

BRIEFING

Proposed approach to the form of the second emissions reduction plan amendment

Date:	28 November 2025	Priority:	High
Security classification:	In Confidence	Tracking number:	BRF-7238


Purpose

1. This briefing seeks your agreement in principle to a proposed approach to the form of the amendment to the second emissions reduction plan (ERP2).

Key points

- The Government has recently concluded its consultation on a proposed amendment to the second emissions reduction plan (ERP2), to reflect the revised approach to reducing agricultural emissions in light of the decision not to proceed with agricultural emissions pricing by 2030.
- This advice outlines our initial proposal on the form of an amendment. The final content and form of the amendment will be subject to your final decision, in consultation with the Minister of Agriculture, after considering officials' advice regarding the requirements in the Climate Change Response Act (CCRA) for amending an emissions reduction plan (including the results of public consultation). However, your in-principle decision on form now will enable officials to begin drafting, to deliver on your preference to publish the amended ERP2 in January 2026.
- We advise amending ERP2 primarily via:
 - **A new addendum** that sets out the revised approach to reducing agricultural emissions and how the amended ERP2 will meet the second emissions budget (EB2); and
 - **changes to existing documents:**
 - an introductory page in ERP2 explaining how to read the original ERP2 alongside amendment content,
 - an update to the agriculture chapter of ERP2,
 - a stamp on relevant pages in ERP2 and the technical annex to highlight where references to agricultural pricing are superseded by the amendment addendum (as tabbed in the appended documents),
 - a header on relevant pages in ERP2's Executive Summary and Projections Chapter and every page of the ERP2 technical annex noting that projections

published in ERP2 were as at December 2024 and providing a hyperlink to MfE's most recent official projections, and

- removal of the *At a glance* document from MfE's webpage.
- We consider this is the most suitable approach to amending ERP2 given the relatively narrow scope of the amendment and the minimal impact of removing agricultural pricing on projected abatement for EB2.
- Alternatively, you have the option to undertake a comprehensive update of ERP2 to reflect the latest projections – for example, the updated projected abatement impact of carbon capture and storage. We do not recommend this as we consider it would be disproportionate to the actual change in the plan, and broader than what was publicly consulted on. Doing so would also delay ERP2 amendment publication.
- 9(2)(h)

- You will receive advice in coming weeks to support your judgement that CCRA obligations have been met, alongside a draft amendment for your consideration. You will need to consider this advice and decide whether to approve the amendment, in consultation with the Minister of Agriculture.
- If you prefer a full revision of ERP2 and associated documentation, officials will provide an updated timeline to publish the amendment later in 2026.

Recommended action

The Climate Change Interdepartmental Executive Board unit recommends that you:

Agree / Disagree

1. **Agree** (subject to your final decisions on the amendment to ERP2) to reflect the ERP2 amendment primarily via an addendum focused on the impacts of the revised approach to reducing agricultural emissions, and revising the ERP2 agriculture chapter (*recommended*)

OR

Agree / Disagree

2. **Agree** (subject to your final decisions on the amendment to ERP2) to a comprehensive update of ERP2 and associated documentation later in 2026 (not recommended)



Kirsty Flannagan
**Executive Director, Climate Change
 Interdepartmental Executive Board Unit**

28 / 11 / 2025

Hon Simon WATTS
Minister of Climate Change

___ / ___ / 2025

Proposed approach to the form of the second emissions reduction plan amendment


Purpose


2. This briefing seeks your approval to our proposed approach to the form of the amendment to the second Emissions Reduction Plan (ERP2).

Background

3. In October 2025, the Government agreed to not progress with an agricultural pricing system [CAB-25-MIN-0329]. At the time of ERP2 publication, a pricing system for agricultural emissions was included as a key policy. Noting that you have a statutory duty to amend ERP2 to present an accurate record of the current plan to meet the second emissions budget, Cabinet authorised you, in consultation with the Minister of Agriculture, to finalise an amendment to ERP2 for publication as soon as possible [ECO-25-MIN-0155].
4. You have indicated a preference to publish the amendment to ERP2 in January 2026. We are seeking your agreement in principle to the form of the amendment now, so we can begin drafting in order to meet your preferred timeframes. The final content and form of the amendment will be subject to your final decision, in consultation with the Minister of Agriculture, after considering officials' advice regarding the requirements in the CCRA for amending an ERP (including the results of public consultation which closed 26 November).

Advice on the form of the plan

5. 9(2)(h) 
6. We consider there are three key objectives for the amendment:
 - a. **Accuracy:** Ensure ERP2 accurately reflects the key policies in place
 - b. **Clarity and Accountability:** Present changes in a transparent manner, enabling stakeholders to understand the impact of the amendment on progress towards EB2 (and long-term targets). Information should be accessible and not overly technical.
 - c. **Proportionality:** Make amendments in line with the impact of changes to the plan.¹
7. Any amendment to ERP2 must clearly outline how EB2 will still be met, and must also outline any impact on other budgets and targets.

9(2)(h) 

The key consideration is how comprehensively to update ERP2 to reflect the latest projections

8. Your main choice on the form of amendment is whether to focus only on the impact of the removal of agricultural emissions pricing, or to comprehensively update all the quantified abatement estimates in ERP2 to reflect 2025 projections. Agricultural pricing was one of the eight key policies highlighted in ERP2, and is intertwined throughout ERP2 and the technical annex. 9(2)(h)

A comprehensive update to ERP2 and associated documentation would likely provide the most accurate record of the plan to meet EB2

9. The updated projections have informed our assessment that New Zealand is still on track to meet EB2, even accounting for the decision not to progress agricultural pricing.
10. 2025 projections now show a different picture of the projections over the EB2 period than at the time the original ERP2 was published in 2024, including:
- Modelled policies are now expected to reduce emissions by 1.2Mt within EB2, compared to 3.2Mt in the original ERP2. This reflects changed assumptions, such as the reduction in expected abatement from carbon capture and storage.
 - On the other hand, shifts in external factors mean baseline emissions are projected to be lower compared to what was assumed in the original ERP2, with 2025 projections now forecasting an increased 'buffer' to EB2.
11. It is not accurate to simply subtract the modelled impacts of the agricultural pricing policy from the original ERP2 modelling. This is because the 2025 projections included different assumptions, in agriculture and across the economy. The amendment must therefore reflect 2025 projections.
12. However, it is difficult to do this without also reflecting 2025 projections for other policies (ie, the removal of abatement from CCUS). Enabling up-to-date, like-for-like comparisons in the projected emissions impact across all ERP2 policies would require a comprehensive update of ERP2 and its technical annex, unless done via an addendum, as outlined below.

But a comprehensive update may be disproportionate to the actual change in the plan

13. A comprehensive update of ERP2 in line with latest projections would be a broader amendment than was publicly consulted on, disproportionate to the actual change in the plan, and would delay publication of an amendment. It may also set an expectation that the emissions reduction plans and/or technical annexes be kept 'live' to reflect shifts in annual projections.

We recommend publishing an addendum to ERP2 that is focused on the impacts of removing agricultural emissions pricing, rather than a comprehensive update across ERP2

14. We recommend the amendment be primarily reflected as an addendum to ERP2, to be published on the MfE website, along with targeted changes to ERP2 and associated documents. We do not recommend a comprehensive update across ERP2, for the reasons set out above. The nature of the proposed changes are outlined in the section below, and indicated in appendices 1 & 2 (noting this is intended to be illustrative, rather than comprehensive).
15. If you agree with this approach, note that as we work through the specific amendments themselves, including in light of analysis of public submissions, we may identify additional changes required. We will highlight any material changes to your office as required.

Part 1: the addendum

16. This will be a separate, additional document that outlines the amendment and how ERP2 continues to meet CCRA obligations – ie, shows a reader how ERP2 will meet EB2 without agricultural pricing, and note any impacts on EB3 and the 2030 and 2050 targets. This will draw heavily from the *Amendment to New Zealand's Second Emissions Reduction Plan 2026-2030* discussion document, in narrative and content. It will be based on 2025 projections, but by being a separate document would not necessitate amending ERP2 as a whole.

Part 2: changes to the ERP2 document

17. The primary ERP2 document would need to include a clear explanation of how to read the plan with the amendment, with a new page inserted (eg, following the table of contents). This page would provide guidance on how to navigate the ERP2 document in conjunction with the addendum, specifying where information has changed and highlighting any implications for interpreting data and policies. Including this explanation early in the document will help users understand the context for any subsequent references to outdated information or 'stamp' disclaimers.
18. The chapter on agricultural emissions (chapter 10) will be revised in full to remove agricultural pricing and discuss other developments in relevant policies to drive technological uptake. This will also reflect the revised 2050 methane target if legislation has been passed at the time the amendment is Gazetted.
19. A 'stamp' disclaimer will be added to relevant pages in ERP2 to highlight where references to agricultural pricing are superseded by the amendment addendum. This includes, for example, tables of ERP2 policies that contain agricultural emissions pricing. The 'stamp' will note information was based on 'as published at' data, and refer readers to the addendum. We have tabbed where the stamp would be applied in appendix 1.
20. A header will be also added on relevant pages in ERP2 (primarily its Executive Summary and Projections Chapter) which contain information on 2024 projections. The

header will note that ERP2's projections are as at December 2024 and provide a hyperlink to MFE's most recent official projections. This is the most practical way of ensuring that readers are aware of the 2025 projections which the ERP2 amendment will be based on without adding too much visual clutter. It will also ensure that when readers access the ERP2 in future years they will be able to quickly cross-reference the most recent official projections and updated information on progress to EB2. This may also apply to your Message from the Minister of Climate Change at the front of ERP2. Note, you may want to include a new Ministerial Message at the front of the Addendum. We will work with your office on this. We have highlighted content where a header to be applied in appendix 1.

Part 3: changes to the technical annex

21. In line with our proposal to not amend ERP2 as a whole, we are not proposing to update the underlying modelling in the technical annex, given the integrated nature of the modelling.
22. We also do not recommend removing references to agricultural pricing from the technical annex. Implementing a partial update could make interpretation of the remaining information challenging and potentially confusing, as it would be difficult to fully disentangle the associated figures and analysis
23. Instead, we propose to apply the 'stamp' disclaimer to references to agricultural emissions pricing in the technical annex. The stamp will note information was based on 'as published at' data, and refer readers to the addendum. We have tabbed where the stamp would be applied in appendix 2.
24. We also propose to apply a header to each page of the technical annex, noting that ERP2's projections are as at December 2024 and providing a hyperlink to MFE's most recent official projections (the same header we will apply to pages in the ERP2 that contain information on projections). As noted above, this is a practical approach for readers that does not add too much visual clutter. We have not highlighted where the header would be applied in appendix 2, as it will be applied throughout.

Part 4: *At a glance* summary document

25. The *At a glance* document is not a statutorily required document, but it is a useful communications tool. Any live *At a glance* document should be an accurate summary of the current ERP. If it does not match up to the content of the amended ERP2 that is likely to cause confusion. However, updating the *At a glance* document will take longer than drafting the ERP2 amendment as we will need to contract designers, and will require some further editorial choices in terms of how to present the 2025 projections and which key ERP2 policies to highlight.
26. We recommend the document is removed from the MfE website alongside the publication of an ERP2 amendment. This does not preclude you from updating and re-publishing a revised *At a glance* document later in 2026 should you choose to do so. Note that keeping an up-to-date *At a glance* document may create ongoing resourcing demands.

27. If you would like to publish a new At a Glance document which reflects the amended ERP2, we will provide you with options and timeframes for doing so in Q1 2026.

Risks

28. 9(2)(h)

Communications

29. Following your consideration of advice and draft amendment material, we will work with your office to confirm an announcement date in January, recognising the benefit of having a current ERP2 publicly available as soon as practicable. Taking into account public holidays and the 2026 Sitting Calendar, we suggest an announcement between 20 January - 29 January, with a preference for 27 January - 29 January. This would ensure Ministerial availability to answer media queries and mitigates possible risk of being perceived to be "burying" the release if released during the holiday period, while still meeting your preference to publish in January.
30. To manage the risk of any negative market reaction caused by the announcement, we recommend that Ministerial communication related to the announcement clearly outline how the amendments fits within the Government's climate response. The Ministry for the Environment will support the release with additional information on Ministry channels, as appropriate.

Outdated materials

31. We do not propose to print hardcopies of the addendum or amended ERP2 and technical annex as we did for the original ERP2. There are still some hard copies in circulation which will be out of date, and may result in confusion. We do not consider this is a significant risk, and intend to manage any residual risk through a clear statement on the MfE website that any hard copies will now be out of date.

Next steps

32. If you agree in principle to the proposed approach, we will begin drafting the amendment and changes to ERP2. You will be provided with draft amendment materials for consideration in the coming weeks, alongside advice to inform your judgement and decisions as to whether the proposed amendment meets CCRA requirements. You will need to consider this advice and decide whether to approve the amendment, in consultation with the Minister of Agriculture. We can then work with

your office to confirm timelines for final publication (including tabling in the House and Gazette).

33. If you prefer a comprehensive update of ERP2 or more time for Ministerial consideration and approval of the advice and amendment, we will come back to you with an updated timeline to publish the ERP2 amendment in early 2026.

Appendices

Appendix 1: ERP2 – amendment edits marked up for illustrative purposes

Appendix 2: ERP2 Technical Annex – amendment edits marked up for illustrative purposes

Appendix 1: ERP2 – amendment edits marked up for illustrative purposes

Note: Tabs indicate where a stamp will be applied. Highlighted text indicates the content the header relates to. The exact text of the stamp / header is to be determined.

Appendix 2: ERP2 technical annex – amendment edits marked up for illustrative purposes

Note: Tabs indicate where a stamp will be applied. A header will applied on each page. The exact text of the stamp / header is to be determined.

Our journey towards net zero

New Zealand's second
emissions reduction plan 2026–30

Tā Aotearoa mahere whakaheke tukunga tuarua



Te Kāwanatanga o Aotearoa
New Zealand Government

This emissions reduction plan is published by the Minister of Climate Change under section 5Z1 of the Climate Change Response Act 2002.

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Message from the Minister of Climate Change

He Karere mai i te Minita mō ngā Take Panoni Āhuarangi



New Zealand remains committed to the global goal of limiting warming to 1.5 degrees. Nine years after the Paris Agreement, commitments by the global community have reduced our trajectory from 4 to 2.7 degrees of warming. But there is more work to do.

As the globe continues to warm and sea levels rise, we expect weather events to become more frequent and severe, damaging what we value most – our communities, businesses, homes and the environment.

The Government is committed to addressing these challenges and meeting New Zealand’s climate obligations. This plan reflects our commitment to delivering effective climate policies, allowing our climate and economy to thrive.

Our plan shows we are on track to meet the first two emissions budgets and the 2050 biogenic methane target. Most importantly, this plan shows that New Zealand is on track to meet our net zero 2050 target, with emissions meeting net zero as early as 2044.

This final plan includes changes based on feedback received during the consultation. It now reflects government policies, such as changes to the New Zealand Emissions Trading Scheme auction settings and private sector actions, like the transition of Huntly Power Station from coal to biomass.

New Zealand stands at a critical point in preparing for a net zero future. Achieving our goals will require collaboration across all groups to reduce emissions, unlock renewable energy, foster innovation, and leverage nature-based solutions.

We are confronting climate change head-on, ensuring a cleaner, more resilient, and prosperous future where our people, economy and environment thrive.

A handwritten signature in blue ink that reads "Simon". The signature is fluid and cursive, with a large initial "S" and a long, sweeping underline.

Hon Simon Watts
Minister of Climate Change

Executive summary

The Government is committed to delivering on our climate change commitments while growing the New Zealand economy. New Zealand can have prosperous communities, affordable and secure energy, increasing primary production and exports, and a thriving economy while meeting our climate change commitments.

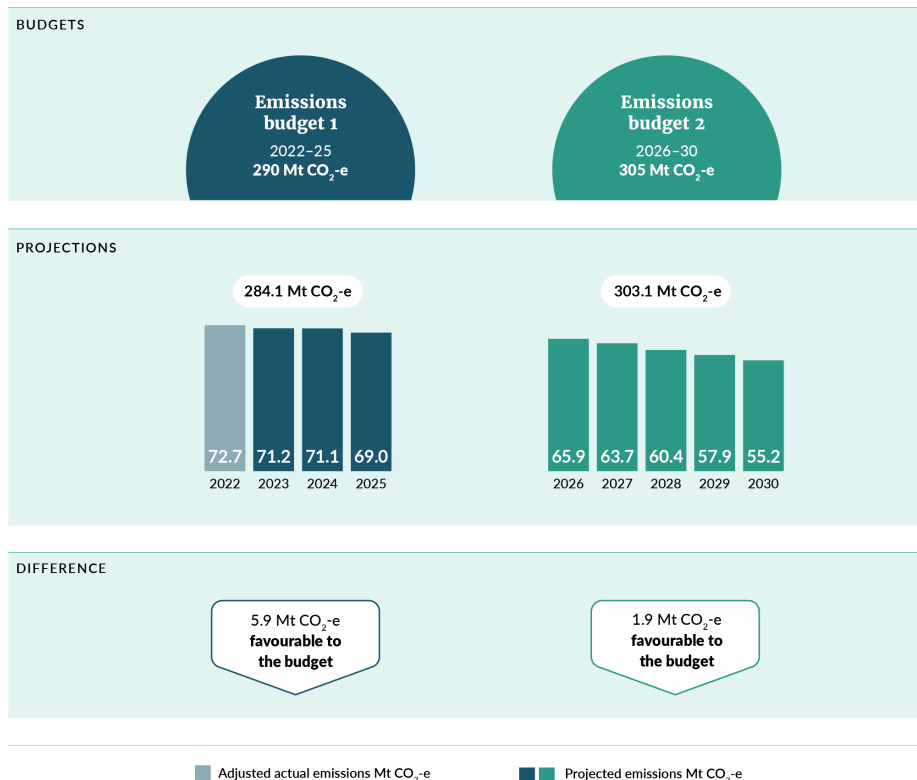
This second emissions reduction plan (ERP2) is the Government’s plan to meet the second emissions budget (EB2) for the period 2026–30. This final plan incorporates feedback and insights from New Zealanders, including the Ministry for the Environment’s youth, climate business, and local government advisory groups, iwi and Māori groups, sector groups, ENGOs, climate scientists and Aotearoa Circle’s Rangatahi Advisory Panel. As a result of that feedback, new sections on technology and innovation, and on building and construction have been added to the plan. We’ve also provided more information about how we’ll monitor our progress and ensure we stay on track.

The first emissions reduction plan ends and ERP2 formally comes into effect on 1 January 2026. However, work on ERP2 initiatives is already underway.

New Zealand is on track to meet the first two emissions budgets

ERP2 confirms that we are on track to meet the first emissions budget (2022–25) and EB2 (2026–30) (figure 0.1).

Figure 0.1: Emissions budgets and projections

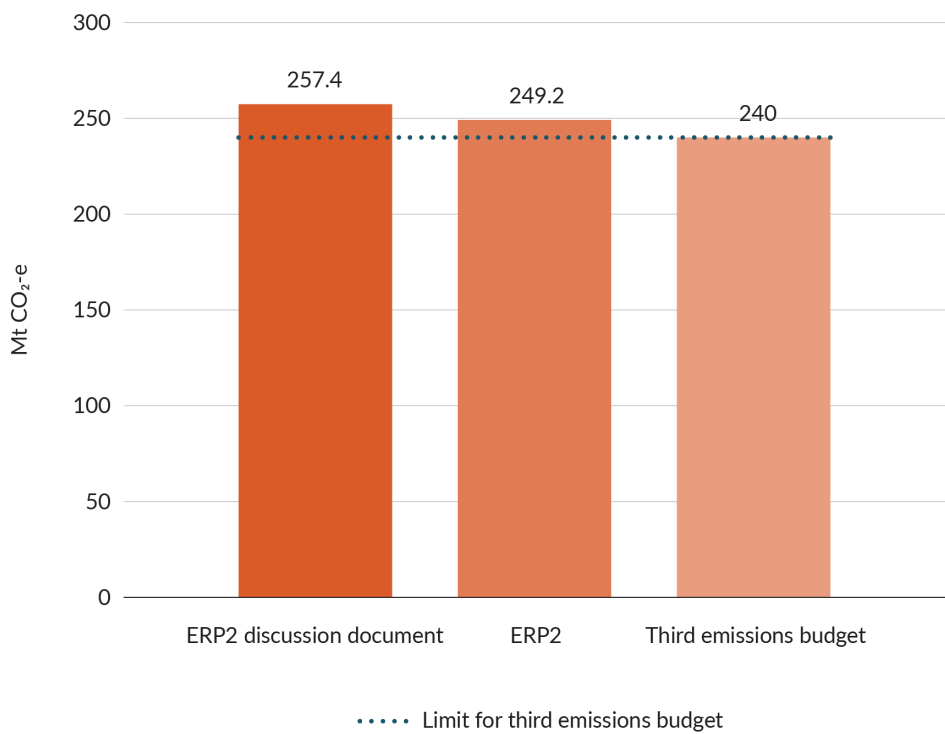


Progress towards the third emissions budget

The focus of ERP2 is achieving EB2. Achieving the third emissions budget (EB3) is the task of the third emissions reduction plan, due by 2030. The Government has another five years to develop policies and strategies necessary to deliver EB3.

ERP2 delivers significant progress towards EB3 (2031–35). The ERP2 discussion document, published in July 2024, showed projected EB3 emissions as 17 Mt CO₂-e¹ unfavourable to the budget. This final ERP2 projects EB3 emissions will be 9.2 Mt CO₂-e unfavourable to the budget, a significant improvement (figure 0.2).

Figure 0.2: Change in projected net emissions between the ERP2 discussion document and final ERP2 for EB3



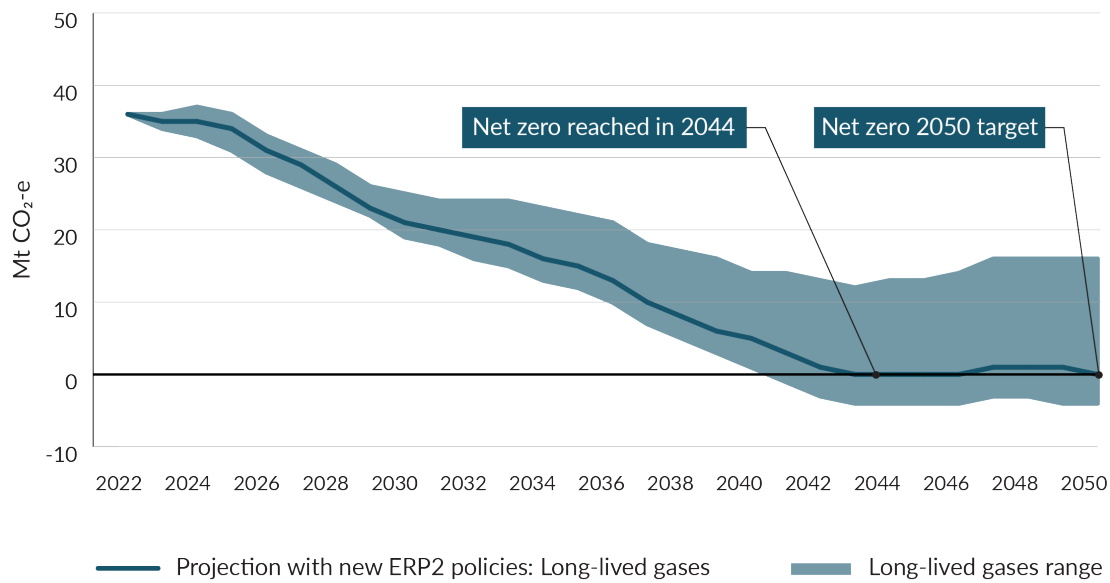
On track for net zero 2050

Emissions budgets are important stepping stones to the long-term target of achieving and sustaining net zero emissions from 2050.

ERP2 projects New Zealand will achieve net zero emissions by 2050 (figure 0.3).

¹ Mt CO₂-e = million tonnes of carbon dioxide equivalent.

Figure 0.3: Net emissions, except biogenic methane, and sensitivity range with ERP2 measures*



* New Zealand is expected to hit net zero as early as 2044 and to stay at net zero from 2050.

Effective action anchored in our Climate Strategy

ERP2 is anchored by the five pillars of our Climate Strategy (figure 0.4). The pillars represent our goals for reducing emissions and managing the impacts of climate change.

Figure 0.4: The five pillars of New Zealand’s Climate Strategy

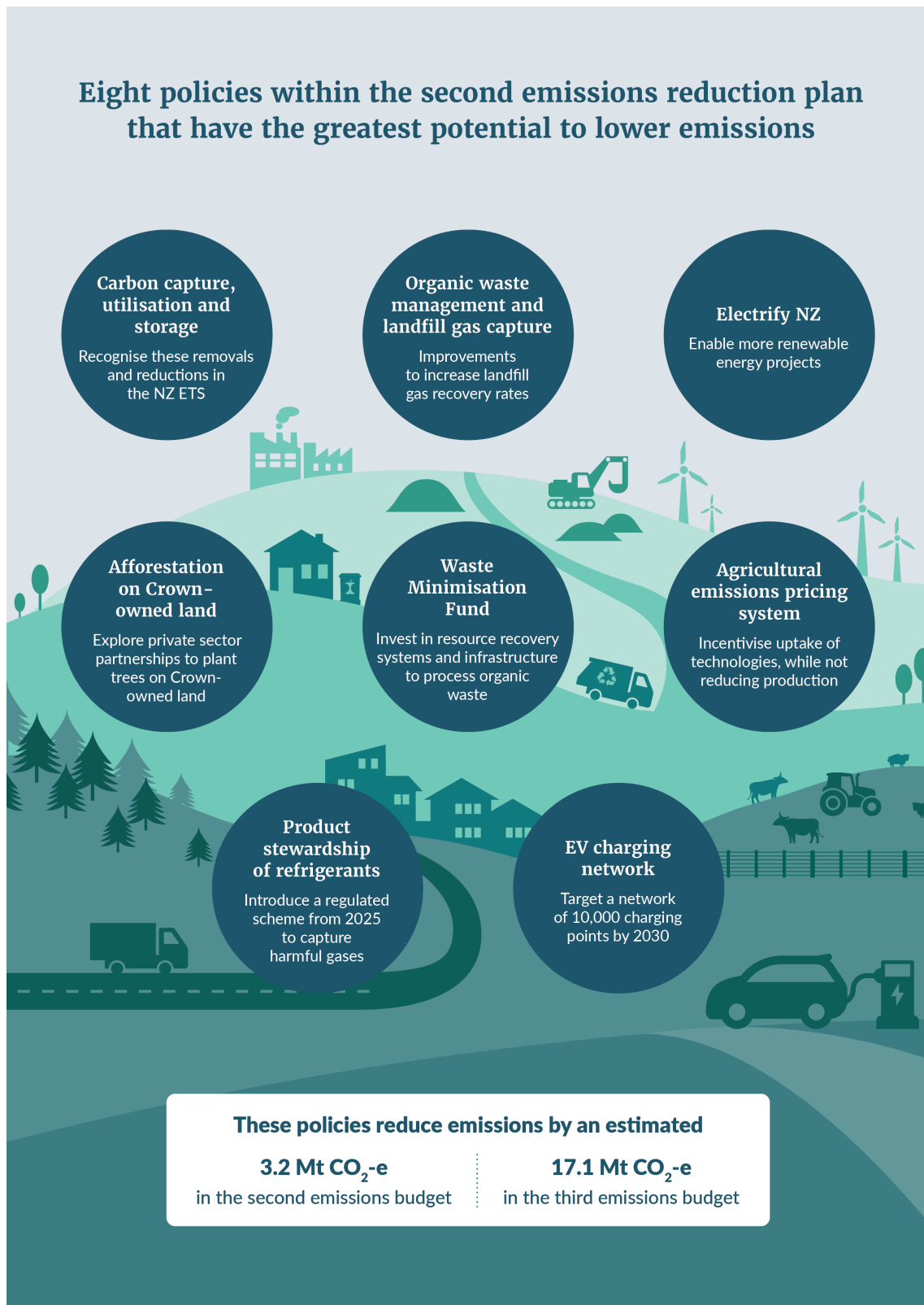


Delivering comprehensive action on emissions

To achieve our ambitious climate change goals, we need cost-effective action.

ERP2 includes a comprehensive range of policies and initiatives to reduce emissions, accelerate the uptake of new technologies and spur innovation (figure 0.5).

Figure 0.5: ERP2 policies with the greatest potential emissions savings



STAMP

Taking a technology-led approach

The Government is taking a technology-led approach so the New Zealand economy can grow as net emissions come down. The Government is investing in research and development of new technologies across a range of programmes with the aim of lowering emissions and increasing removals.

Technology can open new pathways to lower emissions. As technologies become commercially available, New Zealand will have more options for achieving emissions budgets and targets.

Promising technologies include:

- agricultural emissions reduction technologies, so that farmers can cost-effectively reduce on-farm emissions while continuing to increase production
- carbon capture, utilisation and storage (CCUS), to support the sequestration of carbon dioxide from our hard-to-abate industries
- biomass, to produce low-emissions fuel substitutes
- sustainable aviation and marine fuels
- non-forestry removals and nature-based solutions, so that we can remove carbon dioxide while promoting wider environmental benefits.

There is more work to do

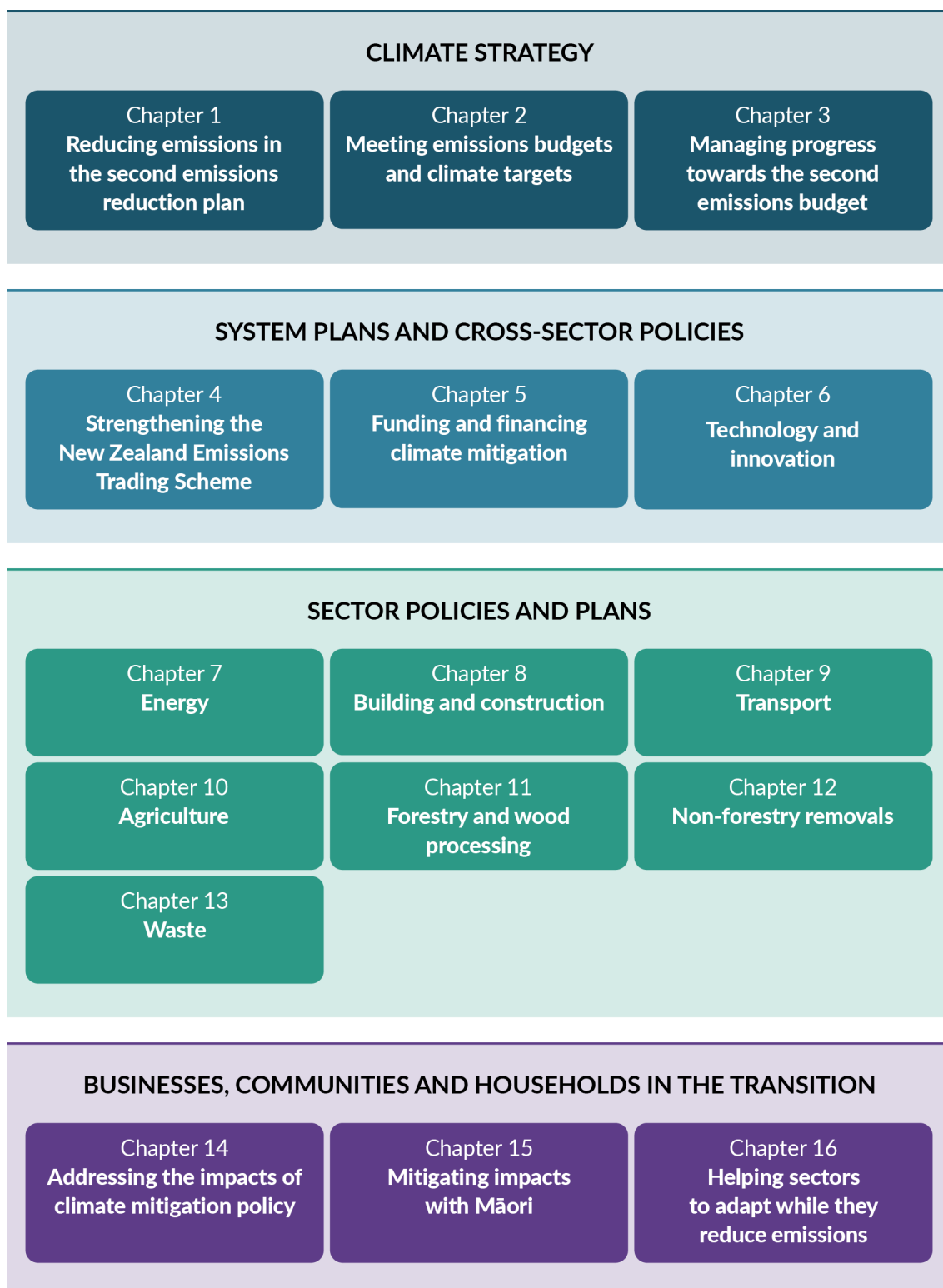
ERP2 will contribute to our short-, medium- and long-term climate change goals. But securing emissions budgets and targets is only the first step. There is still more work to do. We will monitor progress to stay on track throughout the EB2 period.

In 2025, the Government will:

- deliver legislation and policies for biotech, carbon capture and storage, and refrigerant gases to support mitigation and further progress towards our emissions goals
- update the co-investment approach for electric vehicle charging infrastructure
- explore opportunities to partner with the private sector to decarbonise industry and plant trees on Crown-owned land
- update New Zealand Emissions Trading Scheme (NZ ETS) settings for 2026–30
- strengthen NZ ETS market governance and other measures, to support a credible market
- progress work on an adaptation framework that will set out the Government's approach to sharing the costs of preparing New Zealand for the impacts of climate change
- announce our second Nationally Determined Contribution under the Paris Agreement on climate change
- clarify the Government's understanding of the methane component of the 2050 target, based on the independent Methane Science and Target Review and advice from the Climate Change Commission | He Pou a Rangi
- set the fourth emissions budget for the period 2036–40, giving New Zealanders certainty of our long-term direction.

New Zealand's second emissions reduction plan

Tā Aotearoa mahere whakaheke tukunga tuarua



Climate Strategy

Rautaki Āhuarangi

This section outlines how New Zealand's Climate Strategy guides the second emissions reduction plan, and how we are tracking towards our emissions budgets and ultimately the 2050 target. It also outlines an 'adaptive management' approach to implement and monitor the plan.



- ▶ Reducing emissions in the second emissions reduction plan
(chapter 1)
- ▶ Meeting emissions budgets and climate change targets *(chapter 2)*
- ▶ Managing progress towards the second emissions budget
(chapter 3)

1. Reducing emissions in the second emissions reduction plan

Te whakaheke tukunga i roto i te mahere whakaheke tukunga tuarua

Committed to our climate change targets

The Government is committed to meeting New Zealand's climate change targets. The Climate Change Response Act 2002 sets out the Zero Carbon Framework, which guides how we meet our **2050 net zero target**.

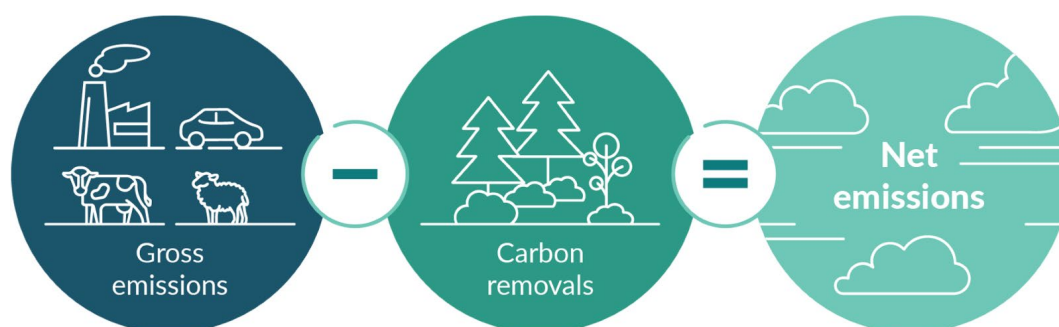
Our 2050 target takes a split-gases² approach:

- reduce net emissions of all greenhouse gases (except biogenic methane) to zero by 2050
- reduce emissions of biogenic methane to 24–47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030.

New Zealand uses a system of emissions budgets and emissions reduction plans to navigate towards net zero. **Emissions budgets** place limits on emissions in five-yearly budget periods and serve as stepping stones towards the 2050 target. Each emissions budget has a corresponding emissions reduction plan, which sets out the policies and strategies that enable New Zealand to meet the target for that budget period. This plan covers the second emissions budget period (2026–30).

Our 2050 target is net based. This means it can be achieved by both reducing gross emissions and increasing emissions removals. Net emissions are the difference between gross emissions and carbon removals (figure 1.1).

Figure 1.1: Achieving net targets by reducing emissions and increasing removals



² New Zealand has a 'split-gas' target for domestic emissions, which considers biogenic methane separately from all other greenhouse gases. This reflects the different warming impact that methane has compared with other greenhouse gases, such as carbon dioxide.

Cost-effective action

The Government wants to reduce net emissions in cost-effective ways. This means the Government, businesses and households will take actions that have the greatest impact on net emissions for a given investment in reductions or removals.

Cost-effective emissions reduction policies minimise the cost-of-living impacts of climate change policies and increase the likelihood of successful delivery of targets and budgets.

The New Zealand Emissions Trading Scheme is the main tool to reduce net emissions

The New Zealand Emissions Trading Scheme (NZ ETS) raises the cost of emissions and reduces the cost of removals. It encourages businesses to find cost-effective ways to reduce emissions and increase removals across the economy. [Chapter 4](#) provides more information on the NZ ETS and how the Government intends to support a credible carbon market through the second emissions reduction plan (ERP2).

Role of complementary policies

Complementary policies work alongside the NZ ETS and make it cheaper or easier for businesses and households to reduce net emissions. They do this by:

- expanding the pathways available to New Zealand for emissions reduction – for example, by introducing new technologies or removing barriers to investment in low-emissions technologies like renewable energy
- lowering the cost of some emissions reduction opportunities, such as partnering with the private sector to plant trees on Crown-owned land
- encouraging emissions reductions in areas not covered by the NZ ETS, particularly agriculture, such as supporting investments in technologies to reduce biogenic methane emissions.

[Chapters 7–13](#) set out the package of complementary sector-based policies for ERP2.

The role of the private sector

The private sector plays an important role in reducing New Zealand's emissions, and their feedback on the ERP2 discussion document has provided additional insights into their work and areas for additional focus from the Government.

One of the most significant changes to the modelling for ERP2 since the discussion document is the inclusion of the plan by Genesis Energy to transition the Huntly power station from coal to biomass, which represents a reduction of 1.1 Mt CO₂-e over the second emissions budget period.

The Government will continue to reduce emissions and ensure the regulatory and economic environment can support the efforts of others to reduce emissions alongside and in addition to government action.

Avoiding unwanted outcomes

Taking a cost-effective approach to emissions reduction has the potential for some unwanted outcomes.

For example, forestry is an affordable and scalable form of abatement. The NZ ETS could encourage more farm conversions to plantation forestry than rural communities would find acceptable. The Government will use legislation or regulation to manage unintended consequences and maintain focus on cost-effectiveness within those constraints. A recent example of this ‘constrained optimisation’ approach is the proposed limits on whole-farm conversions to exotic forestry on high-quality productive land (more information on this policy is in [chapter 11](#)).

2. Meeting emissions budgets and climate targets

Te whakatutuki i ngā tahua tukunga me ngā ūnga panoni āhuarangi

New Zealand is on track for the first and second emissions budgets

With this plan, New Zealand is projected to reduce net emissions to 2030 and to meet the first and second emissions budgets (EB1 and EB2).

The first emissions reduction plan has been kept up to date and aligned with the Government’s Climate Strategy.

New Zealand is making good progress and is on track to meet EB1. Emissions are projected to be 284.1 Mt CO₂-e for 2022–25, which is below the limit of 290 Mt CO₂-e set by EB1 (table 2.1). We will know whether we have managed to stay within that emissions budget in 2027, when official data for the period becomes available.

Table 2.1: Net emissions projections for the EB1 and EB2 (Mt CO₂-e)

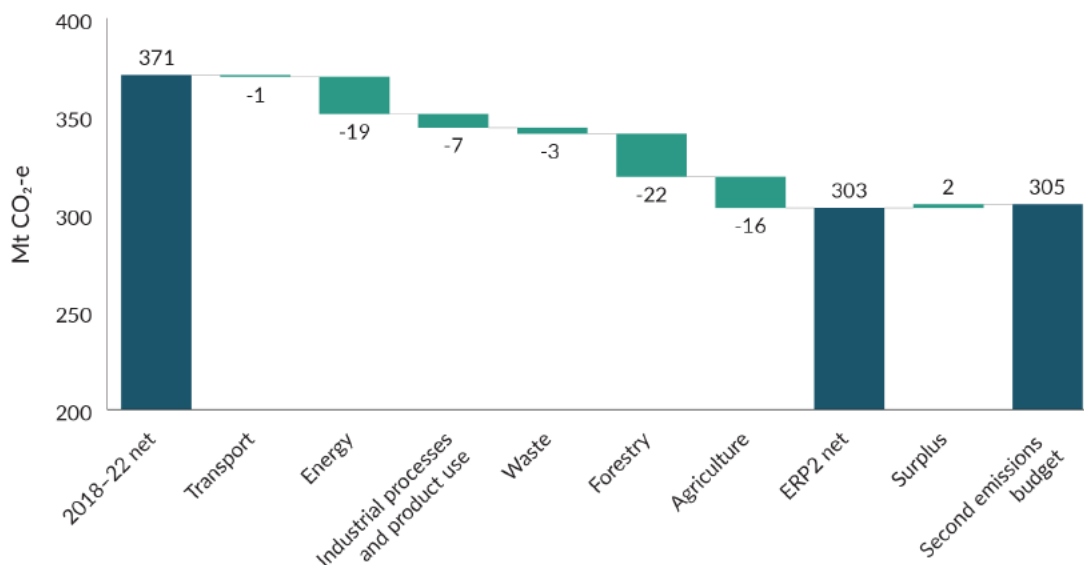
EB	Projection (central estimate*)	Uncertainty range
EB1 290 Mt CO ₂ -e	284.1	± 2.5 %
EB2 305 Mt CO ₂ -e	303.1	± 5.5 %

* The further out we look, the more uncertain the projection becomes. We express this as an ‘uncertainty range’. This shows a spectrum of emissions scenarios, from the lowest expected result to the highest. In the middle is the ‘central estimate’, which we think is the scenario most likely to hold true.

Emissions reductions by sector in EB2

Figure 2.1 shows the impact of the second emissions reduction plan (ERP2) on projected emissions to the end of the EB2 period by sector. Emissions reductions in energy, forestry and agriculture make the largest contribution to meeting EB2.

Figure 2.1: Projected reductions in sector emissions through to EB2, including ERP2 policies



Note: These projections have been rounded to the nearest whole number.

Estimated emissions reductions by key policy

Eight key ERP2 policies have the greatest potential to lower emissions in the EB2 and third emissions budget (EB3) periods (table 2.2).

Table 2.2: Expected abatement from ERP2 policies for EB2 and EB3 (Mt CO₂-e)

ERP2 policy	Projected impact	
	EB2 (2026–30)	EB3 (2031–35)
Electrify NZ	-0.1	-1.6
Enable carbon capture, utilisation and storage	-1.0	-0.9
Target 10,000 public electric vehicle charging points by 2030	-0.01	-0.2
Implement an agricultural emissions pricing system and mitigation technologies	-0.2	-10.6
Invest in resource recovery through the Waste Minimisation Fund	-1.0	-1.0
Improve organic waste management and landfill gas capture	-0.8	-1.1
Introduce a regulated product stewardship scheme for refrigerants	-0.4	-0.7
Afforestation on Crown-owned land	0.4***	-1.8
Impacts of updated NZ ETS settings not captured elsewhere*	-0.2	-1.0
Total – summed above	-3.3	-18.9
Total – integrated analysis**	-3.2	-17.1

* At the time the 2024 New Zealand Emissions Trading Scheme (NZ ETS) settings were decided, the total impact of tightening NZ ETS unit and price control settings was estimated at 0.7 Mt CO₂-e in the EB2 period and 3.1 Mt CO₂-e in the EB3 period. The numbers in this row of the table refer to the impacts of tighter NZ ETS settings that have not been captured in the baseline and elsewhere. See the [technical annex](#) for further details.

** The integrated analysis involves modelling the impact of ERP2 policies within the Emissions in New Zealand model to ensure any interactions between policies are modelled, rather than just summing the emissions reduction for individual measures. This allows for the dynamic effects of individual policies to be taken into account. More information on the modelling approaches for ERP2 can be found in the [technical annex](#).

