCs.

He iringa kupu | Technical glossary

Note there is a te reo Māori glossary provided at the end of *Chapter 7: Whakahekenga haurehu*, which provides English contextual translation of kupu Māori used in that chapter.

adaptation	Adaptation is the process of adjusting to the actual or expected changes brought about by climate change. For people, and the systems people create, this means making changes to try to avoid or minimise the harm or damage from climate change and its effects – or to benefit from opportunities climate change might provide. These could be changes, for example, to laws, policies, practices, processes, as well as to physical structures and the built environment. In nature, and within natural systems, adaptation can happen by itself through ecological and evolutionary processes, or with human assistance, by helping those systems adjust to climate change and its effects.
advanced economies / emerging and developing economies	The country classification used by the International Monetary Fund (IMF) in the World Economic Outlook divides the world into two major groups: 'advanced economies' and 'emerging and developing economies'.
afforestation	The conversion of land from another use, such as pasture for grazing, to forest.
alternative fuels	Liquid fuels derived from sources other than petroleum or diesel.
baseload generation	Electricity generation that operates most of the time.
bioeconomy	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.
bioproducts	Materials, chemicals, and energy derived from renewable biological material.
built capacity	The maximum generating output of an electricity generation plant.
capacity – in terms of electricity supply	When considering security of electricity supply, capacity refers to the availability of generation and transmission capacity to meet peak electricity demand at any point in time. See also 'energy – in terms of electricity supply'.
carbon capture and storage	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. Carbon capture and storage can be considered as emissions reduction, not removal.
carbon capture and reinjection (geothermal)	Carbon dioxide (CO_2) reinjection returns naturally occurring geothermal CO_2 back underground.
carbon dioxide removals	See 'removals'
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.
climate resilience	The ability to prepare for and respond to, and capacity to cope with the impacts of changing climate, including those progressive and ongoing changes that can be anticipated and those that occur as extreme events.
congestion charging	A way to ease congestion by charging road users at different times or locations, depending on how congested the roads are. The charge encourages some users to change the time, route, or method of travel, or they could choose not to travel at all.
CO_2e	Carbon dioxide equivalent. This is a way to describe different greenhouse gases on a common scale. It relates the warming effect of emissions of a particular gas to that of carbon dioxide, over a specified period of time. It is calculated by multiplying the quantity of that greenhouse gas by the relevant Global Warming Potential (GWP). The current values used are from AR5.

decarbonise	To reduce the levels of carbon emissions (such as carbon dioxide) caused by or involved in something, such as an activity or process.
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.
demand response technologies	Technologies that enable flexible energy consumption such as battery energy storage systems, electric vehicles, and solar photovoltaics.
demand-side flexibility	For electricity supply, this describes situations where consumers change the time, or the amount, of their electricity consumption. Reducing or shifting demand reduces the amount of electricity generation needed at the time.
demand-side management	The modification of consumer demand for energy through various methods, such as financial incentives and behavioural change.
demonstration path	A pathway for how Aotearoa New Zealand could meet emissions budgets and the 2050 target. It is a set of measures and action within sectors that could deliver recommended emissions budgets. This monitoring report uses the Commission's 2022 version of the demonstration path as a benchmark for measuring progress towards emissions budgets and the target.
dispatchable generation	Electricity generation that is available to turn on as needed to match electricity demand.
distributed flexibility resource (DFR)	These are controllable energy resources, located in the electricity distribution network or within consumer premises. They include battery energy storage systems, electric vehicles, solar photovoltaics, and other demand response technologies. A distributed flexibility resource (DFR) provides energy services to its owner/operator and to the energy system. Electricity lines companies can use DFR as non-network solutions – an alternative to investing in greater distribution network capacity.
distributed generation	Any form of generation connected to the electricity distribution network (rather than the transmission network). The connections can be direct or indirect.
domestic shipping and aviation emissions	Emissions captured under the Climate Change Response Act 2002 for planes and boats that operate within Aotearoa New Zealand's territory.