*** Initially emissions rise because there are net emissions from land clearance and soil loss due to conversion to forest.

STAMP

Updated New Zealand Emissions Trading Scheme settings

The New Zealand Emissions Trading Scheme (NZ ETS) sets an overall limit on emissions units available to emitters in accordance with emissions budgets. The scheme's supply of units declines over time, consistent with meeting the tightening budgets.

The Government has already aligned supply in the NZ ETS with EB2. We have updated unit and price control settings to reduce the number of units available between 2025 and 2029 from 45 million to 21 million. This decision was estimated to lead to additional emissions reductions of 0.7 Mt CO₂-e in the EB2 period and 3.1 Mt CO₂-e in the EB3 period. The observed market price rose immediately after this decision was announced.

The updated settings will help manage a critical risk to meeting EB2: the large stockpile of units. If more banked units are surrendered than expected, emissions from NZ ETS sectors will exceed our current projections. [Chapter 4](#) has more information on the role of the NZ ETS in ERP2, and the impact of the updated settings.

New Zealand can meet its 2050 target

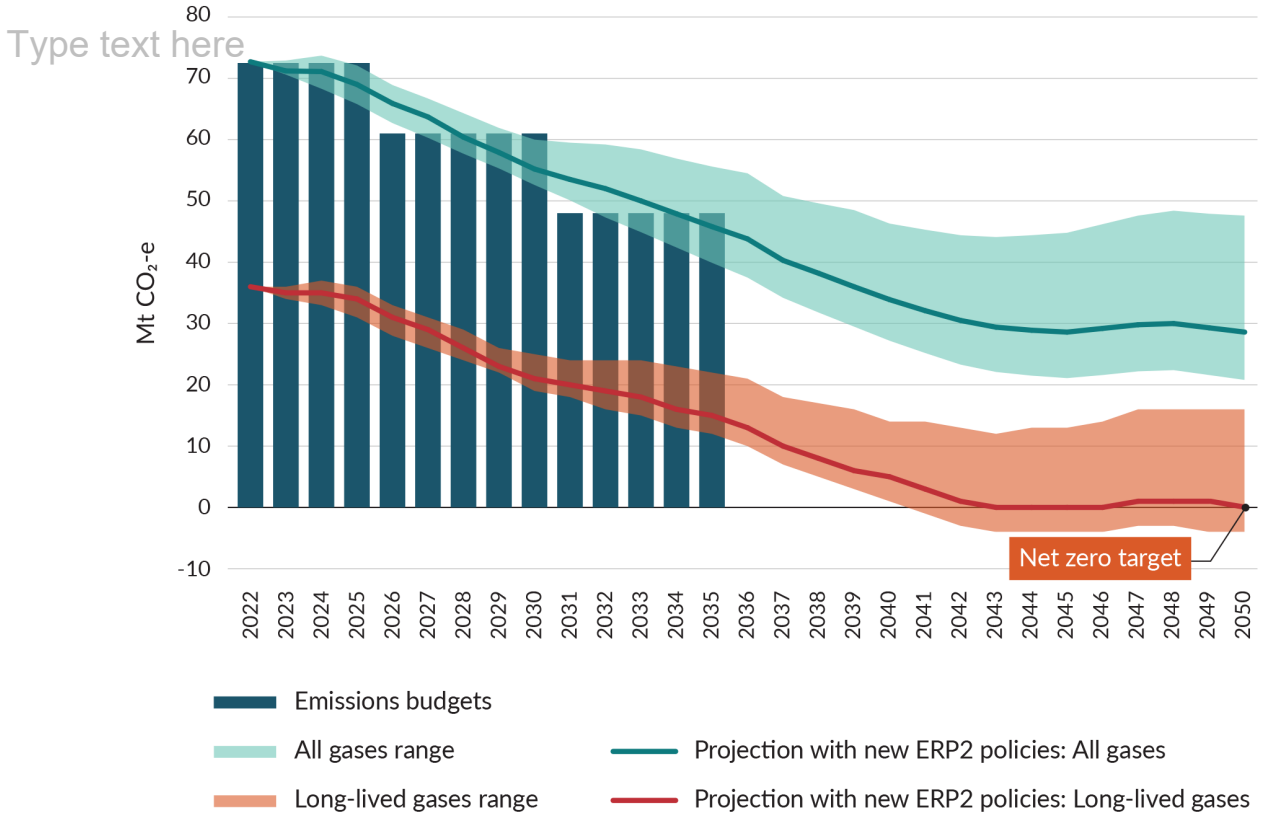
New Zealand is on track to meet our long-term targets.

Figure 2.2 shows that net emissions are now projected to be zero in 2050.

Projections show New Zealand is also on track to achieve the methane target in 2050. Biogenic methane emissions are expected to have reduced by 24.9 per cent in 2050, which is within the legislated target band of a 24 to 47 per cent reduction, and in 2030 biogenic methane emissions are expected to have reduced by 10 per cent, consistent with the target for that year.

Progress has also been made toward EB3 since consultation in July. Current modelling projects net emissions of 249.2 Mt CO₂-e during the EB3 period (2031–35), 9.2 Mt CO₂-e above the 240 Mt CO₂-e EB3 limit. This is a significant improvement on the interim projections of 17.4 Mt CO₂-e above EB3 in the ERP2 discussion document. This improvement is mostly driven by greater than expected abatement from some new ERP2 policies, updated NZ ETS settings and lower than expected emissions from the energy and industrial processes and product use (IPPU) sectors.

Figure 2.2: Emissions projections with new ERP2 policies and sensitivity range (Mt CO₂-e), 2022–50



How we’re tracking towards New Zealand’s Nationally Determined Contribution

Key policies introduced through ERP2 will contribute to meeting the first Nationally Determined Contribution (NDC). Net emissions are now projected to be 84 Mt CO₂-e above the target.

ERP2 significantly increases the contribution of domestic emissions reductions to future NDCs. The second NDC will be set in 2025 for the period 2031–35, overlapping with EB3. Key ERP2 policies are projected to contribute 17.1 Mt CO₂-e of abatement towards the second NDC.

3. Managing progress towards the second emissions budget

Te whakahaere i te kokenga ki te tahua tukunga tuarua

Under the Climate Change Response Act 2002, the Government is responsible for meeting emissions budgets and climate change targets. New Zealand's reputation is affected by whether we deliver on our commitments.

The Government is confident we can deliver the actions in this second emissions reduction plan (ERP2). However, progress toward emissions budgets and targets is affected by a range of factors. Many of those factors that influence the timing and quantity of net emissions are beyond the Government's control. For example, long periods of dry weather could reduce renewable electricity supply, leading to more gas or coal use to generate electricity.

This is why we need to monitor and respond to meet the second emissions budget (EB2) and support meeting future budgets. This chapter outlines the Government's adaptive management approach to ERP2 to ensure we meet EB2.

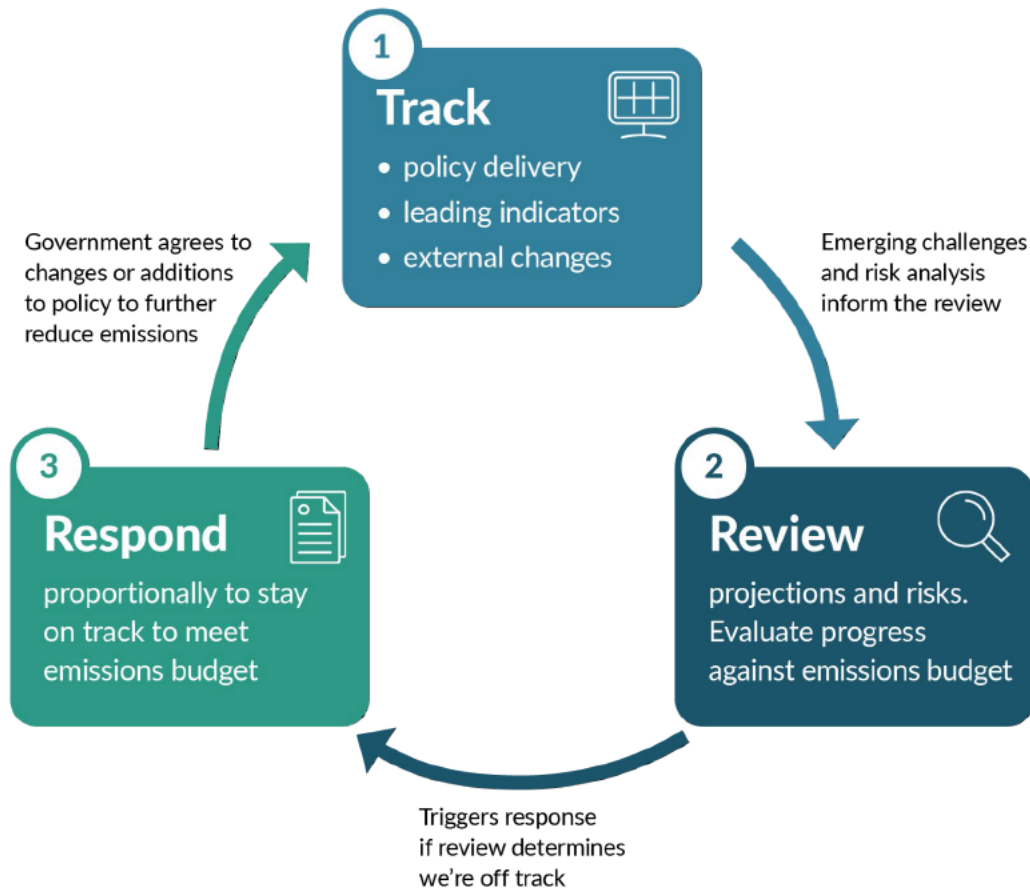
What is adaptive management?

Adaptive management means actively monitoring and responding to policy delivery and changing circumstances that affect how New Zealand is tracking towards EB2.

Every year, the Government will progress through three stages (figure 3.1):

1. **tracking** policy delivery and leading indicators
2. **reviewing** projections and risks, and evaluating progress against the emissions budget
3. **responding** when necessary to stay on track for EB2.

Figure 3.1: Adaptive management process



Tracking progress

The Prime Minister’s public sector targets require quarterly tracking and reporting. To reinforce the importance of meeting climate targets, we have included the first emissions budget (EB1) and EB2 in Government Target 9.

The Climate Change Chief Executives Board reports on progress towards Target 9 to the Prime Minister and Cabinet. The reports are released to the public, so New Zealanders can see how we are tracking.

Government Target 9 – Reduced net greenhouse gas emissions

<p>TARGET</p> <p>9</p>	<p>Reduced net greenhouse gas emissions</p>	<p>What is the target?</p> <p>On track to meet New Zealand’s 2050 net zero climate change targets, with total net emissions of no more than 290 Mt CO₂-e from 2022 to 2025 and 305 Mt CO₂-e from 2026 to 2030.</p>
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We will track and report on a comprehensive set of indicators through the Target 9 process. These will allow a faster approach to adaptive management, to complement the official, annual updates to the Greenhouse Gas Inventory. The types of indicators we plan to have in place by 2026 are listed in table 3.1.

Table 3.1: Leading ERP2 indicators

Type	Explanation	Indicators
External factors	Metrics with an important link to emissions levels where the Government has no influence or control, eg, natural phenomena/events, international factors.	Global oil prices, global commodity prices, hydro-electric dam lake levels
Progress indicators	Metrics that indicate progress in areas where the Government has some influence, but where the influence is indirect or limited . They have an important link to emissions levels and pathways.	Fuel imports, tree planting rates, New Zealand Emissions Trading Scheme stockpile
Action delivery	Metrics showing whether planned Government policies are delivering as expected. Includes actions set under ERP1 policies that will continue to contribute to abatement during the EB2 period.	Number of new electric vehicle charging points
Mitigation availability	Monitoring emissions reduction technologies and practices, including current costs, availability and progress towards commercialisation.	Availability and cost of agricultural greenhouse gas mitigation technologies

The Climate Change Commission | He Pou a Rangi will play an important role in independently reviewing progress towards EB2 through its monitoring and review function for emissions budgets and the 2050 target.

Reviewing progress and risks, and evaluating whether we are on track for EB2

Cabinet will meet annually to evaluate whether New Zealand is on track to meet EB2. This evaluation will be informed by:

- comprehensive indicator tracking in quarterly Target 9 reporting
- the annual emissions reduction monitoring report from the Climate Change Commission | He Pou a Rangi
- the latest official emissions projections.

Responding to stay on track

If a risk to meeting EB2 emerges, Cabinet can decide on a proportionate response. This may include:

- ensuring NZ ETS settings are aligned with emissions budgets, international commitments and our 2050 target, through the annual review of settings
- adjusting existing policies
- bringing in new policies
- continuing to monitor indicators.

The Climate Change Response Act 2002 also allows the banking of some emissions across budget periods, to account for the uncertainty of designing emissions reduction plans. If emissions come down by more than is required to meet EB1, the excess could be carried forward and contribute to EB2. Current projections show New Zealand over-achieving EB1 by 6 Mt CO₂-e. Final emissions for EB1 will be known when the New Zealand Greenhouse Gas Inventory is released in 2027.

System plans and cross-sector policies

Ngā mahere pūnaha me ngā kaupapahere whakawhiti rāngai


This section outlines system-wide settings and cross-sector policies that support emissions reductions across the economy.

- ▶ **Strengthening the New Zealand Emissions Trading Scheme**
(chapter 4)
- ▶ **Funding and financing climate mitigation** *(chapter 5)*
- ▶ **Technology and innovation**
(chapter 6)



4. Strengthening the New Zealand Emissions Trading Scheme

Te whakakaha i te Kaupapa Hokohoko Tukunga o Aotearoa

Chapter at a glance Strengthening the New Zealand Emissions Trading Scheme 	
Lead Minister	<ul style="list-style-type: none"> Hon Simon Watts, Minister of Climate Change
Why the New Zealand Emissions Trading Scheme (NZ ETS) is important	<ul style="list-style-type: none"> The NZ ETS is our main tool to reduce emissions and increase removals, supporting cost-effective climate action.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Credible markets support the climate transition.
Key actions and policies	<ul style="list-style-type: none"> Restoring confidence in the NZ ETS by committing to no vintaging of New Zealand Units (NZUs) (ie, not placing an expiry date on NZUs), committing to no differential treatment of forestry NZUs, strengthening market governance and clarifying market information. Aligning the scheme with the second emissions budget (ie, aligning NZU supply with the NZ ETS cap through annual updates of the scheme's settings).
Contribution during the second emissions budget period	<ul style="list-style-type: none"> The NZ ETS supports emissions reductions across the economy.

Supporting a credible NZ ETS and broader market confidence

The New Zealand Emissions Trading Scheme (NZ ETS) raises the cost of emissions and reduces the cost of removals. To deliver a credible NZ ETS, market participants must trust that governments will remain committed to targets and choose NZ ETS settings and other policy accordingly. This is important to give businesses the confidence to make long-term investment decisions that reduce emissions.

Providing regulatory predictability is a priority for the Government. That is why one of the Government's first actions was to end the review of the NZ ETS. It is also why we are committed to:

- no vintaging of New Zealand Units (NZUs) (ie, not placing an expiry date on NZUs)
- treating forestry NZUs in the same way as other units, recognising that one tonne of carbon dioxide removed from the atmosphere makes the same contribution to our targets as one tonne equivalent (CO₂-e) of emissions reductions.

Strengthening market governance to manage risks of misconduct in the NZ ETS market is another important step to improve NZ ETS market credibility. This work will help to build a robust, efficient and credible NZ ETS, ensuring there is enough transparency of trading activity and enhancing participants' understanding of how the market works.



Aligning the scheme with the second emissions budget

Decisions on NZ ETS settings

It is crucial that the role of the NZ ETS in achieving emissions budgets is clear, and that the scheme is managed in line with that role.

We have made decisions on the settings for 2025–29³ that recognise the NZ ETS market is currently over-supplied. The number of units at auction between 2025 and 2029 has been reduced from 45 million to 21 million, to encourage emitters to use the surplus units currently held in private accounts. These decisions provide medium-term regulatory predictability for participants, and support the credibility of the scheme, by:

- tightly aligning unit limits to budgets, so that the settings support confidence that net emissions from covered sectors will align with the budgets
- preserving existing price control settings to incentivise enough reductions to meet the budgets.

Future settings decisions may also need to consider net emissions reductions arising from any new complementary policies. This includes considering whether the NZ ETS cap (see below) should be tightened to lock in those emissions reductions and prevent those policies from disrupting market dynamics.

The NZ ETS cap for the second emissions budget

One aspect considered in the methodology for determining NZ ETS unit settings each year is apportioning the emissions budgets to sectors covered by the NZ ETS (the NZ ETS cap). Being clear on how the Government intends to distribute the emissions budget between NZ ETS sectors and non-NZ ETS sectors (mostly agriculture) will give the market greater regulatory certainty.

For the second emissions budget (EB2), we propose to align the cap with the projected emissions from NZ ETS sectors under the second emissions reduction plan (see the [technical annex](#) for details). We propose allocating 91 Mt CO₂-e of EB2 to NZ ETS sectors. We will consult on this allocation as part of the NZ ETS settings process in 2025.

NZ ETS sectors are responsible for most of the net reductions required to meet EB2. The allocation to other sectors is in line with reaching the 2030 biogenic methane target.

Updating industrial allocation settings

Industrial allocation (IA) is the provision of NZUs to firms in emissions-intensive and trade-exposed industries. Its purpose is to manage the risk of emissions leakage⁴ by helping eligible firms meet some of their emissions costs. The Government has agreed to update some IA settings that were last set in 2010, including new baselines which are planned to affect allocations from 2024 onwards.


The Government is investigating the provision in the Climate Change Response Act 2002 that gives the Minister of Climate Change discretion to review IA baselines every 5 to 10 years. Several large firms have indicated this could create uncertainty and discourage investment in decarbonisation. It is important that we balance keeping the allocation up to date, managing leakage risk, providing investment certainty and managing the fiscal cost of IA.

³ Ministry for the Environment. 2024. *NZ ETS unit limits and price control settings for 2025–2029*.

⁴ Emissions leakage occurs when manufacturing is relocated to other countries with less stringent climate change policies, causing global emissions to rise.

5. Funding and financing climate mitigation

Te pūtea me te utu i te whakamauru panoni āhuarangi

<h3>Chapter at a glance</h3> <p>Funding and financing climate mitigation</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Simon Watts, Minister of Climate Change
Why funding and finance are important	<ul style="list-style-type: none"> Understanding the funding and financing landscape is crucial to increasing and directing investment towards New Zealand's climate change response, and into activities that reduce emissions.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Infrastructure is resilient and communities are well prepared. Credible markets support the climate transition. Clean energy is abundant and affordable. World-leading climate innovation boosts the economy. Nature-based solutions address climate change.
Key actions and policies	<ul style="list-style-type: none"> Developing a sustainable finance strategy. Developing a sustainable finance taxonomy. Continuing to support credible, efficient and resilient markets Investigating the potential of a biodiversity credits market. Cooperating with Australia to align the sustainable finance policy and regulatory landscape.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Funding and finance support emissions reductions across the economy.

Enabling emissions reductions through funding and finance

We need significant domestic investment in low-emissions activities and technologies to achieve our climate goals. Although we expect investment to come mainly from the private sector, the Government has a role in addressing barriers to investment and ensuring settings enable it.

Green investment and transition finance

- Green investment is a way to help reduce emissions. It refers to financial activities that aim to generate benefits for the environment, alongside financial returns. This typically involves funding and financing projects, companies or initiatives focused on activities such as renewable energy or resource efficiency.
- Transition finance refers to investment in activities, technologies and sectors that are not yet green, but moving towards it. Financing the transition to a low-emissions future will be key in ensuring that major sectors continue to grow.

Policies and initiatives

Increasing green investment and removing barriers

Green investment is beginning to pivot from mitigation to broader activities (eg, adaptation and resilience as well as indigenous biodiversity).

Voluntary carbon and biodiversity credits markets are emerging to meet this demand. However, we have heard that market participants, including investors and land owners, need greater certainty to increase investment.

There is an ongoing mismatch between some climate investment opportunities and the risk appetite of many mainstream investors. These constraints also increase the risk of misrepresented or misleading climate credentials – greenwashing – within the market.

As part of the second emissions reduction plan, our work includes:

- **developing a sustainable finance strategy** to provide clarity and certainty across New Zealand’s funding and financing landscape. This includes aligning New Zealand with global sustainability trends to increase investment in low-emissions ventures
- **developing a sustainable finance taxonomy** to give stakeholders, including capital market participants, clarity and confidence on which economic activities are green and transitional. The taxonomy:
 - will start with agriculture and forestry to show New Zealand’s leadership in sustainable practices and support investment in activities that will drive down emissions in these sectors
 - could expand to cover the sectors identified in this plan and the Climate Strategy, including energy, manufacturing, building and construction, and transport
- **continuing to support credible, efficient and resilient markets.** We will provide information and data to reduce information gaps and enable the integration of climate information into decision-making (eg, climate-related disclosures and open-source climate projections)

- **investigating the potential of a biodiversity credits market** as part of broader Ministry for the Environment work to catalyse private financing for nature
- **cooperating with Australia to align the sustainable finance policy and regulatory landscape**, and position the region as a robust green finance market. We are also engaging on emerging sustainable finance developments, including transition planning and investment product labelling
- **engaging and sharing knowledge with international partners** to reduce investment friction and compliance burdens, while supporting New Zealand firms and investors to access a wider pool of investment
- **working with the finance sector** to identify barriers and find solutions that support investment in green and transition activities. This includes:
 - partnering with Toitū Tahua: Centre for Sustainable Finance, for example, to develop New Zealand’s sustainable finance strategy and the taxonomy
 - establishing a sustainable finance reference group to give expert advice to the Minister of Climate Change and the Ministry for the Environment on priority actions for delivery between 2024 and 2026.

Other opportunities identified during consultation include:


- **improving investor confidence in green investments** by reducing real or perceived risks, such as supporting improved data and evidence, further transparency, market integrity via guidance and monitoring, capability building and technical assistance
- **developing sector-based transition pathways** by identifying and addressing barriers facing specific sectors
- **exploring interventions** that can mobilise additional private investment (ie, by reducing perceived investment or legal risk).

We will continue to work with the private sector on actions that will increase green investment and transition finance.



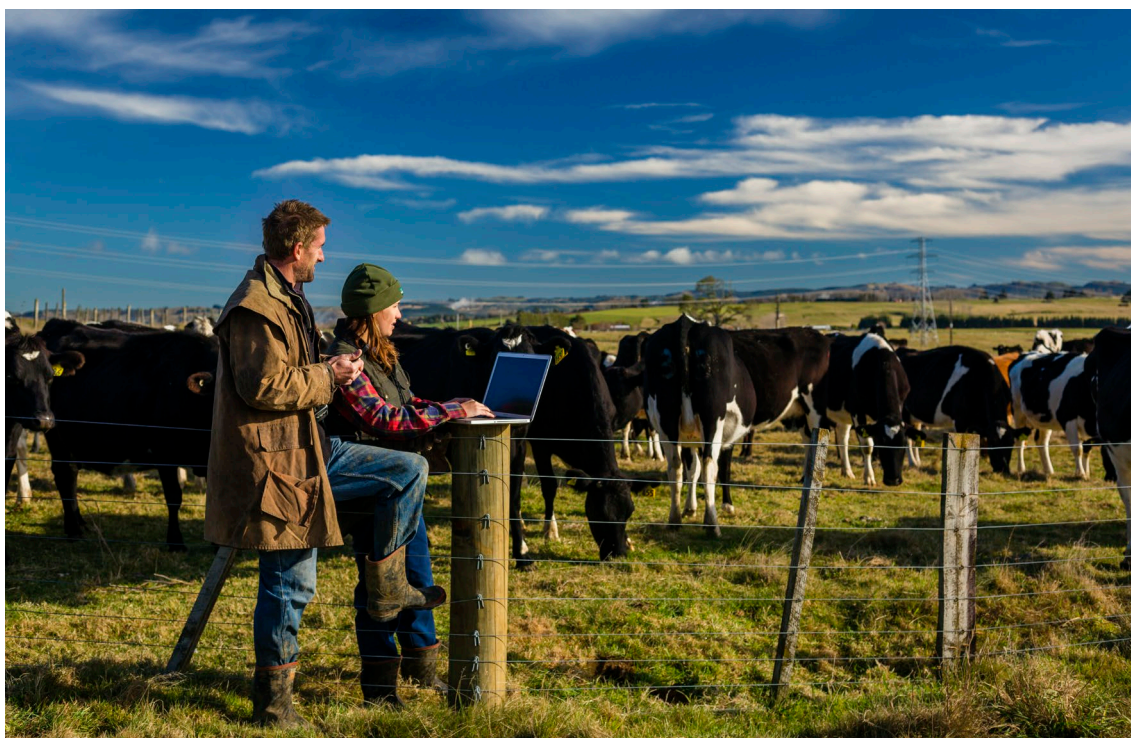
6. Technology and innovation

Te hangarau me te aronga hou

Chapter at a glance Technology and innovation 	
Lead Minister	<ul style="list-style-type: none"> Hon Simon Watts, Minister of Climate Change
Why technology and innovation are important	<ul style="list-style-type: none"> A technology-led approach to reducing emissions will help sectors reduce emissions cost-effectively and speed our transition to net zero. This addresses emissions while increasing productivity, growing exports, opening new markets, and creating jobs and a prosperous economy.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> World-leading climate innovation boosts the economy.
Key actions and policies	<ul style="list-style-type: none"> Encouraging the private sector to commercialise solutions faster by removing regulatory barriers. Ending the ban on gene technology outside the laboratory. Increasing renewable energy and encouraging advances in enabling technology, like battery storage. Removing market barriers to encourage new technology to be trialled in New Zealand.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Supporting and accelerating the uptake of new technologies in agriculture, forestry and energy will reduce emissions and increase removals.

Enabling emissions reductions with technology and innovation

Innovation can fundamentally shift how we do things. Some advances, such as biofuels, can replace emissions-intensive products and create a climate-friendly future. New technologies such as smart chargers or other smart appliances can bring efficiencies and lower operating costs through energy savings. There are emerging technologies that can significantly reduce emissions across the economy. Simpler pathways will allow these tools to reach end users faster. The Government is focused on streamlining regulations and approval processes to enable the private sector to move quickly from prototype to commercialisation.



Providing technology for agriculture

Work underway for the agriculture sector ([chapter 10](#)) includes:

- ending the nearly 30-year effective ban on gene technology outside the laboratory (discussed below)
- supporting the development and use of emissions-reducing technologies, including agriculture
- incentivising the private sector to move from prototype to commercialisation.

Ending the ban on gene technology

The Government will establish an independent regulator in the Environmental Protection Authority to oversee applications to use gene technology. The aims are to allow New Zealand to benefit from these technologies and to protect our health, environment and biodiversity.

Gene technology allows scientists to examine and alter the genetic material of plants, animals, viruses or bacteria. This has helped scientists understand how we might edit genes to promote health, productivity and conservation, and even address climate issues.

Ending the effective ban on gene technology outside the laboratory will allow researchers and companies to develop and commercialise innovative products and create commercial opportunities. These technologies can help farmers and growers mitigate their emissions and raise productivity. For example, gene technologies could lead to sterile conifers that meet forestry needs but prevent the spread of wildings.

Enabling use of renewable energy

Advances in energy storage (eg, batteries, grid management, demand flexibility, smart meters, fuel cells and new processes to develop industrial goods) can help balance electricity supply and demand. Such advances help manage intermittent wind- and solar-generated electricity and continue our energy decarbonisation. See [chapter 7](#) for more detail.

Supporting emissions-reducing technology

Sometimes there are challenges to early investment in new technology, such as the cost of trialling it in the New Zealand context.

Initiatives such as the Low Emissions Heavy Vehicle Fund (LEHVF) can encourage early adoption of new technology. This fund aims to increase the number of zero- and low-emissions heavy vehicles, and therefore encourage manufacturers to supply more such vehicles to the market. The LEHVF offsets the capital costs of fleet conversion by funding either:

- up to 25 per cent of the purchase price of a new low- or zero-emissions heavy vehicle, or
- 25 per cent of the cost to convert an internal combustion engine heavy vehicle to approved clean energy.

CASE STUDY

Effluent treatment system shows promise for reducing emissions

Pillar 4: World-leading climate innovation boosts the economy



Image: Measuring methane emissions on an effluent pond

EcoPond is an advanced effluent treatment system that cuts over 90 per cent of methane emissions from effluent ponds. This innovative solution is the result of a four-year collaboration between Ravensdown and Lincoln University. It works by inhibiting methanogens and reducing conditions that foster methanogenesis, which is the process responsible for methane production. EcoPond also reduces *Escherichia coli* (*E. coli*) in treated effluent, reduces odour from ponds and minimises phosphate leaching where treated effluent is applied.

The research and trial results demonstrating EcoPond's effectiveness have led to it being recommended for inclusion in New Zealand's Greenhouse Gas Inventory. EcoPond is included in the latest Overseer™ model update (6.5.5). Strategic funding from the Ministry for Primary Industries' Accelerating New Mitigations Fund and Ravensdown's ongoing support have allowed the system to evolve, reducing the high initial costs of installation. Recent redesigns include a cost-effective shock-dosing method and economical yet effective consumables. These improvements have reduced EcoPond's capital and operational expenses and enhanced its commercial viability.

Ravensdown's commercialisation and venture arm, Agnition, is driving EcoPond's market readiness with continued research support from Lincoln University. This joint effort has lowered the estimated operating cost of EcoPond to around \$10,000 per year for a typical New Zealand dairy farm when deployed at scale, making it an effective solution.

EcoPond's effectiveness will be further evaluated through ongoing real-world trials on multiple farms across New Zealand over the coming months. The goal is to deploy working pilots of the system in 2025.

Sector policies and plans

Ngā kaupapahere me ngā mahere o te rāngai

This section sets out policies and actions that will help reduce net emissions across different sectors.

- ▶ **Energy** (*chapter 7*)
- ▶ **Building and construction** (*chapter 8*)
- ▶ **Transport** (*chapter 9*)
- ▶ **Agriculture** (*chapter 10*)
- ▶ **Forestry and wood processing** (*chapter 11*)
- ▶ **Non-forestry removals** (*chapter 12*)
- ▶ **Waste** (*chapter 13*)



7. Energy

Te pūngao

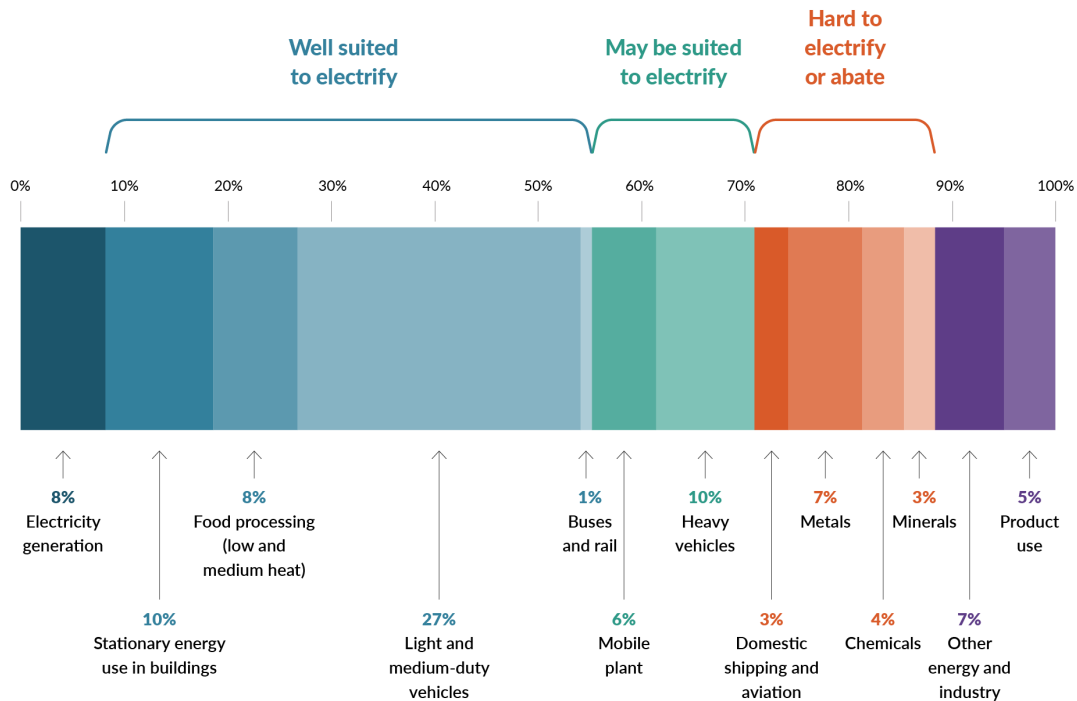
Chapter at a glance	
Energy	
Lead Minister	<ul style="list-style-type: none"> Hon Simeon Brown, Minister for Energy
Why this sector is important	<ul style="list-style-type: none"> New Zealand has abundant renewable energy potential. Harnessing this will help meet our emissions budgets, reduce our dependency on imported fuels, and support the reliability and affordability of the energy system.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Infrastructure is resilient and communities are well prepared. Credible markets support the climate transition. Clean energy is abundant and affordable.
Key actions and policies	<ul style="list-style-type: none"> Delivering Electrify NZ to help achieve our goal of doubling renewable energy (including reducing consenting times). Enabling energy efficiency and a smarter electricity system. Enabling carbon capture, utilisation and storage. Enabling woody bioenergy.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Electrify NZ: -0.1 Mt CO₂-e. Enable carbon capture, utilisation and storage: -1.0 Mt CO₂-e.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> Yes



Energy emissions

Emissions from energy use make up 37 per cent of New Zealand’s gross emissions. This includes 17.5 per cent from energy for transport. Figure 7.1 shows the makeup of emissions from energy, and industrial processes and product use. We expect energy emissions reductions in the second emissions budget (EB2) to come mainly from increased electrification and from energy efficiency gains in light transport and process heat.

Figure 7.1: New Zealand’s energy, and industrial processes and product use emissions, 2022



Role of government

It will take significant investment to meet expected demand for energy and achieve our goals. New Zealand needs investment in generation, transmission and local lines.

New Zealand’s energy sector is dominated by private companies. It is critical that we maintain investment confidence. Government intervention in the market can have an effect on investment. Therefore, we are taking an appropriate role by delivering policy and regulatory certainty, and a level playing field.

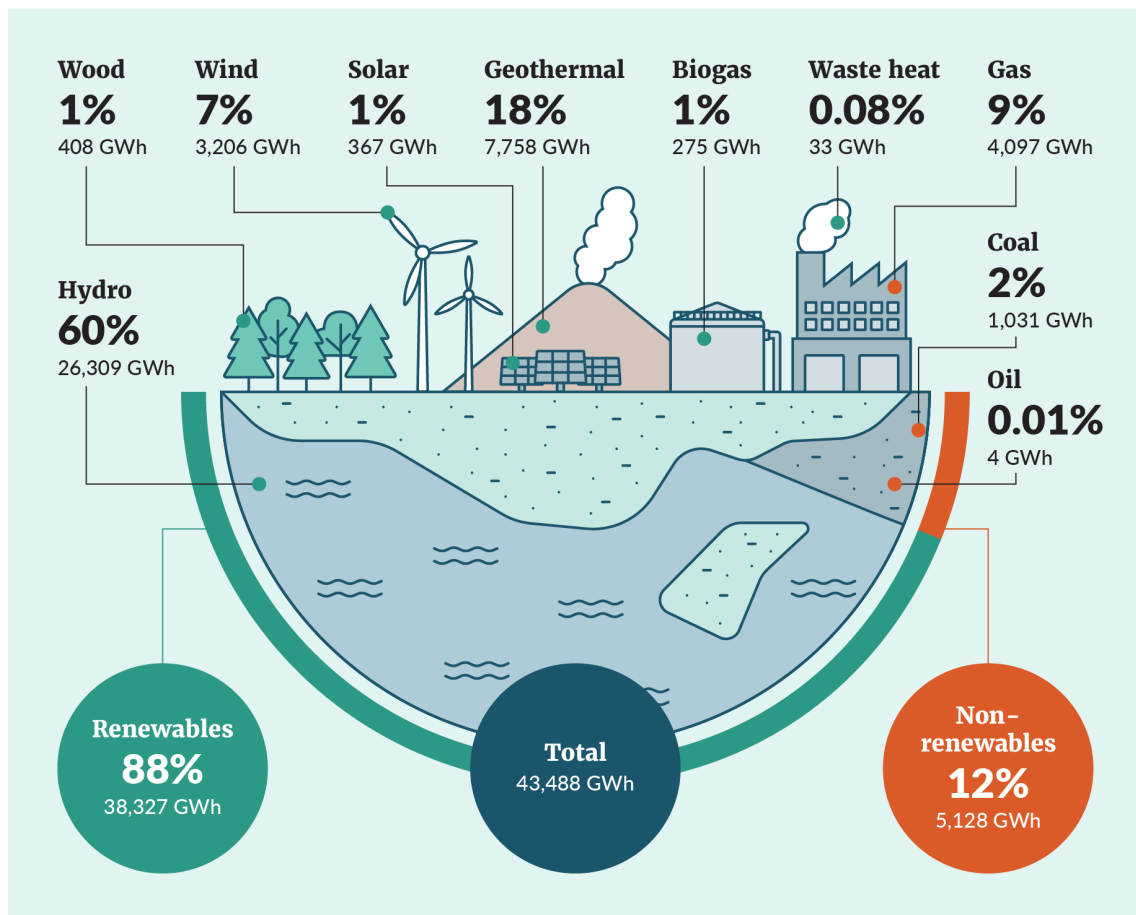
New Zealand does not subsidise renewables. Renewable energy already competes with fossil fuels, in part due to its abundance and because emissions pricing improves its competitiveness. Most of the known investment pipeline is renewable (largely solar and onshore wind, with some geothermal) and decarbonisation of the energy system will be guided by prices and markets. The Government’s role is to enable those markets to work effectively. The New Zealand Emissions Trading Scheme (NZ ETS) is central to reducing net emissions in the energy sector (see [chapter 4](#)).

New Zealand has faced recent challenges on energy security and affordability. The Government is committed to alleviating these problems. Tackling security and affordability concerns is a necessary precursor to giving businesses and households the confidence to electrify and reduce their emissions.

Renewable energy is critical to reaching our targets

New Zealand has a high share of renewable energy (figure 7.2). Electricity demand is expected to rise significantly by 2050 as electric technologies are more widely adopted. This increase will outpace the demand growth of previous decades. Renewable generation capacity must be ready to meet this demand.

Figure 7.2: Net electricity generation by source (GWh), 2023



Note: These electricity generation data are from 2023, which was a record-high year for renewable energy supply. The mix of renewable and non-renewable energy in New Zealand can change year-to-year depending on a range of factors. Individual sources of electricity generation may not add up to the renewable and non-renewable percentages due to rounding.
GWh = Gigawatt hour.

We need to enable new investments in electricity transmission and distribution infrastructure to improve the reliability of our grid. An estimated \$100 billion of investment is needed by 2050 to build and maintain this infrastructure.⁵

⁵ Boston Consulting Group. 2022. *The Future is Electric*. Auckland: Boston Consulting Group.

Policies and initiatives

Electrify NZ: A key policy of the second emissions reduction plan

The Government has committed to doubling renewable energy by 2050. Electrify NZ is the work programme to support private investment in electricity generation and networks that will enable us to achieve this goal.

Electrify NZ includes the following initiatives.

- **Progressing the Fast-track Approvals Bill.** This will create a one-stop-shop that allows for faster, more efficient consents for nationally or regionally significant renewable energy and transmission projects.
- **Amending the Resource Management Act 1991 (RMA).** This will reduce the consenting and re-consenting time for most renewable energy consents to within one year. It will also extend the default lapse periods for renewable energy, transmission and local electricity lines consents from 5 to 10 years. We will increase the default consent duration to 35 years for most renewable energy consents.
- **RMA national direction for renewable energy and transmission.** We will advance amendments to the National Policy Statements for Renewable Electricity Generation and Electricity Transmission, so they are more directive and enabling.
- **Offshore renewable energy.** We will develop a regime to be in place by mid-2025 to unleash investment.
- **Further RMA national direction to enable a range of energy and infrastructure projects.** This will include a new National Policy Statement for Infrastructure, and subsequent standards for different types of energy generation and infrastructure.
- **A range of work underway by the Commerce Commission and the Electricity Authority.** This will update regulatory settings so that the electricity system can cope with the shift to electrification – including supporting the goal to supercharge electric vehicle (EV) infrastructure.

The role of gas in an affordable, low-emissions energy system

In 2023, gas contributed around 9 per cent of New Zealand's electricity generation. Gas provides energy for industry, commerce and public use, and is a raw material in the production of methanol and urea. Gas-fired generation keeps electricity affordable and secure, which in turn supports electrification. Gas can also reduce our reliance on coal, which has twice the emissions impact.

We expect that as consumers switch to renewable energy, the demand for gas will reduce. However, we expect gas will continue to play a role in generation out to 2050. The electricity system currently relies on gas and a limited amount of coal to meet peak demand in winter and to cover dry years. Gas and coal are substitutes for each other for electricity generation. Insufficient gas supply could therefore result in New Zealand burning more coal to keep the lights on, increasing emissions.

Enabling end users to electrify

Promoting an affordable supply

The Energy Competition Taskforce brings together regulatory experts from the Commerce Commission and the Electricity Authority with observers from the Ministry of Business, Innovation and Employment. It will assess how well the market is delivering efficient investment and affordable electricity. The programme includes:

- enabling new generators and independent retailers to enter and better compete in the market
- providing more options for energy users.

We are also working to minimise the impacts on those least able to pay. This includes continued support for the Warmer Kiwi Homes programme.

Enabling energy efficiency and a smarter electricity system

Work is underway to enable a smarter electricity system. This includes:

- amending the Energy Efficiency and Conservation Act 2000 to enable standards for devices to support demand flexibility, including EV smart chargers; this will support the uptake of EV smart charging and improve consumers' ability to shift demand for home EV charging away from network peaks
- work led by the Energy Competition Taskforce exploring innovation in tariff design (such as feed-in tariffs for rooftop solar and battery systems). This could enhance uptake and encourage businesses and households to change how and when they use electricity. This will include additional work led by the Electricity Authority.

Ensuring security of supply

As we have seen in 2024, our energy security and affordability are under pressure. Work is underway to further improve the security of New Zealand's electricity supply. This includes:

- mitigating the impact of severe weather on energy infrastructure (eg, amending rules about how close trees can grow to power lines)
- enabling the development of new fuels and technologies (eg, better market access for grid-scale batteries and demand-response)
- continued support for the Community Renewable Energy Fund to build energy resilience in communities, and trial innovative ways to store and distribute locally generated electricity.

Responding to broader affordability and security challenges

To address the current and longer-term risks to energy affordability and security, the Government is committed to a range of actions. These include:

- delivering effective electricity market regulation; the Government has initiated a review of the performance of electricity markets

- removing restrictions on electricity lines companies owning generation
- reversing the ban on offshore oil and gas exploration, to enable domestic gas production, increase energy affordability and security, and reduce reliance on imported coal
- improving access to gas for electricity generation by removing barriers to building critical facilities to import liquefied natural gas (LNG).

The Government has also issued a Government Policy Statement to the Electricity Authority to:

- require the Electricity Authority to give sufficient priority to the settings needed to promote competition and security of supply
- clarify the Government’s role in electricity. The Government Policy Statement sets clear expectations that the sector must manage its own risk. Generators will not invest if they think the Government may intervene.

Enabling options for supplying energy

In future, we may see more widespread adoption of technologies like hydrogen, sustainable aviation fuel and offshore renewable energy. Getting the enabling settings right now can support future emissions budgets.

Carbon capture, utilisation and storage

The Government has agreed to create an enabling regime for carbon capture, utilisation and storage (CCUS). This will allow New Zealand’s industries to access CCUS technology on a level playing field with other reduction and removal tools.

The regime will include a financial incentive for CCUS operators through the NZ ETS. It will draw on international examples, which typically include assessment and monitoring, and a clear liability framework. Through 2025, the Government will progress legislation to establish the CCUS regime.

The most likely opportunity for CCUS is to establish sequestration facilities at existing gas fields during EB2 and third emissions budget periods.⁶ The regime will enable a gas operator to sequester carbon dioxide from their own production and from third parties. This will support the possible sequestration of carbon dioxide from our hard-to-abate industries, and from activities like direct air capture if and when they become economically viable.

Renewable gases

We have taken steps to create an enabling environment and remove barriers to the uptake of renewable gases, including:

- **updating the Climate Change (Unique Emissions Factors) Regulations 2009.** This will allow for offsite destruction of landfill gas produced by Class 1 landfills and includes a new destruction factor for upgrading biogas to biomethane. These changes will remove the disincentive under the NZ ETS for landfill operators to provide biogas for offsite uses, including biomethane upgrading

⁶ This is additional to use of CCUS for geothermal generation, which is already happening.

- **revising the NZS 5442:2008 Specification for reticulated natural gas** to be fit for purpose with blends of biomethane and natural gas. Further revisions are underway to consider blending hydrogen with reticulated natural gas and biomethane.

We are continuing to explore additional measures to increase the uptake of renewable gases. We will also review existing gas and related regulations, so they are fit for purpose and compatible with renewable gases in the reticulated system.

Diversifying fuels by replacing natural gas with low-emissions alternatives such as biomethane and hydrogen is a way to improve the security of our energy supply and reduce emissions.

There is an opportunity to use organic waste streams to capture biogas and upgrade it to biomethane. Biomethane is chemically identical to natural gas. It can be injected into gas transmission and distribution networks and used in existing appliances.

An estimated 4.9 petajoules of biogas (equivalent to about half of residential and commercial gas demand) is produced by landfills, wastewater treatment plants and industrial facilities every year. Much of this biogas is currently flared to reduce its global warming potential. Some of it is used on-site to generate electricity and process heat. There is also considerable potential for generation from agricultural waste sources.

Some biomethane supply is expected to come online for injection into gas distribution networks during the EB2 period. How much this will reduce New Zealand's emissions depends on the wider energy system.

Enabling woody bioenergy

New Zealand has abundant bioenergy potential, stemming from its strong plantation forestry base. Bioenergy includes products such as woody biomass (chips, pellets) for use in boilers in industry and power generation, and liquid and gaseous forms such as renewable gases and sustainable aviation fuel. Enabling greater use of bioenergy increases the diversity of our low-emissions fuel, which in turn improves security of the supply.

Factors hindering uptake include price volatility, concerns about the security of supply over the life of an industrial plant (20-plus years), poor information on regional feedstock availability, and a lack of secondary processing at scale of bioenergy products (eg, into pellets).

We are supporting markets by providing information. The Energy Efficiency and Conservation Authority (EECA) is publishing insights to promote private sector investment in fuel-switching in the regions.

The Government will establish a domestic ministerial woody bioenergy taskforce to identify strategic opportunities for bioenergy. There is significant potential to make greater use of woody biomass for energy purposes to complement forestry resources for high-value economic activities. The taskforce will focus on investigating regulatory barriers to woody biomass uptake for bioenergy. More details on the taskforce will be released in 2025. See [chapter 11](#) for more on the forestry sector's role in the production of biomass.

CASE STUDY

Biomass to displace coal generation at Huntly

Pillar 3: Clean energy is abundant and affordable



Image: Huntly Power Station

Huntly Power Station, run by Genesis Energy, is New Zealand's largest power station.

One of its roles is to provide back-up power when the country does not have enough renewable energy – for example, when the wind doesn't blow, the sun doesn't shine, or the rain doesn't fall.

Three of the five generating units at Huntly can run on coal or natural gas. Coal generation from these units produced 1.35 Mt CO₂-e of emissions from July 2023 to June 2024. Genesis Energy has a public goal of delivering 300,000 tonnes of biomass to Huntly Power Station by the end of fiscal year 2028. This fuel is intended to displace coal generation.

Initial government estimates suggest this could deliver reductions of 1.1 Mt CO₂-e in the EB2 period and 1.6 Mt CO₂-e in the EB3 period.

CASE STUDY

Mercury progresses sustainable geothermal generation

Pillar 3: Clean energy is abundant and affordable

Pillar 4: World-leading climate innovation boosts the economy



Image: Pipes at Ngā Tamariki geothermal station

Geothermal generation makes up around 18 per cent of New Zealand's total electricity generation and plays a vital role in decarbonising the electricity system and providing baseload generation.

Mercury is adding a fifth generating unit at Ngā Tamariki geothermal station, which will boost generation output by 46 megawatts at a cost of approximately \$220 million. The station normally produces about 730 gigawatt hours of electricity each year, which is enough to power approximately 103,000 households. The expansion will increase this to 1,120 gigawatt hours per year or approximately 158,000 households once it is complete in 2025.

Mercury is also continuing to invest in technologies and processes designed to reinject non-condensable gases into the geothermal reservoirs. Releasing these gases is an inherent part of the geothermal generation process. Currently, around 98 per cent of Mercury's Scope 1 emissions are attributed to fugitive emissions arising from geothermal generation.

Ngā Tamariki geothermal station has been successfully developing reinjection technology since 2022. The current reinjection rate is around 40 per cent of the station's emissions. This translates to about 14,000 t CO₂-e per year, equivalent to the emissions of about 1,800 households.⁷

Mercury is carrying out ongoing research and development to evaluate the effects of the current reinjection of non-condensable gases on the reservoir. It has begun trials to assess how to ensure continued sustainable management of the geothermal system. Over the next five years, it plans to expand reinjection to more geothermal sites.

⁷ Gen Less. *Calculate your carbon footprint*. Retrieved 23 November 2024. This calculation assumes 7.5 tonnes per household.

Exploring deeper geothermal energy

New Zealand is a rich source of geothermal energy, which is used for electricity generation. Currently most geothermal wells are drilled to a maximum depth of around 3.5 kilometres, but it may be possible to access more energy if wells are drilled deeper.

Through the Regional Infrastructure Fund, the Government will invest in exploring the potential of supercritical geothermal technology (SCGT). SCGT could unlock more geothermal energy for New Zealand and further reduce reliance on fossil fuels in later budget periods.

Hydrogen

Hydrogen is being trialled and demonstrated as a low-emissions alternative in heavy industry, heavy and specialty transport, production of green fuels (see below) and power generation.

Although hydrogen is not expected to play a significant role in EB2, it could in later budgets.

We aim to support private investment in hydrogen. The Hydrogen Action Plan focuses on:

- creating an enabling regulatory environment
- reducing consenting barriers for hydrogen projects
- promoting a cost-effective and market-led transition to a low-emissions economy
- supporting access to international investment and markets.

Sustainable aviation fuels


Sustainable aviation fuels (SAF) support decarbonisation of air travel and the transportation of cargo.

The Government has funded feasibility studies with Air New Zealand to explore domestic supply chains of alternative jet fuel, including the use of woody biomass (forestry slash) and municipal waste. We intend to release the findings in 2025.

EECA and New Zealand Trade and Enterprise have also contributed funding for a feasibility study of producing SAF from green hydrogen at Marsden Point, by Fortescue Future Industries and Channel Infrastructure.

8. Building and construction

Te hanganui me te hanga whare

<h3>Chapter at a glance</h3> <p>Building and construction</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Chris Penk, Minister for Building and Construction
Why this sector is important	<ul style="list-style-type: none"> The building and construction sector is a critical part of New Zealand's economy. It supports economic growth and employment, and provides housing, commercial and industrial buildings. Buildings contribute around 12 per cent of domestic greenhouse gas emissions. Reducing building-related emissions can help us achieve our targets.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Credible markets support the climate transition.
Key actions and policies	<ul style="list-style-type: none"> Expanding voluntary energy performance ratings for non-residential buildings. Making it easier for people to retrofit their buildings to improve energy efficiency. Improving emissions data for building products, materials and buildings.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> More work is needed to understand the role of building and construction in achieving New Zealand's domestic and international targets.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> Yes

Building emissions

Buildings contribute around 12 per cent of gross domestic greenhouse gas emissions. Building-related emissions come from the energy used to operate buildings (**operational emissions**, 9 per cent or 6.7 Mt CO₂-e) and the emissions associated with the materials used to construct them (**embodied emissions**, just under 4 per cent or 2.8 Mt CO₂-e).

About half (54 per cent) of operational emissions are from electricity, with the remaining 46 per cent from fossil fuels, mainly coal and gas.

Reducing emissions in the building and construction sector can support wider decarbonisation of the economy.

Energy-efficient buildings require less energy to run, creating fewer operational emissions and reducing the cost of running buildings, which encourages people to improve the energy efficiency of their buildings.

Our approach is to remove barriers and make information more accessible. This approach aims to enable households and businesses to make quicker, cheaper and easier decisions on lower-emissions materials and on the design and use of buildings. It can also help the market to function more effectively.

Policies and initiatives

Expanding voluntary energy performance ratings for non-residential buildings

Currently, limited information on the energy performance of buildings is available for owners, buyers and renters.

Energy performance ratings provide verified and credible sustainability data to building owners and users. By enabling comparisons with other buildings, ratings can facilitate sustainable investments by revealing opportunities for building owners to improve energy efficiency at low cost.

Ratings also allow tenants to make informed choices when renting buildings. This can encourage landlords and developers to invest in energy efficiency.

New Zealand has a voluntary energy performance rating scheme called NABERSNZ. This scheme provides performance information about commercial office buildings and public hospitals. Some government agencies must obtain a NABERSNZ rating for office buildings they own or lease.

The Government intends to increase the availability of voluntary ratings by expanding the NABERSNZ scheme to other non-residential buildings such as shopping malls and hotels.

In Australia, NABERS ratings are available for 11 building types. Commercial office buildings over 1,000 square metres are required to have a NABERS rating. Rated buildings have reduced their energy use by over 40 per cent on average since 2010.⁸

⁸ NABERS. 2022. *Energy efficiency in commercial buildings*. Retrieved 3 December 2024.

Making it easier to retrofit buildings

Around 70 per cent of the buildings that will exist in New Zealand in 2050 have already been built. Retrofitting buildings is therefore critical to reducing operational emissions.

We will investigate options to streamline compliance with building regulations to make it easier for people to voluntarily retrofit a building.

Reducing embodied emissions

Embodied emissions can be reduced by:

- **maximising new build efficiency:** ensuring the size and quantity of new buildings is proportional to the need, and increasing their longevity to reduce the number of avoidable new builds in future
- **increasing building material efficiency:** using fewer materials in new buildings, reducing waste and minimising replacement over the life of the building
- **opting for low-carbon materials or innovating supply chains** to reduce emissions from construction materials.

The Government is already working on actions to support lower embodied emissions by:

- making it easier to build small buildings, by removing the need for a building consent for small secondary dwellings such as granny flats
- improving access to innovative and sustainable materials by enabling the use of overseas building products and standards
- developing a methodology for the building sector to measure embodied emissions in a consistent and credible way.

Other Government actions include boosting domestic wood processing ([chapter 11](#)) and investing in resource recovery through the Waste Minimisation Fund ([chapter 13](#)).

Improving emissions data for products, materials and buildings

New Zealand's understanding of the embodied emissions of building materials has improved in recent years from a low base. However, limited availability of credible data and information can make understanding, comparing and reducing embodied emissions challenging.

Better and more accessible data can make it easier for consumers and building designers to understand and measure embodied emissions. This enables people to consider the emissions impact of design and construction choices.

The Government will work alongside the sector to encourage lower embodied emissions by:

- supporting the Building Research Association of New Zealand (BRANZ) and Masterspec to develop and maintain a national online resource of embodied carbon data for building materials and products
- improving the consistency and accessibility of tools currently used to measure embodied emissions
- supporting an industry-led pilot of an online platform for sharing embodied carbon assessments of different buildings. This is aimed at improving industry understanding of what low-embodied carbon buildings look like. It will also help industry identify opportunities to improve reporting of embodied emissions.

These initiatives will help build strong evidence and improve the sector's ability to make well-informed decisions.

CASE STUDY

Coming together to reduce emissions in AUT's Tukatuku building

Pillar 4: World-leading climate innovation boosts the economy



Image: Tukatuku building at Auckland University of Technology

Auckland University of Technology's (AUT's) Tukatuku building accommodates around 2,200 students and staff within the Faculty of Health and Environmental Sciences. Tukatuku sets a new benchmark for sustainable tertiary education buildings in New Zealand while creating a vibrant, inclusive space for learning and collaboration.

Tukatuku's careful design and orientation optimise natural light and indoor temperature and balance solar heat gains and losses. These design features have minimised the building's energy use and operational emissions. Tukatuku also has extra insulation, a rainwater harvesting system and a displacement ventilation system. Together, these measures mean it is expected to be one of the most energy-efficient tertiary-education buildings.


Tukatuku is designed to use 60 kilowatt hours per square metre of energy annually. Operational emissions from running the building over 50 years are anticipated to be around 490 kilograms of CO₂-e per square metre.

To minimise the embodied emissions associated with the construction materials, Tukatuku was built using an innovative, lightweight timber structure and repurposes parts of an existing building. The lightweight structure allowed the building to go up to four storeys whereas a heavier, more traditional system would have limited the height to three storeys because of the poor ground conditions. This construction approach resulted in Tukatuku creating only half the embodied emissions – around 448 kilograms CO₂-e per square metre – compared with an equivalent industry standard building.

Further environmental and economic benefits were achieved by diverting over 90 per cent of the construction and demolition waste from landfill. This saved 40 per cent on disposal costs.

9. Transport

Te tūnuku

<h3>Chapter at a glance</h3> <p>Transport</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Simeon Brown, Minister of Transport
Why this sector is important	<ul style="list-style-type: none"> The transport system is critical to economic growth and productivity. New Zealand is in a strong position to decarbonise transport through electrification. Making clean energy accessible and enabling electric vehicle (EV) uptake via improved charging infrastructure will remove some non-market barriers to uptake.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Credible markets support the climate transition. Clean energy is abundant and affordable.
Key actions and policies	<ul style="list-style-type: none"> Aiming for a network of 10,000 public EV charging points by 2030 and facilitating private investment in EV charging infrastructure. Reviewing regulatory barriers to decarbonising heavy vehicles (eg, EVs and hydrogen). Promoting innovation through the Low Emissions Heavy Vehicle Fund. Continuing to support the aviation sector to decarbonise, and working with other countries on low- and zero-carbon shipping on key trade routes by 2035. Supporting public transport in our main cities.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Target 10,000 public EV charging points by 2030: -0.01 Mt CO₂-e.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> Yes

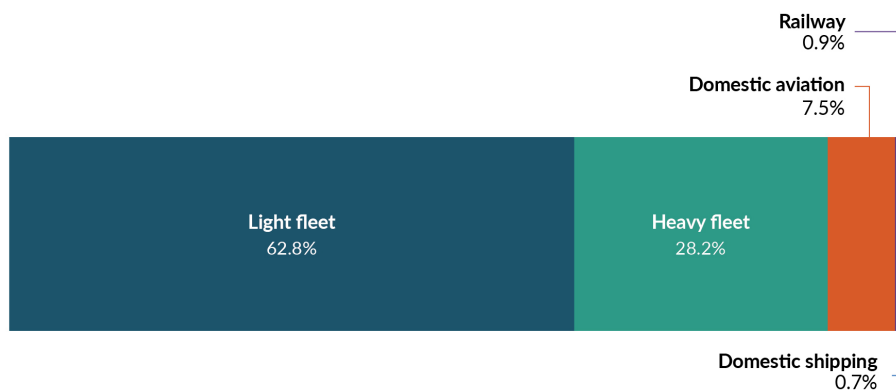
Transport emissions

Transport was responsible for 17.5 per cent of New Zealand’s gross greenhouse gas emissions in 2022. More than 90 per cent of transport emissions are from road transport. New Zealand has the fifth highest per-capita transport emissions among developed countries. Transport emissions increased by 68 per cent from 1990 to 2022. This was mostly driven by population growth and economic activity.

Figure 9.1 shows the light vehicle fleet – typically cars and other vehicles for personal use – is responsible for 63 per cent of transport emissions. The heavy vehicle fleet – typically medium and heavy trucks – is responsible for 28 per cent.

The remaining 9 per cent comes from domestic aviation, rail, and domestic shipping and pipeline.

Figure 9.1: Transport emissions by transport type, as at December 2022



Policies and initiatives

To give New Zealanders the confidence to move to electric vehicles, the Government is planning a network of 10,000 public charging points by 2030

In general, the market for electric vehicles (EVs) is expected to make a big impact to transport emissions in the 2030s and 2040s. This will happen gradually as people and businesses replace their vehicles. By the end of November 2024, there were approximately 117,000 EVs in New Zealand, including plug-in hybrids, which is up 9.3 per cent from 1 January 2024.

‘Range anxiety’ and concerns about the availability of public charging points continue to hamper EV uptake. Accelerating the rollout of public charging points can address these concerns.

New Zealand currently has about 1,250 public charging points. Over 500 more are in development as of September 2024. This creates a good base network, including fast chargers every 75 kilometres along most of the state highway network.

However, New Zealand’s EV charging infrastructure is behind that of other countries. At the end of 2023, New Zealand had one public charging point for every 88 EVs. Most comparable countries have ratios of one charging point to fewer than 40 EVs.⁹

⁹ The International Energy Agency’s annual Global EV Outlook for 2024 finds Australia has about one charging point to every 68 EVs, while the United Kingdom has one to every 31 and Germany has one to every 25. However, countries record charging-point numbers differently.

The Government has a target of a network of 10,000 public EV charging points by 2030. This is expected to meet all public charging needs. Some possibilities include:

- ultra-rapid charging on the highway network
- fast charging at destinations such as shopping malls, gyms and marae
- slower AC (alternating current) charging where an EV will be parked for longer, such as at workplaces, hotels, motels and holiday parks.

Facilitating private investment

The Supercharging EV Infrastructure work programme sets out actions to facilitate private investment and review Government co-investment.

These actions include:

- making the installation of public EV charging points a permitted activity under the Resource Management Act 1991
- enabling standards to help consumers shift home EV charging demand away from network 'peaks'
- with the Electricity Authority, addressing barriers such as high connection costs, and ensuring efficient application processes for EV charging connections across all 29 electricity distributors.

Reviewing co-investment

Although EV numbers are growing, the private sector may not provide charging infrastructure without demand. At the same time, demand for EVs may be restricted if there are not enough charging points.

The Government can solve this problem by co-investing in public charging points with the private sector.

Co-investment can also support specific sites that would not attract private investment but are important for an effective nationwide network. For example, tourism hotspots can see high peak demand but low demand for most of the year.

As the network scales up and regulatory barriers are removed, the private sector will likely be able to invest with more confidence.

It is timely to review the Government's co-investment approach, so that it can reach its national network goal and maximise value. Until now, most public EV charging points have been set up with government co-funding from the Energy Efficiency and Conservation Authority.

The review will consider the scale of co-investment, how it is prioritised across charging point types and locations, the processes to apply for and receive co-investment, and how it could change as the market develops. Cost-benefit analysis will inform the design of an updated co-investment model.

The Government is engaging with the EV charging market on this review. We expect decisions to be made in early 2025. This will support final decisions on changes to the approach, which will be implemented later in 2025.

CASE STUDY

Hauraki transport hub gets fast EV charging

Pillar 1: Infrastructure is resilient and communities are well prepared

Pillar 3: Clean energy is abundant and affordable



Image: The Kwetta charging point at Z Energy in Ngātea

Ngātea, a town in the Hauraki Plains, is an ideal location for an EV charging point as it sits at the heart of the 'Golden Triangle', a busy transport route between Auckland, Tauranga and Hamilton. However, the town's existing electricity network does not have enough spare capacity to install high-speed EV charging points. Increasing the network's capacity would have required difficult, time-intensive and expensive grid upgrades.

To solve this problem, Z Energy worked with PowerCo, the local electricity distribution business, and Kwetta, a New Zealand EV-charging solutions supplier. Its 'Prime' charging unit allows fast charging points to be installed without major upgrades to the grid. The Energy Efficiency and Conservation Authority saw the demonstration opportunity for the project and provided support through its Low Emissions Transport Fund.

Connecting directly to the high-voltage network, the Kwetta Prime unit combines multiple elements necessary for fast charging into a single module. This includes the high-voltage switch and transformer (usually installed by the local lines company) and the metering, distribution and conversion (usually installed by the customer). Charging is then provided by Kwetta's Skyhook fast DC charging point.

This solution also uses static synchronous compensator technology, which helps manage voltage during charging to ensure the stability of the electricity supply. This greater stability, in turn, allows more power to be transferred and improves stability on the wider network.

The Kwetta charging point was commissioned in December 2023 at the Ngātea Z Energy station, after a short, three-month deployment phase. The Ngātea site can now support up to 500 kilowatts of fast charging, even during constrained periods.

This solution will enable charging point operators to install high-capacity EV charging in locations with constrained electricity networks.

Supporting actions

Ensuring the Clean Vehicle Standard is effective

The Clean Vehicle Standard (the Standard) came into effect on 1 January 2023. It aims to progressively reduce the average carbon dioxide emissions of light vehicles entering the fleet. It does this by setting annual carbon dioxide targets that vehicle suppliers must meet on average across the vehicles they import.

Signalling achievable targets well in advance helps compliance and minimises supply and price impacts for consumers. In 2024 the Government reviewed the Standard. The review concluded that the 2025–27 targets (apart from the 2025 target for passenger vehicles) were too stringent and, if unchanged, were unlikely to be achieved. The annual targets out to 2027 were subsequently eased to ensure that the Standard is effective, targets are achievable, and the Standard supports vehicle availability, affordability and choice for consumers. Additionally, targets were added for 2028 and 2029.

Pricing for more efficient use of transport infrastructure

From January 2027, the Government plans to return to the practice of regular fuel excise duty (FED) and road user charges (RUC) increases. The Government Policy Statement on Land Transport 2024–2034 signalled an increase of 12 cents per litre to FED in January 2027 and a further 6 cents per litre in January 2028, followed by a 4 cents per litre annual increase starting in January 2029. The purpose of these changes is to support further investment in transport infrastructure.

Light EVs started paying RUCs in 2024, and currently may pay more than equivalent petrol vehicles (such as efficient hybrids) in FEDs. The Government will transition the entire light vehicle fleet to RUCs, and away from fuel tax, by 2027. This will ensure that all road users contribute to the upkeep of our roads, whatever vehicle they drive.

We will also introduce legislation to set up time-of-use schemes in New Zealand. This will improve traffic flows and shorten journey times by charging road users at certain times or locations, depending on how busy the roads are. The charge encourages some users to change their travel habits, so there are fewer people on the roads at the busiest times.

Time-of-use schemes will help lower emissions, increase productivity and enable New Zealanders and freight to get where they need to go quickly and safely.

Heavy vehicle decarbonisation

Our freight is mainly carried on road by heavy trucks. Other heavy vehicles have key roles in other sectors such as waste removal and construction. Heavy vehicle emissions are currently about a quarter of our transport emissions.

Decarbonisation of heavy vehicles is at an earlier stage than light vehicles both globally and in New Zealand. Zero-emissions heavy vehicles (ZEHVs) make up less than 0.13 per cent of the national heavy truck fleet.

The freight sector and other commercial sectors using heavy vehicles are market-led and highly competitive. They are best placed to lead decarbonisation. The Government can support the sector to reduce heavy vehicle emissions by removing barriers. It will also protect access to overseas markets as other countries set increasingly stringent expectations about supply chain emissions.

Over the second emissions budget (EB2) period, we expect significant global improvements in heavy vehicles. This is likely to include better fuel efficiency in internal combustion engine (ICE) trucks, and the supply of more makes and models of ZEHVs. We expect the capital cost difference between ZEHVs and ICE trucks to keep reducing, and the range of ZEHVs to keep increasing as technology improves.

Reviewing barriers to low- and zero-emissions heavy vehicles

The current vehicle dimension and mass rules tend to favour trucks that are relatively heavy (for greater efficiency) but with relatively low axle weights (to reduce damage to roads and highways) compared with other markets. These rules affect a range of heavy vehicles, including some ZEHVs. For example, some battery electric trucks sacrifice payload for battery weight to meet the current rules, making them less competitive than ICE trucks. Hydrogen tanks on heavy vehicles can cause them to exceed volume constraints.

The additional weight of electric batteries may put these trucks in a higher driver licence category than the equivalent ICE model. This adds costs to businesses using these zero-emissions vehicles.

We will review the regulatory system for barriers to uptake of ZEHVs, including the impact of axle weights and licence categories. Any change must be balanced against the increased wear and tear on roads and bridges from heavier vehicles, as well as their higher maintenance costs.

Grants supporting uptake of low- and zero-emissions heavy vehicles

We have launched the Low Emissions Heavy Vehicle Fund (LEHVF) to promote innovation and offset the cost of hundreds of heavy vehicles powered by clean technologies. Budget 2024 provided \$27.75 million for the fund, which is administered by the EECA. This aims to help early adopters to overcome upfront cost barriers and accelerate the uptake of these vehicles – whether they are battery electric, hydrogen fuel cell or hybrid.

The EECA's early high-level modelling estimates up to 500 diesel vehicles would be replaced by low- or zero-emissions vehicles by 2028 through the LEHVF. This scenario could reduce transport gross emissions by around 367 kt CO₂-e over the EB2 and third emissions budget periods.¹⁰ There is uncertainty about which vehicles the market will choose, in terms of both size and technology type, which will affect actual reductions.

The Government will also consider the merits of extending the exemption of heavy electric vehicles from RUC, which is currently due to expire at the end of 2025.

Public charging for heavy vehicles

For the short term, we expect electric charging of heavy vehicles to occur mainly at private depots. Some of the barriers to charging will be addressed by actions on electricity network infrastructure and supply ([chapter 7](#)). We will continue to monitor the uptake of heavy electric vehicles, and whether there is any role for the Government to facilitate charging infrastructure for heavy vehicles.

¹⁰ The grant scheme estimates were modelled separately from other policies of the second emissions reduction plan, which used the Emissions in New Zealand model.

Aviation and shipping decarbonisation

Domestic aviation and coastal shipping emissions make up a small proportion of transport emissions (about 8 per cent). Sea freight and supply chains are key drivers of New Zealand's economy. Playing our part in decarbonising these sectors helps us manage supply chain emissions to maintain access to international markets.

The Government's role is to facilitate industry discussions through existing forums, consider regulatory barriers and ensure New Zealand's interests are represented on the international stage. International cooperation will also prepare us to use new technologies as they become available.

The Government has established Sustainable Aviation Aotearoa, a group of private sector and government agencies supporting the decarbonisation of the aviation sector. The group is exploring ways to work with counterparts in other countries, such as Australia, on settings that would support sustainable aviation fuel supply and uptake.

Creating the conditions for green shipping routes by 2035

During the 2+2 Climate and Finance Dialogue with Australia in July 2024,¹¹ the Government committed to convening roundtables with the maritime sector. These will identify the conditions required for green routes between countries.

Bringing together diverse industry stakeholders, a pre-feasibility study was completed in 2023 for an Australia–New Zealand green shipping corridor.¹² This could allow commercially operating ships to use alternative fuels.

Separately, Zespri¹³ partnered with the CMA CGM Group on a feasibility study for a green route from New Zealand to Europe.

Low- or zero-carbon shipping corridors could allow New Zealand to:

- maintain the marketing advantage of low- or zero-carbon credentials, avoiding extra costs such as carbon tariffs on ships or goods, based on voyage emissions
- support an equitable transition by enabling low- or zero-carbon Pacific supply chains
- maintain common regulations with regional partners, so that operators can easily move the same craft around all ports in the region.

Reviewing domestic use of international carbon intensity requirements

Domestic coastal shipping is exposed to the NZ ETS price through fuel purchases. International shipping, including any international carrier of domestic cargo that is incidental to its international cargo, is excluded from the NZ ETS.

Annex VI of the International Convention for the Prevention of Pollution from Ships requires member countries to adopt measures to ensure that domestic voyaging ships operate

¹¹ The dialogue is an annual meeting between the respective Ministers of Finance and Climate Change from New Zealand and Australia.

¹² The study was completed by the Maersk Mc-Kinney Moller Centre for Zero Carbon Shipping.

¹³ Zespri International Limited is the largest marketer of kiwifruit globally. Its international headquarters are in Mount Maunganui.

consistently with the international requirements. New Zealand chose to apply the Annex VI international ship carbon-intensity requirements to coastal shipping. Other countries, such as Australia, use alternative measures.

The NZ ETS and the carbon intensity requirements are not direct duplicates. However, applying both regimes could disadvantage domestic coastal shipping against competing international operators that move freight around New Zealand and are not subject to the NZ ETS.

It is unclear whether engaging with the Annex VI requirements would support lower emissions from domestic coastal ships. We will review whether applying the Annex VI requirements is effective and should continue.

Public transport in the main cities

Reliable and accessible public transport enables more efficient use of New Zealand's existing transport infrastructure – especially in the largest cities. It also supports our emissions goals.

We have proposed investments in several major projects in Auckland and the lower North Island, to be completed over the next decade. These include:

- Auckland City Rail Link
- Eastern Busway
- Northwest Rapid Transit
- Auckland airport to Botany busway
- rail upgrades in the lower North Island.

The Government is investing \$802.9 million in the Wairarapa and Manawatū rail lines as part of a funding agreement with the NZ Transport Agency, KiwiRail, and the Greater Wellington and Horizons Regional Councils. This will deliver more reliable services for commuters in the lower North Island.

Realising the benefits of reliable and accessible public transport will require continued planning, delivery and maintenance to support growing populations and meet demand. Improvements will need to occur progressively through investments in and enhancements to infrastructure and services. This work includes:

- making better use of existing infrastructure
- introducing new technologies to optimise networks and services
- integrating transport investment with housing and land-use planning.

Supporting the transition to zero-emissions buses

Most public transport authorities have begun using zero-emissions buses in their public transport fleets, because of the economic, health and emissions benefits.


From 1 July 2025, authorities are required to procure only zero-emissions buses.

To support this transition, the Government has reconfirmed \$44.721 million through Budget 2024 over four years. Co-funding will be available to authorities to:

- speed up the deployment of the buses
- encourage innovative approaches for the rollout of buses and infrastructure.

10. Agriculture

Te ahuhenua

<h3>Chapter at a glance</h3> <p>Agriculture</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Todd McClay, Minister of Agriculture
Why this sector is important	<ul style="list-style-type: none"> Agriculture makes up about half of New Zealand's total emissions. Efforts to reduce emissions must support farmers to produce emissions-efficient products, and not cause production to shift to other parts of the world where it is more emissions intensive.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> World-leading climate innovation boosts the economy.
Key actions and policies	<ul style="list-style-type: none"> Reviewing methane science and targets. Accelerating the development of mitigation tools and technologies to reduce on-farm emissions. Developing measurement of on-farm emissions for use by 2025. Implementing a fair and sustainable pricing system for on-farm emissions by 2030.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Implement an agricultural emissions pricing system and mitigation technologies: -0.2 Mt CO₂-e.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> No

New Zealand agriculture is world leading

New Zealand is an agricultural nation. Agriculture is a critical contributor to our economy and way of life, making up 81 per cent of merchandise exports and nearly 13 per cent of overall employment.

Agriculture also makes up over 50 per cent of New Zealand's gross emissions. Importantly, New Zealand farmers are among the most climate-efficient producers in the world.¹⁴

We need to reduce agricultural emissions in a way that does not compromise exports or lead to emissions leakage. Climate change policies cannot lower global emissions by shifting agricultural production to less efficient producers overseas. It is critical for the economy and for global emissions that New Zealand's trade-exposed agricultural production remains competitive.

This is why the Government is taking a technology-led approach to managing agricultural emissions, which we are making good progress in implementing.

Customers are increasingly demanding low-emissions products, with knock-on effects through the supply chain. We are seeing increasing international and market-led action, and it is critical that the New Zealand agricultural sector keeps up. Taking action will help to maintain and enhance New Zealand farmers' and growers' competitiveness in markets demanding sustainably produced food, and their contributions to New Zealand's economic prosperity.

Efficiency gains have been driven by farmer-led improvements in productivity, technology development and genetics improvements over time. These gains are expected to continue (see figure 10.1).

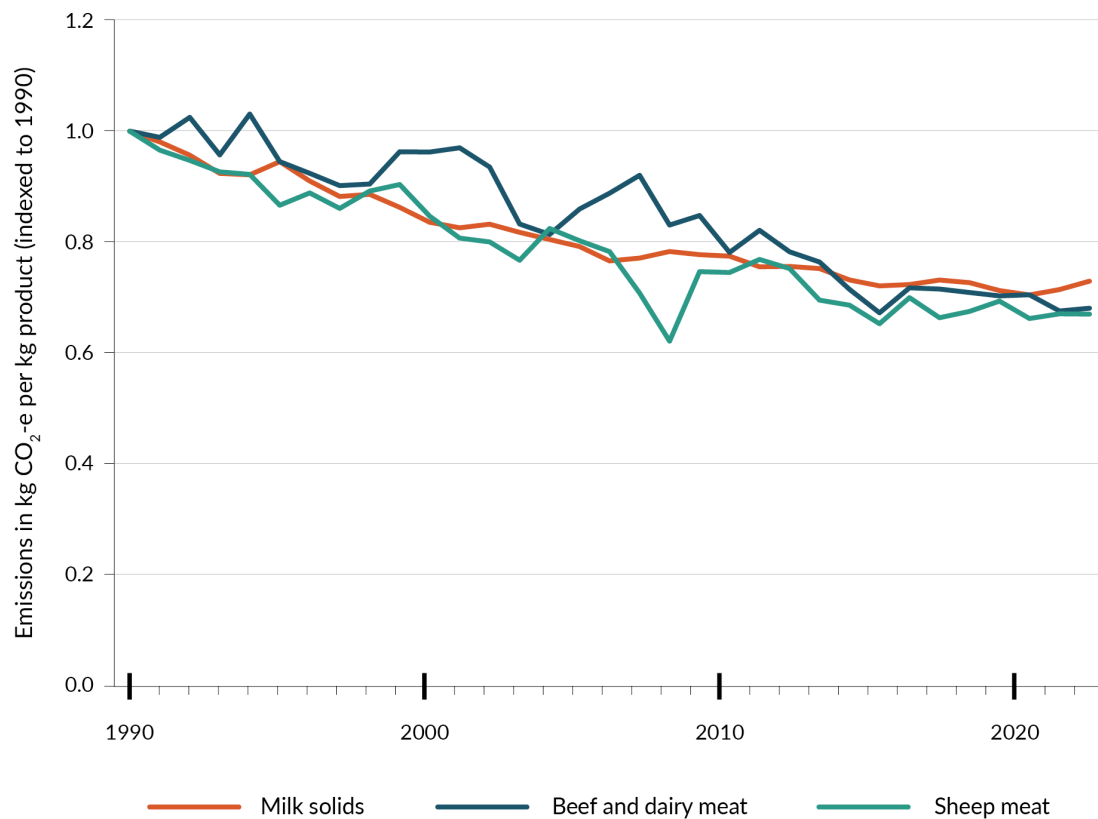
We are seeing New Zealand agribusinesses setting ambitious, science-based targets to reduce emissions throughout their supply chains. We are also seeing increased demand from multinational companies looking to source their products from lower-emissions farms.¹⁵

¹⁴ For example, see: Mazzetto AM, Falconer S, Ledgard S 2022. Mapping the carbon footprint of milk production from cattle: a systematic review. *Journal of Dairy Science* 105(12): 9713–9725; Mazzetto AM, Falconer S, Ledgard S. 2023. Carbon footprint of New Zealand beef and sheep meat exported to different markets. *Environmental Impact Assessment Review* 98: 106946.

¹⁵ New Zealand food and fibre producers face a range of initiatives, including:

1. Fonterra's Scope 3 targets, which target a 30 per cent intensity reduction in land-based emissions by 2030 (from a 2018 baseline)
2. Synlait's targets of a 30 per cent reduction in on-farm emissions per kilogram of milk solids and a 45 per cent reduction in absolute Scope 1 and 2 emissions by 2028 (from a 2020 base year)
3. Nestle's reporting across Scope 1, 2 and 3 emissions, and its target of a 50 per cent reduction of its annual net emissions by 2030 compared with its 2018 baseline
4. Countdown's aim to reduce Scope 3 emissions by 19 per cent by 2030 compared with a 2015 baseline.

Figure 10.1: Changes in emissions intensity of meat and dairy products (kg CO₂-e per kg product), 1990–2022



Agriculture emissions

Compared with other developed countries, agriculture contributes a relatively high proportion of New Zealand’s emissions. It also makes up a more significant portion of gross domestic product.

Agricultural emissions by activity are shown in figure 10.2. They include:

- 78.2 per cent from methane emissions produced by enteric fermentation – the digestive process of ruminant animals such as cattle, sheep and goats creating methane emissions
- 15.2 per cent from agricultural soils – mostly nitrous oxide generated by micro-organisms acting on nitrogen introduced via livestock urine, dung or synthetic fertilisers
- 4.6 per cent from manure management systems
- 2.2 per cent as carbon dioxide from other sources (including 2.1 per cent from urea application and liming, and 0.1 per cent from field burning of agricultural residues).

Figure 10.2: Agriculture emissions by activity, 2022



Of the 2022 agriculture emissions, the most significant come from dairy cattle (48.3 per cent), sheep (23.3 per cent) and beef cattle (19.8 per cent). Most emissions from agriculture are methane. Methane is a short-lived gas compared with other greenhouse gases, but it has a much greater warming effect.

Approach to reducing agriculture emissions

We are taking a multi-pronged approach to reducing emissions without undermining profitability, which involves:

- getting tools to farmers and growers faster, by investing in research, development and commercialisation
- ensuring we have effective regulatory frameworks for new tools – here and internationally
- better estimating on-farm emissions consistently across the country
- supporting changes in practice on-farm
- reviewing our methane science and target
- bringing in an on-farm emissions-pricing system by 2030.

Getting tools to food and fibre producers

Accelerating development and commercialisation

The Government has invested over \$400 million to accelerate the development and commercialisation of tools and technologies to reduce emissions. This investment is:

- getting technologies to market faster
- unblocking capability, infrastructure and regulatory constraints in research and development (R&D) and commercialisation
- leveraging capability and investment in New Zealand and around the world to get tools in the hands of farmers faster.

This investment programme has three main components, which benefit New Zealand and the world. The investment programme is critical to growing the technology pipeline.

Global Research Alliance on Agricultural Greenhouse Gases (GRA)

Through the GRA the Government is partnering with other countries in research on New Zealand's interests (eg, the Ireland–New Zealand Joint Research). It enhances New Zealand's domestic research capacity and connects with key partners.

Over 140 New Zealand scientists have collaborated on more than 70 large multinational research programmes. Global collaboration has generated new insights into areas such as the biology of the rumen, which led to the current research on methane inhibitors and vaccines, the impact of feeds and genetics, and management practices.

The GRA also supports developing countries to build capability to reduce global agricultural emissions. It promotes understanding of the challenges of addressing greenhouse gases while maintaining and increasing food production. We have partnered with 15 developing countries to support their understanding of emissions through improving greenhouse gas inventories. These countries are improving their emissions accounting to meet the same standards as New Zealand works to.

New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)

Established in 2009, the NZAGRC funds pre-commercialisation research into ruminant methane, nitrous oxide and farm systems to reduce emissions. The funding portfolio includes:

- co-investing with industry to determine indicators for breeding low-methane sheep and cattle
- identifying novel methane and nitrous oxide inhibitors, and developing the promising ones to proof of concept
- understanding how to combine new mitigations
- advancing research on methane vaccines.

NZAGRC also supports outreach and provides credible, science-based support to broader primary-sector initiatives that are mainstreaming climate change thinking into farm planning. This includes training rural professionals to increase understanding of agricultural emissions in New Zealand and what can be done at the farm level.

AgriZero^{NZ}

Established in February 2023, AgriZero^{NZ} is a public–private joint venture to drive development and commercialisation of promising emissions-reduction products for New Zealand farms.

Industry and the Government have so far committed \$191 million over four years.

AgriZero^{NZ} aims to:

- make at least two new mitigation tools available by 2028
- enable development and adoption of solutions to drive towards near-zero methane and nitrous oxide by 2040.

Since it began, AgriZero^{NZ} has spent \$34.7 million across 10 investments. Investments to date include a slow-release, biodegradable, methane-inhibiting bolus, probiotics and natural enzymes, a methane vaccine and methane inhibitors.

Targeted investment

The Government is exploring opportunities to target investments with industry. These will address barriers to getting tools into the hands of farmers fast – such as in measurement equipment and capability – and will also support scale-up.

Mitigation pipeline

The R&D pipeline has a growing number of very promising mitigation tools with high abatement potential.¹⁶

New Zealand's farming and growing systems are diverse, and not all mitigation tools will work for all systems. This is why the R&D programme focuses on delivering enough adoptable solutions, across different system types. We expect that these tools can be exported and used internationally – bringing further benefit.

We expect to see the uptake of mitigation solutions increase over time, including to support meeting market-driven supply-chain targets and our climate change targets.

Table 10.1 shows a range of tools¹⁷ that have been invested in across key sectors. It also lists estimates of efficacy and commercial availability. These are a snapshot in time, subject to varying uncertainty, and estimates will change as technology develops and progress is made through the regulatory system.

¹⁶ As more mitigation tools emerge, we will also need to understand their 'stackability' – that is, what happens when multiple tools are used at the same time. In our modelling, we assume no additionality between tools that target the same source of emissions. This assumption is conservative in that some interventions might 'stack', but we cannot count on this at this stage as it needs to be demonstrated through research.

¹⁷ Many other mitigation tools are in development. Examples include Fonterra's Kowbucha and DSM'S Bovaer.

CASE STUDY

New long-acting bolus to cut emissions from livestock



Pillar 4: World-leading climate innovation boosts the economy



Image: Methane inhibitor technology for dairy cattle

New Zealand-based Ruminant BioTech has developed world-leading methane inhibitor technology, with its long-duration bolus platform capable of reducing daily methane emissions in cattle by over 70 per cent for up to 100 days. The bolus platform will be the first commercially viable product for beef and dairy producers in New Zealand, providing a simple, practical and highly effective methane-reduction solution specifically designed for grass-fed pastoral farming operations.

Over recent years, the company's research and development programme has focused on fine-tuning this technology, including through extensive testing to ensure it is safe for animals and has no adverse impact on the quality or safety of the food produced.

Boluses have been used safely by New Zealand farmers for over 50 years, most commonly to deliver medicines and trace elements or minerals. Administered to the animal by mouth with an applicator specially designed for the purpose, the bolus moves through the digestive tract to locate in the animal's rumen. Once in place, the bolus releases an optimal dose of active ingredient over a prolonged period.

To date, the company has concentrated on delivering a bolus for beef cattle weighing over 350 kilograms, with plans to expand this solution to all beef and dairy cattle. Broad adoption of the bolus platform will ensure New Zealand has a significant impact on reducing greenhouse gas emissions from the agriculture sector to meet its 2030 emissions reduction targets.

Table 10.1: Technology for reducing agricultural greenhouse gas emissions

Name and/or mechanism	Description	Target source of emissions	Estimated/targeted efficacy on target source of emissions ^[1]	Earliest date available to New Zealand farmers ^[2]
EcoPond – treatment for anaerobic lagoons	EcoPond reduces the methane (CH ₄) emissions from anaerobic lagoons by adding polyferric sulphate and concentrated sulphuric acid to the stored effluent. These additives inhibit the CH ₄ -producing organisms.	Manure management – CH ₄ from anaerobic lagoons on dairy farms	92%	2025
Low-emissions breeding	Sheep and cattle can be genetically selected to emit less CH ₄ . Within a species, animals vary naturally in the amount of CH ₄ they produce with the same intake of the same diet, and this trait has been shown to be heritable.	Enteric CH ₄ emissions	Sheep: 1% per annum (max 20%) Dairy: 1% per annum (max 20%) Beef: 1% per annum (max 20%)	Sheep: 2024 Dairy: 2029 Beef: 2035
New Zealand methane inhibitor	Identifying compounds suitable for slow-release delivery systems.	Enteric CH ₄ emissions from livestock	At least 20% target	2032
Ruminant BioTech – methane-inhibiting bromoform bolus	An Auckland start-up is developing a CH ₄ -inhibiting bolus for livestock. The biodegradable bolus sits in the rumen for up to six months while the active ingredient is slowly released in a controlled manner.	Enteric CH ₄ emissions from livestock	45–70%	Beef: 2026/27 Dairy: 2028
Agroceutical Products Limited – haemanthamine (alkaloid produced by daffodils)	A Welsh company is developing a methane inhibitor for cattle using haemanthamine, a naturally occurring alkaloid produced by daffodils.	Enteric CH ₄ emissions from dairy cattle	Up to 30%	TBC
Lucidome Biotech – methane vaccine	Methane vaccine for ruminant animals – new venture to accelerate the development, building on New Zealand research previously funded via PGgRc and the Crown (via NZAGRC).	Enteric CH ₄ emissions from livestock	Up to 30%	TBC
ArkeaBio – methane vaccine	A Boston, US start-up is developing a CH ₄ vaccine for ruminant animals, with an initial focus on cattle.	Enteric CH ₄ emissions from livestock	13–15% ^[4]	TBC

Name and/or mechanism	Description	Target source of emissions	Estimated/targeted efficacy on target source of emissions ^[1]	Earliest date available to New Zealand farmers ^[2]
BioLumic – high-lipid pasture	An agricultural biotech company founded in New Zealand is using UV light to develop a low-emissions farm pasture with higher productivity.	Enteric CH ₄ emissions	Up to 15%	2026/27
Plantain	A modern plantain (<i>Plantago lanceolata</i> L.) cultivar is showing promise for reducing nitrous oxide (N ₂ O) emissions when included in pasture swards.	N ₂ O emissions from urine and dung deposited on pastures	TBC 4–30%	2025
AgResearch high metabolic energy (HME) ryegrass	A genetically modified ryegrass with elevated leaf lipids increases energy content.	Enteric CH ₄ emissions	10%	2030
Hoofprint Biome – probiotics and natural enzymes	Hoofprint Biome, a US start-up, is developing probiotics and natural enzymes to reduce CH ₄ .	Enteric CH ₄ emissions from dairy cattle	30–80%	TBC
Nitrification inhibitor	A potential novel inhibitor to target urine patches or be applied with fertiliser.	N ₂ O emissions from urine and dung deposited on pastures ^[5]	30%	2030

^[1] Based on developer estimates. Level of confidence in efficacy varies depending on where the technology is in the R&D pipeline, from proof of concept to commercialisation. The efficacy percentage relates to where the technology is applied and could vary significantly.