dry year	In Aotearoa New Zealand, lakes used for generating hydroelectricity 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, hydroelectric generation is reduced, and the system has to rely on other forms of generation such as from natural gas and coal. These periods of time are colloquially referred to as 'dry years'.
electric vehicle (EV)	A vehicle that has an electric motor powered by a battery, which is charged by an external source of electricity. There are two main types of EVs: (1) Battery electric vehicles (BEVs) – these are powered by a battery only. (2) Plug-in hybrid electric vehicles (PHEVs) – these have two engines – one is 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.
electrification	The shift from fossil fuels to electricity as an energy source.
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	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 or CO_2e) that can be released over a five-year period (or four years in the case of 2022–2025).
emissions intensity	The ratio of greenhouse gas emissions to a unit of activity or output. This could be emissions per unit of economic output, such as GDP, to give a measure across an entire economy, or relative to other variables such as per kilometres travelled for modes of transport, or per unit of revenue or of a good produced in firms' production processes. Measures of emissions intensity allow comparison of emissions performance across different activities and tracking of progress over time, where changes in economic activity can obscure some types of progress such as efficiency improvements.

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 did 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.
energy – in terms of electricity supply	When considering the security of electricity supply, energy refers to the availability of generation and transmission capacity to meet expected national demand over a longer period of time. See also capacity (of electricity supply).
energy storage	The capture of energy produced at one time for use at a later time, such as in a battery.
equitable transition	The concept of ensuring the transition to a low emissions economy is fair and inclusive. The Act requires a strategy to mitigate the impacts that reducing emissions and increasing removals will have on employees and employers, regions, iwi/Māori, and wider communities.
exotic production forests	Forests consisting of non-native species, such as pine, that have been planted for harvesting.
external factors	The Climate Change Chief Executives Board that collates information about government agencies' implementation of the emissions reduction plan notes that external factors include 'macroeconomic variables outside of the government's direct control', and provides examples: 'For example, economic activity, climatic events such as weather affecting hydro lake inflows, and international developments such as oil prices'.
fluorinated gases (f-gases)	Fluorinated gases include hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.
fugitive emissions (fossil fuels)	Greenhouse gas emissions produced during fossil fuel production, transmission, and storage, and from non-productive combustion.
fugitive emissions (geothermal)	Fugitive emissions are greenhouse gases released during electricity generation in geothermal power plants. They come from the gases dissolved in the geothermal fluid used as an energy source.
geothermal generation	Generation of electricity from hot geothermal fluids and steam in geothermal reservoirs.
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 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 Aotearoa New Zealand.
greenhouse gases (GHGs)	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).
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.
hydroelectricity generation	Generation of electricity from hydroelectric dams that control the flow of water stored in a pool or reservoir, like a lake or river.
indicator	A sign or signal that shows something exists and its level of progress.
industrial 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.
intermittent resources	Intermittent renewable electricity generation resources that vary in availability, such as wind and sun.
internal combustion engine (ICE)	The engine, typically associated with transport, found in petrol and diesel vehicles.
international shipping and aviation emissions	These are greenhouse gas emissions from shipping and aviation to and from Aotearoa New Zealand; they are currently not counted in the country's emissions budgets, which cover only the shipping and aviation emissions related to domestic travel and transport.
light commercial vehicle	A goods vehicle, including vans, trucks, and utilities, 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.

limiting warming to 1.5°C	When discussing the Paris Agreement, this reflects that agreement set a goal of limiting global warming to well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit it to 1.5 degrees Celsius. When discussing the Act, this refers to Aotearoa New Zealand contributing to the global effort to limit warming to 1.5°C.
long-lived greenhouse 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, we refer to all greenhouse gases other than biogenic methane collectively as long-lived gases, although this includes a small amount of other short-lived gas emissions (non-biogenic methane and certain fluorinated gases).
low-carbon liquid fuels	Fuels that emit significantly lower amounts of carbon dioxide and other greenhouse gases when burned, compared to traditional fossil fuels. These include biofuels (derived from organic materials such as plants, algae, and waste), synthetic fuels (produced from renewable energy sources, water, and carbon dioxide through chemical processes), and advanced biofuels (derived from non-food biomass feedstocks such as agricultural residues and woody crops).
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.
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.
mode shift	Changing to travel by public transport and cycling and walking, rather than by private motor vehicle.
model, modelled	Representation of an idea, object, process, or system to describe or explain phenomena that cannot be experienced directly, to discover features of and ascertain facts about a system and its behaviour.
$MtCH_4$	Megatonnes of methane (one Mt is one million tonne)
MW	A megawatt (MW) is a measure of electricity generated. One MW is one million watts.