^[2] Based on developer estimates. This will be affected by R&D progress and regulatory approval processes.

^[3] Wide-scale commercial availability is likely from 2026.

^[4] As advised by ArkeaBio.

^[5] Maximum of 70% of all dairy pastures, considering slope and access, during winter only.

NZAGRC = New Zealand Agricultural Greenhouse Gas Research Centre; PGgRc = Pastoral Greenhouse Gas Consortium; TBC = to be confirmed.

Supporting effective regulatory pathways

Users and markets must be assured that products are safe and effective. The Government wants regulation that is fit for purpose.

The Government is progressing work on the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act) and Hazardous Substances and New Organisms Act 1996 (HSNO Act) to:

- exempt some inhibitors under the ACVM Act
- use group standards for inhibitors under the HSNO Act
- use inhibitor approvals overseas to streamline ACVM Act registrations
- streamline requirements for demonstrating efficacy in ACVM Act registrations.

The Ministry for Regulation is also reviewing the ACVM Act and HSNO Act to improve access to new agricultural and horticultural products. The Ministry for Regulation will provide its recommendations to Cabinet in early 2025.

The Government has committed to open access to gene technologies. It will establish a dedicated gene technology regulator by the end of 2025.

International acceptance

As New Zealand's food and fibre sector makes up 80.9 per cent of our merchandise exports, it is critical that markets accept our produce when a new mitigation technology has been used to reduce emissions in animals or crops. This is why the Government has a programme to proactively support market acceptance.

An example is New Zealand's work to support:

- the pathway and progress of maximum residue levels for inhibitors in animal products to be approved through Codex¹⁸
- their acceptance and uptake in the production of animal products for trade.

The Government is also working to support recognition of the use of emissions-reduction tools in the New Zealand Greenhouse Gas Inventory, so that efforts on-farm contribute to our targets.

Standardising the estimation of on-farm emissions

To support measurement of on-farm emissions by 2025, we are developing a standardised calculation method, so measures are transparent, up to date and scientifically robust. We will make this method available for use in existing farm calculator tools. New mitigation technologies will be incorporated in the calculations as they emerge.

Currently, farmers have a range of ways to estimate emissions, but many of these measures differ in the results they give. For farmers, standardisation will provide a consistent foundation to inform their investment in new technology. For processors, it will increase confidence in their greenhouse gas reporting.

¹⁸ International food safety standards are coordinated through the Codex Alimentarius Commission, in which New Zealand is an active participant.

Providing extension to help producers adapt

To reduce emissions, producers may need advice on adopting approaches that best fit their farming system.

Our support builds on the existing public and private advisory services sector. An example is the Ministry for Primary Industries' **On Farm Support** programme, which has 56 regionally based staff who provide on-the-ground assistance to farmers and growers. On Farm Support helps them build on sustainability practices and navigate climate, water and environmental requirements, supported by integrated farm planning. It can connect farmers and growers to resources, advice, funding opportunities and extension services – offered by the public and private sectors, and industry organisations.

We expect extension services to support other policies across the second and third emissions budgets. The effect on emissions is included in the reductions projected for emissions pricing and uptake of technology.

Independent review of methane science and target

Currently, there is a wide range in New Zealand's legislated 2050 methane target. This is causing uncertainty about what the sector should be aiming for.

The Government has appointed an independent panel of experts to review New Zealand's biogenic methane science and target. The independent panel has reviewed the latest science and provided an up-to-date evidence base about methane's warming impact. It also advised on a biogenic methane target consistent with the principle of no additional warming for New Zealand. The Government is now considering [the report](#).


Implementing a fair and sustainable pricing system for on-farm emissions by 2030

The Government has committed to keeping agriculture out of the New Zealand Emissions Trading Scheme and to introducing a fair and sustainable pricing system of on-farm emissions no later than 2030, which reduces emissions without causing emissions leakage by sending production overseas. The Government's technology-led approach will be key to achieving this.

A system to price agricultural emissions is assumed to drive the uptake of mitigation technologies.

11. Forestry and wood processing

Te ahumahi ngāherehere me te tukatuka rākau

<h3>Chapter at a glance</h3> <p>Forestry and wood processing</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Todd McClay, Minister of Forestry
Why this sector is important	<ul style="list-style-type: none"> Forestry and wood processing remove carbon from the atmosphere, to reduce our net emissions and produce high-value products that can replace emissions-intensive ones.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Credible markets support the climate transition. Nature-based solutions address climate change.
Key actions and policies	<ul style="list-style-type: none"> Restoring price stability and confidence in the New Zealand Emissions Trading Scheme (NZ ETS) to give certainty to forestry (see chapter 4). Limiting whole-farm conversions to NZ ETS forestry to protect highly productive farmland. Exploring partnering with the private sector to plant trees on Crown-owned land. Improving the consenting framework for wood processing. Ensuring the Wood Processing Growth Fund continues to support commercial investment.
Contribution during the second emissions budget period	In response to the NZ ETS and other market factors, forestry removals are projected to total 60 million tonnes in EB2.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> Yes

Emissions profile

Forestry is the only form of carbon removal currently recognised as contributing to New Zealand’s domestic and international climate targets. Forests can be either a carbon sink (while growing and when turned into long-lived wood products such as building materials) or a source of emissions (eg, through deforestation).

The Ministry for Primary Industries’ September 2024 baseline projections indicate the land use, land-use change and forestry sector is projected to remove between 52.7 and 62.6 Mt CO₂-e from the atmosphere in the second emissions budget (EB2) period (table 11.1). The projections have been updated since consultation to align with the accounting methodology for reporting on emissions reduction.

The lower scenario has been revised in response to consultation feedback.¹⁹ This is based on the 2023 afforestation intentions survey findings, but limits exotic afforestation to the lower range of estimates.

Table 11.1: 2024 baseline projections of forestry’s contribution to emissions targets using target accounting*²⁰ (Mt CO₂-e)

Scenario	EB1 (2022–25)	EB2 (2026–30)	EB3 (2031–35)	2050
Lower	–21.0	–52.7	–66.3	–15.1
Central	–25.2	–60.7	–82.0	–21.8
Upper	–26.6	–62.6	–86.7	–27.9

1. A negative number represents a removal of carbon dioxide from the atmosphere.
2. The lower and upper scenarios reflect varying levels of afforestation and deforestation as included in the 2024 projections.
3. The 2050 figures show the estimated removals from forestry during 2050 (net zero target).
4. The table shows only net emissions and removals from afforestation/reforestation and deforestation.

Projected exotic afforestation will be an important contributor to the budgets. However, newly planted forests take time to start sequestering carbon. They also create emissions from clearing land and soil. As a result, new exotic afforestation in the EB2 period will start contributing carbon removals in later budgets.

Carbon removals from many exotic production forests that were planted in the early 1990s are slowing as the forests reach maturity and harvest. However, these existing forests will contribute more to the first emissions budget (EB1) and EB2 than any new planting that occurs (or has already occurred) in these periods.

¹⁹ The lower scenario results are revised from the ERP2 discussion document. They result in about 29,000 fewer hectares of exotic afforestation over 2024–26, and removals reduced by about 0.3 and 1.9 Mt CO₂-e for the lower scenario during the EB2 and EB3 respectively.

²⁰ Target accounting emissions include gross emissions, along with a subset of forestry and land-use emissions and removals. Target accounting is designed to be compatible with net emissions targets, under which business-as-usual removals from pre-1990 forests are not counted. Only emissions and removals due to additional human activities are counted. This means emissions from deforestation are counted for all forests, but to address permanence, removals from afforestation are only counted for post-1989 forests up until their long-term average is reached.

Forestry and wood-processing policies that support the displacement of emissions from other sectors contribute to reducing emissions (eg, wood products replacing higher-emissions products). However, these impacts can be hard to model because of differences in underlying assumptions, high uncertainty and the potential for double counting.

Removals and reductions from forestry and wood processing

Forestry removes carbon dioxide from the atmosphere, reducing net emissions. Wood processing can reduce gross emissions by producing high-value products to replace emissions-intensive ones such as steel and concrete.

The Government's strategy is to restore confidence and certainty in the forestry and wood-processing sector. This will unlock its full potential to help rebuild the economy, expand exports and meet our climate targets, while balancing productive land uses between forestry and agriculture.

The policies and initiatives included in this plan are part of a wider government programme and will further build confidence by getting the incentives right for forestry and improving the investment environment for high-value wood processing.

Policies and initiatives

Encouraging afforestation through appropriate incentives

Over the last few years, we have seen greater investment in forestry, particularly exotic forestry, due to the significant increase in the New Zealand Emissions Trading Scheme (NZ ETS) price. The increased planting will help us meet emissions budgets cost-effectively through the carbon stored as the forests grow. It supports other forestry objectives – for example, for sustainable land management and increased fibre supply.

It is important to balance productive land use between forestry and agriculture. If left unchecked, increases in farm conversions to forestry on high-quality land can affect those with interests in these sectors, local communities and food production. Appropriate incentives, including restoring price stability and confidence in the NZ ETS ([chapter 4](#)), will balance encouraging afforestation for increased carbon sequestration with other land uses. The following policies aim to achieve this.

Limiting whole-farm conversions to NZ ETS forestry to protect highly productive farmland

The Government is taking action to protect productive farmland and support sustainable forestry growth. At current (and higher) NZ ETS prices, exotic forests are cost-competitive with pastoral land uses, driving whole-farm conversions to forests. While these forests can help us meet our climate targets, they can also have undesirable impacts on rural communities, agricultural supply chains, local employment, economic activity and land-use flexibility.

We are fixing this by limiting the number of NZ ETS registrations for whole-farm conversions to exotic forestry on high-quality productive land. This policy aims to balance productive land uses to ensure the best use of land for New Zealand in the long term and retain farmers' flexibility.

Although the proposals will involve some change to current NZ ETS settings, the aim is to provide greater certainty in the NZ ETS in the medium term through clear rules to support forestry investment and emissions reductions.

Partnering with the private sector to plant trees on Crown-owned land

The Government is exploring opportunities to partner with the private sector to plant trees on Crown-owned land (excluding national parks) that is of low conservation value and low farming value. These public-private partnerships could help New Zealand meet climate change targets and create more jobs in the forestry and wood processing sector.

There are opportunities to plant both exotic and native trees on Crown-owned land. Exotic forestry sequesters carbon more quickly and offers a way to use land more productively where suitable for plantation forestry. Native forests grow more slowly, but can provide longer-term carbon sinks and co-benefits, including biodiversity and adaptation.

The Government will release a request for information in late December which will help clarify the circumstances and conditions under which potential partners are interested in taking forward opportunities to plant on Crown-owned land. This will help the Government understand what land may be suitable to offer for partnership. Proposed afforestation on Crown-owned land will not contribute to achievement of EB2, but can contribute to reaching net zero for all greenhouse gas emissions, except biogenic methane, by 2050. The [technical annex](#) provides further details of the impact of this policy on sufficiency.

Boosting wood processing

Boosting wood processing will result in more long-lived wood products, which store carbon during their lifetime. It will also grow the economy, provide regional jobs and create export potential. There are significant opportunities for growth in these products. For example, modern engineered timber in construction could replace emissions-intensive materials such as steel and concrete, while also storing carbon. We expect that wood solutions will become more mainstream, and their costs will continue to fall.

The low-grade logs we currently export could be used to produce high-value wood products, including:

- engineered wood products such as GluLam, laminated veneer lumber and remanufactured timber
- reconstituted panels such as oriented strand board, medium-density fibreboard, particle board, chipboard and plywood
- bioproducts and materials, such as adhesives, paints, polymers, advanced packaging, refined carbon, textiles and plastics
- bioenergy, such as white and black pellets, marine fuel, biodiesel and aviation fuel.

We are also investigating providing NZ ETS credits for wood processors based on the embedded carbon captured in longer-life timber products.

[Chapter 8](#) includes actions to improve access to information for choosing sustainable building products.

Increasing the supply of woody biomass

Woody biomass can comprise any woody material from a forest, including material left after harvest, residues from wood processing (ie, sawdust and woodchips) and logs from plantings of fast-growing trees (ie, pulp forest or biomass crops). Woody biomass can be used as a feedstock to produce low-emissions fuel substitutes such as wood pellets. These produce high-temperature heat for industry and sustainable aviation fuel.

We are progressing a biomass planting programme (5,000 hectares of plantation forest is planned) to increase the supply of biomass in targeted regions and to give insights for private investment in supply-side infrastructure. Research underway will also improve guidance on growing and harvesting woody biomass. In the future, we can expect more industrial process heat to be fuelled by woody biomass.

Improving the consenting framework for wood processing

The Government is improving the resource consenting framework for wood processing to make it easier to establish new facilities and to re-consent existing ones. This will give wood processors longer-term certainty to invest in production and innovation. We have begun to improve consenting for infrastructure and other activities that will support forestry and other primary production, including through the fast-track regime discussed in [chapter 7](#).

For wood-processing facilities, we are proposing to mandate a maximum processing time of one year for consents of both new and existing wood-processing facilities. We are also considering options to streamline re-consenting of existing facilities. This work will be progressed as part of the Resource Management Act 1991 reform.

Ensuring the Wood Processing Growth Fund continues to support commercial investment

Set up in 2003, the Wood Processing Growth Fund (WPGF) helps wood processors increase New Zealand's onshore capacity. By boosting domestic wood processing, the WPGF will support the sector to store more carbon in long-lived wood products.

The fund seeks to unlock private capital through investment support to overcome the barriers facing the industry. In its first year, the WPGF has made investments that are:

- supporting a shift to higher-value wood manufacturing, enabling the manufacture of high-value products (eg, engineered timber) from the industrial-grade logs that are currently exported unprocessed
- supporting new manufacturing developments for Radiata pine clearwood, creating appearance timbers that compete with hardwoods in premium export markets

- showing that there is unmet demand for alternative species timbers that command premium prices, and that small-scale assistance is effective for them to scale up significantly.

Balancing forestry and the environment

Forestry has several environmental co-benefits, including erosion control (eg, intercepting rain, reducing run-off and sedimentation, and anchoring erosion-prone soils). These will become increasingly important for adaptation as severe weather events rise in frequency. More information on adaptation is in [chapter 16](#).

Forestry can also have negative impacts if not managed well. These impacts include risks to water quality and biodiversity, and a greater risk of wildfires and wilding conifers. Increasingly severe weather events can mobilise slash and other woody debris from forests to damage downstream infrastructure, property and low-lying areas.

We understand the need for environmental policies and regulations to help manage the risk of negative impacts.

The National Environmental Standards for Commercial Forestry (NES-CF) are the main regulatory instrument for managing the environmental impacts of commercial forestry. They provide nationally consistent standards for managing eight of the main activities carried out by commercial forests, including afforestation, harvesting and replanting.


The NES-CF is part of the broader resource management framework, which is currently being reformed. The reform includes a **review of slash management regulations** in the NES-CF to ensure they are evidence-based and fit for purpose. Amendments will enable foresters and councils to focus on the most at-risk areas in order to prevent mobilisation that harms freshwater environments and downstream communities.

As part of changes to the Resource Management Act 1991, we are **strengthening the penalties regime**, with the guiding principle that low-risk activity should be permitted. However, penalties exist for people who break the rules. This includes any offences in forest harvesting, such as failure to comply with slash management regulations.

The Government is also **developing national direction for natural hazards**. This could cover other environmental risks linked to forests, such as landslips, erosion and wildfire. This work is expected to cover commercial forests and to direct councils on how to identify natural hazards, assess the risks and respond through their planning and consenting.

12. Non-forestry removals

Ngā tangohanga ngāherehere-kore

<h3>Chapter at a glance</h3> <p>Non-forestry removals</p> 	
Lead Minister	<ul style="list-style-type: none"> Hon Simon Watts, Minister of Climate Change
Why this sector is important	<ul style="list-style-type: none"> Recognising non-forestry removals could provide additional options for reducing net emissions and achieving climate targets. It could also create incentives to change land use or management practices that lower net emissions and deliver other co-benefits, such as improved water quality, biodiversity and climate resilience.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Nature-based solutions address climate change.
Key actions and policies	<ul style="list-style-type: none"> Developing a framework to recognise non-forest removals, assess which categories are ready to be recognised and identify any gaps.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> More work is needed to understand the role of non-forestry removals in achieving New Zealand's domestic and international targets.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> No, but its inclusion may be investigated as an option for some removals.

What are non-forestry removals?

Emissions removals are human-induced activities that draw carbon dioxide from the air or ocean and store it in rocks, on land, in ocean reservoirs or in products such as construction materials.

The following are examples of non-forestry removals.

- **On-farm vegetation.** Some on-farm vegetation, such as riparian plantings (next to rivers and streams) and shelterbelts, sequesters carbon and improves water quality and biodiversity. Currently, the scientific data on how much carbon these types of vegetation removes are uncertain. Improving the science specific to New Zealand will require further investigation.
- **Wetlands and peatlands.** Managing and restoring wetlands and peatlands can protect existing carbon stores, enhance carbon uptake, increase biodiversity, improve water quality, and protect against flooding and drought. Estimates show a significant potential for reducing emissions if drained peatlands are rewet.
- **Coastal vegetation management (blue carbon).** Better management of coastal land such as wetlands, mangroves and sea grasses can protect existing carbon sinks and establish new ones. Restoration can also benefit coastal and marine ecosystems and social outcomes.

Many activities act as both a sink and a source of emissions. For example, a carbon sink can become a source of emissions if vegetation is removed or if ecosystems are disturbed or degraded.

Other categories

Some other types of removal include carbon capture and storage (CCS), enhanced rock weathering and biochar.²¹ These can remove atmospheric carbon and store it on a permanent basis. [Chapter 7](#) has more detail. Other examples are marine ecosystems, carbon mineralisation and ocean fertilisation, and technology-based activities.

Approach to increasing non-forestry removals

Carbon sequestration can occur through biological, geological, oceanic, chemical and technological processes. Alongside forestry, we will assess other forms of removing emissions that may become viable.

In practice, we will prioritise the most promising technologies, based on affordability, scalability, scientific validation and overseas acceptance.

Factors for recognising these removals include:

- robust scientific validation of sequestration at a standard consistent with the Greenhouse Gas Inventory
- additionality (where the reductions or removals are due to a specific intervention and would not otherwise have occurred)
- recognition (or ability to achieve recognition) under New Zealand's international agreements.

²¹ Biochar is stable, carbon-rich material produced by heating biomass in an oxygen-limited environment. It may be added to soils to improve soil functions, to reduce greenhouse gas emissions from biomass and soils, and for carbon sequestration.

Why it helps to recognise non-forestry removals

Recognising and rewarding non-forestry removals draws a lot of interest – for example, from people restoring local habitats and from farmers improving the sustainability of their land.

The Government is exploring recognition of non-forestry removals in the New Zealand Emissions Trading Scheme (NZ ETS) or another mechanism, which would require changes to the Climate Change Response Act 2002.

Recognising non-forestry removals could be an incentive that rewards businesses or land owners for their efforts. To ensure any scheme remains balanced, the incentive may also need to be paid back if the removals are later lost (eg, when vegetation is cleared). This is the approach that the NZ ETS takes for forestry.

Recognition could also offer more options for land owners and businesses, create incentives to shift to land use or management that reduces net emissions, and offer other co-benefits, such as better water quality, biodiversity and climate resilience from wetlands. Non-forestry removals can also ensure New Zealand is not reliant solely on forestry offsets.

How non-forest removals could be recognised

Different removal activities are at different stages of scientific readiness for recognition in New Zealand. Activities such as peatland restoration could be viable now. However, some activities, such as coastal vegetation management, require further international and New Zealand-specific data and evidence before they can be recognised. The Government will prioritise activities that are viable and have maximum impact.

Exploring whether non-forestry removals can contribute to our targets

More work is needed to understand the role of non-forestry removals in reaching New Zealand's domestic and international targets. Compared with forestry, the potential carbon sequestration is likely to be small in the short to medium term. Changes to our national accounting would also be needed so that New Zealand could count any non-forestry removals towards the targets. This would also mean that emissions from these categories would count against the targets, potentially making these harder to meet in the short to medium term.

Setting a framework to recognise non-forest removals

There is a range of mechanisms that could recognise non-forest removals. We will develop an assessment framework to identify whether removals are ready to be recognised, and to identify any gaps. Work on the assessment criteria is progressing.

Purpose

The framework will help us assess a category's readiness for recognition in the NZ ETS or another mechanism. It will provide the private sector with a recognition pathway that will encourage investment, expanding the portfolio of removals. The categories with larger carbon sequestration potential will be prioritised for assessment when they are ready.

Assessment criteria

There are two criteria for recognising a non-forest removal:

- it counts towards our Nationally Determined Contribution (NDC)
- it is recognised in the NZ ETS or another mechanism.

Assessing inclusion in the NDC

Currently, forestry is the only land-use category that New Zealand counts towards its NDC. Including non-forest land use is likely to represent an increase in ambition, as New Zealand will have to account for both emissions and removals occurring on that land. It will expand opportunities to use removals other than forestry to meet our international targets, in line with other developed countries.

We will evaluate the best approach to expanding the NDC to include non-forest categories before inclusion in a market system, protecting the integrity of the system. We will use criteria such as: the category meets the Paris Agreement principles; it is supported by strong science; and it meets the minimum Intergovernmental Panel on Climate Change data requirements.

Assessing the recognition mechanism

A process for recognising and assessing non-forest removals is set out in figure 12.1.

To assess which mechanisms could recognise a removal category, an impact analysis will determine the costs and benefits. This will include the volume of removals that could be generated, the cost to participants and the Government, and the impact on market credibility and on iwi and Māori.

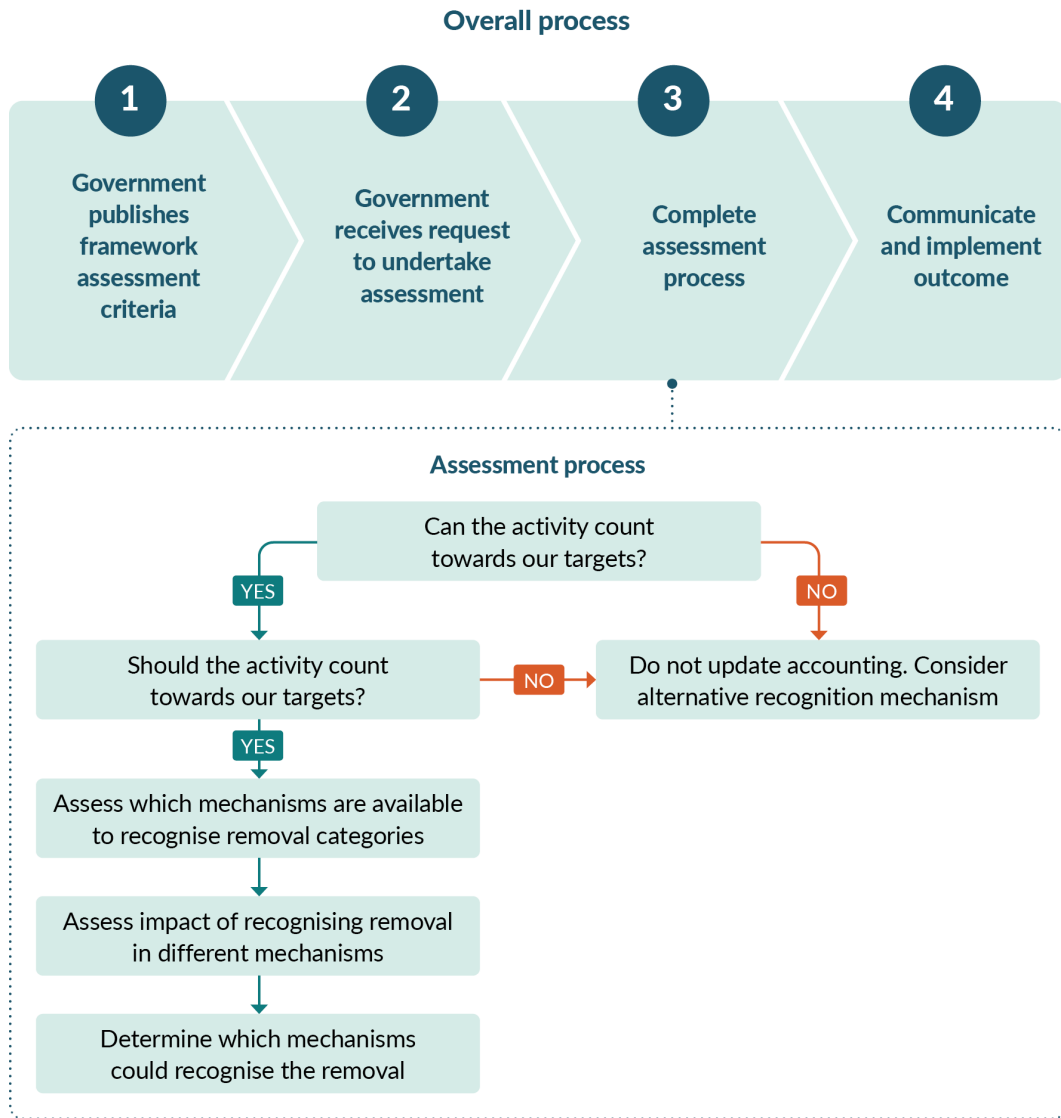
This will include assessing which mechanisms, other than the NZ ETS, are available to recognise removal categories. Some potential mechanisms need further policy work.

The Government will then decide whether to recognise the removal category:

- in the NZ ETS, under current policy settings and in line with cost-effective, market-led climate action, and/or
- through an alternative mechanism to add to net reductions.


Officials will then work towards implementing the recognition in the appropriate mechanisms.

Figure 12.1: Process for recognising and assessing non-forest removals



13. Waste

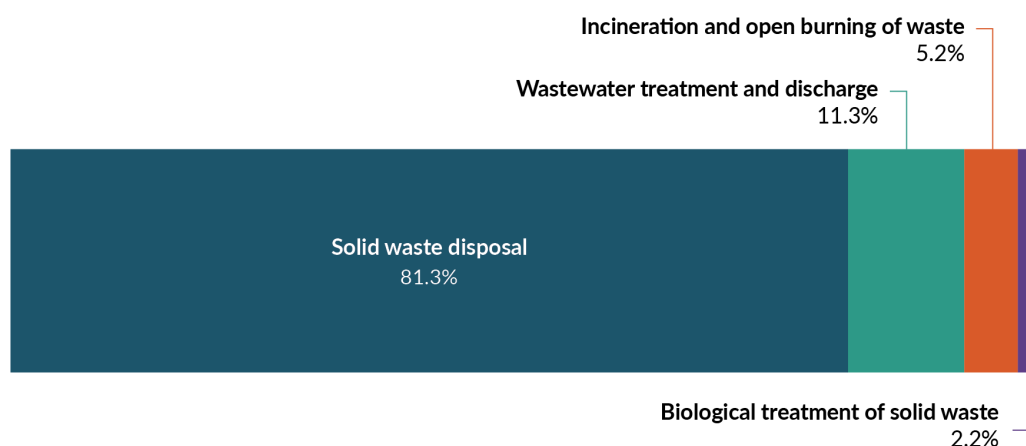
Te para

<h3>Chapter at a glance</h3> <p>Waste </p>	
Lead Minister	<ul style="list-style-type: none"> Hon Penny Simmonds, Minister for the Environment
Why this sector is important	<ul style="list-style-type: none"> Waste is an important issue for New Zealanders. Although emissions from waste are not the largest contributor, reduction and efficiency improvements can play a key role in reducing domestic emissions, including of biogenic methane. Enabling investment in resource recovery systems and infrastructure will help households and businesses reduce their waste and its emissions.
Pillars of New Zealand's Climate Strategy	<ul style="list-style-type: none"> Infrastructure is resilient and communities are well prepared. Credible markets support the climate transition.
Key actions and policies	<ul style="list-style-type: none"> Making further targeted investment in resource recovery infrastructure and systems (including for construction and demolition waste). Investigating ways of improving organic waste disposal and landfill gas capture. Implementing a regulated product stewardship scheme for refrigerants.
Contribution during the second emissions budget period	<ul style="list-style-type: none"> Waste Minimisation Fund: -1 Mt CO₂-e. Organic waste management and landfill gas capture: -0.8 Mt CO₂-e. Regulated product stewardship scheme for refrigerants: -0.4 Mt CO₂-e.
Is the sector covered by the New Zealand Emissions Trading Scheme?	<ul style="list-style-type: none"> Yes

Emissions profile

In 2022, the waste sector produced an estimated 3.5 Mt CO₂-e (about 4.5 per cent) of New Zealand's gross greenhouse gas emissions. Waste emissions were comprised of methane (93.3 per cent), nitrous oxide (4.3 per cent) and carbon dioxide (2.4 per cent). Figure 13.1 shows the proportion of emissions by activity.

Figure 13.1: Waste emissions by activity, as at December 2022



Investing in resource recovery

Waste is an important issue to New Zealanders. By reducing waste, we can also reduce its emissions. Initiatives for the second emissions reduction plan focus on biogenic methane, because it is the main greenhouse gas produced by waste disposal.

Policies and initiatives

Supporting investment through the Waste Minimisation Fund

New Zealand has a waste disposal levy that is paid on each tonne of waste sent to most landfills in the country.²² The revenue is reinvested through the Waste Minimisation Fund (WMF) and through an allocation to territorial authorities (councils) to invest in local and regional waste minimisation solutions. Since 2022, the WMF has supported infrastructure projects that divert organic materials from landfill, process organic waste or otherwise improve resource recovery, particularly for organics.

New Zealand has a deficit in resource recovery infrastructure²³ relative to comparable countries like Australia. Although local government and the waste sector continue to improve waste services, households and businesses still face challenges in recycling unwanted resources that would also help them to reduce emissions.²⁴

²² Excluding class 5 landfills, industrial monofills and farm fills.

²³ In 2020, New Zealand had a waste management infrastructure deficit of an estimated \$2.1–\$2.6 billion. Additional service funding needs amounted to about \$0.9 billion. More recent (2024) industry estimates suggest a \$4 billion deficit.

²⁴ Waste-related emissions include both disposal emissions (biogenic methane from biodegradable wastes) and the embodied emissions in wasted products and resources. Metals, concrete and plastics have relatively high embodied emissions, but are relatively inert in landfills.

The Government has committed to waste minimisation investment priorities (for the WMF) that will also help reduce emissions, including during the second emissions budget (EB2) period. It is assumed a proportion of the WMF will target infrastructure projects and systems that reduce organic waste and emissions (and other waste streams), including those that:

- divert and process organic waste, including from construction and demolition
- develop and implement schemes for businesses, manufacturers and consumers to take responsibility for the products they produce and buy (product stewardship schemes)
- expand and upgrade resource recovery facilities (including transfer stations)
- investigate and develop infrastructure and regulations for renewable energy recovery from hard-to-recycle materials (eg, treated wood waste).

Waste minimisation investments are cost-effective.²⁵ They also offer co-benefits, such as encouraging co-investment from the private sector (commercial projects can contest for WMF funding and require at least 60 per cent as co-funding), and reducing pressure and cost on local government to develop infrastructure, alongside industry and community partners, to meet business and consumer expectations for affordable alternatives to landfill.

Investigating improvements to organic waste disposal and landfill gas capture

In 2004, regulations were introduced requiring landfills that accept municipal waste with a capacity of over 1 million tonnes of waste to capture their emissions.²⁶ Large municipal landfills that meet this threshold have landfill gas (LFG) capture systems. Despite New Zealand's historically high level of waste per capita, waste emissions have reduced – indicating better management. There may be opportunities to further reduce emissions, including through LFG capture.

Landfill gas capture

Landfill gas (LFG) capture is technology that captures the biogenic methane emissions from organic waste in landfills. A network of gas wells and pipes is installed into waste in a landfill. This captures a portion of the gas that the waste produces as biodegradable materials break down. Methane and other gases are captured and then flared (ie, converted to carbon dioxide, which has less potent warming effects) and sometimes used to generate energy.

Actions to reduce landfill emissions

The waste sector broadly supports policy to progress reducing emissions from organic waste. We will work with the sector to further investigate how we dispose of and manage organic waste streams in order to:

- encourage diversion of organic materials from landfill
- determine which landfill types accept which types of organic waste, and the impact on the waste disposal levy

²⁵ Recent waste minimisation investments targeting emissions reductions are forecast to achieve an average abatement of about \$30 per tonne of CO₂-e across the life of the assets.

²⁶ Resource Management (National Environmental Standards for Air Quality) Regulations 2004. See Ministry for the Environment. *National environmental standards for air quality*. Retrieved 1 July 2024.

- review the scope of landfills that require LFG capture systems
- improve settings to raise the average LFG capture efficiency
- extend the New Zealand Emissions Trading Scheme (NZ ETS) to a wider range of landfills
- improve data and evidence to support LFG capture efficiency calculations and reporting, and accurate NZ ETS accounting.

We will consider the emissions reduction potential and costs of any regulatory changes.

A regulated product stewardship scheme for refrigerants

Refrigerants are essential for heating, ventilation, air-conditioning and refrigeration (HVACR). They enable the ‘cold chain’ for transporting and storing perishable food and medicines, and are critical to the domestic and export economy.

Fluorinated gases (F-gases) are just under 2 per cent of New Zealand’s gross greenhouse gas emissions. F-gases are mainly used as refrigerants in heating and cooling appliances. Hydrofluorocarbons (HFCs) are a subset of F-gases, and they contribute significantly to global warming despite being emitted in relatively low quantities.²⁷ This is due to their global warming potential, which can be thousands of times greater than carbon dioxide.

Most refrigerant emissions are from leaks in improperly installed or maintained equipment, and from disposal of end-of-life equipment. Refrigerant emissions are not necessary for effective HVACR services in New Zealand, and can be prevented with existing technology and practices.

A regulated scheme from 2025

The first emissions reduction plan included an investigation proposal for a refrigerant regulated product stewardship scheme. In 2022 we consulted on a proposal, and subsequent work progressed this. A regulated scheme is coming into effect from 2025. It will reduce emissions through improved industry training standards and ensuring the purchase and disposal of synthetic refrigerants is done in accordance with the scheme. An additional 0.4 Mt CO₂-e of abatement can be achieved in the EB2 period and 0.7 Mt CO₂-e in the third emissions budget period, with impact on emissions budgets from 2027 onwards. This will help bring New Zealand up to widely adopted international best practice.

²⁷ HFCs are used across various sectors and reported in the New Zealand Greenhouse Gas Inventory as a source subcategory under the industrial processes and product use (IPPU) sector. IPPU emissions are distinct from waste emissions from disposal.

Businesses, communities and households in the transition

Ngā pakihi, ngā hāpori me ngā wharenoho i te whakaumutanga

This section outlines the expected impacts of the second emissions reduction plan on different groups of New Zealanders and sets out government support to mitigate these.

- ▶ Addressing the impacts of climate mitigation policy (*chapter 14*)
- ▶ Mitigating impacts with Māori (*chapter 15*)
- ▶ Helping sectors to adapt while they reduce emissions (*chapter 16*)



14. Addressing the impacts of climate mitigation policy

Te whakatutuki i ngā pāpānga o te kaupapahere whakamauru panoni āhuarangi

Chapter at a glance

Addressing the impacts of climate mitigation policy



Lead Minister	<ul style="list-style-type: none"> Hon Simon Watts, Minister of Climate Change
Why addressing the impacts of climate mitigation policy is important	<ul style="list-style-type: none"> Addressing the impacts of climate mitigation policy supports New Zealanders to manage challenges from reducing emissions and seize low-emissions opportunities.
Key actions and policies	<ul style="list-style-type: none"> Taking a cost-effective mitigation approach to minimise impacts. Returning proceeds of New Zealand Unit auctions to low- and-middle-income households through income tax bracket adjustments. Continuing existing Government financial and retraining support. Providing targeted support for Māori through the Māori Climate Platform. Monitoring impacts and responding with further support when necessary.

Impacts across the economy and society

Meeting New Zealand’s climate targets will involve businesses, communities and households in making different choices about how they trade, work and live. These choices will create benefits for New Zealanders, including new, low-emissions jobs and business opportunities.

In addition, meeting targets is expected to have additional benefits from the avoided loss of international reputation that could result in trade impacts in key export markets. The benefits are difficult to quantify but are likely to be widely distributed. In this chapter we focus just on the distribution of the costs.

We have analysed the expected impacts of the second emissions reduction plan (ERP2) for different groups of New Zealanders. This was informed by modelling, qualitative analysis by government agencies, and public feedback during consultation. It shows that:

- the policies in ERP2 are consistent with meeting the second emissions budget, without adding significant costs to households
- the impacts will likely be similar to what is projected without ERP2 policies; they are also expected to be similar to the initial analysis included in the ERP2 discussion document
- ERP2 will have very limited impact on inflation or the cost of living. The impacts mainly come from emissions pricing.



Table 14.1 shows the expected impact on the cost of living for households with different income levels, before and under ERP2.

Table 14.1: Household expenditure resulting from New Zealand Emissions Trading Scheme prices before and under ERP2

Household income type	Annual expenditure in 2030*			
	Before ERP2**		Under ERP2***	
	Expenditure (in 2024 dollar terms)	As % of annual household income	Expenditure (in 2024 dollar terms)	As % of annual household income
Average	\$585	0.6%	\$705	0.7%
Lowest (deciles 1 and 2)	\$310–335	0.9–1.2%	\$370–400	1.0–1.4%
Highest (deciles 9 and 10)	\$840–975	0.4%	\$1,010–1,175	0.5%

* This estimates the amount of annual household expenditure on New Zealand Emissions Trading Scheme prices that are included in the cost of other goods and services, mostly fuel and electricity.

** Based on the impact of emissions reduction policies in place before the introduction of ERP2.

*** Based on the impact of emissions reduction policies introduced through ERP2.

The modelling:

- suggests that the economy will grow between now and 2050, increasing New Zealand’s prosperity
- extends the current economic structure out to 2050
- does not predict what the future economy will look like, with new goods, services and exports.

Table 14.2 summarises the impacts that emerged from our analysis. For full analysis, see the [technical annex](#).

Table 14.2: Key impacts of ERP2 policies

Group affected	Impact
Households	<ul style="list-style-type: none"> • New Zealand households are, on average, expected to have only marginally lower consumption in 2050 than they would have without efforts to reduce emissions. • Lower-income households are expected to be the most affected by higher household and transition costs. This includes a disproportionate number of disabled people, and people from Māori and Pasifika communities.
Employees and employers	<ul style="list-style-type: none"> • Agriculture is expected to be the most affected sector. Agricultural output (in GDP terms) is expected to be higher in 2050 than today, but lower than it would be without any mitigation actions, mainly because of land-use changes to forestry. Agricultural manufacturing is similarly affected. • Farm owners may benefit from changes in land use to forestry. However, workers on farms and in agricultural manufacturing may face disruption, reduced opportunities, and the need to re-skill and change careers. • Other sectors are less affected. Further details are in the technical annex.
Regions	<ul style="list-style-type: none"> • Regional impacts are mainly driven by the mix of industry in each region and how they are affected by the changes in land use. The impact on specific areas varies significantly, depending on forest and farm type, and region. • More affected areas, such as Southland and the West Coast, have a risk of disruption through lower local employment, the need to retrain local workers, reduced population for small communities and greater exposure to climate risks.

Group affected	Impact
Iwi and Māori	<ul style="list-style-type: none"> Māori households are expected to be marginally more affected than non-Māori households. Māori are more likely to be affected by economic transitions, as they start from a position of greater socio-economic disadvantage. Māori are disproportionately affected by expected land-use changes from agriculture to forestry, because they have high involvement in agriculture and forestry, and disproportionate ownership of lower-quality land.
Youth	<ul style="list-style-type: none"> A strong focus on forestry to meet the budgets and targets leaves future generations with high gross emissions that must be either reduced or offset through further removals. Both come with costs and economic trade-offs, but these may be reduced somewhat by future technological advances. Large areas of forestry must be maintained to prevent the release of stored carbon. This limits land-use flexibility for future generations.

Note: GDP = general domestic product.

Strategy to mitigate impacts

Our efforts to minimise the costs of climate action to New Zealanders mean that existing, funded support measures are able to reduce impacts on those who are affected. Listed below, they give people options to manage the disruptions and changes stemming from Government policies to reduce emissions.

We are focused on reducing the impacts on the cost of living and have already taken several actions to ease this. Through Budget 2024, proceeds of the auction of New Zealand Units have been returned to low- and middle-income households as part of the adjustment to income tax brackets. We are also supporting families with young children through the FamilyBoost tax rebate.

The commitment to cost-effective climate policy will ensure every dollar spent has the maximum possible impact. However, we know that impacts are uncertain and may emerge over time. We will continue to monitor them and respond with further support when necessary.

Financial support

Financial support will benefit all groups. Existing government financial assistance and the income support system (including the Winter Energy Payment) will help New Zealanders who are facing higher costs or employment challenges related to emissions reduction efforts.

Many of these supports are indexed to the consumer price index. As the cost of goods and services increases, some benefits will increase as well. This will further offset financial impacts for lower-income households.

The Government's 'climate dividend' tax relief began in 2024. It is returning money from New Zealand Emissions Trading Scheme (NZ ETS) revenue to New Zealanders to meet rising costs, including from mitigation. While all taxpayers benefit from this, it will bring extra relief to those who are likely to face the greatest additional costs.

Support for retraining

Several supports are available for employers or employees looking to re-skill or up-skill to respond to mitigation efforts. These include a range of government employment services available through the Ministry for Social Development and Apprenticeship Boost, which provides financial aid for employers to take on and retain apprentices.

Employees will have pathways to retrain if changes lead to fewer jobs in their line of work. Employers will have greater access to needed skills and be supported to provide training for potential workers. Retraining support will be particularly important for people in the regions and Māori, as they may be more at risk of disruptions to employment.

Providing information

The Government's Climate Data Initiative, currently under development, will equip New Zealanders with data and tools related to climate mitigation. This will give people and businesses the information they need to decide on a way to manage the economic and social effects of climate policies.

Targeted support for Māori

The Māori Climate Platform will focus on investing in Māori-led climate action to ensure whānau, hapū and iwi are at the forefront of the Government's climate response. [Chapter 15](#) has more information on how the impacts on Māori will be lessened.

The Government also supports Māori through programmes such as the Māori Agribusiness Extension Programme and Māori-led approaches to reducing biological emissions. These programmes support Māori agribusinesses to:

- identify, develop and implement innovative, scalable and culturally appropriate ways to reduce emissions
- enhance resilience in food and fibre production
- improve overall sustainability.

Sector-specific support

Some of the largest distributional risks we can see are caused by conversions from farmland to forestry. These will impact regional communities, Māori and agricultural manufacturing. We have taken steps to reduce these impacts by:

- committing to limit on-farm conversions registering in the NZ ETS, to restrict shifts on productive land from agriculture to forestry
- delaying the pricing of agricultural emissions
- providing substantial support for research and development on mitigation tools for farming in order to offer alternatives to land-use change.²⁸

See [chapter 10](#) and [chapter 11](#) for more detail.

²⁸ Including investing in the Centre for Climate Action on Agricultural Emissions, support for the Global Research Alliance on Agricultural Greenhouse Gases and funding through the Sustainable Food and Fibre Futures Fund.

15. Mitigating impacts with Māori

Te whakamauru i ngā pāpānga ki te Māori

Chapter at a glance	
Mitigating impacts with Māori	
Lead Minister	<ul style="list-style-type: none">Hon Simon Watts, Minister of Climate Change
Why mitigating impacts with Māori is important	<ul style="list-style-type: none">Recognising the Treaty of Waitangi, this section underscores a partnership approach in climate action. It stresses the importance of including Māori in the development and execution of climate policies, ensuring these actions are fair and that Māori perspectives and Treaty rights are acknowledged and respected.
Key actions and policies	<ul style="list-style-type: none">Fostering partnership in climate action. Engage with Māori on a partnership basis to integrate their insights and priorities in shaping responsive and inclusive climate policies.Supporting Māori-led solutions. Empower Māori communities through targeted support and funding, via the Māori Climate Platform, to develop and lead their own climate solutions.Building resilient communities. Enhance the adaptive capacity of Māori communities to respond to the impacts of climate change, promoting sustainability and resilience through tailored capacity-building and resource allocation.



Approach

As New Zealand reduces emissions, the Government and Māori will need to work together to address risks and realise opportunities for the Māori economy. [Chapter 14](#) describes the specific impacts of climate policies on Māori.

This chapter outlines the Government's plan to:

- give effect to the principles of the Treaty of Waitangi
- lessen the impacts of climate policies on iwi and Māori.

Four principles guide the implementation of the plan.

- **Existing universal support.** As outlined in [chapter 14](#), government financial assistance and the income support system will help New Zealanders, including Māori, who are facing higher costs or employment challenges related to actions to reduce emissions.
- **Sector-led initiatives.** We aim to support sector-specific initiatives with Māori, such as the Ministry for Primary Industries' Māori-led Approaches to Reducing Biological Emissions, subject to ongoing evaluations and available resources. These programmes prioritise Māori participation and leadership in sectors with a disproportionate impact on Māori communities, particularly in rural and land-based economies.
- **Māori-led climate priorities.** The Māori Climate Platform enables action by Māori communities to adapt, lead local resilience efforts and build on opportunities to reduce emissions.
- **Recognising mātauranga Māori as a guide to local action.** The Government recognises the importance and opportunity of mātauranga Māori to iwi, hapū and whānau as a guide to reducing emissions and adapting at place.

Māori Climate Platform

The Government is continuing the Māori Climate Platform as a place to foster partnership and support Māori-led climate action. It focuses on enabling outcomes in key areas such as resilience, renewable energy, sustainable land use and nature-based solutions. These projects can be designed to mitigate climate impacts on Māori communities, while aligning with the Climate Strategy.

Fostering partnership in climate action

The second emissions reduction plan supports Māori-led initiatives through the Māori Climate Platform, which drives:

- funding and resources for Māori-led projects to reduce emissions at place
- community-based adaptation initiatives tailored to local Māori needs
- greater Māori involvement in the design and implementation of climate policies across key sectors.

Partnering with the National Iwi Chairs Forum

Mitigation of adverse climate impacts is a key aspect of the Ministry for the Environment and Pou Take Āhuarangi²⁹ joint work programme. Pou Take Āhuarangi have conducted a comprehensive adaptation risk stocktake, assessing vulnerabilities across 1,062 marae and identifying high-risk sites affected by climate impacts such as flooding and coastal erosion.

The joint work programme has also piloted focused climate risk assessments for marae. This work has highlighted immediate action pathways, including infrastructure upgrades like flood defences and water storage.

These efforts build our understanding of the spectrum of needs within Māori communities and support targeted mitigation work and resilience planning for marae under climate pressure.

²⁹ Te Pou Take Āhuarangi is the climate group (pou) within the National Iwi Chairs Forum.

16. Helping sectors to adapt while they reduce emissions

Te āwhina i ngā rāngai kia urutau haere i a rātou e whakaheke tukunga ana

Chapter at a glance

Helping sectors to adapt while they reduce emissions



Lead Minister	<ul style="list-style-type: none">• Hon Simon Watts, Minister of Climate Change
Why this is important for sectors	<ul style="list-style-type: none">• Climate change will affect different sectors in different ways. If sectors do not consider the risks and manage the impacts, they will become less efficient over time, which will affect their ability to reduce their emissions.
Key actions and policies	<ul style="list-style-type: none">• Implementing the three adaptation goals for the second emissions reduction plan.<ul style="list-style-type: none">- Goal 1: Sectors understand climate risks and opportunities as they reduce emissions.- Goal 2: Actions to reduce emissions deliver adaptation co-benefits and avoid maladaptation.- Goal 3: Efforts to reduce emissions build future resilience.

Improving how New Zealand adapts to climate change

New Zealand must take action to adapt to the impacts of climate change. If sectors do not consider the risks and manage the impacts, they will become less efficient over time, and this will affect their ability to reduce their emissions.

The Government has several existing initiatives to support sectors to adapt, including those described below.

The [first national adaptation plan](#) (NAP1) aims to help New Zealand prepare for the impacts of climate change. It has four priority areas for adapting by 2028, and addresses the priority risks identified in the first [National Climate Change Risk Assessment](#).³⁰

Work is underway on the [adaptation framework](#), which is expected to:

- minimise expected long-term costs
- ensure responses and funding support to property owners, if any, are predictable, principled and rules-based wherever possible
- improve information flows on climate risk and response
- address market failures and support market efficiency
- ensure people have the incentive and ability to manage risks.

Sectors also have a responsibility to ensure they are resilient and can adapt. There are initiatives across the private sector to raise understanding of climate risks, impacts and ways to manage them. For example, [The Aotearoa Circle](#) has worked with many sectors on [sector-level analysis](#) to develop climate change scenarios as part of its climate-related disclosures. For some sectors, the scenarios have informed adaptation pathways.

Some businesses are already assessing risks and opportunities for their own operations, and managing them, but others will need more support.

³⁰ Under the Climate Change Response Act 2002, the Government must publish a national adaptation plan (NAP) to set out how it will address the most significant risks identified in the National Climate Change Risk Assessment (NCCRA). NAP1 was published in 2022, and each NAP must be published within two years of the latest NCCRA. The next NCCRA is due in 2026.

CASE STUDY

Energy fund builds resilience of community buildings

Pillar 1: Infrastructure is resilient and communities are well prepared

Pillar 3: Clean energy is abundant and affordable



Image: Cook Islands Community Hall in Flaxmere

The Community Renewable Energy Fund, administered by the Ministry of Business, Innovation and Employment, is funding the installation of solar photovoltaic (PV) and battery systems on community buildings to reduce emissions and enhance resilience.

This fund aims to improve the capacity of community halls, marae, church buildings and schools to operate during and after civil emergencies. For example, many community halls and marae in areas affected by Cyclone Gabrielle played a critical role in the civil defence response. They opened their doors to the people in their community, providing them with temporary shelter and allowing evacuation to be done safely.

One of the sites that has benefited from the fund is the Cook Islands Community (CIC) Hall in Flaxmere. It received funding to install a 30.25-kilowatt solar PV array on the roof, to improve the electrical switchboard and to integrate a 32.8 kilowatt-hour battery system. This will help keep the lights on and the kitchen operating if electricity from the network is interrupted.

The solar PV system is expected to generate about 36,000 kilowatt hours of electricity each year. This will reduce the amount of electricity the CIC Hall will need to buy from the grid.

The CIC Hall is at the centre of the Hawkes Bay's Cook Islands community and hosts visitors and supports cultural events, wedding celebrations, birthdays and wakes. Through its kitchen and umu, it caters for hundreds of people. For example, during Cyclone Gabrielle, it hosted and fed (with help from the local community) about 150 seasonal workers rescued from the flood waters until alternative accommodation could be found.

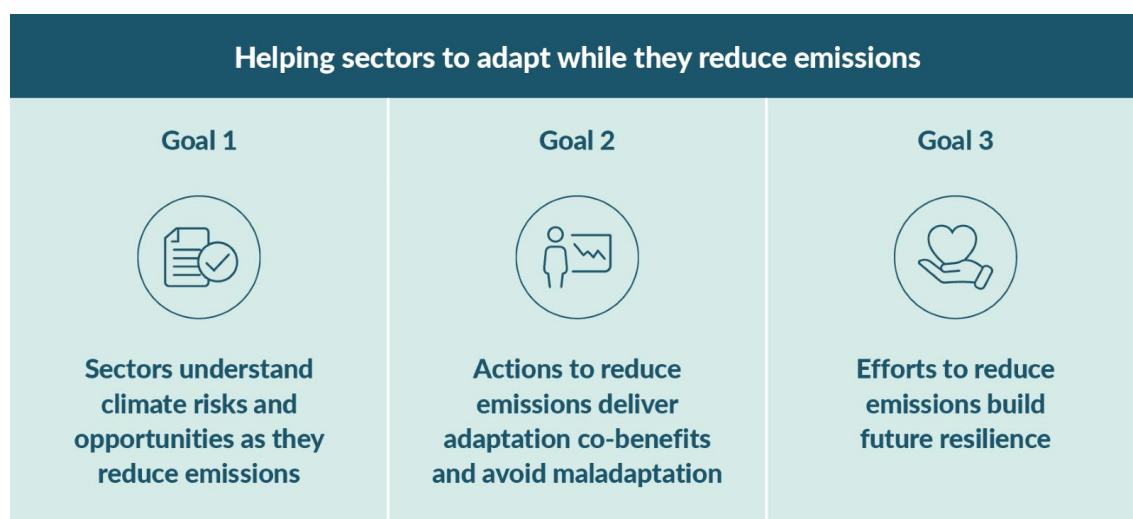
Adaptation goals for the second emissions reduction plan

While both Government and private sector initiatives are supporting sectors to adapt, sectors need to do additional work when reducing emissions. This includes:

- considering climate risks
- maximising co-benefits
- avoiding maladaptation
- building future resilience through emissions-lowering initiatives.

To support sectors to adapt while they reduce emissions, the second emissions reduction plan (ERP2) has three adaptation goals (figure 16.1).³¹

Figure 16.1: Adaptation goals for ERP2



Goal 1: Sectors understand climate risks and opportunities as they reduce emissions

Lack of awareness, education, tools and methods to manage climate impacts is affecting the ability of sectors to make risk-informed decisions. In some cases, sectors are continuing development in high-risk areas, without plans to manage that risk. Limited access to resources and expertise is limiting sectors' ability to take action.³²

We are supporting sectors to understand climate risks and opportunities by developing data, information and guidance. This will be addressed in part by NAP1. The adaptation framework is also considering the availability of and access to risk information to improve the information flow, which will have benefits for wider economic sectors.

³¹ Under the Climate Change Response Act 2002, emissions reduction plans must outline how the Government will improve the ability of sectors to adapt **while they reduce their emissions**.

³² Ministry for the Environment. 2024. *Adaptation preparedness: 2024 update – A summary of responses to the second information request from reporting organisations under the Climate Change Response (Zero Carbon) Amendment Act 2019*. Wellington: Ministry for the Environment.

New national direction instruments under the Resource Management 1991 may also play a role in supporting consistent risk management across the country.

Sectors will be able to make risk-informed decisions about where to locate infrastructure, assets and services, and how to manage exposure and vulnerability to climate impacts. This can help to improve the resilience of infrastructure and communities (pillar 1) and support energy security (pillar 3). Sectors will also have a better understanding of the many benefits from nature-based solutions (pillar 5).

Goal 2: Actions to reduce emissions deliver adaptation co-benefits and avoid maladaptation

How sectors reduce emissions can create positive effects (co-benefits) or negative effects (maladaptation) on their ability to adapt. For example, nature-based solutions, such as wetland restoration and mangrove protection, can help manage the impacts from sea-level rise. On the other hand, exotic forest plantations, if not well managed, could pose an increased wildfire risk.

Existing reporting on [adaptation preparedness](#) and mandatory [climate-related disclosures](#) can help sectors to better align their emissions-reduction initiatives to support adaptation and resilience.

Goal 3: Efforts to reduce emissions build future resilience

Emissions reduction initiatives must be resilient to future climate impacts. However, the cost of upgrading infrastructure, adaptation planning and recovery work can make this challenging.

We are seeking to clarify cost-sharing, investment, and roles and responsibilities through the NAP1 and adaptation framework. New national direction on managing natural hazards and changes to land-use planning also seeks to support sectors' growth and development, while ensuring their resilience to future challenges.





Ministry for the
Environment
Manatū Mō Te Taiao



Te Kāwanatanga o Aotearoa
New Zealand Government

Our journey towards net zero

New Zealand's second
emissions reduction plan 2026–30

Tā Aotearoa mahere whakaheke tukunga tuarua

Technical annex



Te Kāwanatanga o Aotearoa
New Zealand Government

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Abbreviations

Abbreviation	Term
ADF	Absolute deviation factor
ADOPT	Adoption and Diffusion Outcome Prediction Tool
BEV	Battery electric vehicle
CCD	Clean car discount
CCUS	Carbon capture, utilisation and storage
CGE	Computable general equilibrium
CPI	Consumers price index
EB1	First emissions budget (2022–25)
EB2	Second emissions budget (2026–30)
EB3	Third emissions budget (2031–35)
EECA	Energy Efficiency and Conservation Authority
ENZ model	Emissions in New Zealand model
ERP2	Second emissions reduction plan
EV	Electric vehicle
FED	Fuel Excise Duty
GIDI	Government Investment in Decarbonising Industry
HFC	Hydrofluorocarbons
HWP	Harvested wood products
ICE	Internal combustion engine
IPPU	Industrial processes and product use
LFG	Landfill gas
LUC	Land Use Capability
LULUCF	Land use, land-use change and forestry
MBIE	Ministry of Business, Innovation & Employment
MfE	Ministry for the Environment
MoT	Ministry of Transport
MPI	Ministry for Primary Industries
NDC	Nationally Determined Contribution
NZ ETS	New Zealand Emissions Trading Scheme
NZU	New Zealand Unit
PHEV	plug-in hybrid electric vehicle
PSRM	Pastoral Supply Response Model
RRPS	Refrigerants Regulated Product Stewardship
RUC	Road user charges
SAF	Sustainable aviation fuel
VKT	Vehicle kilometres travelled
WEM	With existing measures
WMF	Waste Minimisation Fund
ZEHV	Zero-emissions heavy vehicles

Executive summary

This technical annex describes the analysis used to provide emissions projections for the second emissions reduction plan (ERP2). It is intended to support analysis of the plan and provides additional information on:

- the modelling approaches to ERP2
- the emissions baseline for ERP2
- the projected impact of key policies introduced in ERP2 on emissions and contribution to meeting emissions budgets and targets
- ERP2 distributional impacts modelling and analysis.

Impact of ERP2 on emissions budgets and 2050 target

Table 1 shows projected net emissions for the first three emissions budgets, including the impact of key measures introduced through ERP2.

Table 1: ERP2 projections with new measures per emissions budget period (Mt CO₂-e)

Budget period	Category	ERP2 (central)	ERP2 (low)	ERP2 (high)
First (290)	Net emissions	284.1	277.4	291.4
	Gross emissions	309.3	304.0	312.4
	Removals	-25.2	-26.6	-21.0
Second (305)	Net emissions	303.1	288.6	321.8
	Gross emissions	363.4	351.3	374.5
	Removals	-60.3	-62.7	-52.7
Third (240)	Net emissions	249.2	224.6	289.7
	Gross emissions	333.4	310.6	356.0
	Removals	-84.3	-86.0	-66.3

Using the central estimate, New Zealand is on track to meet the first and second emissions budgets (EB1 and EB2). Net emissions are projected to be 5.9 Mt CO₂-e below EB1 and 1.9 Mt CO₂-e below EB2. Meeting EB3 remains challenging. Using the central estimate, net emissions are projected to be 9.2 Mt CO₂-e above EB3.

Table 2 shows net long-lived emissions with ERP2 measures for 2050. Under the central projection, emissions are projected to be zero in 2050. However, there is significant uncertainty projecting emissions out to 2050.

Table 2: ERP2 projections with new measures for 2050 (long lived gases)

	Category	ERP2 (central)	ERP2 (low)	ERP2 (high)
2050	Net emissions	0.0	-4.3	15.6
	Gross emissions	26.7	22.6	30.7
	Removals	-26.8	-26.9	-15.1

Table 3 shows the expected abatement impacts of key ERP2 policies over the first three emissions budget periods.

Table 3: Estimated emissions reduction impacts of new policies in ERP2 on emissions budgets (Mt CO₂-e)

Sector	Policy	EB1	EB2	EB3
Energy	Electrify NZ	0.0	-0.1	-1.6
	Enable carbon capture, utilisation and storage	0.0	-1.0	-0.9
Transport	10,000 public EV charging points	0.0	-0.01	-0.2
IPPU	Refrigerants Regulated Product Stewardship (RRPS) scheme	0.0	-0.4	-0.7
Agriculture	Agricultural emissions pricing system (abatement via uptake of mitigations)	0.0	-0.2	-10.6
Forestry	Afforestation on Crown-owned land	0.0	+0.4*	-1.8
Waste	Waste Minimisation Fund	0.0	-1.0	-1.0
	Organic waste management and landfill gas capture	0.0	-0.8	-1.1
Multi-sector	Residual effects of NZ ETS settings change not captured elsewhere	0.0	-0.2	-1.0
Total – summed above		0.0	-3.3	-18.9
Total – integrated analysis		-0.4	-3.2	-17.1

* Initially emissions rise because there are net emissions from land clearance and soil disturbance for afforestation

Inevitably, uncertainty is involved in forecasting emissions projections across a diverse economy. Accounting for the behaviour and actions of business and households, as well as the impacts of policies, is challenging, but modelling continues to improve. Our projections ultimately represent the best understanding we have of New Zealand’s overall future emissions.

The information contained in this annex has been used to assess whether ERP2 will reduce emissions to meet EB2 and support ministerial decisions. The assessment of the plan’s ability to meet EB2 is included in chapter 2 of ERP2.

This annex is divided into four parts.

- **Part 1** provides background information on modelling approaches used for ERP2.
- **Part 2** presents the updated ERP2 baseline and outlines what has changed since the interim projections were used for the ERP2 discussion document.
- **Part 3** presents the impact of key ERP2 policies on emissions. It includes the implementation logic for individual policies, modelling and supporting assumptions for ERP2 policies, and the integrated final ERP2 projections.
- **Part 4** presents the background to and analysis from computable general equilibrium modelling on the economy and individual sectors.

This annex presents the historical and projection data in carbon dioxide equivalents, using 100-year global warming potentials from the Intergovernmental Panel on Climate Change Fifth Assessment Report.¹

¹ IPCC. 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: IPCC. p 87, box 3.2, table 1.

STAMP

Part 1: Modelling approaches

Introduction

This part of the technical annex describes the modelling approaches used for ERP2:

- the Emissions in New Zealand (ENZ) model
- uncertainty analysis
- computable general equilibrium (CGE) modelling.

The ENZ model

The ENZ model is a mature model that has been used widely in New Zealand, including by the Climate Change Commission | He Pou a Rangi for its demonstration and other pathways and advice,² and by the Boston Consulting Group for its *The Future is Electric* report.³ It has been used to develop the baseline for ERP2 and model the impact of key ERP2 policies.

The flexibility of the ENZ model means it can analyse alternative scenarios and be rapidly updated with new assumptions. It also enables more timely tracking of emissions, supporting the monitoring and review of how New Zealand is tracking towards meeting emissions budgets and targets.

The ENZ model is a bottom-up model that includes data to represent individual industries and technologies – for example, efficiencies and numbers of industrial boilers, and numbers of electric vehicles (EVs) and internal combustion engine (ICE) vehicles. For agriculture, the model includes stock numbers for sheep, cattle and deer. This level of detail means the model can estimate the impacts of policies or technology trends, such as uptake rates for EVs.

The ENZ model:

- projects the emissions outcomes for the sectors that produce greenhouse gas emissions
- provides insights into how such outcomes may vary according to changes in future ‘state-of-the-world’ drivers (eg, future technology or commodity prices) or policy settings (eg, agricultural emissions pricing system, or potential application of Clean Car Standards to passenger vehicle sales).

The ENZ model projects the future economic and emissions outcomes of decisions that range from whether households buy an EV or ICE vehicle to whether land owners switch from sheep and beef farming to forestry. In many cases, these decisions can be endogenous (ie, defined by activity within the model), where decision-makers are assumed to choose the least-cost option driven by relative prices (eg, EV vs ICE vehicle purchase prices). In other cases, the decisions are exogenously specified (ie, defined as an external assumption that is an input to the model),

² Climate Change Commission. 2021. *Emissions in New Zealand (ENZ) Model Technical Manual*. Wellington: Climate Change Commission; and Climate Change Commission. 2024. *Technical Annex. Modelling and analysis to support the draft advice on Aotearoa New Zealand’s fourth emissions budget*. Wellington: Climate Change Commission.

³ Boston Consulting Group. 2022. *The Future is Electric. A Decarbonisation Roadmap for New Zealand’s Electricity Sector*. Auckland: Boston Consulting Group.

due to current lack of information on key drivers (eg, the costs of zero-emissions aircraft). Areas that allow for endogenous decisions can also be exogenously specified.

The outputs from the model include emissions, capital and operating costs, consumer prices and various other key metrics such as electricity demand, number of road vehicles, tonnes of waste going to landfill, and milk production. Calculating outputs takes account of the significant feedback loops that can occur throughout the economy. For example, fuel switching from fossil to electric options (eg, EVs, industrial electro-boilers, home heat pumps) will increase electricity demand, which will drive the need for generation and network investment, which will increase electricity prices, which will affect the rate of fuel switching from fossil to electric. Similarly, the extent of conversion from pastoral farming to forestry will determine the demand for food-processing energy plus the potential availability of biomass for industrial boiler heat decarbonisation. The ENZ model is a 'dynamic recursive' model, meaning it solves for these circularities in one year, and those results are used as starting parameters for the next year.

Scenario functionality allows users to test how outcomes may vary for different external state-of-the-world or policy settings.

State-of-the-world inputs to the ENZ model include:

- macro-indicators (eg, GDP and population)
- emissions prices
- commodity prices (eg, gas, coal, oil, milk and timber)
- costs of both renewable and fossil technologies (eg, power generation, industrial boilers, space heating, cars and batteries).

Given inherent uncertainty over most of the above state-of-the-world variables, scenario functionality allows for these inputs to be varied, to explore the sensitivity of outcomes to such factors.

Policy settings can be 'turned on' or 'turned off' on a scenario basis to explore the potential effect of different policies on emissions and economic outcomes. Examples include limits on specific technologies, the Clean Car Standard, limitations on new forestry planting entering the New Zealand Emissions Trading Scheme (NZ ETS) by land-use class, agricultural emissions pricing system, prohibitions on certain technologies or fuels, and subsidies for fuel switching for different types of consumer situations.

Given the many different individual state-of-the-world and policy scenarios, a scenario management module allows for the use of 'composite scenarios' to consider different combinations of individual scenarios.

The ENZ model is explained in more detail in the discussion document for the ERP2 discussion document and its technical annex.⁴

⁴ Ministry for the Environment. 2024. [New Zealand's second emissions reduction plan \(2026–30\): Discussion document](#). Wellington: Ministry for the Environment; and Ministry for the Environment. 2024. [New Zealand's second emissions reduction plan \(2026–30\): Technical annex to the discussion document](#). Wellington: Ministry for the Environment.

Approach to using the ENZ model in ERP2

For the ERP2 discussion document, we used an ‘ENZ Adding Up’ approach to assess future emissions. This involved using the ENZ model only to produce an emissions baseline. We analysed the impacts of individual ERP2 policies separately, then subtracted their impact from the emissions baseline to project emissions with the impact of policies.

An alternative approach – ‘ENZ Integrated’ – involves modelling the impact of ERP2 policies within the ENZ model to ensure any interactions between policies are modelled, rather than just the emissions reduction results. This makes a small difference to the effects of some policies only.

For the final plan, we have included both approaches. This is intended to provide transparency for how we have assessed the ability of ERP2 to meet EB2 and emissions reduction targets.

Uncertainty

We have used two approaches to explore the uncertainty in emissions projections in the ENZ model.

1. **Historical analysis**, in which previous official government emissions projections are compared with the actual emissions as reported in [New Zealand’s Greenhouse Gas Inventory](#). This is used to develop a relationship between the difference in emissions estimated and the years since the projection was made.
2. **Sensitivity analysis**, using alternative values for key assumptions.

Historical analysis

The results of historical analysis include a central projection and an uncertainty range around this. The range is based on a comparison of the difference between emissions projections previously estimated and the outturn emissions when published in New Zealand’s Greenhouse Gas Inventory. Historical deviations were calculated as the absolute percentage difference between actual emissions inventory and historical projections by sector, defining this as the absolute deviation factor (ADF).

We then fitted a regression model to the ADF, considering how far in advance each projection was published. This relationship was applied to the new projections: the high estimate was the central projection plus the fitted ADF, and the low estimate was the central projection minus the fitted ADF. The advantage of this approach is that uncertainty estimates are informed by past deviations. However, it is limited by the availability of historical data (projections began in 2015), and it does not necessarily account for all possible sources of deviation. In addition, the historical projections were made using models other than the ENZ model.

Sensitivity analysis

We also performed a sensitivity analysis of the ERP2 baseline by varying key assumptions likely to be influenced by external factors rather than direct policy interventions. These changing parameters include population growth, GDP and prices, which are drivers of long-run emissions trends. A description of the differences is provided in [appendix 1](#), along with the full list of baseline assumptions, including the variants used in sensitivity analysis.

CGE modelling

To complement the projections, we have undertaken additional analysis to assess the effects of ERP2 on the whole economy and individual sectors, particularly households. This analysis uses a computable general equilibrium (CGE) model.

CGE models use economic data and relationships founded in micro-economic theory to estimate how an economy might react to changes in policy instruments (eg, emissions prices) or technology (eg, EV uptake). A key advantage of CGE models is that they consider the flow-on effects of changes in one part of the economy to changes in other parts of the economy. However, CGE models are aggregated and lack the granularity of policy impacts that can be modelled in sector-specific models. They are therefore a useful complementary tool to ENZ and sector-specific models.

One notable limitation of the CGE modelling is that it does not account for the impacts of climate change itself on society and the economy, or for the benefits of mitigating climate change impacts. The economic impacts of climate mitigation actions (which are mostly negative, when compared with a counterfactual without mitigation actions) need to be considered in that context.

We contracted a consortium of experienced CGE modellers (Principal Economics, Infometrics, and the Centre of Policy Studies, Victoria University of Melbourne) to model the impacts of ERP2.

Wherever practical, the CGE modelling uses assumptions that are the same as or similar to the ENZ modelling assumptions. The different natures of the two models means they sometimes need different inputs to represent a given policy intervention. In other cases, the timing of modelling means that CGE assumptions need to be agreed earlier than those for ENZ modelling, because the latter can more readily incorporate recent information.

The full modelling results, together with detailed information on the CGE framework and methodology, are contained in an accompanying report from Principal Economics in collaboration with the Centre of Policy Studies (Victoria University of Melbourne) and Infometrics.⁵

⁵ Torshizian E, Adams P, Stroombergen A. 2024. *Economic Impact of New Zealand's Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited.

Part 2: Emissions baseline

Introduction

This part of the technical annex provides information on the emissions baseline for ERP2. The baseline is the likely trajectory of net emissions based on existing policy settings and in the absence of additional policies introduced through ERP2.

The baseline provides an understanding of the extent of the current challenge to meet emissions budgets. It allows for the potential impact of new policies introduced through ERP2 on future emissions to be assessed.

Previous projections

We published the most recent official greenhouse gas emissions projections in late 2023.⁶ This followed the requirements for international reporting that define the assumptions to use for a ‘with existing measures’ (WEM) projection. This includes assuming the effects of only those policies or measures that have been fully implemented. This is the same as the requirement for the ERP2 baseline.

The 2023 WEM projection was produced from an aggregation of projections of sectoral emissions and removals. This used the outputs from several individual models or calculations, curated by different government agencies.⁷

The 2023 WEM projection adopted assumptions as of mid-2023. Several factors have changed since then, including the following.

- Assumptions around New Zealand Emissions Trading Scheme (NZ ETS) prices have changed from the 2023 projections, which used a New Zealand Unit (NZU) price path that rose to \$230 per tonne in 2050 (in 2023-dollar values). More recent assessments (including those released as part of the public consultation on the discontinued NZ ETS review⁸) suggest that, without substantial changes to the scheme, NZU prices might fall towards the long-run supply costs of NZUs from forestry, which may be no more than \$50 per tonne.⁹ Observed NZU prices have also been lower than the assumed price path for the 2023 projections. This assumption does not necessarily reflect the Government’s preferred price pathway for the NZ ETS. Rather, it reflects broad market dynamics expected in the NZ ETS as the steady tightening of the NZ ETS cap leads to modest price increases in the near term, while, over the medium-to-long term, the marginal cost of exotic afforestation is expected to anchor the NZ ETS price.

⁶ Ministry for the Environment. 2023. *New Zealand’s projected greenhouse gas emissions to 2050*. Retrieved 5 November 2024.

⁷ This approach is described in: Ministry for the Environment. 2024. *New Zealand’s second emissions reduction plan (2026–30): Discussion document*. Wellington: Ministry for the Environment; and Ministry for the Environment. 2024. *New Zealand’s second emissions reduction plan (2026–30): Technical annex to the discussion document*. Wellington: Ministry for the Environment.

⁸ Ministry for the Environment. 2023. *Review of the New Zealand Emissions Trading Scheme: Summary of modelling*. Wellington: Ministry for the Environment.

⁹ This is the NZU price at which landowners are assumed to be willing to change from sheep and beef farming to forestry.

- Some climate policies have been discontinued, including the clean car discount (CCD) and future applications under the Government Investment in Decarbonising Industry (GIDI) fund.
- Agricultural emissions pricing has been delayed from 2025. Although the Government has committed to pricing agricultural emissions by 2030, there are no detailed policy decisions to date that make it sufficient to include this policy measure in the baseline.
- The Tiwai Point aluminium smelter was previously assumed to close at the end of 2024 (when its previous power supply agreement ends), but the smelter extended its supply agreement in May 2024 and is now modelled as staying open.
- The 2024 New Zealand Greenhouse Gas Inventory, published in April 2024,¹⁰ contains:
 - methodological improvements that have resulted in historical agricultural emissions being higher than previously reported
 - updated activity and emissions data, including for land use, land-use change and forestry (LULUCF), with revised time series and new estimated actuals for 2021 and 2022 on levels of deforestation and afforestation.¹¹

More recent changes since the 2023 WEM projection include the following.

- Updated information about plans to replace existing coal-fired electricity generation with biomass fuel has been used to update the projections of electricity generation emissions.
- New reported animal numbers (which fell significantly in 2022) have revised agricultural emissions down over the next two years, but a smaller decrease is projected for the longer term, increasing projected emissions.
- The latest afforestation and deforestation intentions survey¹² results suggest future afforestation levels as lower than previously projected. This also impacts projected agricultural emissions.
- The Ministry for the Environment has confirmed the methodology used to report actual forestry abatement over 2021 and 2022 is to be included within New Zealand's first Biennial Transparency Report. This methodology sets the rules for how forestry emissions and removals are calculated for emissions budgets and our first Nationally Determined Contribution (NDC1).

¹⁰ Ministry for the Environment. 2024. *New Zealand's Greenhouse Gas Inventory 1990–2022*. Wellington: Ministry for the Environment.

¹¹ See changes in Ministry for the Environment. 2024. *New Zealand's Greenhouse Gas Inventory 1990–2022 / Volume 1, chapter 1–10*. Wellington: Ministry for the Environment. ch 10.

¹² Manley B. 2024. *Afforestation and Deforestation Intentions Survey 2023 Final Report*. MPI Technical Paper No: 2024/14. Prepared for Ministry for Primary Industries by Professor Bruce Manley, School of Forestry, University of Canterbury.

The emissions baseline for ERP2 has been developed using the ENZ model

The emissions baseline has been developed using the ENZ model, rather than by re-running the cross-government projection models.¹³ For some sectors, outputs from agency models and analysis have been used to provide direct inputs to the ENZ model, including agriculture, forestry and waste activity projections. Other sectors (particularly energy sectors) are well specified with considerable detail within the ENZ model. The assumptions and inputs for the baseline include updated data and market information, in addition to the effects of removal of some policies. The full set of baseline assumptions is included in [appendix 1](#).

Through ERP2, new emissions reduction policies will be introduced, including:

- the roll-out of 10,000 EV charging points
- reductions in barriers to consenting renewable electricity generation (as part of the Electrify NZ)
- limiting whole-farm conversions to forestry on high-quality land
- the introduction of a fair and sustainable agricultural emissions pricing system by 2030.

These policies are analysed separately and are included in a new measures scenario rather than the baseline. [Part 3](#) describes the impact of key ERP2 policies on future emissions.

Progress relative to emissions budgets (excluding new policies)

The resulting emissions projection using the ENZ model and baseline assumptions is outlined in table 4, expressed in million tonnes of carbon dioxide equivalent (Mt CO₂-e). It also shows how the baseline has changed since consultation on the ERP2 discussion document earlier in 2024. More detailed results, by sector, are discussed further below.

The summary suggests net emissions are expected to be:

- below budget for the first emissions budget (EB1), apart from at the high end of the uncertainty range
- above EB2 – achieving the budget is within the range of uncertainty
- above EB3 – achieving the budget remains within the range of uncertainty.

¹³ These models are explained in Ministry for the Environment. 2024. *New Zealand's second emissions reduction plan (2026–30): Technical annex to the discussion document*. Wellington: Ministry for the Environment.

Table 4: Interim and final baseline net emissions, excluding new policies, per budget period (Mt CO₂-e)

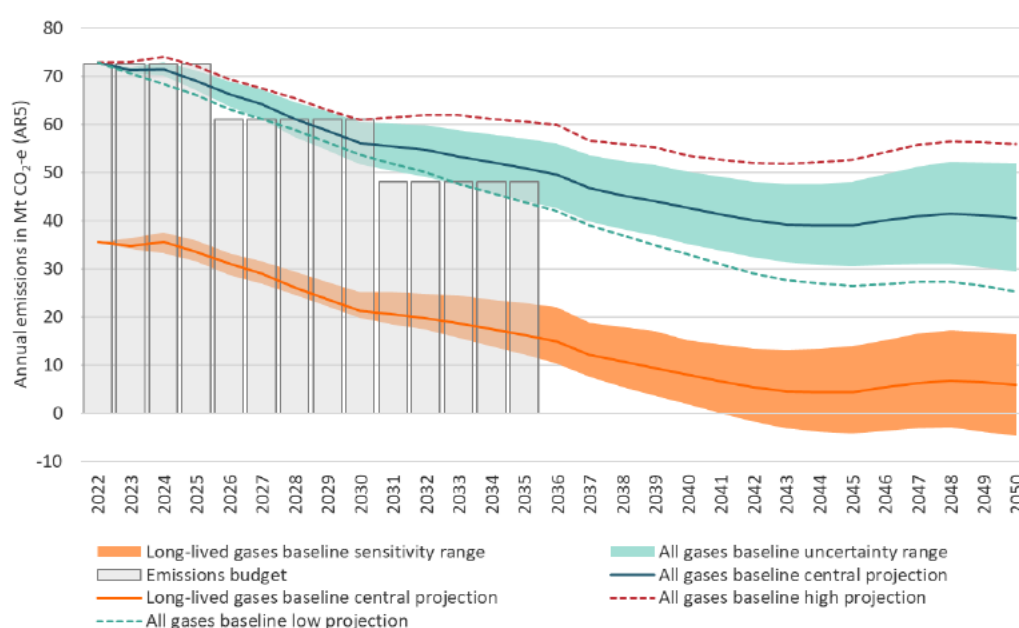
Budget period	Category	Budget	Discussion document baseline	Final ERP2 baseline
EB1	Net emissions	290	284.0 ± 4	284.5 ± 7
	Gross emissions		307.4	309.7
	Removals		-23.2	-25.2
EB2	Net emissions	305	307.1 ± 18	306.3 ± 17
	Gross emissions		368.4	367.0
	Removals		-61.3	-60.7
EB3	Net emissions	240	270.1 ± 29	266.3 ± 34
	Gross emissions		352.5	348.2
	Removals		-82.3	-82.0

Uncertainty

Uncertainty analysis uses two approaches, as explained in Part 1. One uses the difference between historical projections and the most recent inventory to establish a relationship based on how long ago the projection was made. The other approach uses sensitivity analysis on key input assumptions. Figure 1 shows the results using the two approaches. Sensitivity analysis provides a smaller range in the short run, but a wider range in the longer run. The chart includes net emissions for all greenhouse gases and for long-lived gases only, to which the net zero target applies.

The uncertainty values have changed somewhat from the ERP2 discussion document baseline, reflecting some changes to the assumptions used in sensitivity analysis, particularly from the range in updated LULUCF projections.

Figure 1: Baseline projections range from sensitivity analysis, compared with a range based on historical deviation and sensitivity analysis (low and high), 2022–50



Differences from previous projections

The baseline projections have a central estimate of 306 Mt CO₂-e for the EB2 (ie, for the period 2026–30). This is lower than estimated in the interim projections in the ERP2 discussion document (307 Mt CO₂-e).

The main sources of the differences are outlined below.

- **Changes to input assumptions**, which included:
 - the earlier assumed introduction and greater impact of NZ Steel’s electric arc furnace
 - the switch of some coal-fired electricity generation to biomass fuel at the Huntly Power Station
 - earlier closure of methanol production plants.
- **Shifts from baseline.** A regulated product stewardship scheme for refrigerants had previously been assumed to be in the baseline. However, it was decided that as its mandatory form depends on a future Cabinet decision, such a scheme should be included in the policy scenario instead.
- **Activity changes.** Revisions have been made to some activity data, including projections of animal numbers following updates to the projections of future agricultural commodity prices.

The contributions of the different factors to the differences in emissions projections for the second emissions budget are shown in table 5.

Table 5: Sources of differences between the ERP2 interim and final baseline (Mt CO₂-e)

Source of difference	Sector							
	Energy	Transport	IPPU	Agriculture	Waste	Forestry	Gross	Net
1. Interim ERP2 baseline	72.8	68.8	18.0	192.1	16.6	-61.2	368.3	307.1
2. Earlier steel electric arc furnace	0	0	-1.8	0	0	0	-1.8	-1.8
3. Earlier Methanex closure	-2.9	0	-0.2	0	0	0	-3.1	-3.1
4. Biomass fuel use at Huntly	-1.1	0	0	0	0	0	-1.1	-1.1
5. Refrigerant regulated product stewardship scheme removed	0	0	+0.7	0	0	0	+0.7	+0.7
6. New activity data & modelling revisions	-0.6	+1.3	-0.7	+4.2	-0.1	+0.5	+4.1	+4.5
7. Total change from interim to final	-4.6	+1.3	-2.0	+4.2	-0.1	+0.5	-1.2	-0.8
8. Final ERP2 baseline	68.2	70.1	16.0	196.3	16.5	-60.7	367.0	306.3

Note: IPPU = industrial processes and product use.

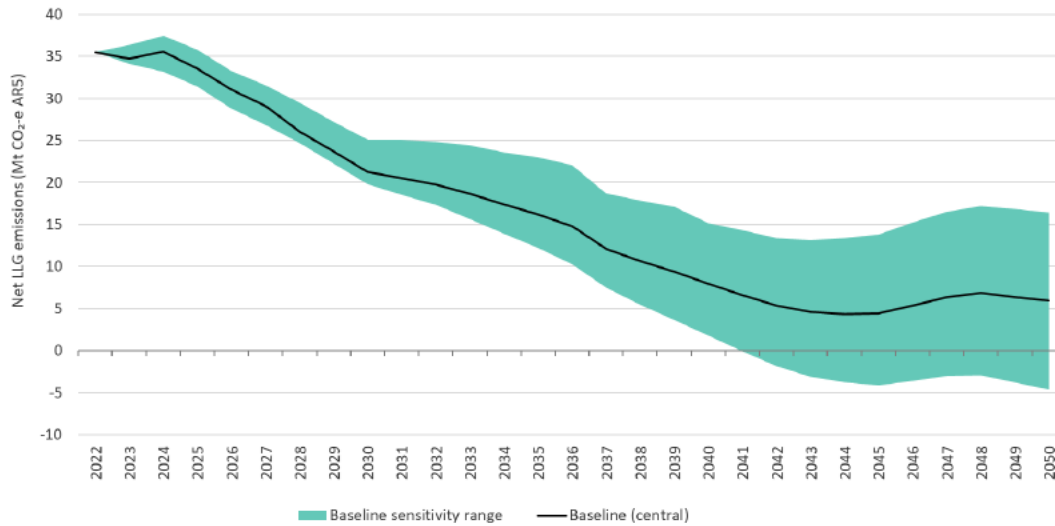
Progress relative to emissions targets

In addition to measuring progress relative to emissions budgets, the analysis has been used to compare projections with longer-term emissions targets. This includes the 2050 net zero target for long-lived gases, and the current 2030 and 2050 targets for biogenic methane.

Long-lived gases baseline

Figure 2 shows the central baseline projection of net emissions of long-lived gases and the range of outcomes using the low and high estimates based on the assumptions from the sensitivity analysis above. The range widens considerably towards 2050. The projections suggest that net zero could be achieved before 2050, although the central baseline projection is above the target level, at approximately 5.9 Mt CO₂-e.

Figure 2: Long-lived gas net emissions in ERP2 baseline, 2023–50



Note: LLG = long-lived gas.

Table 6 summarises the results for individual emissions budgets and the 2050 net zero target.

Table 6: Baseline long-lived gases compared with interim ERP2 projections per budget period (Mt CO₂-e)

Budget period	Category	ERP2 interim baseline (central)	ERP2 baseline (central)	ERP2 baseline (low)	ERP2 baseline (high)
EB1 (2022–25)	Net emissions	140.0	139.4	134.2	145.1
	Gross emissions	163.3	164.5	160.8	166.1
	Removals	-23.3	-25.2	-26.6	-21.0
EB2 (2026–30)	Net emissions	134.2	131.0	122.3	146.5
	Gross emissions	195.5	191.8	184.9	199.3
	Removals	-61.3	-60.7	-62.6	-52.7
EB3 (2031–35)	Net emissions	100.2	92.6	77.6	120.9
	Gross emissions	182.6	174.5	164.3	187.2
	Removals	-82.3	-82.0	-86.7	-66.3
2050 target	Net emissions	4.6	5.9	-4.6	16.4
	Gross emissions	26.0	27.7	23.2	31.5
	Removals	-21.4	-21.8	-27.9	-15.1

Biogenic methane baseline

Figure 3 shows the projected baseline emissions of biogenic methane, the 2030 and 2050 biogenic methane targets. The high-low range for agriculture is derived by varying livestock trends to align with a range based on an ADF approach described [above](#), while the range for waste is scenario-based with different assumptions about waste tonnages and landfill gas capture rates.

Table 7 summarises the results for individual emissions budgets and for the 2030 and 2050 targets. The central baseline projection suggests emissions would not meet the 2030 target of 34.3 Mt CO₂-e, but the target would be within the uncertainty range (without taking account of the impact of any additional policies). The 2050 target is not within the uncertainty range. The lower scenario is a reduction of 21 per cent, while the 2050 target requires a 24–47 per cent reduction.

Note that these are projections before the addition of new policies, which show that New Zealand can be favourable against both the 2030 and 2050 methane targets, as described [below](#).