nationally determined contribution (NDC)	Each country that is party to the Paris Agreement must define its contribution to achieving the long-term goals set out in the Paris Agreement. The first NDC adopted by Aotearoa New Zealand is a target to reduce greenhouse gas emissions by 30% below 2005 levels by 2030.
net carbon dioxide removals	See 'removals'.
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 through absorption by forests as trees grow.
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 CO_2e emitted.
non-network solutions	Distributed flexibility resources (see above) that provide a service to the electricity network and are not part of the physical electricity grid. Non-network solutions can be a package of distributed flexibility resources.
organic waste	Waste containing organic matter that decays to create methane emissions.
overallocation (of NZUs in the NZ ETS)	When the number of units (NZUs) provided for free – to firms undertaking activities that are eligible for industrial allocation – is higher than intended or necessary to prevent emissions leakage.
Paris Agreement	An international treaty under the UNFCCC to address climate change after 2020.
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. See also 'vehicle-kilometres-travelled'.
PJ	A petajoule is a measure of energy – it is the standard unit of energy in scientific applications. A petajoule is equal to one million billion joules.
plug-in hybrid electric vehicles (PHEV)	See 'electric vehicle'
post-1989 forests	New forest established after 31 December 1989 on land that was not forest at that date.
pre-1990 forests	Forest or shrub land established before 1 January 1990.
projections, projected	Estimated value of a future quantity (such as emission levels) based on a prescribed set of assumptions.

removals	The removal of carbon dioxide from the atmosphere, also called sequestration. In Aotearoa New Zealand, this usually refers to absorption of carbon by forests as trees grow.
renewable freight certificates	These would be part of a potential market-led mechanism to decarbonise freight transport. Certificates would be generated by companies for their low-carbon freight vehicles (such as low or zero emissions trucks), which could then be sold to people who need to move goods, certifying they have used low-carbon options. They would be similar to the renewable Electricity Certificate system already in use in this country.
renewable sources of energy	Aotearoa New Zealand's renewable energy sources are used for electricity generation and direct use. Renewable sources for electricity generation are geothermal, hydro, solar, and wind. Renewable energy sources for direct use includes geothermal energy used as heat for industrial applications.
scenarios (for Commission modelling)	A plausible set of assumptions about economic and social development, and technological and behavioural changes between now and 2100.
social licence	The perceptions of local stakeholders that a project, a company, or an industry that operates in a given area or region is socially acceptable or legitimate.
spot price	The current market price of a security, currency, or commodity (such as electricity) available to be bought/sold for immediate settlement. In other words, it is the price at which the sellers and buyers value an asset right now.
subtarget	An emissions target for a key economic sector (such as agriculture), in terms of that sector's contribution to an emissions budget.
supercritical geothermal (SCGT) power	Very high temperature geothermal fluids that offer more energy and are found at deeper depths than the conventional geothermal fluids found at current depths and reservoir temperatures.
sustainable aviation fuel (SAF)	There are multiple types of sustainable aviation fuel. Some of the more common ones include bio-based aviation fuels – produced from renewable feedstocks like animal fats, waste, and crops or forests without major environmental or land-use impacts, and e-fuels (also called power-to-liquid fuels) – which are created by using renewable electricity and water to produce green hydrogen, and then combining that green hydrogen with CO_2 from the air.
sustainable finance taxonomy	A classification system that defines which economic activities are aligned to a sustainable, low emissions future, with a goal of directing investment to the activities required for the transition.

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.
TWh	A Terawatt-hour (TWh) is a unit of energy representing one trillion watt hours.
UNFCCC	The United Nations Framework Convention on Climate Change is the major foundation global treaty focused on climate change. It was signed in 1992 at the Earth Summit in Rio de Janeiro.
urease inhibitor	A substance or biological compound that reduces ammonia losses when applied with urea fertiliser, maximising the nitrogen available for plant uptake, and resulting in small reductions in nitrous oxide emissions.
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. See also 'person-kilometres-travelled'.
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 = 1012 Wh.
zero emissions vehicle (ZEV)	A vehicle with zero tailpipe emissions.
2050 target	The target set out in the Climate Change Response Act 2002, for 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 fluorinated-gases (hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride). • reduce biogenic methane emissions by at least 10% by 2030 and 24–47% by 2050 and beyond, compared to 2017 levels. It has three components – see Figure A1.

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He Pou a Rangi
Climate Change Commission

Level 21, 1 Willis Street
Wellington 6011
PO Box 24448
Wellington 6142

www.climatecommission.govt.nz

Te Kāwanatanga o Aotearoa
New Zealand Government