Figure 3: Biogenic methane emissions in ERP2 baseline 2017–2050

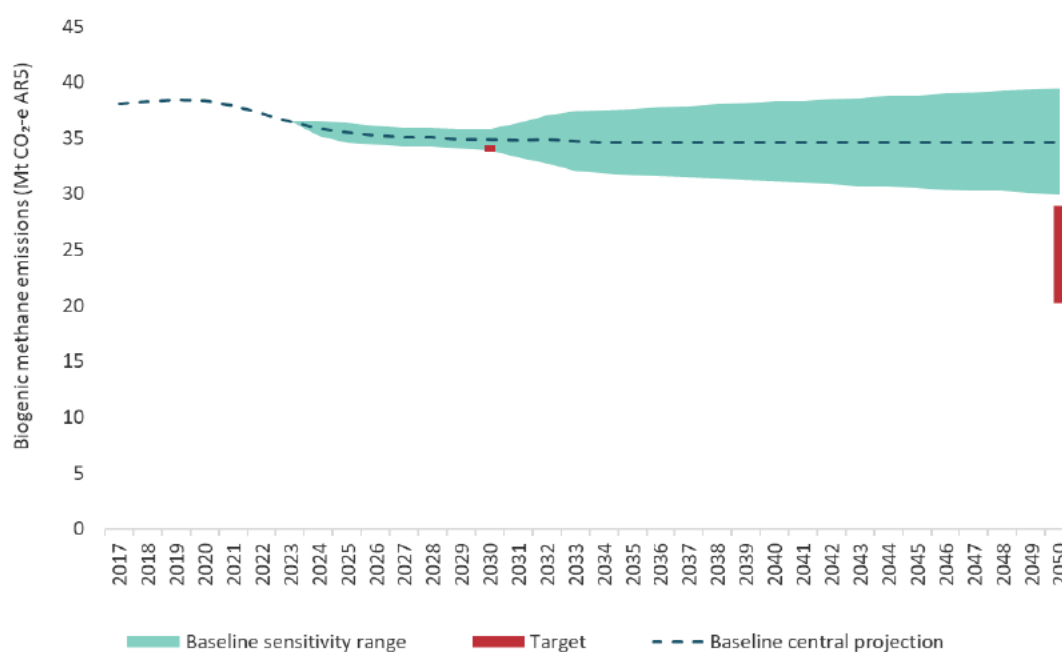


Table 7: Baseline for biogenic methane compared with interim ERP2 projections, per target year (Mt CO₂-e)

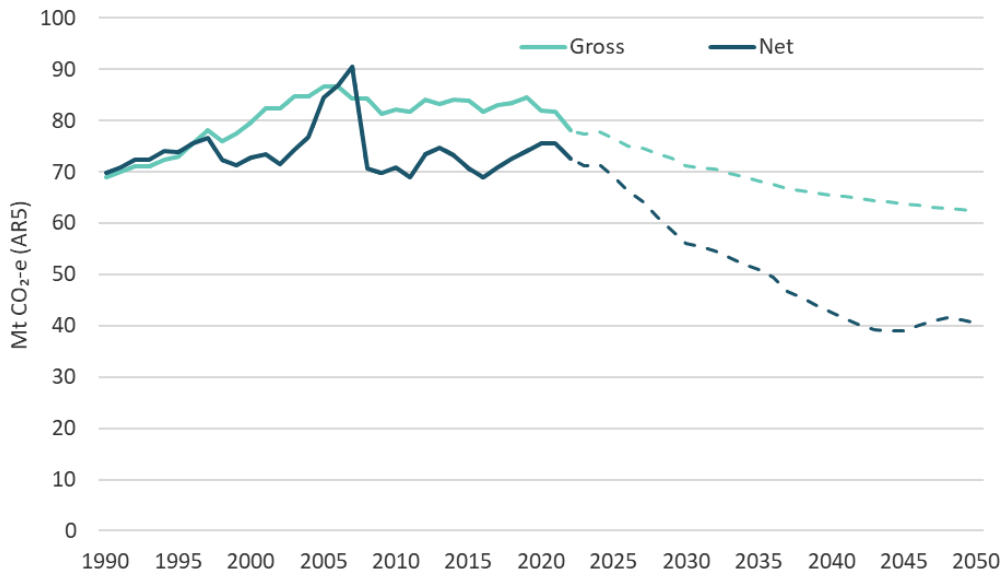
Target year	Targets	Interim ERP2 baseline	ERP2 baseline (central)	ERP2 baseline (low)	ERP2 baseline (high)
2030	34.3 (–10%)	34.3 (–9.9%)	34.9 (–8.4%)	33.9 (–10.9%)	35.9 (–5.8%)
2050	20.2–29.0 (–24–47%)	33.1 (–13.2%)	34.6 (–9.1%)	29.9 (–21.4%)	39.5 (3.6%)

Detailed results

Total gross and net greenhouse gas emissions

Emissions in gross and net terms (using target accounting)¹⁴ are shown in figure 4. Emissions rose until approximately 2005 and have been relatively static since then. Net target accounting emissions are projected to fall because of the increase in forecast removals from forestry.

Figure 4: Baseline projections – gross and net emissions (using target accounting), 1990–2050

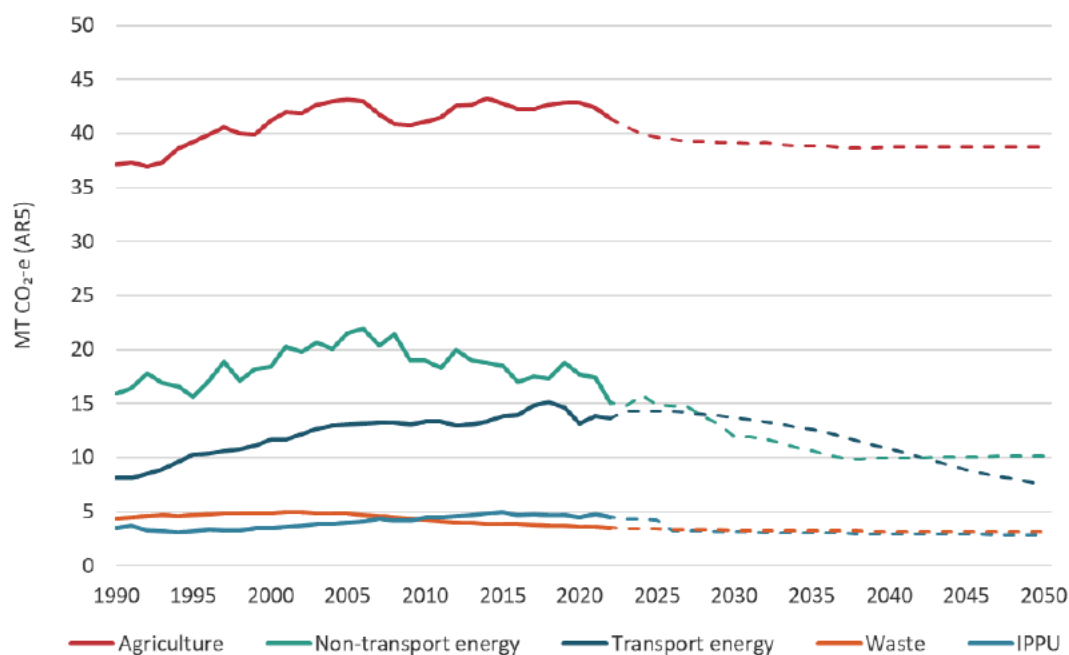


Note: Solid lines = historical data; dashed lines = projections.

Figure 5 shows the historical changes to gross emissions by sector, as well as projections to 2050.

¹⁴ Target accounting emissions include gross emissions, along with a subset of forestry and land-use emissions and removals. Target accounting is designed to be compatible with net emissions targets, under which business-as-usual removals from pre-1990 forests are not counted. Only emissions and removals due to additional human activities are counted. This means emissions from deforestation are counted for all forests, but to address permanence, removals from afforestation are only counted for post-1989 forests up until their long-term average is reached.

Figure 5: Historical and projected baseline emissions by sector, 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

The largest rises in emissions from 1990 to 2005 were for transport energy (61 per cent) and non-transport energy (36 per cent), with smaller rises in agriculture (16 per cent), industrial processes and product use (IPPU) (15 per cent) and waste (11 per cent). Since 2005, emissions have fallen for non-transport energy and waste, have risen for transport energy, and have been reasonably steady for agriculture. Both transport and agricultural emissions are expected to fall in the future. IPPU emissions peaked in approximately 2015 and have slowly fallen since then.

The projections suggest falling baseline emissions for all sectors. Table 8 shows the changes in emissions relative to average emissions in the five-year period to 2022. (We chose this period to even out annual fluctuations, and because 2022 is the most recent year for which we have actual emissions data.)¹⁵

Table 8: Changes in sector emissions from 2018–22 average to 2030, 2035 and 2050 (Mt CO₂-e and percentage change)

Sector	2018–22 average	Change to 2030	% change	% of total	Change to 2035	% change	% of total	Change to 2050	% change	% of total
Transport energy	14.1	-0.4	-3%	4%	-1.5	-11%	11%	-6.6	-47%	34%
Non-transport energy	17.2	-5.4	-31%	50%	-6.6	-38%	48%	-7.1	-41%	36%
IPPU	4.6	-1.5	-32%	14%	-1.6	-34%	11%	-1.8	-38%	9%
Agriculture	42.4	-3.3	-8%	30%	-3.6	-8%	26%	-3.6	-9%	19%
Waste	3.6	-0.3	-9%	3%	-0.4	-11%	3%	-0.5	-13%	2%
Total	81.9	-10.8	-13%	100%	-13.7	-17%	100%	-19.6	-24%	100%

Note: IPPU = industrial processes and product use.

¹⁵ These include data in *New Zealand’s 2024 Greenhouse Gas Inventory*, modified with recent updates to animal numbers and forestry expectations.

The largest contributions to the 13 per cent projected fall in emissions to 2030 come from non-transport energy (47 per cent) and agriculture (32 per cent). In contrast, transport is the most significant projected source of emissions reductions to 2050 because of the increasing numbers of EVs expected over time.

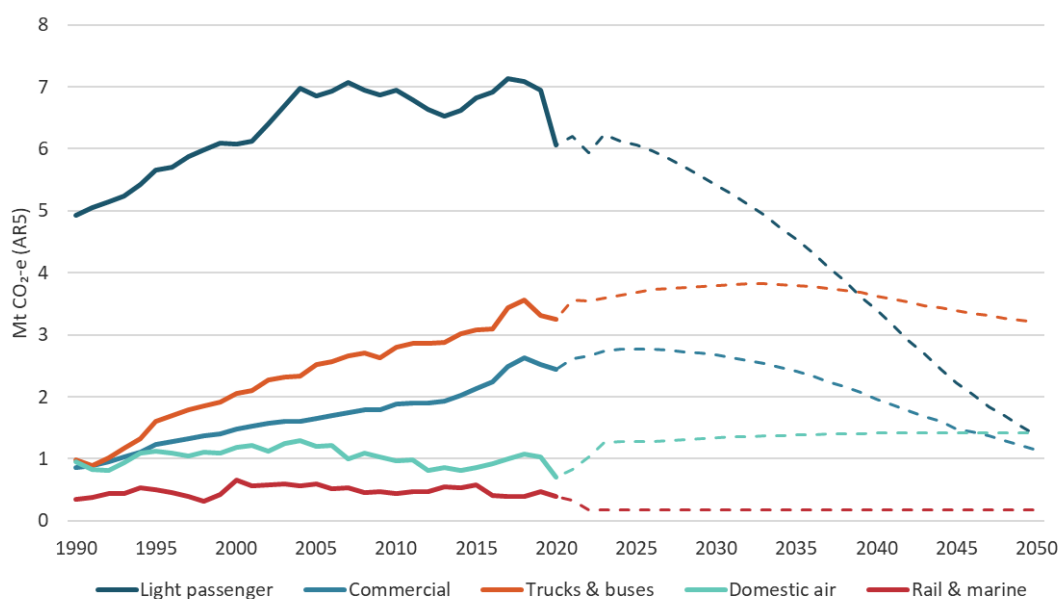
Transport energy

Transport emissions have risen by 61 per cent since 1990 (figure 5) and peaked in 2018 at 15.1 Mt CO₂-e, before falling to 13.2 Mt CO₂-e in 2020 during the COVID-19 pandemic because of a drop in total vehicle travel. Emissions are projected to gradually decline over the next 10 years or so (reaching 12.6 Mt CO₂-e in 2035), before falling to approximately 7.5 Mt CO₂-e by 2050.

Light passenger vehicle (LPV) emissions have not increased since 2000 because of the increased fuel efficiency of the light vehicle stock, despite increasing fleet stock and total distance travelled. The projected future reductions in car emissions (figure 6) are dominated by the shift to EVs.

In contrast, domestic air emissions are projected to rise, while light commercial (LCV) emissions and truck and bus emissions are projected to reduce later and less rapidly.

Figure 6: Historical and projected transport emissions by subsector, 1990–2050



Despite increases in total vehicle travel, the transport emissions reductions reflect the projected shift to EVs (figure 7 and figure 8). This shift is greater and faster for light passenger vehicles than for other vehicle types. Some of this emissions reduction occurs through a sectoral shift, as there will be reduced vehicle tailpipe emissions and an associated increase in upstream emissions from electricity generation, depending on the generation fuel mix (see [below](#)).

Figure 7: Projected percentage of EVs in categories of newly registered vehicles

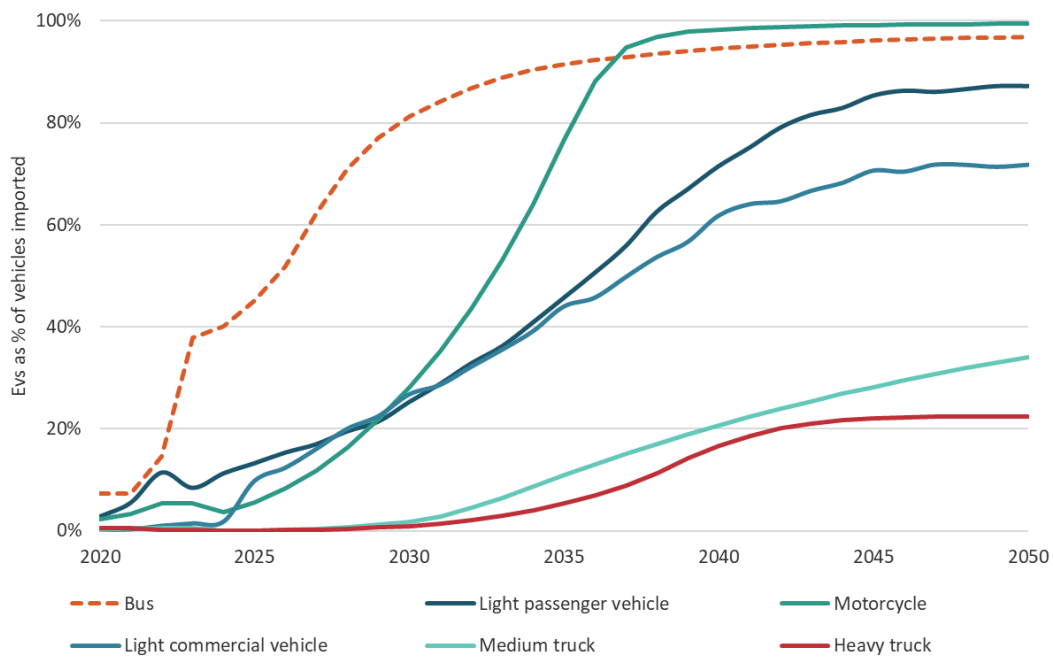
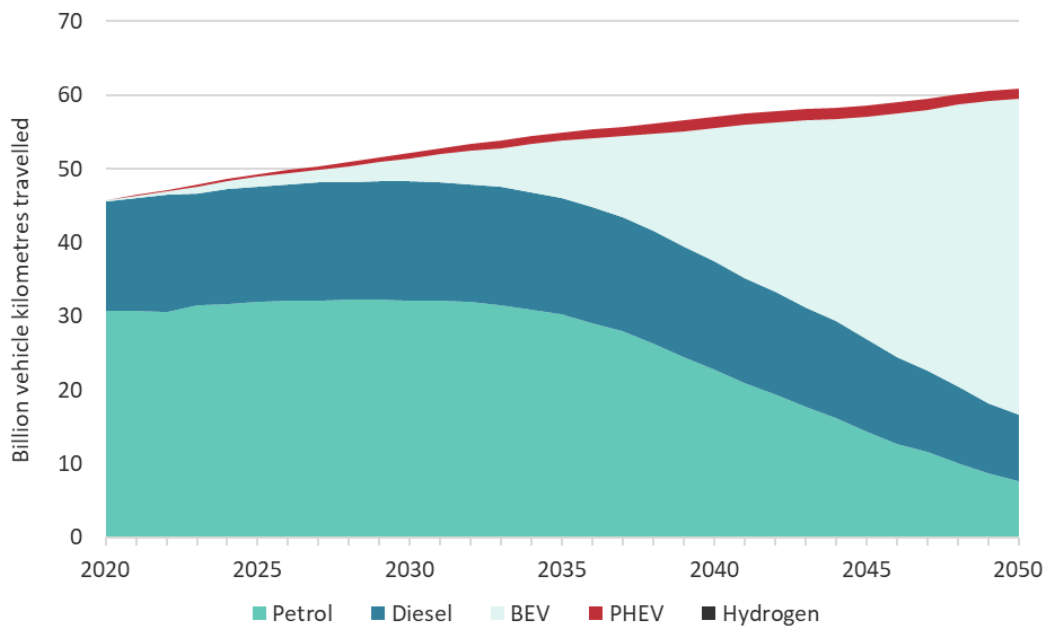


Figure 8: Projected travel distance by vehicle type (all road vehicles), 2020–50



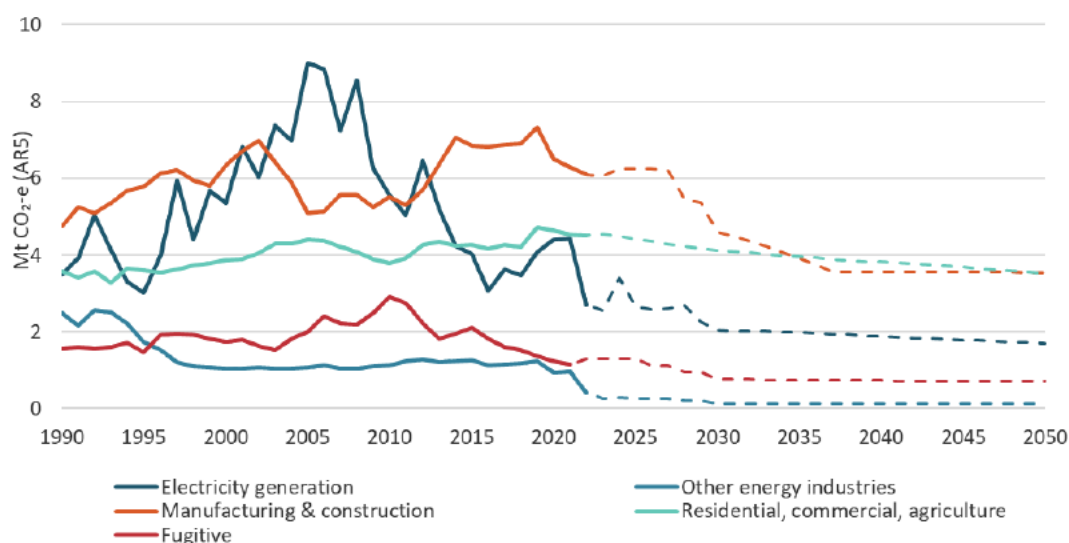
Note: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle.

Non-transport energy

Non-transport energy emissions are forecast to fall through to just after 2035 because of the effects of plant closures and fuel switching for industrial heat, but then remain relatively constant thereafter (figure 5). Historical and projected energy emissions by subsector are shown in figure 9. Manufacturing and electricity generation have been the largest emissions sources, followed by ‘residential, commercial and agriculture’. Other energy industries have fallen in response to changes in industrial activity. This includes petrochemicals, which has

fallen with the closure of the Marsden Point oil refinery in 2022. Fugitive emissions arise from sources including the production, transmission and storage of fuels (eg, carbon dioxide venting at gas treatment plants and from geothermal fields).

Figure 9: Historical and projected baseline energy emissions by subsector, 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

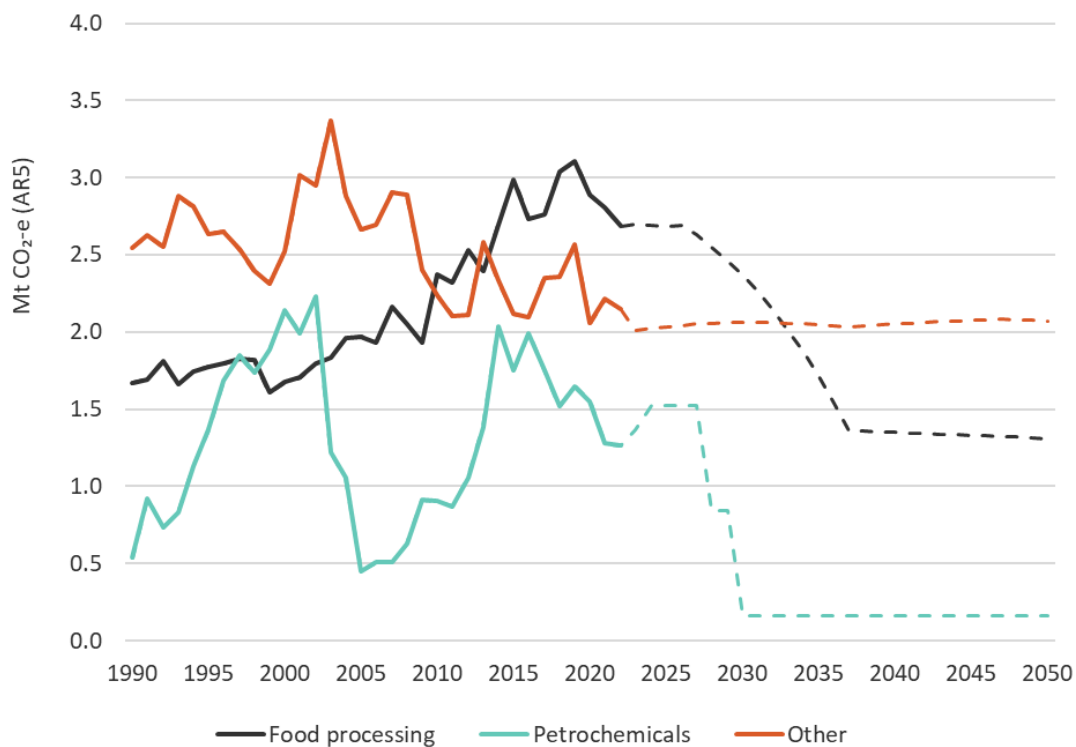
The largest projected contribution to total reductions is from the manufacturing and construction sectors (table 9), reflecting the shift away from fossil fuels towards electricity for industrial heat – particularly in food processing (including the response to national direction on industrial process heat)¹⁶ and the reductions in output from petrochemical production with projected closures of methanol trains (see figure 10). Electricity generation emissions are also forecast to fall significantly, as fossil fuel generation is replaced by renewables.

Table 9: Changes in energy emissions from 2018–22 average to 2030, 2035 and 2050 by subsector (Mt CO₂-e and percentage change)

Sector	2018–22 average	Change to 2030	% change	% of total	Change to 2035	% change	% of total	Change to 2050	% change	% of total
Electricity generation	3.8	-1.8	-47%	33%	-2.1	-56%	32%	-1.8	-47%	25%
Other energy industries	1.0	-0.8	-85%	15%	-0.8	-86%	12%	-0.8	-87%	12%
Manufacturing and construction	6.6	-2.0	-31%	38%	-2.7	-41%	41%	-3.1	-47%	43%
Residential, commercial, agriculture	4.5	-0.4	-8%	7%	-0.5	-12%	8%	-1.0	-22%	14%
Fugitive	1.3	-0.4	-27%	7%	-0.4	-30%	6%	-0.4	-30%	5%
Total	17.2	-5.4	-31%	100%	-6.6	-38%	100%	-7.1	-41%	100%

¹⁶ Ministry for the Environment. 2023. *National Policy Statement for Greenhouse Gas Emissions from Industrial Process Heat 2023*. Wellington: Ministry for the Environment; and Resource Management (National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat) Regulations 2023.

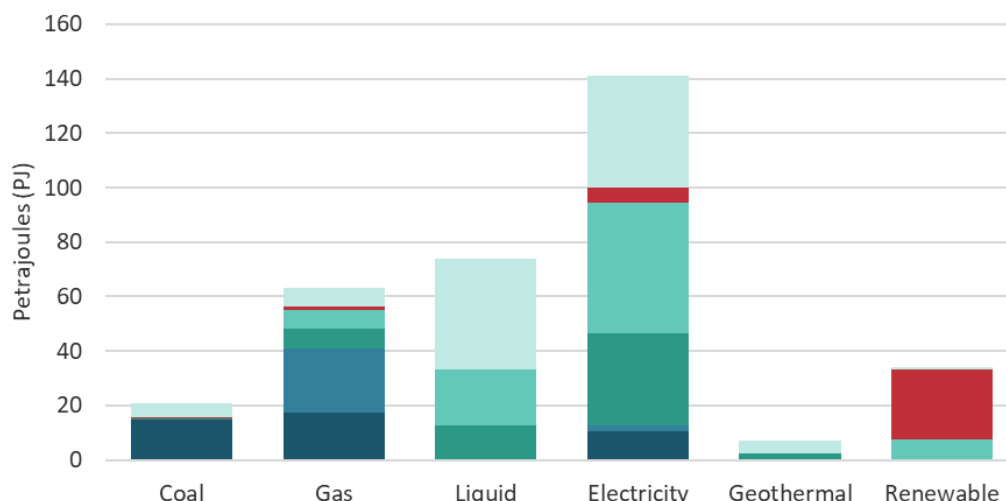
Figure 10: Historical and projected baseline manufacturing and construction energy emissions, 1990–2050



Note: Solid lines = historical data; dashed lines = projections. Historical data up to the end of calendar year 2022 are shown, with projections covering 2023 onwards.

Figure 11 shows final use of fuel by type and sector in the 2022 calendar year. This covers the use of energy directly consumed by users (such as households, businesses, and factories) but does not include the use of fuel (such as coal and gas) to generate electricity. Coal is used mainly for food processing, which is dominated by milk processing. Gas is also used in food processing, as well as in chemicals manufacture (largely methanol production) and directly for space and water heating by buildings (largely in commercial and residential sectors). Liquid fuels are used for off-road transport uses (not counted in transport emissions) in addition to use for small-scale electricity generation.

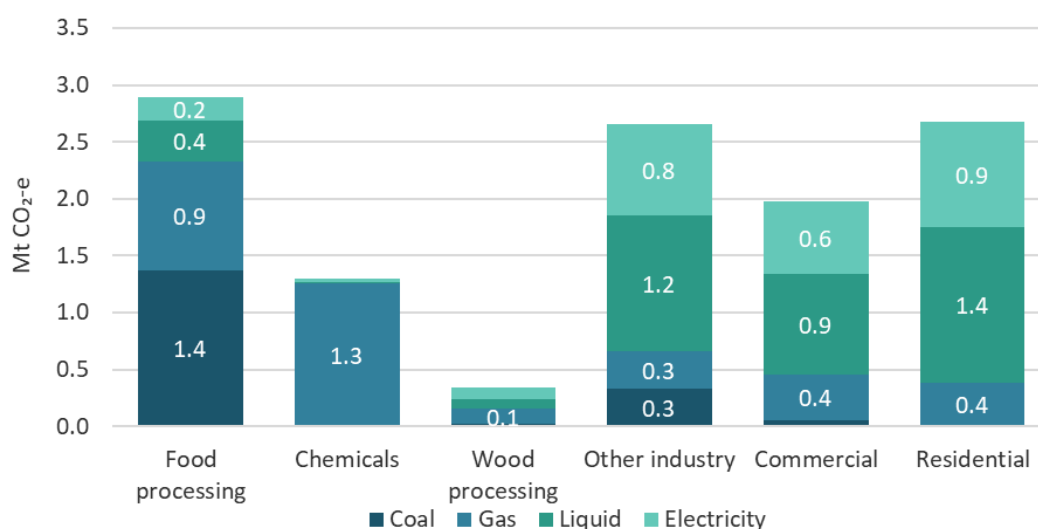
Figure 11: Energy use by fuel and sector, 2022



Source: Ministry of Business, Innovation and Employment (MBIE). [Energy balances](#).

Figure 12 shows the associated emissions, arranged by sector but including emissions by fuel type. Electricity emissions are calculated using a current average emissions factor and applying this to all sectors. This uses the current emissions intensity of electricity, but this is likely to reduce in the future because of an increase in renewable generation.

Figure 12: Energy emissions by end use sector and fuel, 2022



Source: MBIE. [New Zealand energy sector greenhouse gas emissions](#).

Food processing is the main emitting sector for non-transport energy emissions. Emissions are expected to reduce in response to the national direction on industrial process heat, which requires the phase-out of coal for industrial heat production (below 300°C) by 2037.¹⁷ The ENZ model projects that direct emissions from food processing will fall from 2.7 Mt CO₂-e in 2022 (excluding electricity emissions) to 2.4 Mt CO₂-e in 2030, and to 1.4 Mt CO₂-e in 2037 (when the coal phase-out in the national direction ends). Additional emission reductions (of

¹⁷ See Ministry for the Environment. 2023. [National Direction for Greenhouse Gas Emissions from Industrial Process Heat: Industry factsheet](#). Wellington: Ministry for the Environment.

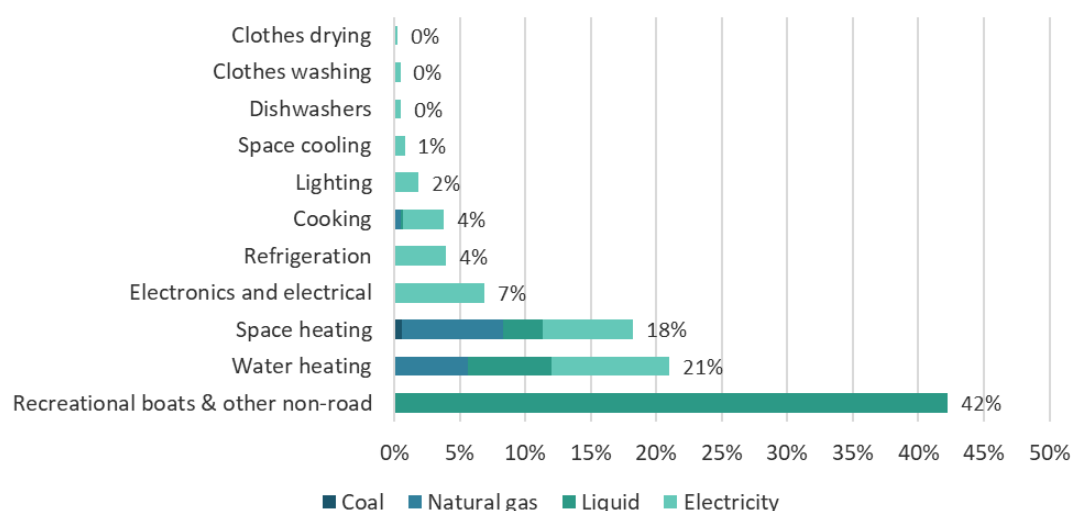
around 0.95 Mt CO₂-e per year) would be achieved by also replacing natural gas for food processing with electricity or biomass.

Other industry includes iron, steel, other metals, mining, construction, and manufacturing of textiles, machinery, and other goods.

Commercial and residential sectors – in these, in addition to gas used for heating and cooking (and resulting in emissions of 0.8 Mt CO₂-e per year), significant quantities of liquid fuel (diesel and petrol) are used for off-road vehicles, generators, boats, and equipment such as lawnmowers.¹⁸ Gas use for heating and cooking could be replaced with electricity, as could some uses of liquid fuels.

Figure 13 shows the residential non-road transport emissions by end use. The major contributor to emissions is from mobile sources – estimated as being largely recreational boating (which, at an estimated 0.9 Mt CO₂-e per year, comprises 34 per cent of total residential emissions and 54 per cent of residential non-electricity emissions).¹⁹ These activities are not a focus of government policy, as markets for low-emissions recreational vehicles will need to develop over the next two decades to provide consumers with those choices.

Figure 13: Residential sector emissions – percentage by end use (not including road transport)



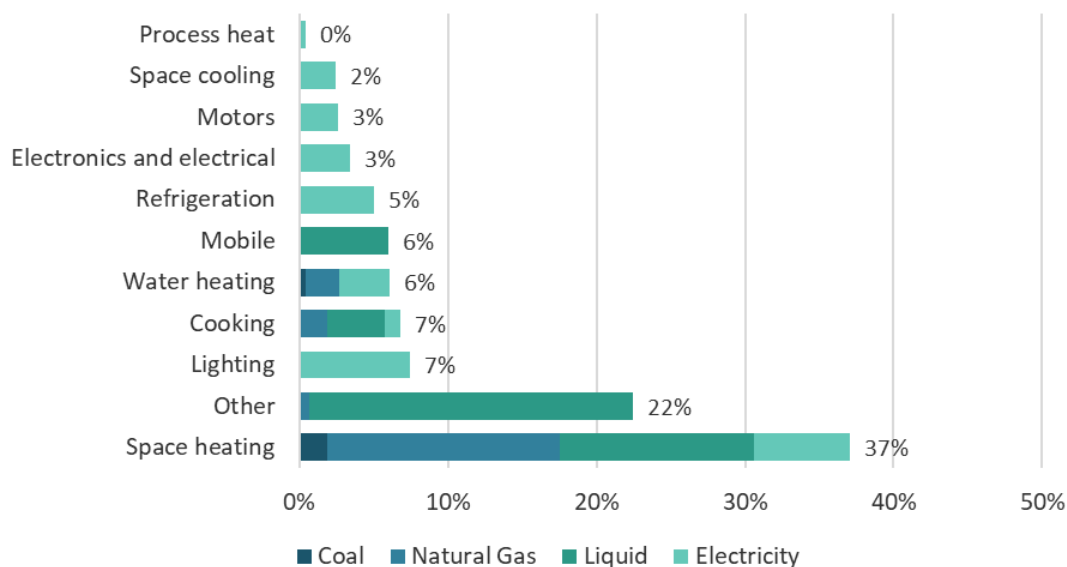
Source: Ministry for the Environment allocation of energy use from Energy Efficiency and Conservation Authority (EECA) [Energy End Use Database](#); MBIE [emissions factors](#).

Commercial sector emissions are disaggregated in figure 14. The largest source is space heating, which includes emissions from natural gas and liquid fuels (largely diesel). A significant percentage of emissions sourced from diesel and petrol use is unclassified.

¹⁸ See, for example, Greed A, Byers T, Van Barneveld A, Field B, Fanselow M. 2021. *Off-road liquid fuel insights. Quantifying off-road diesel and petrol use in New Zealand*. Prepared for Energy Efficiency and Conservation Authority by Martin Jenkins.

¹⁹ Based on an estimated 383 million litres of petrol used for recreational boating. See Energy Efficiency and Conservation Authority. *Off-road liquid fuel insights*. Retrieved 5 November 2024.

Figure 14: Commercial sector emissions – percentage by end use (not including road transport)



Source: Ministry for the Environment allocation of energy use from EECA Energy End Use Database; MBIE emissions factors.

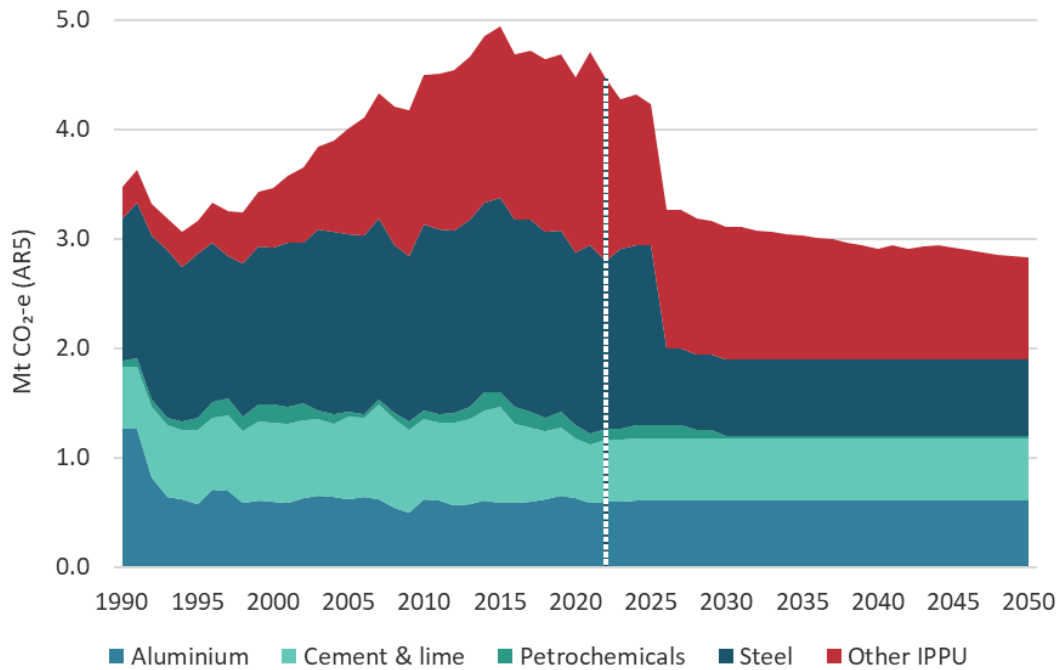
Industrial processes and product use

Historical and projected IPPU emissions are shown in figure 15. The major changes are associated with the reduction in emissions from steel manufacture following the introduction of an electric arc furnace at New Zealand’s only steel mill, which is expected to occur from the beginning of 2026.²⁰ The other major sources (aluminium, and cement and lime) are projected to continue at broadly current levels, assuming current production levels continue and no major shift in technology.

Another change is due to the refrigerant regulated product stewardship (RRPS) scheme proposal. The RRPS scheme is estimated to provide an additional 0.4 Mt CO₂-e of abatement in EB2 and 0.7 Mt CO₂-e in EB3. These central impact estimates assume regulations come into effect from 2025, with impact on emissions from 2027 onwards.

²⁰ New Zealand Steel. *Transition to Lower Emissions Steel Making Can Go Further, Faster*. Retrieved 5 November 2024. www.nzsteel.co.nz/news-and-media/securing-the-future-of-steelmaking-in-nz

Figure 15: Historical and projected IPPU emissions

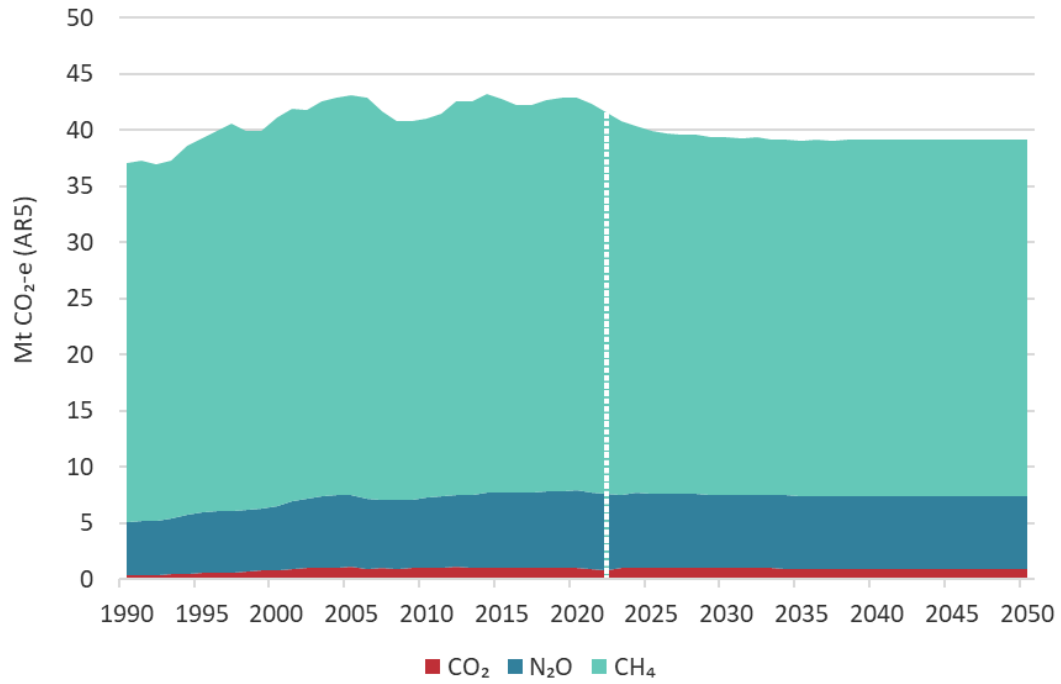


Note: Projections are to the right of the dashed line.

Agriculture

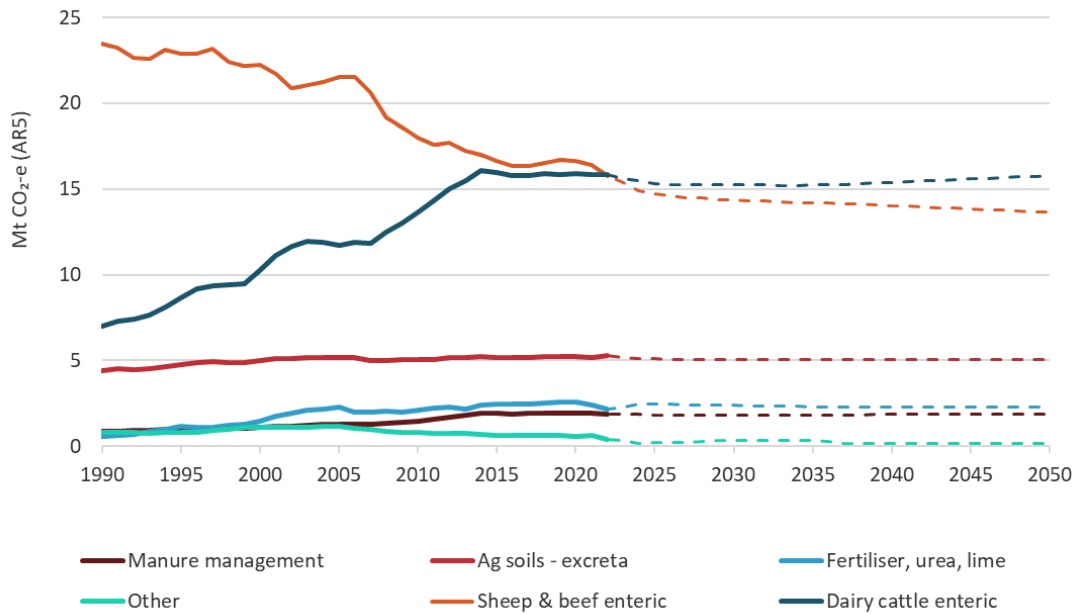
Overall trends in agricultural emissions are shown in figure 16. The major change in the projections is from the reduction in modelled methane emissions. The major contribution to the overall downward projection comes from the ongoing fall in enteric fermentation emissions from sheep and beef, accompanied by a flattening out in dairy enteric emissions (figure 17). These trends are associated with projected downward trends in animal numbers (figure 18).

Figure 16: Historical and projected baseline agricultural emissions by gas, 1990–2050



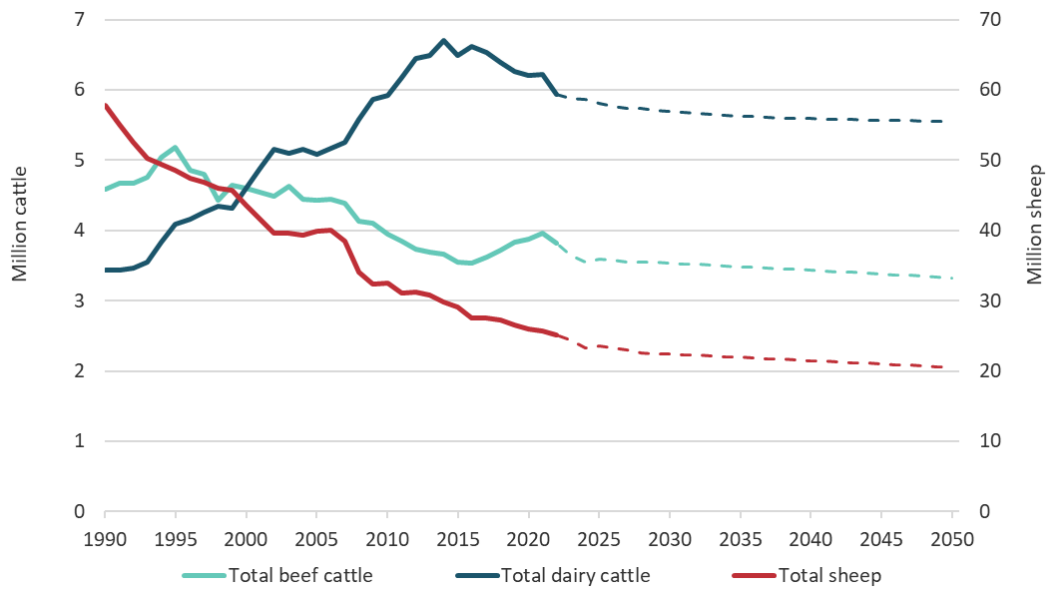
Note: Projections are to the right of the dashed line.

Figure 17: Historical and projected baseline agricultural emissions by source, 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

Figure 18: Historical and projected baseline stock numbers by stock type, 1990–2050



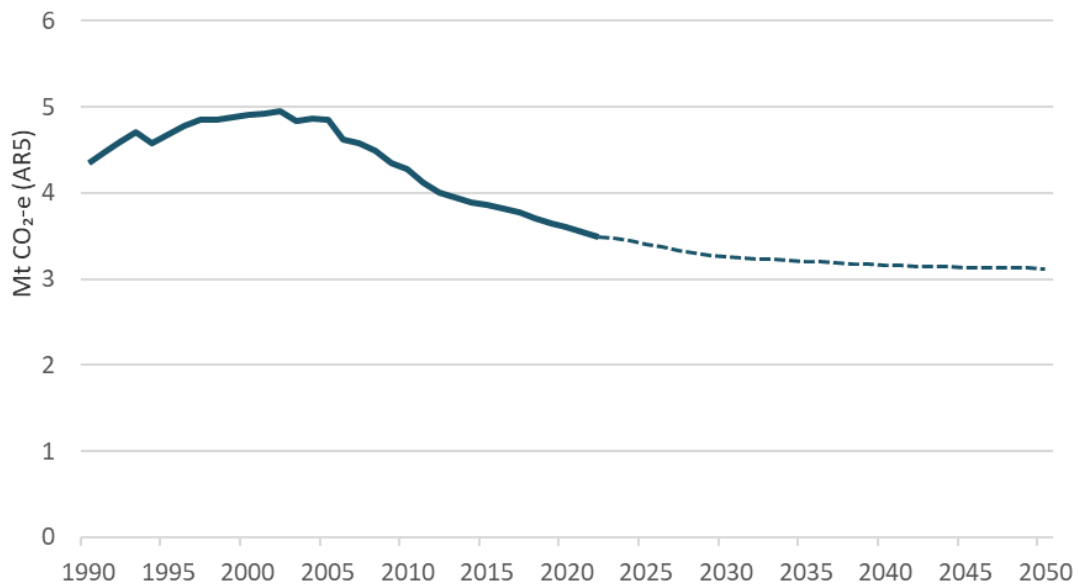
Note: Solid lines = historical data; dashed lines = projections.

Dairy emissions stabilise, despite the falling animal numbers, because of the projected increase in dry matter consumption and milk solids production per head.

Waste

Historical and ENZ model projections of waste emissions are shown in figure 19. Emissions peaked around 2002, but they have been falling since then and are expected to continue to do so at a reduced rate.

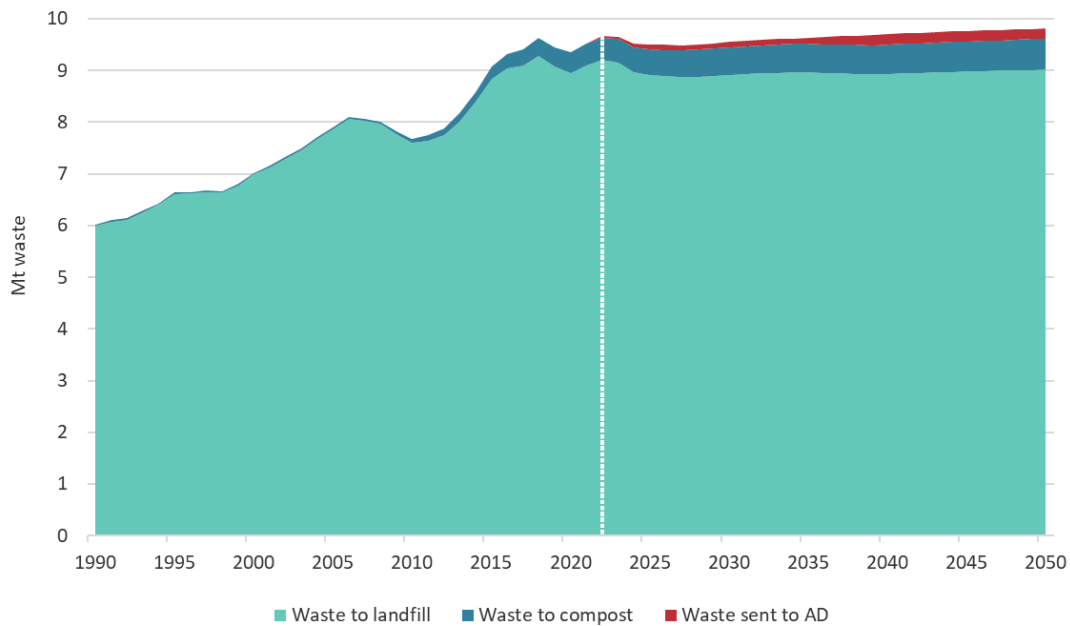
Figure 19: Historical and projected baseline waste emissions, 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

There are some small projected reductions in waste tonnages going to landfill (figure 20), with some volumes going to compost or anaerobic digestion. However, changes are also anticipated from improvements to and greater use of landfill gas capture.

Figure 20: Historical and projected baseline waste tonnages by destination of waste, 1990–2050



Note: Projections are to the right of the dashed line. AD = anaerobic digestion.

Forestry removals

Figure 21 shows the historical and projected forestry removals, including under central, low and high scenarios for the future. The data are from the Ministry for Primary Industries’ September 2024 afforestation and deforestation projections. They suggest that the land use, land-use change and forestry sector is projected to remove between 52.7 and 62.6 Mt CO₂-e from the atmosphere in the second emissions budget (EB2) period (table 10). The projections have been updated since consultation to align with the accounting methodology for reporting on emissions reduction.

The lower scenario has been revised in response to consultation feedback.²¹ This is based on the 2023 afforestation intentions survey findings, but limits exotic afforestation to the lower range of estimates.

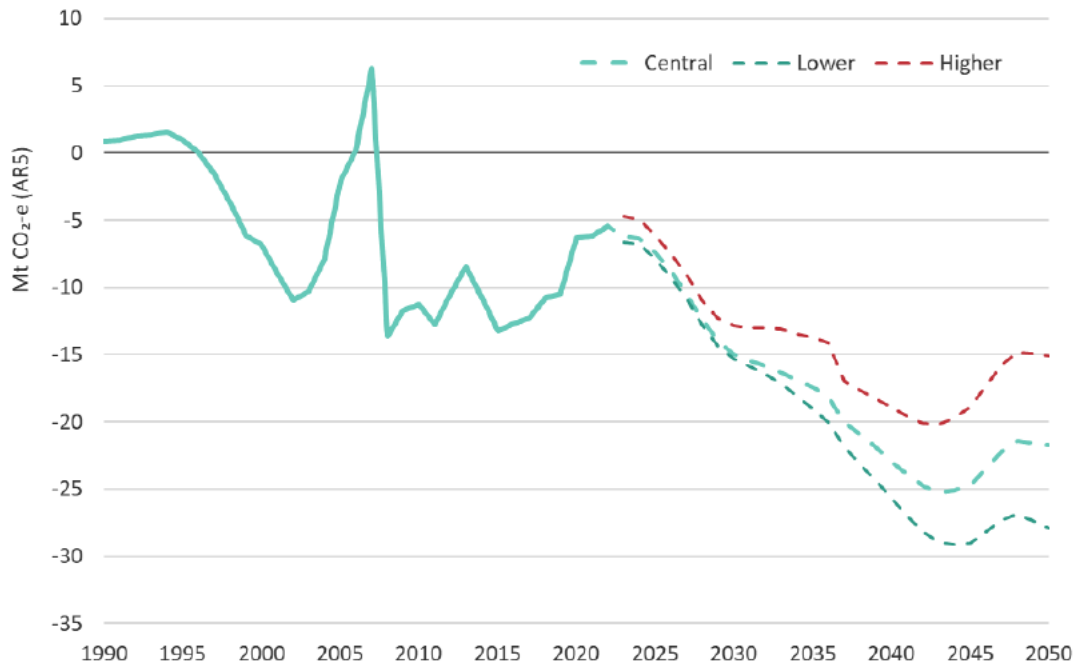
²¹ The lower scenario results are revised from the ERP2 discussion document. They result in about 29,000 fewer hectares of exotic afforestation over 2024–26, and removals reduced by about 0.3 and 1.9 Mt CO₂-e for the lower scenario during the EB2 and EB3 respectively.

Table 10: 2024 baseline projections of forestry’s contribution to emissions targets using target accounting (Mt CO₂-e)

Scenario	EB1 (2022–25)	EB2 (2026–30)	EB3 (2031–35)	2050
Lower	-21.0	-52.7	-66.3	-15.1
Central	-25.2	-60.7	-82.0	-21.8
Upper	-26.6	-62.6	-86.7	-27.9

1. A negative number represents a removal of carbon dioxide from the atmosphere.
2. The lower and upper scenarios reflect varying levels of afforestation and deforestation as included in the 2024 projections.
3. The 2050 figures show the estimated removals from forestry during 2050 (net zero target).
4. The table shows only net emissions and removals from afforestation/reforestation and deforestation.

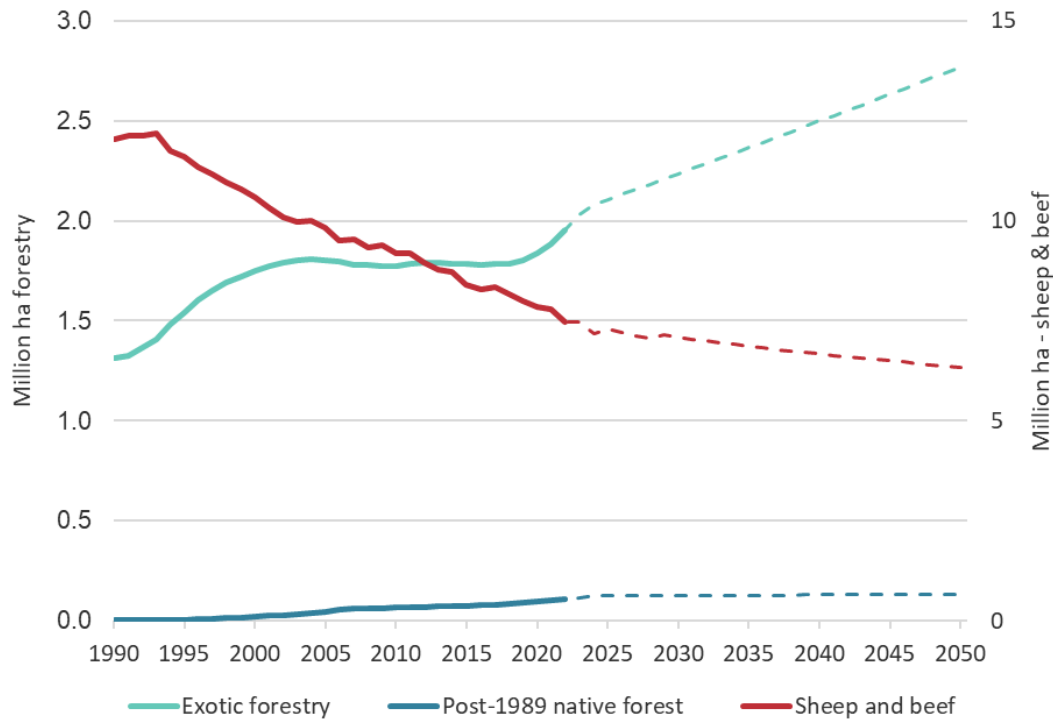
Figure 21: Historical and projected forestry removals, 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

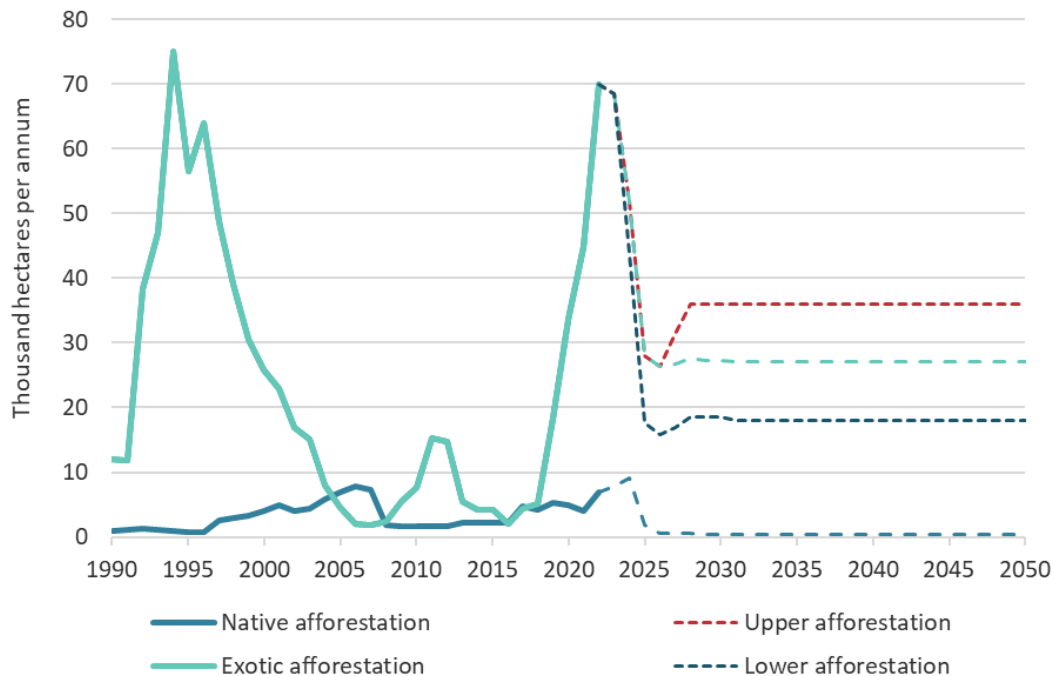
The increasing contribution of removals reflects the ongoing extent of land-use change, mainly from sheep and beef farming to exotic forestry (figure 22).

Figure 22: Historical and projected land area in forestry, and sheep and beef farms, 1990–2050



Note: Solid lines = historical data; dashed lines = projections. Area in forestry is net forest area (ie, only the area forested and excluding land taken up by roads, gullies and streams within the forest estate).

Figure 23: Historical and projected afforestation rates (upper, central and lower), 1990–2050



Note: Solid lines = historical data; dashed lines = projections.

Afforestation from 1990 to 2022 sourced from New Zealand’s Greenhouse Gas Inventory. 2023–35 afforestation projections are based on annual reports on the Afforestation and Deforestation Intentions Survey. Afforestation reflects net stocked area.

Source: Ministry for Primary Industries.

Part 3: Impact of key policies in ERP2

Introduction

This part of the technical annex describes the strategies and policies contained in ERP2, in addition to baseline activity in [Part 2](#) above. In this section we assess these policies for their potential impact on emissions and their contribution to meeting emissions budgets and targets.

Key policies in ERP2

Table 11 sets out the key policies introduced through ERP2, with more details and modelling assumptions below.

Table 11: New policies included in ERP2

Sector	Policy	Explanation
Energy	Electrify NZ	Enables increased renewable energy projects, including through creating a more enabling consenting environment.
	Enable carbon capture, utilisation and storage (CCUS)	Recognises and rewards CCUS emission reductions and removals in NZ ETS. Also creates a regulatory regime to set out consenting, monitoring and liability arrangements for individual projects.
Transport	10,000 public EV charging points	Enables a network of 10,000 EV charging points by 2030.
IPPU	Refrigerants Regulated Product Stewardship (RRPS) scheme	Applies compulsorily RRPS from 2027.
Agriculture	Agricultural emissions pricing system by 2030	Introduces emissions pricing from 2030 to incentivise the uptake of technologies while not reducing agricultural production.
Forestry	Limiting whole-farm conversions to forestry on high-quality land	Proposes a moratorium on exotic forestry NZ ETS registrations on high-versatility land (LUC classes 1–5); an annual hectare limit on exotic forestry NZ ETS registrations on medium-versatility land (LUC class 6); and no restrictions on low-versatility land (LUC classes 7 and 8). This proposal provides flexibility for on-farm planting by providing a 25% exemption to these restrictions.
	Afforestation on Crown-owned land	Involves the Government partnering with the private sector to plant trees on Crown-owned land. This policy would contribute emissions removals.
Waste	Waste Minimisation Fund (WMF)	Invests a portion of the forecast levy revenue (through to 2030) into resource recovery systems and infrastructure that processes organic waste.
	Organic waste management and landfill gas capture	Expands landfill gas capture systems to smaller class 1 (municipal waste) facilities – for example, facilities that receive over 10 kt of waste per year. Make regulatory changes resulting in up to a 5% increase in landfill gas recovery rates.

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Intervention rationale and approach to analysis

This section sets out how individual ERP2 policies are expected to affect emissions, and how these have been analysed. [Appendix 2](#) provides further detail on the intervention rationale and [appendix 3](#) summarises the assumptions used.

The ability of individual policies in ERP2 to deliver expected emissions reductions depends on their successful implementation. Each policy has a set of specific steps that will need to be identified and undertaken to ensure their successful implementation. More generally, the estimates of the abatement potential of the policies are subject to several dependencies and assumptions. They will need to be monitored carefully to ensure they are realised.

The uncertainty for individual policy delivery and impact should be considered as part of our broader approach for managing the uncertainty inherent in a multi-decade response, as set out in ERP2.

NZ ETS settings

The New Zealand Emissions Trading Scheme (NZ ETS) provides incentives for emission reductions and removals for all sectors apart from agriculture, non-municipal waste, and a handful of other small exceptions. Although analysis suggests that gross emissions reductions are relatively inelastic with respect to NZ ETS prices in the short run, emissions reductions and removals are more responsive over the longer term to the signals the NZ ETS provides. The NZ ETS is therefore an important cross-sectoral tool for driving cost-effective emissions reductions across the economy.

However, the NZ ETS is somewhat constrained in its ability to achieve certainty of net emission reductions within a budget because of the size of the current NZU stockpile.²² The stockpile – that is, the current private holdings of NZUs – is part of the overall cap that limits allowable emissions. The stockpile means that reductions in the supply of auction units may not have an immediate effect on emissions, which otherwise might be assumed.

NZ ETS unit and price control settings (NZ ETS settings) are updated annually, so that five calendar years of settings are always in place. The Government announced updates to the NZ ETS settings for 2025 to 2029 in August 2024,²³ and these have now been set in regulations. The updates to NZ ETS settings included a significant reduction in auction volumes to reduce the risk posed by the stockpile. The current expectations for the EB2 period are for 45 million NZUs to be supplied (28 million via industrial allocation and 17 million auctioned units). This means the current projected NZ ETS sector demand of 91 million units for EB2 would have to be met by a combination of additional reductions or removals, or by use of the stockpile.

²² The current size of the stockpile (at 30 September 2024) is 146 million NZUs – approximately four times annual compliance demand. Environmental Protection Authority. *Privately held units*. Retrieved 5 November 2024.

²³ Ministry for the Environment. *Annual updates to emission unit limits and price control settings*. Retrieved 5 November 2024.

At the time NZ ETS settings were decided, the total impact of tightening the settings was estimated at 0.7 Mt CO₂-e in EB2 and 3.1 Mt CO₂-e in EB3.²⁴ Secondary market prices increased following the announcement of tighter NZ ETS settings.

NZ ETS prices are an important input assumption into the ENZ model.²⁵ Most of the impacts of the NZ ETS are already included in the baseline and other policy impacts, and they are difficult to disentangle from other factors driving net emissions reductions. To estimate the marginal additional impact of tighter NZ ETS settings not captured elsewhere, we used the NZ ETS market model, which simulates the NZ ETS market (supply, demand and prices) in response to changes in auction supply levels and other market factors.^{26, 27}

The market model was run with old NZ ETS settings (based on 2023 decisions) and new settings (based on 2024 decisions) to produce estimates of alternative NZU prices and afforestation levels in response to the changes in prices (see table 12). These alternative scenarios were used as inputs to the ENZ model to estimate net emission reductions additional to those already captured elsewhere. These *additional* impacts totalled 0.2 Mt CO₂-e in EB2 and 1.0 Mt CO₂-e in EB3, suggesting about two-thirds of the overall impact of tighter NZ ETS settings has been captured elsewhere. The differences were seen particularly in forestry, with some related effects on agricultural emissions via changes in land use. These differences were then added to or subtracted from the ‘with new measures’ ENZ model run.

Table 12: Differences in auction volumes – old and new NZ ETS unit settings

	Old settings	Old cumulative	New settings	New cumulative	Cumulative difference
2025	12.6	12.6	6.0	6.0	6.6
2026	10.7	23.3	5.2	11.2	12.1
2027	9.1	32.4	4.3	15.5	16.9
2028	7.0	39.4	3.3	18.8	20.6
2029	5.7	45.1	2.4	21.2	23.9
2030	3.1	48.2	1.7	22.9	25.3
2031	6.2	54.4	6.6	29.5	24.9
2032	4.1	58.5	4.4	33.9	24.6
2033	2.0	60.5	2.2	36.1	24.4
2034	0.1	60.7	0.4	36.5	24.2

Note: Auction volumes are set in regulation for the next five calendar years (ie, to 2028 for old settings and to 2029 for new settings). Auction volume assumptions beyond these dates (in italics) are based on the same methodology being applied to future years until auction volumes reach zero.²⁸

²⁴ Ministry for the Environment. 2024. *Regulatory Impact Statement: 2024 update to New Zealand Emissions Trading Scheme limits and price control settings for units*. Wellington: Ministry for the Environment.

²⁵ Officials need to make assumptions on the forward pathway of NZ ETS prices to inform modelling. The emissions price assumptions are not a prediction or forecast of future NZ ETS prices. They should be considered in the context for which they are intended to be used – namely, to provide a consistent input into government climate policy modelling.

²⁶ The model is described in: Ministry for the Environment. 2023. *Review of the New Zealand Emissions Trading Scheme: Summary of modelling*. Wellington: Ministry for the Environment.

²⁷ Work is underway to incorporate NZ ETS dynamics within the ENZ model itself. Although the functionality has been developed, it was not judged to be sufficiently tested and robust for use in the final ERP2 projections.

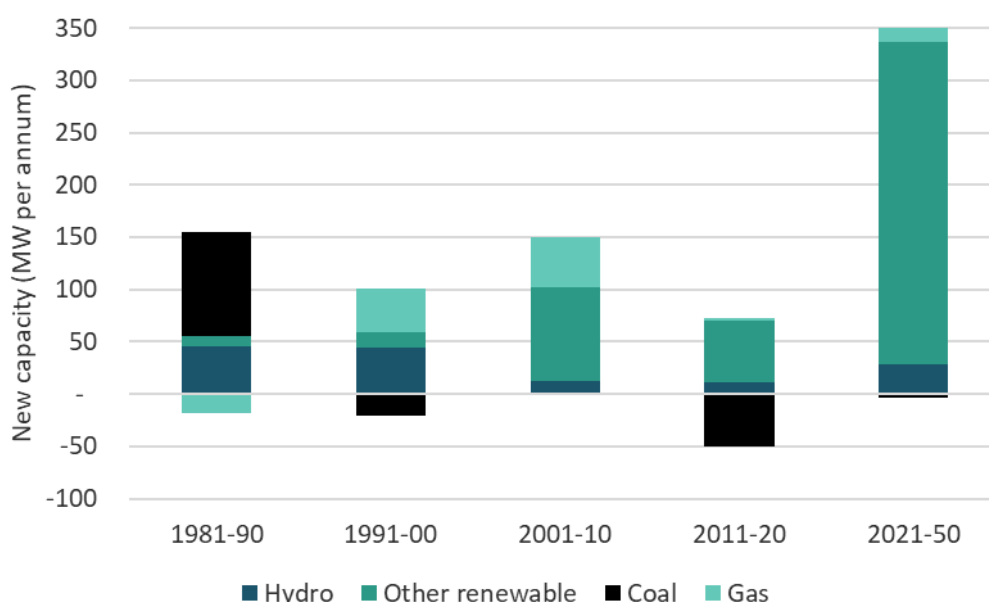
²⁸ For example, see the ‘For visibility’ calculations throughout the Climate Change Commission’s NZ ETS unit limits and price controls advice. 2024. *Advice on NZ ETS unit limits and prices control settings for 2025–2029. Technical Annex 1: Unit limit settings*. Wellington: Climate Change Commission.

Electrify NZ

The key opportunity for reducing emissions from electricity generation is via a shift to renewables, such as onshore wind and solar. These are currently the lowest-cost generation options. We therefore expect generators to prefer and invest in renewables over the next three decades.

The requirement for new generation is largely to meet expanding demand for electricity for EVs and industrial heat. Figure 24 shows average annual historical new builds (and closures) by decade, compared with the annual estimated requirement from now until 2050 using the Ministry of Business, Innovation and Employment’s central (reference) projection. Although most new build generation is expected to be renewable (such as wind and solar), fossil generation is likely to be needed to ensure that demand can be met in periods of low renewable supply (such as dry years or low-wind periods). This may change as alternative approaches are developed (such as green technologies used for peaking, some mix of hydro/battery storage, or interruptible supply). This figure does not take account of the change from coal to biomass combustion as included in the ERP2 baseline projections.

Figure 24: Electricity generation capacity – historical and future requirement



Source: Historical – MBIE electricity data tables;²⁹ Projections – electricity demand and generation scenarios.³⁰

Electrify NZ includes a range of initiatives focused on removing consenting barriers for renewable electricity generation, transmission and distribution infrastructure, as well as initiatives focused on updating network rules so a goal of doubling renewable energy can be achieved faster. The combination of these actions is expected to accelerate the shift to renewables over the next 10 years. In modelling this policy, there is a baseline assumption that new electricity generation and transmission infrastructure will be built to meet demand. Lower consenting costs are expected to flow through to lower wholesale prices, and to affect electricity demand relative to other energy sources. These effects are calculated using the ENZ model to estimate slightly lower emissions.

²⁹ Ministry of Business, Innovation & Employment. *Electricity statistics*. Retrieved 5 November 2024.

³⁰ Ministry of Business, Innovation & Employment. 2024. *Electricity Demand and Generation Scenarios: Results summary*. Wellington: Ministry of Business, Innovation & Employment.

For modelling, we assumed a halving of consenting costs (which are about 2 to 5 per cent of capital costs) for renewables generation, but no change to completion time of new build. This is because the models assume that generation is built to meet demand, consistent with market participants currently making investment decisions that account for consent delay.

Enabling CCUS

Enabling CCUS would require its inclusion in the NZ ETS as a source of removals. The assumptions on uptake are based on feedback from the private sector on potential investments. The emissions figures are based on information provided during consultation on the amount of CO₂ that can be captured during gas production in a high-CO₂ field and the potential injection rate at the storage site.

Three potential scenarios³¹ for CCUS deployment in New Zealand over the next five to ten years have been considered.

- **Low CCUS deployment scenario** – no CCUS is deployed in New Zealand until after 2035.
- **Medium CCUS deployment scenario** – CCUS is deployed from 2027 at a high CO₂ gas field, with gas production from existing ‘proven plus probable’ (2P) reserves.
- **High CCUS deployment scenario** – CCUS is used by two gas producers to capture emissions during gas production from 2027 for high CO₂ gas fields. One producer stores CO₂ from production from existing 2P reserves, as well as production from third parties, at the full possible sequestration rate. The other gas producer can produce contingent gas resources in one of the gas fields as a result of CCUS improving economics of gas extraction. Here, the CO₂ sequestered does not contribute to emissions reductions, because it is assumed that the gas would not be produced without CCUS.

The emission reduction estimates for the three scenarios are shown in table 13.

Table 13: Estimated reduction in emissions resulting from CCUS in EB2 and EB3

CCUS scenario	Description	Estimated reductions in emissions (Mt CO ₂ -e) ³²	
		EB2	EB3
Low	No CCUS deployed until after 2035.	0	0
Medium	CCUS deployed in 2027 at a high CO ₂ gas field.	1.0	0.9
High	CCUS deployed in 2027 at two gas fields. CO ₂ from gas production and from third parties is sequestered at one gas field. Extra gas is mined at the other gas field as a result of CCUS improving economics.	<1.1	<1.6

The medium scenario has been adopted for the ERP2 projections.

In our assessment, the high scenario is least likely, particularly because of its assumption of sequestration of gas from third parties, which is a much less proven technology. Officials have used their professional judgement in choosing either the low or medium scenario.

³¹ There are other possible permutations.

³² These are figures for changes to emissions resulting from CCUS in EB2 and EB3. In the high CCUS scenario, the net effect on emissions is less than the amount that is sequestered, as there will be emissions associated with the extra gas that is mined, as a result of CCUS changing the economics of mining gas.

We have adopted the medium scenario, while noting some relatively conservative assumptions that go with it. These include the following.

- Deployment of the technology is assumed to be later in the emissions budget, managing optimism about the pace at which plant may be commissioned.
- Deployment is limited to the one site, despite options existing for use elsewhere.

Increased public EV charging points

A target of 10,000 public EV charging points by 2030 is expected to help reduce ‘range anxiety’ associated with the purchase of electric vehicles – a major barrier to EV uptake.

The effects of 10,000 public EV charging points are estimated using relatively conservative assumptions, in the absence of suitable empirical evidence to base any assessment on. The modelling has assumed a modest improvement in EV uptake due to reduced range anxiety, and that this will have a small effect on transport emissions. This used an existing option for transport assumptions built into the ENZ model. The EV proportion of all road kilometres travelled in 2030 is projected to increase from 9.0 per cent in the baseline to 9.2 per cent with the policy.

RRPS scheme

The Refrigerants Regulated Product Stewardship (RRPS) scheme provides for mandatory participation in an accredited scheme to collect and destroy synthetic refrigerants (sometimes known as fluorinated gases or F-gases). Refrigerants and other synthetic greenhouse gases are already a declared priority product under the Waste Minimisation Act (2008), which enables the regulations to be introduced. The modelling of the effect of the RRPS (table 14) is based on independent analysis by Verum. The impacts of an RRPS were updated to reflect impacts sooner than 2030 (2027 onwards).

Table 14: RRPS abatement by year (kt CO₂-e (AR5))

2027	2028	2029	2030	2031	2032	2033	2034	2035
51	106	134	131	127	147	137	153	152

Agricultural emissions pricing system

Agricultural emissions pricing has been modelled to take effect by 2030 and is assumed to incentivise the uptake of mitigation technologies and not impact production or livestock numbers (table 15). We expect that, over the budget period, some farmers will want to be early adopters of mitigation technologies, in the absence of an emissions price driver. However, our assumption in the modelling is that price will be a key driver of uptake. Given this, we have adopted relatively conservative assumptions that have a very small impact on EB2.

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Table 15: Mitigation technology assumptions

Technology	Target emissions source	Efficacy	Date available to farmers	Baseline		With emissions pricing	
				Date of peak adoption	Peak adoption level	Date of peak adoption	Peak adoption level
Dairy							
Nitrification inhibitor	Agricultural soils – grazing	17%	2030	2045	1%	2045	1%
Methane inhibitor	Enteric fermentation	45%	2028	2042	3%	2041	69%
Low-methane genetics	Enteric fermentation	TS	2029	2042	4%	2040	96%
Low-emissions feeds	Enteric fermentation	8%	2024	2037	1%	2035	6%
EcoPond	Manure management CH ₄	92%	2025	2037	2%	2037	3%
Sheep & beef							
Methane inhibitor (beef)	Enteric fermentation	45%	2028	2047	2%	2047	15%
Low-methane genetics (beef)	Enteric fermentation	TS	2035	2052	1%	2050	91%
Low-methane genetics (sheep)	Enteric fermentation	TS	2026	2041	4%	2040	92%

Note: TS = time series.

Source: MPI

The uptake assumptions in the policy scenario are shown in table 16.

Table 16: Assumed technology uptake (percentage) (bold text indicates year of peak adoption)

Year after availability	Dairy genetics	Dairy CH ₄ -inhibitor	Dairy low-emissions feed	Dairy EcoPond	Dairy N-inhibitor	Sheep genetics	Beef genetics	Beef CH ₄ -inhibitor
1	2	1	0	0	0	1	1	0
2	8	4	0	0	0	5	4	0
3	19	10	1	1	0	12	9	1
4	33	18	2	1	0	22	17	2
5	50	28	3	2	0	34	27	3
6	65	38	4	2	0	47	38	4
7	77	47	5	3	1	59	50	6
8	86	54	5	3	1	69	60	7
9	91	59	6	3	1	77	69	9
10	94	63	6	3	1	83	76	10
11	96	66	6	3	1	87	82	11
12	96	67	6	3	1	89	86	12
13	96	69	6	3	1	91	88	13
14	96	69	6	3	1	92	90	14
15	96	69	6	3	1	92	91	14

Year after availability	Dairy genetics	Dairy CH ₄ -inhibitor	Dairy low-emissions feed	Dairy EcoPond	Dairy N-inhibitor	Sheep genetics	Beef genetics	Beef CH ₄ -inhibitor
16	96	69	6	3	1	92	91	15
17	96	69	6	3	1	92	91	15
18	96	69	6	3	1	92	91	15
19	96	69	6	3	1	92	91	15
20	96	69	6	3	1	92	91	15

Afforestation on Crown-owned land

The scenario for this policy involves a mix of indigenous and exotic planting on up to 320,000 hectares of Crown-owned land from 2027 until 2050. The scenario is based on the following assumptions:

- a high level of uptake, with an average planting rate of around 15,000 hectares per year from 2027.
- at least 320,000 hectares of Crown-owned land has the biophysical factors required for afforestation (e.g., altitude/slope/rainfall) and is free of other constraints that may limit the Crown's ability to offer it for partnership (e.g. land held for future Treaty settlements).
- calculates abatement in alignment with the methods used within emissions budgets and targets, as described under *Part 1: The ENZ model*.
- calculates NZ ETS unit allocations and returns using the default look-up tables for the Canterbury-West Coast regions.³³

The Government intends to progress this policy through partnership with the private sector. Early market engagement will improve understanding of the factors that will drive private sector interest and support successful implementation.

The estimated emissions and removals for the afforestation on Crown-owned land scenario is shown in table 17. This includes the emissions impact from displaced stock (sheep and beef farming on Crown-owned land).

Table 17: Estimated emissions removals for the afforestation on Crown-owned land scenario

Budget period or year	Emissions removals (Mt CO ₂ -e)
EB1	0.0
EB2	+0.4*
EB3	-1.85
EB4	-10.5
2050	-5.1

* Initially emissions rise because there are net emissions from land clearance and soil disturbance for afforestation.

³³ These tables were used as they represent the region where a large proportion of this land is located. However, actual NZ ETS unit allocations and returns will differ based on land location, productivity, forest type and the use of default or participant specific tables.

Waste policies

The Waste Minimisation Fund (WMF) is funded from the waste disposal levy. The WMF has recently reopened (October 2024), with investment signals aligned to waste minimisation projects that reduce emissions.

The WMF investment impact on emission reductions uses a central scenario and is based on an additional \$30 million per year of WMF funding over EB2. The cumulative impact builds on the existing WMF pipeline of committed projects and is estimated at an average 200 kt CO₂-e per year (1 Mt CO₂-e to 2030).

The level of abatement is broadly proportional to the level of funding, which also assumes co-investment (from industry and local government). The central scenario uses the mid-point estimate for WMF dollar invested per tonne of CO₂-e abated and the mid-point of abatement impact for approved projects combined.³⁴ Estimates for \$30 million per year for EB2 are 0.7–1.3 Mt CO₂-e (with a 1.0 Mt CO₂-e mid-point). The impact estimate assumes that WMF co-funding is allocated to eligible projects, and that project proposals continue to come forward in response to investment signals. Existing funds are available to support ERP2 waste policy implementation. Further assumption detail is available in [appendix 3](#).

Regulatory changes that improve the management of organic waste and the average efficiency of landfill gas capture across New Zealand will require a combination of policy measures equivalent to:

- the expansion of landfill gas capture to all class 1 (municipal) landfills over 10 kt per year
- a 5 per cent average increase in landfill gas capture rates for class 1 landfills that already have landfill gas (LFG) capture (ie, from an assumed 68 per cent to 73 per cent).

Cabinet decisions will be required for any future regulatory changes. Combining both policies provides a central estimate of 0.76 Mt CO₂-e (0.80 Mt CO₂-e), with a range of 0.39–1.10 Mt CO₂-e. Several regulatory tools are available in addition to those two in the modelled scenario including extending the NZ ETS to a wider range of landfills, and consideration of controls on organic waste disposal at differing landfill classes.

Data uncertainty around LFG capture efficiency in New Zealand has been reduced through working with industry on a voluntary basis towards improved site-specific evidence. The evidence has highlighted wide-ranging practices and associated efficiencies across New Zealand's disposal facilities. This evidence will help inform regulatory proposals.

Impacts of key ERP2 policies on net emissions

Using the assumptions and modelling approaches noted above and in [appendix 3](#), table 18 summarises the estimated effects of proposed new policies in the periods of EB1, EB2 and EB3. In addition to these stated policies are effects of the change to the NZ ETS settings that has reduced the supply of NZUs. These are partly included in the baseline and partly via separate analysis (included in table 8).

³⁴ Infrastructure projects delivering abatement impact are assumed to come online gradually, reaching full impact in year 5.

Table 18: Estimated emissions reduction impacts of new policies in ERP2, per budget period (Mt CO₂-e)

Sector	Policy	EB1	EB2	EB3
Energy	Electrify NZ	0.0	-0.1	-1.6
	Enable CCUS	0.0	-1.0	-0.9
Transport	10,000 public EV charging points	0.0	-0.01	-0.2
IPPU	RRPS scheme	0.0	-0.4	-0.7
Agriculture	Agricultural emissions pricing system (abatement via uptake of mitigations)	0.0	-0.2	-10.6
Forestry	Afforestation on Crown-owned land	0.0	0.4	-1.8
	Limiting whole-farm conversions to forestry on high-quality land	0.0*	0.0	0.0
Waste	WMF	0.0	-1.0	-1.0
	Organic waste management and LFG capture	0.0	-0.8	-1.1
Multi-sector	Residual effects of NZ ETS settings change not captured elsewhere	0.0	-0.2	-1.0
Total – summed above		0.0	-3.3	-18.9
Total – integrated analysis		-0.4	-3.2	-17.1

* Because the projections for estimated afforestation are lower than the proposed restrictions on NZETS registrations (specifically the annual hectare limit on land-use capability class 6 farmland) there is no overall emissions impact from the proposal.

The total policy impact is calculated in two ways.

- The effects of the individual policies are estimated through separate analysis outside of the ENZ model. The individual estimates of effects are totalled to produce a total.
- The assumptions behind the individual policies are used as input assumptions to the ENZ model or, in some instances, the results of the analyses are input directly. This picks up on interactions between the policy effects (eg, where an emission reduction in one sector changes demand for energy supply). It also removes any potential double counting of effects.

Overall impacts of key ERP2 policies on meeting emissions budgets

Table 19 shows the estimated emissions and removals that take into account the proposed new measures for ERP2. This uses the integrated approach to using the ENZ model, as described above and in [Part 1](#). Under the central projection, net emissions are on track to achieve the second emissions budget, but a significant uncertainty margin remains.

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Table 19: Projections of emissions and removals including effects of proposed new measures, per budget period (Mt CO₂-e)

Budget period	Category	Budget	Interim ERP2 with measures projections	ERP2 projection with new measures
EB1	Net emissions	290	284.0 ± 4	284.1 ± 7
	Gross emissions		307.3	309.3
	Removals		-23.3	-25.2
EB2	Net emissions	305	303.3 ± 18	303.1 ± 17
	Gross emissions		364.5	363.4
	Removals		-61.3	-60.3
EB3	Net emissions	240	257.4 ± 29	249.2 ± 33
	Gross emissions		339.7	333.4
	Removals		-82.3	-84.3

Figure 25 shows the emissions projections incorporating the effects of new measures – both for net greenhouse gases (all gases) and for long-lived gases only, which we discuss below.

Figure 25: Projections range from sensitivity analysis compared with a range based on historical deviation and sensitivity analysis (low and high), 2022–50

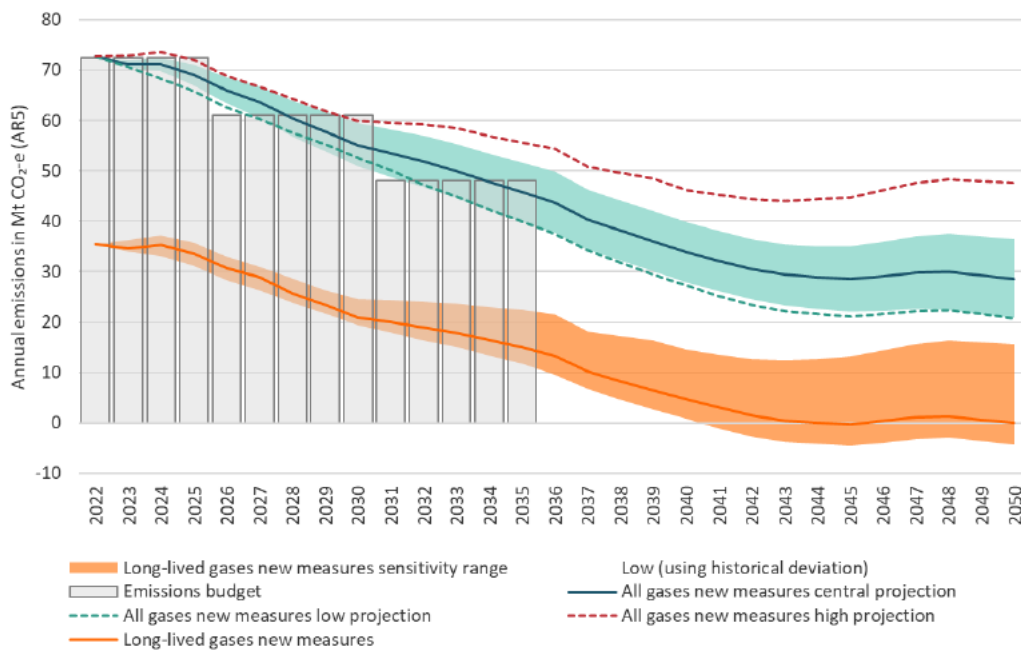


Table 20: ERP2 projections with new measures, per budget period (Mt CO₂-e)

Budget period	Category	ERP2 interim (central)	ERP2 (central)	ERP2 (low)	ERP2 (high)
EB1	Net emissions	284	284.1	277.4	291.4
	Gross emissions	307	309.3	304.0	312.4
	Removals	-23	-25.2	-26.6	-21.0
EB2	Net emissions	303.3	303.1	288.6	321.8
	Gross emissions	365	363.4	351.3	374.5
	Removals	-61	-60.3	-62.7	-52.7
EB3	Net emissions	257	249.2	224.6	289.7
	Gross emissions	340	333.4	310.6	356.0
	Removals	-82	-84.3	-86.0	-66.3
2050	Net emissions	35.1	28.6	20.8	47.6
	Gross emissions	56.5	55.4	47.7	62.7
	Removals	-21.4	-26.8	-26.9	-15.1

Overall impact of key ERP2 policies on meeting the 2050 target for long-lived emissions

Figure 25 above shows the impact of key ERP2 policies on reducing long-lived emissions to net zero by 2050. Under the central projection, emissions are projected to be zero in 2050. However, there is significant uncertainty projecting emissions out to 2050.

Table 21 summarises the results relative to the 2050 net zero target.

Table 21: ERP2 projections with new measures for 2050 (long-lived gases)

Budget period	Category	ERP2 interim (central)	ERP2 (central)	ERP2 (low)	ERP2 (high)
2050	Net emissions	2.5	0.0	-4.3	15.6
	Gross emissions	23.9	26.7	22.6	30.7
	Removals	-21.4	-26.8	-26.9	-15.1

Impact of key ERP2 policies on the target for biogenic methane emissions

New waste and agricultural emissions reduction policies in ERP2 suggest New Zealand can meet its biogenic methane target (figure 26 and table 22).

- The 10 per cent 2030 biogenic methane target is finely balanced, with a projected 9.4 per cent reduction under 'ENZ Adding Up' and 10.1 per cent reduction under 'ENZ Integrated'. The difference in results partly reflects the more simplistic approach used in 'adding up', which takes less account of the annual changes in baseline animal numbers but applies an equal annual effect. By contrast, 'ENZ Integrated' accounts for these dynamic effects.
- By 2050, biogenic methane emissions reduce by 14.7 per cent under 'ENZ Adding Up' and 24.9 per cent under 'ENZ Integrated', compared to the target of 24–47 per cent reduction below 2017 levels. As for 2030, the 'adding up' approach is simplistic in approach and does not vary the effect by year. 'ENZ integrated' is preferred.

Figure 26: Biogenic methane emissions in ERP2, 2017–50

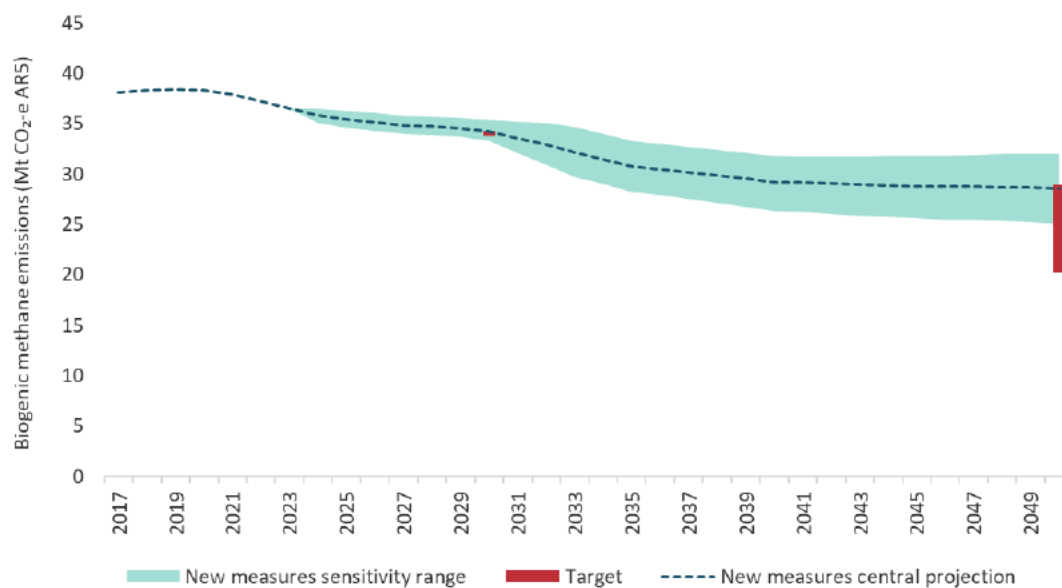


Table 22: Biogenic methane projections, per target year (Mt CO₂-e)

Target year	Targets	Interim ERP2	ERP2 (central)	ERP2 (low)	ERP2 (high)
2030	34.3 (–10%)	33.9 (11.1%)	34.3 (–10.1%)	33.3 (–12.5%)	35.4 (–7.1%)
2050	20.2–29.0 (–24–47%)	32.6 (14.4%)	28.6 (–24.9%)	25.1 (–34.1%)	32.0 (–16.1%)

Impact of key ERP2 policies on meeting NDC1

The updated gap that needs bridging, to meet NDC1, is reduced to a central projection of 84 Mt CO₂-e.

Part 4: Impacts of ERP2 across our economy and society

Introduction

This part of the technical annex provides analysis of the expected distributional impacts from climate mitigation policies on different groups of New Zealanders. This analysis is informed by quantitative modelling, qualitative analysis carried out by government agencies, and public feedback received during consultation. Our analysis is focused on the impacts from government efforts to reduce emissions, not on any impacts of the broader transition to low emissions, or of climate change itself.³⁵

Our quantitative analysis largely stems from computable general equilibrium (CGE) modelling commissioned by the Ministry for the Environment.^{36, 37} The modelling has a framework and evidence base for assessing distributional impacts. Based on this, it estimates the aggregate impacts of ERP2 on the economy and then breaks these down into insights on distributional impacts across different groups. Results show the expected difference in outcomes across households, sectors and regions for three scenarios.³⁸

- **ERP2 pathway** – this includes the impact of existing climate mitigation policies and planned ERP2 measures.
- **With existing measures pathway** – this includes impacts of current climate mitigation policies,³⁹ but not planned new ERP2 measures.
- **Without measures pathway** – this is a hypothetical counterfactual with no climate mitigation policy.

This analysis informs the strategy in ERP2 to mitigate the impacts that reducing emissions and increasing removals will have on employees and employers, regions, iwi and Māori, and wider communities.

³⁵ For example, we are not focused on impacts on New Zealand businesses from increased climate demands from customers or supply chains. Additionally, impacts from climate risks are addressed separately through the Government’s adaptation workstream, except where government mitigation policy increases those risks.

³⁶ See Tortonian E, Adams P, Stroombergen A. Forthcoming. *Economic Impact of New Zealand’s Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited.

³⁷ The WEM pathway and the ERP2 pathway were finalised on 27 September 2024 and 22 October 2024, respectively. This means neither the WEM pathway nor the ERP2 pathway includes the impact of biomass at Huntly power station. This information was received after the CGE results were finalised. However, officials judge that these impacts do not materially alter the macro-economic and distributional impacts presented in this section.

³⁸ Because equivalent whole-of-economy modelling was not undertaken for ERP1, it is not possible to make comparisons of whole-of-economy markets between ERP1 and ERP2.

³⁹ ERP1 policies that have since been cancelled (such as the Clean Car Discount) are not included in the WEM pathway.

Limitations of CGE modelling

As with all modelling, especially on a three-decade horizon, the CGE modelling can provide insights into where impacts are likely to occur and in what direction, but the magnitude of the impacts is uncertain.

CGE modelling as used here reflects our best possible estimates, but it has several known limitations when determining the expected distributional impacts.

- The model largely extends New Zealand's current economic structure out to 2050; it does not predict what the future economy could look like, with new goods, services and exports.
- The model does not account for the impacts of climate change on society and the economy, or the long-term benefits of reducing climate risks.
- The emissions price used in the models for the ERP2 and WEM pathways is exogenous and has been aligned with the assumptions outlined in [Part 2](#).
- The model does not account for structural breaks. This means that businesses and sectors reduce their output as costs increase, but never reach a point where they become unprofitable and stop operations. The modelling is therefore likely to understate business closures and unemployment for businesses and industries that face higher costs and competition from alternative, lower-emissions products or services.
- Uptake of EV and other technologies is averaged across households and does not consider the challenge or impact of high upfront costs on lower-income households, meaning the overall impacts on lower-income households are likely understated.

Macro-economic impacts

Broadly, expected macro-economic impacts found in our latest modelling are similar to those in the indicative modelling used during consultation for the ERP2 discussion document. The New Zealand economy is expected to continue to grow steadily, with the impacts of climate mitigation policies changing the mix of industries.

At an economy-wide level, the modelling suggests that ERP2 climate mitigation actions will lead to real GDP that is about 0.3 per cent lower in 2030 and about 0.4 per cent lower in 2050 than it would be in a hypothetical 'without measures' pathway. The bulk of the adjustment happens through the investment and trade channels, which are 0.9 per cent and 1.2 per cent lower, respectively, in 2030, and 0.4 per cent and 1.6 per cent lower in 2050. Household consumption is expected to change minimally over EB2, but impacts are expected to accumulate such that real private consumption is about 0.3 per cent lower in 2050.

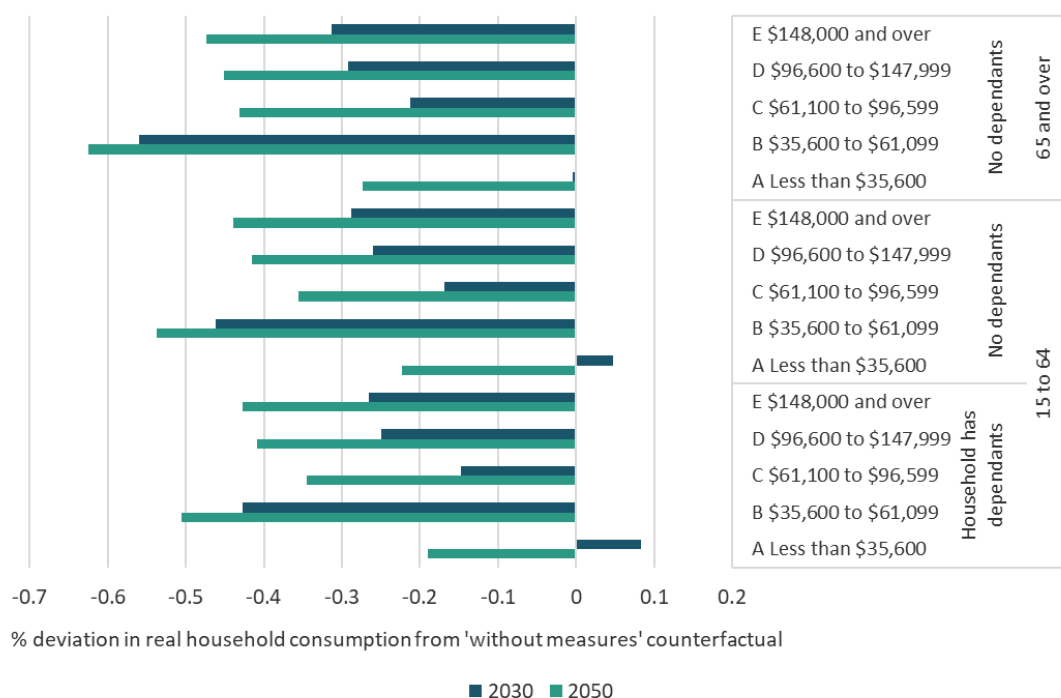
When compared to the existing measures pathway, real GDP is 0.02 per cent lower in 2030 and 0.15 per cent lower in 2050 as a result of ERP2 actions.

Employment is projected to be about 0.2 per cent lower in 2030 than under the 'without measures' counterfactual. Over the long term, however, employment is assumed to return to close to its long-run trend levels, reflecting an expectation that over the medium-to-long term, employment will shift from contracting to expanding sectors of the economy. The bulk of the adjustment in the labour market is expected to occur via real wages, which are about 1.3 per cent to 1.4 per cent lower than the 'without measures' counterfactual over the medium-to-long term.

ERP2 impacts on households

Figure 27 shows that, under the ERP2 pathway, all households in New Zealand are expected to have lower consumption in 2050 than they would have without efforts to reduce emissions (the ‘without measures’ counterfactual). This is due to the prices of goods and services increasing because of the NZ ETS and due to added costs from businesses changing to low-emissions production. This means people cannot purchase as much as they would have otherwise. However, the difference in consumption is small – between 0.2 per cent and 0.6 per cent by 2050, depending on the type of household.

Figure 27: Expected impact of ERP2 policies on household consumption, by household income, dependants and age, 2030 and 2050



Note: Deviation in real consumption in 2030 and 2050 under the ERP2 pathway from real consumption in 2030 and 2050 under the counterfactual ‘without measures’ pathway.

Source: Torshizian E, Adams P, Stroombergen A. Forthcoming. *Economic Impact of New Zealand’s Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited.

Lower-income households are expected to be the most affected, particularly those earning between \$35,600 and \$61,099. Lower-income households contain a disproportionate number of disabled people and people from Māori and Pasifika communities. These effects are largely driven by the impacts of emissions pricing.

Impacts of emissions pricing on lower-income households

The Government will use the NZ ETS as the main tool for reducing emissions across New Zealand. We know that emissions pricing disproportionately affects lower socio-economic

groups.^{40, 41} The costs of emissions pricing will be felt by all New Zealanders, but especially by lower-income households.

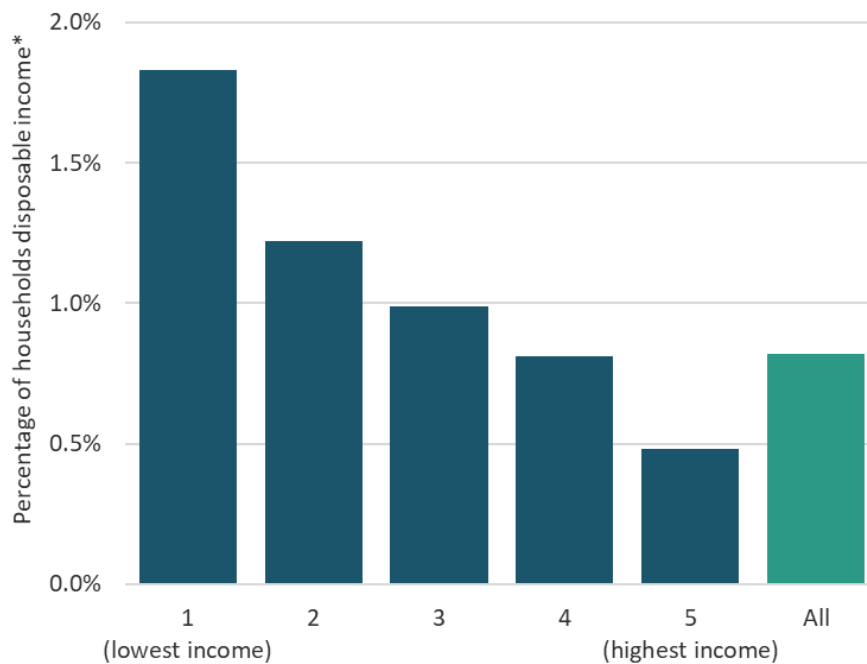
This is because lower-income households spend a relatively greater portion of their income on emissions-intensive items and have less capacity to substitute those items for low-emissions options, particularly in the short term. The lower incomes of these households mean they feel the additional costs from emissions pricing more keenly.

Under the recently announced NZ ETS settings, annual household expenditure caused by emissions pricing is expected to be about \$610 in 2026 and \$690 in 2029, up from \$440 today.

Analysis from the Treasury highlights the impact on lower-income households.⁴² It models how a hypothetical increase in emissions pricing would impact different households by increasing the costs of household essentials such as fuel, electricity and food.

Figure 28 presents a simplified version of the Treasury’s analysis. It shows that lower-income households would spend a higher percentage of their disposable income on emissions pricing costs, compared with higher-income households.

Figure 28: Relative impact of emissions price increases on households, by household disposable income



Note: Mean increased spending on petrol, diesel, gas, electricity, domestic airfares and food due to a carbon price increase from \$24.73 to \$134.90 per Mt CO₂-e, as a percentage of mean household disposable income. Households are divided based on their household equivalised disposable income, with 1 indicating mean household earning in the bottom 20 per cent, and 5 indicating mean household earning in the top 20 per cent.

⁴⁰ Davis C, Hart B, Stubbing B. 2024. *Household cost-of-living impacts from the Emissions Trading Scheme and using transfers to mitigate regressive outcomes* (Analytical Note 24/02). Wellington: The Treasury.

⁴¹ Ministry for the Environment. 2023. *Review of the New Zealand Emissions Trading Scheme: Summary of modelling*. Wellington: Ministry for the Environment. pp 31–38.

⁴² Adapted and simplified from Davis C, Hart B, Stubbing B. 2024. *Household cost-of-living impacts from the Emissions Trading Scheme and using transfers to mitigate regressive outcomes*. Analytical Note 24/02. Wellington: The Treasury.

To illustrate how the impact can differ for households based on their income, the price of petrol is the main way that households are exposed to an emissions price. Fuel costs represent a higher share of income for lower-income households than for higher-income households. Lower-income households that need a private vehicle will also be relatively less able to pay the upfront costs of switching to an EV, or to a more fuel-efficient vehicle such as a hybrid.

In 2024, the NZ ETS unit price contributed about 15 cents per litre to petrol prices at the pump.⁴³ The average household currently spends about 0.27 per cent of annual gross income on NZ ETS costs embedded in private transport. This percentage will generally be higher for lower-income households.

Other impacts on lower-income households

Similarly, higher electricity prices expected over the next decade will affect lower- and higher-income households in different ways. Although electrification will generally lower overall household energy bills, people on lower incomes will be least able to afford the technological innovations and household upgrades (eg, EVs and home solar generation) that could help offset rising costs.

The impacts are not only financial. For example, people who cannot afford to heat their homes are likely to have poorer health outcomes. This has flow-on effects, such as reduced economic and educational opportunities, and increased pressure on the health system.

The impacts on lower-income households are partly offset by the indexing of some existing income support payments to the consumers price index (CPI). This means that, as the cost of goods and services increases because of efforts to reduce emissions, some benefits will increase as well. Recent Treasury analysis found that around 80 per cent of household equivalised disposable income decile 1–4 households received CPI-indexed payments, and these payments compensate for around 50 per cent of increasing costs from emissions pricing.⁴⁴

Impacts on older people

Older people can be more impacted by mitigation policies, as many have low levels of financial resilience, particularly those who rely on NZ Superannuation alone.⁴⁵ Older people who spend more time at home may be more impacted by increased energy prices and may even avoid using the energy they need.

The Climate Change Commission predicts that older workers will be disproportionately impacted by the transition to a low-emissions economy. Industries that are negatively affected by climate change or policies related to climate change tend to have an older worker profile, and older workers face greater challenges with retraining.⁴⁶

⁴³ Ministry of Business, Innovation & Employment. *Energy prices*. Retrieved 5 November 2024.

⁴⁴ The Treasury. Internal analysis – Treasury Analytical Reports 365 and 367.

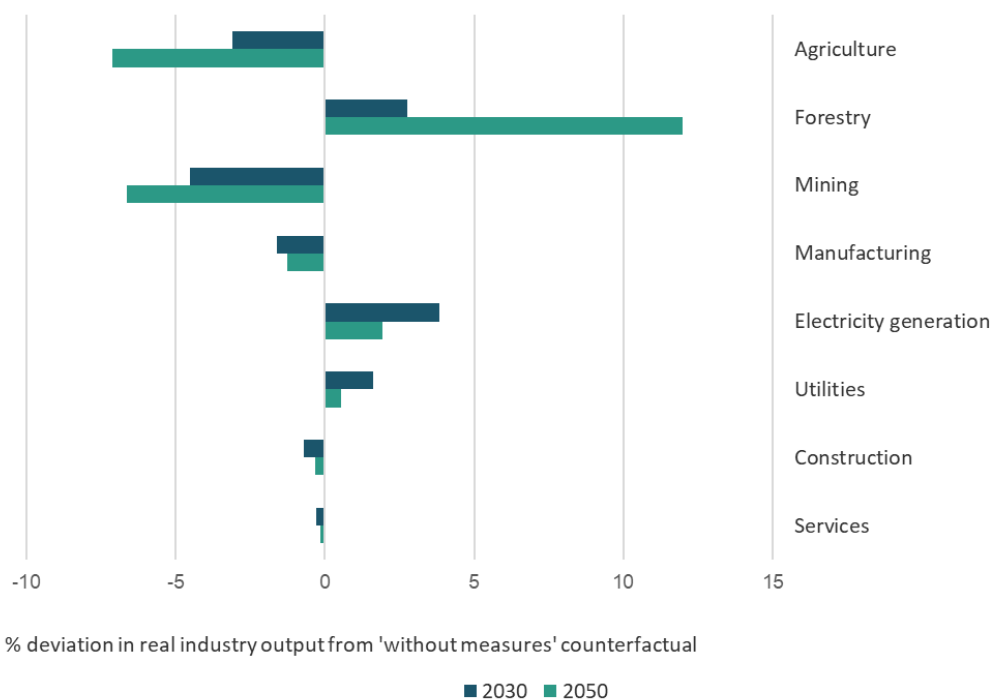
⁴⁵ Qualitative research published in 2022 found that 40% of people aged 65 and over rely solely on their income from NZ Superannuation. Gamble J. 2022. *Older People's Voices: Qualitative Research with New Zealanders Aged 65 or Older*. Prepared for Te Ara Ahunga Ora | Retirement Commission.

⁴⁶ Riggs L, Mitchel L. 2021. *Predicted Distributional Impacts of Climate Change Policy on Employment*. Motu Working Paper 21-07. Prepared for Motu Economic and Public Policy Research.

ERP2 impacts on employees and employers

Impacts on employees and employers are best understood by analysing expected impacts on different sectors, as per figure 29 and the following paragraphs.

Figure 29: Expected impact of mitigation policies on output by sector, 2030 and 2050



Note: Deviation in sectoral output in 2030 and 2050 under the ERP2 pathway from sectoral output in 2030 and 2050 under the counterfactual 'without measures' pathway.

Source: Torshizian E, Adams P, Stroombergen A. Forthcoming. *Economic Impact of New Zealand's Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited. Sector aggregations by Ministry for the Environment.

Impacts on agriculture

Agricultural output (in GDP terms) is expected to be higher in 2050 than output today, but to be 7 per cent lower than it would have been without any mitigation actions.⁴⁷ Sheep and beef farming are expected to be the most affected agricultural subsectors, with combined output expected to be 11 per cent lower than the without measures counterfactual (but still higher than output today).

This impact is largely driven by voluntary land-use changes from farm owners as NZ ETS settings make forestry relatively more profitable. Because agriculture is largely owner-operated, the impacts on farm owners are likely not as negative as indicated by modelling,

⁴⁷ Biogenic methane pathways in the CGE modelling have been aligned with those from the ENZ model (which include the impacts from agricultural emissions pricing and from the proposed limits on farm conversions registering in the NZ ETS), but they use different modelling approaches to achieve these results. Agricultural mitigation costs in the CGE modelling do not explicitly include expected new mitigation technologies. As a result, agricultural emissions mitigation costs are higher in the CGE modelling compared to ENZ. This means the impacts described here would be lower if new, cheaper, mitigation options are available.

as farm owners benefit from selling their land or moving to a more profitable land use. However agricultural employees will not receive these benefits, and some may face disruption, reduced opportunities, and the need to re-skill and change careers. The possible negative impacts were raised by the agricultural industry and the wider public during consultation. This effect is softened somewhat by the Government's proposed limits on conversions of high-quality land to forestry.

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The implementation of a pricing system by 2030 is expected to increase costs for the sector, but the exact impact will depend on the design of the pricing system.

This assessment does not account for the impacts of climate change itself on land use and agricultural productivity.

Impacts on forestry

Forestry output is expected to be 12 per cent higher in 2050 than it would have been without any mitigation actions. This reflects increased afforestation levels, and the land-use change to forestry, explained above.

Impacts on mining

Mining output (in GDP terms) is expected to be higher in 2050 than output today, but to be 7 per cent lower than it would have been without any mitigation actions. This is largely driven by lower levels of natural gas mining (24 per cent lower), compared to the without measures pathway. This impact flows through into manufacturing and energy production subsectors that use gas as an input.

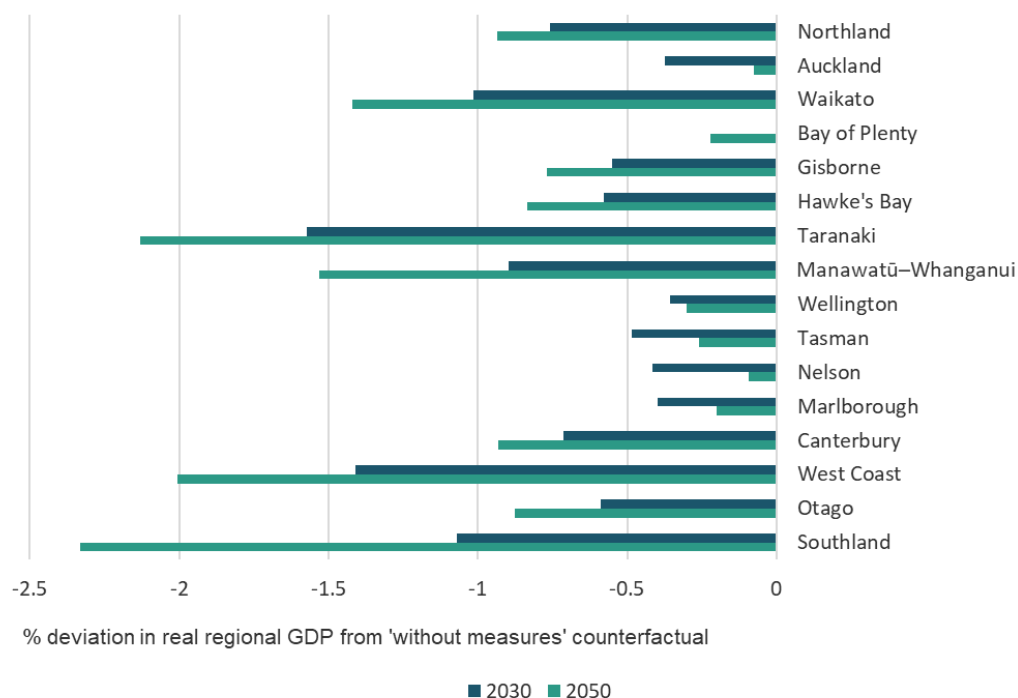
Impacts on other sectors

The results for manufacturing are mixed. Oil and chemical manufacturing are expected to be 4 per cent lower than the without measures pathway – in part reflecting lower mining output (7 per cent lower). Food manufacturing is also expected to be lower overall (5 per cent lower), with lower levels of manufacturing of meat products (13 per cent lower) and dairy products (9 per cent lower), offset by higher levels of manufacturing of other food products (1 per cent higher) and drink products (2 per cent higher). Other types of manufacturing are modestly higher than the without measures pathway.

Construction, services and utilities sectors are expected to be largely unaffected by climate mitigation policies. Electricity generation is expected to be 2 per cent higher than a without measures pathway, reflecting the expansion in renewables generation (3 per cent higher) and outweighing the reduction in gas generation of electricity (21 per cent lower).

ERP2 impacts on regions

Figure 30: Expected impact of mitigation policies on real GDP by region, 2030 and 2050



Note: Deviation in real GDP in 2030 and 2050 under the ERP2 pathway from real GDP in 2050 under the counterfactual 'without measures' pathway.

Source: Torshizian E, Adams P, Stroombergen A. Forthcoming. *Economic Impact of New Zealand's Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited.

Regional impacts in our modelling are mainly driven by the mix of industries in each region and how they are affected by the changes in land use explained above.

As figure 30 shows, the regions most affected, compared to the without measures pathway, are those with a heavier reliance on dairy, and sheep and beef farming. These include Southland (2.3 per cent lower), the West Coast (2.0 per cent lower), Manawatū-Whanganui (1.5 per cent lower), the Waikato (1.4 per cent lower), and Taranaki (2.3 per cent lower), which is particularly impacted by lower levels of gas mining and related manufacturing.

The regions least affected, compared to the without measures pathway, are urban areas with more service industries such as Auckland (0.1 per cent lower) and Wellington (0.2 per cent lower). There are also minimal effects for regions with a different primary sector mix, such as the Bay of Plenty and Marlborough (0.2 per cent lower) and Nelson (0.1 per cent lower).

Employment impact of land-use change from agriculture to forestry

Analysis suggests that the impact on rural employment from the expected shift from agriculture to forestry will be mixed. Overall, the impact is expected to vary depending on the type of agricultural land use replaced, the type of forestry established, and the specific regional circumstances.

Some New Zealand research has found higher employment from production forestry compared with sheep and beef farming,⁴⁸ while other research has found the reverse.⁴⁹

Research has also found that forestry could add to the employment of a region, but this is likely to occur in or around main centres, rather than in more rural areas where the forests (and farms) are located.⁵⁰

All sources suggested that agriculture and production forests provide significantly more relative employment than carbon and/or permanent exotic forestry as they require greater ongoing management practices.

Regardless of overall employment figures, changes in industry will need workers in regions to develop different skills.

Broader impacts on regional communities

Impacts are likely to reduce job availability in some regions but increase job availability in other regions.

A key theme from submissions is that farmers are vital contributors to local regional communities, and that forestry is often operated by larger-scale businesses who are less integrated in community life.

Submitters raised concerns that reduced job availability from land-use change could force migration away from regions. They noted the potential for significant impacts on those who need to move for work opportunities (eg, economic cost, mental health impact, loss of connection to whenua and cultural practices), as well as other challenges for affected communities (eg, impacts on local schools, small business closures, fewer volunteer firefighters, degradation of community-based support). Conversely, areas that see an increase in jobs would likely experience greater economic benefits and opportunities, and strengthened communities.

Rural communities also have less access to public transport. In addition, low-emissions options for vehicles needed for agriculture are expected to take longer to develop, exacerbating impacts from emissions pricing for those in regional communities.

ERP2 impacts on Māori

The Government has a particular obligation under [section 3A](#) of the Climate Change Response Act 2002 to recognise and mitigate impacts on iwi and Māori.

⁴⁸ PwC New Zealand – Economic Impact of Forestry in New Zealand. May 2020.

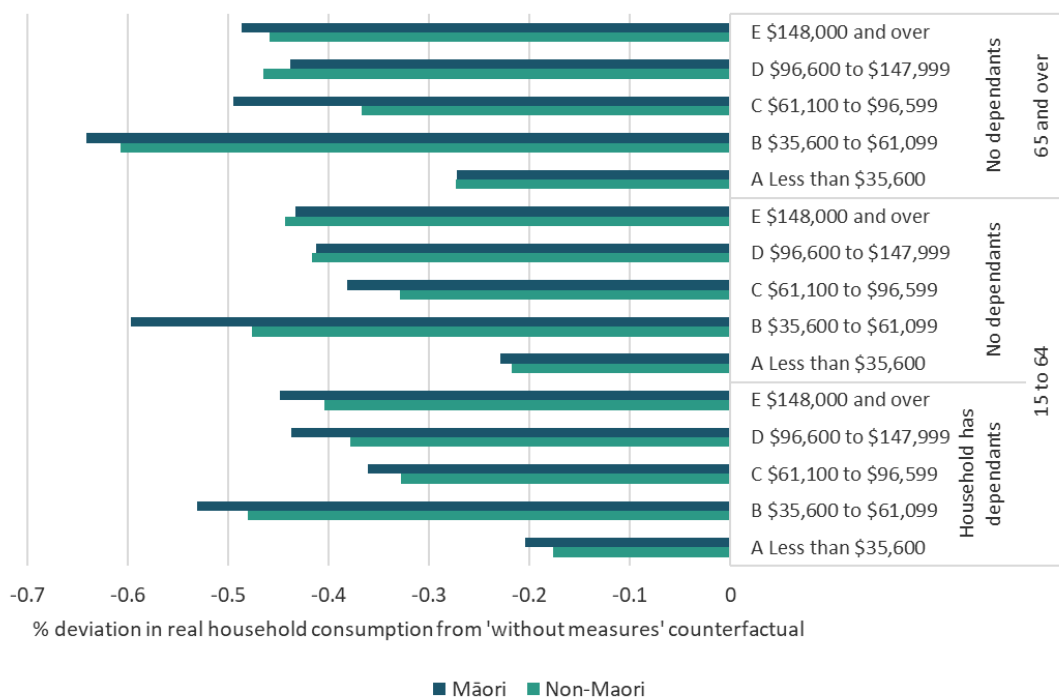
⁴⁹ BakerAg – Socio-economic impacts of large-scale afforestation on rural communities in the Wairoa District – August 2019 https://beeflambnz.com/sites/default/files/Wairoa%20Afforestation_FINAL.pdf

⁵⁰ Fairweather J R, Mayell P J, Swaffield S R., August 2000 – A Comparison of the Employment Generated by Forestry and Agriculture in New Zealand https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/761/aeru_rr_246.pdf?sequence=1

Overall impacts and risk exposure

Māori households are expected to be more affected than non-Māori households, but the difference is very small (figure 31). Depending on the household breakdown, the impact on Māori household consumption ranges between 0.13 per cent higher and 0.03 per cent lower than non-Māori households.

Figure 31: Expected impact of ERP2 policies on household consumption, by ethnicity, household income, dependants and age, 2050



Note: Deviation in real consumption in 2050 under the ERP2 pathway from real consumption in 2050 under the counterfactual 'without measures' pathway.

Source: Torshizian E, Adams P, Stroombergen A. Forthcoming. *Economic Impact of New Zealand's Second Emissions Reduction Plan (final results)*. Prepared for the Ministry for the Environment by Principal Economics Limited in collaboration with the Centre for Policy Studies and Infometrics Limited.

Māori are more likely to be affected by economic transitions, as they are starting from a position of greater socio-economic disadvantage. As noted above, they are over-represented in lower-income households, which are more affected by emissions pricing and less equipped to invest in low-emissions products and technology.

The Māori economy is over-represented in New Zealand's emissions profile. In 2018, the gross greenhouse gas emissions from the Māori economy accounted for 11.2 per cent of New Zealand's total emissions profile, while the Māori economy's share of New Zealand's GDP was 6.4 per cent. This means the Māori economy is more exposed to impacts from emissions reduction efforts.⁵¹

⁵¹ McMillan A, Riley H, Dixon H. 2021. *Māori economy emissions profile: Climate change mitigation impact on the Māori economy*. Prepared for Ministry for Primary Industries by BERL.

The relative risk of negative employment impacts for Māori is expected to be higher than for non-Māori, based on the Māori share of the workforce across sectors. Analysis from BERL identified that the Māori workforce is over-represented in food manufacturing⁵² and forestry, and slightly underrepresented in dairy, and sheep and beef farming. Māori are also significantly underrepresented in low-emissions sectors such as the professional, scientific and technical services sectors.⁵³

Impacts of land-use change from agriculture to forestry

Māori have significant interests in forests as rangatira, kaitiaki, land and forest owners, workers and business owners. In 2018, Māori were estimated to own \$4.3 billion of forestry assets. An estimated 30 per cent of New Zealand's 1.7 million hectares of plantation forestry is on Māori land, and this is expected to grow to 40 per cent as Treaty settlements are completed. A significant proportion of New Zealand's privately owned indigenous forest is on Māori-owned land.

Māori freehold land and land returned in Treaty settlements includes sizeable areas of existing forest. About 71,000 hectares of Māori freehold land comprise remote and less versatile land, making it well suited to forestry. These two factors mean that Māori are uniquely placed to contribute to the growth and development of the sector.

A large amount of Māori freehold land is well suited to forests and could qualify for registration in the NZ ETS. Income gained from NZUs could provide a revenue stream for what would otherwise be unproductive land and assist with regional employment opportunities. Submitters considered that moving land to forestry registered in the NZ ETS could in future restrict choices for future generations of iwi/Māori.

Impacts on future generations

Future technological developments are expected to reduce the costs of decarbonisation relative to today and mitigate some of this impact, though timing on these developments and the extent of savings is uncertain.

Consultation feedback included concern in taking a net-based approach to reducing emissions, due to the increased burden of meeting New Zealand's net zero climate change target on future generations. Future generations could be left with high levels of gross emissions that will need to be either reduced or continued to be offset, both of which come with costs and economic trade-offs.

Submitters also expressed concern as to the increased impact of climate change (such as increased severity of storms) on future generations.

⁵² Māori make up around 40 per cent of the meat-processing workforce. See McMillan A, Riley H, Dixon H. 2021. *Māori economy emissions profile: Climate change mitigation impact on the Māori economy*. Prepared for Ministry for Primary Industries by BERL.

⁵³ McMillan A, Riley H, Dixon H. 2021. *Māori economy emissions profile: Climate change mitigation impact on the Māori economy*. Prepared for Ministry for Primary Industries by BERL.

Impacts of sector-specific policies

Below we highlight some of the high-level impacts expected from significant ERP2 policies. Note these policy-specific impacts have been incorporated into the above analysis on impacts on specific groups; they do not reflect impacts beyond those already identified.

Energy

- Electricity and fuel prices are expected to rise over the EB2 period. Energy costs are a major input cost for businesses and have a significant impact on New Zealanders' cost of living. The policies proposed for ERP2 may help to reduce pressure on the cost of energy over the long term, by reducing the cost for consenting electricity infrastructure projects. Reducing energy emissions provides an opportunity to meet trading partners' growing expectations that goods are produced and transported with renewable energy, maintaining and growing international markets and creating skilled jobs. Further distributional impacts will depend on final policy decisions and specific projects pursued by developers.
- Enabling businesses to use CCUS may bring a range of positive benefits, depending on the level of private uptake of CCUS technology. Businesses deploying CCUS may result in the following distributional impacts:
- **Employees** – additional job opportunities may arise in CCUS activities, which may be suitable for people that work in the energy sector. Employees may also benefit from retention of jobs in gas production or industry if CCUS makes these activities commercially viable.
- **Employers** – CCUS may support the viability of gas production and industrial businesses.
- **Regions** – regions with significant gas production or industrial activity (eg, Taranaki) may experience the economic benefits of CCUS.
- **Iwi and Māori** – the sites with the most CCUS potential in the near future are natural gas reservoirs in Taranaki. Iwi in that region could be impacted more. New economic opportunities for Māori groups may arise, should businesses seek to establish CCUS projects in their rohe (tribal area).
- **Wider communities** – electricity and natural gas consumers could enjoy more stable electricity and natural gas prices if CCUS unlocks additional gas production.

Agriculture

STAMP

- Implementing a fair and sustainable pricing system by 2030 will increase costs somewhat for the agricultural sector, but the exact impacts will depend on the design of the pricing system.
- Positive economic and social impacts will likely result from support for the development of mitigation tools and technologies for agricultural emissions.
- The agricultural sector plays a significant role in the Māori economy through collectively owned land assets, iwi authorities, and individual Māori-owned agribusinesses, and due to the level of Māori employment in the sector. Policies that continue to enable Māori land owners to develop unused or underused lands will reduce the potential impact on Māori.

Forestry

- The key impact from increased levels of afforestation will be the impacts of land-use change primarily driven by the NZ ETS. The impacts of increased afforestation are both positive and negative and include impacts to employment which are described above.
- The Government's proposal to limit NZ ETS registrations for whole-farm conversions to exotic forestry on high-quality productive land will reduce some of the expected impacts on the agricultural sector and rural communities.
- Māori have significant rights and interests within the forestry and wood processing sector, native afforestation, native plant and/or taonga species, and the production and processing of wood products as well as future potential revenue streams from native forestry. The impacts of forestry and wood processing policies on Māori will be diverse, depending on the specific interests.

Transport

- Reducing transport emissions by supporting more EVs (by addressing range anxiety through support for EV charging points) can have many benefits, such as reducing air and noise pollution, improving physical health and mental wellbeing, and making our towns and cities more liveable.
- Reducing CO₂ emissions from transport also reduces emissions of local pollutants that have health impacts. Internal combustion engine vehicles emit pollutants that include small particulate matter less than 2.5 µm⁵⁴ (PM_{2.5}) and nitrogen dioxide (NO₂). When people are exposed to these pollutants, such as when they live next to busy roads, there can be a range of adverse cardiovascular and respiratory effects. The outcomes include increased mortality rates in the exposed population, higher hospital admissions for respiratory and cardiac illnesses – including asthma hospitalisations for children – and more days in which people reduce their activities because of the pollution levels.
- Studies in New Zealand have quantified the relationship between pollutant exposure and health effects, and estimated the overall costs to New Zealand, including the impacts of higher mortality rates or life years lost.⁵⁵ Updated data on costs, including on the value of reduced mortality, have been used to estimate the costs per tonne of PM_{2.5} and NO₂.⁵⁶ Data have also been collated on projected changes in vehicle emission rates for both CO₂ and local pollutants,⁵⁷ which allows us to estimate the health co-benefits of lower CO₂ emissions from transport, both in associated reductions in these other pollutants (figure 32) and as a monetary value (figure 33). The co-benefits fall over time because the emission rates of PM_{2.5} and NO₂ are forecast to fall over time with regulatory-driven improvements in vehicle technology.

⁵⁴ A micrometre (µm) is a millionth of a metre.

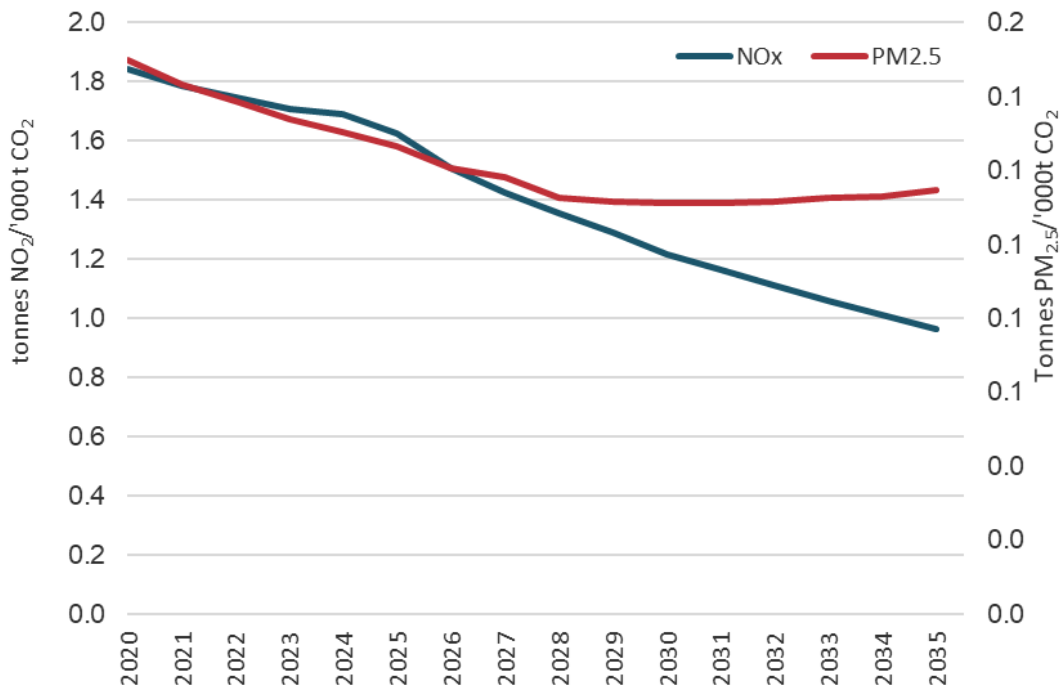
⁵⁵ Kuschel G, Metcalfe J, Sridhar S, Davy P, Hastings K, Mason K, Denne T, Berentson-Shaw J, Bell S, Hales S, Atkinson J and Woodward A (2022). *Health and air pollution in New Zealand 2016 (HAPINZ 3.0): Volume 2 – Detailed methodology*. Reports prepared for Ministry for the Environment, Ministry of Health, Te Manatū Waka Ministry of Transport and Waka Kotahi NZ Transport Agency.

⁵⁶ See Table 9 in NZ Transport Agency Waka Kotahi (2024). Monetised benefits and costs manual. Version 1.7.1. July 2024. These values have been updated to 2025-dollar values in NZ Treasury's CBAX model: <https://www.treasury.govt.nz/publications/guide/cbax-spreadsheet-model>. The values are \$408,377/t NO₂ reduction and \$666,179/t PM_{2.5} reduction.

⁵⁷ Metcalfe J and Kuschel G (2023). *Public Health Risks associated with Transport Emissions in NZ: Part 2 Road Transport Emission Trends*. ESR report FW22041 for Ministry of Health.

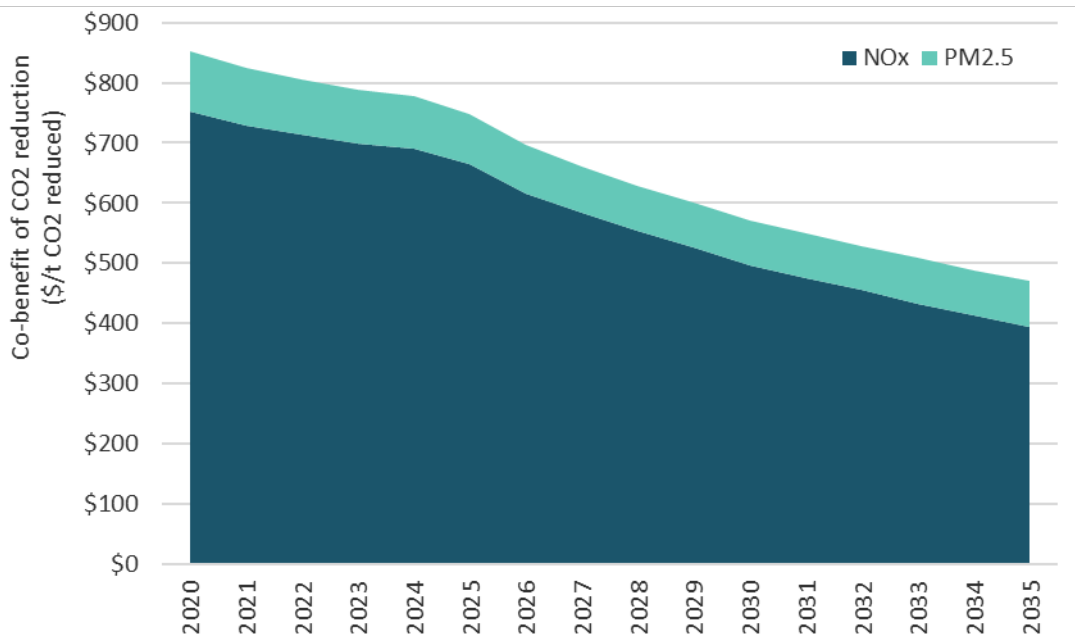
The co-benefits of transport emission reductions are very significant, estimated at several hundred dollars per tonne of CO₂ reduced.

Figure 32: Tonnes of local pollutant per thousand tonnes of CO₂ from light duty vehicles



Source: data from Metcalfe J and Kuschel G (2023). Public Health Risks associated with Transport Emissions in NZ: Part 2 Road Transport Emission Trends. ESR report FW22041 for Ministry of Health.

Figure 33: Local pollutant co-benefits of reducing CO₂ emissions from light duty vehicles



Source: Ministry for the Environment analysis using data from figure 32 and values from the NZ Treasury's CBAX model.

Waste

- Economic impacts from waste policies are expected to be manageable in the longer term. Although waste disposal costs may increase, the volume of disposed waste should decline as alternative systems for resource recovery and recycling grow. We do not expect any mitigation will be necessary to respond to the potential impacts of the emissions reduction policy presented here for the waste sector.

Appendix 1: Baseline assumptions

Table A1.1: List of baseline assumptions

Parameter	Assumptions or input data	Rationale
Population	0.7% population average growth rate 2022–40.	StatsNZ central projections.
GDP (real 2009/10 NZ\$, production measure)	1.9% average real growth rate 2022–40.	Treasury projections from the Budget Economic and Fiscal Update.
Exchange rate (US\$/NZ\$)	Constant at 0.65.	Consistent with Climate Change Commission 2024 advice on EB4.
Greenhouse Gas Inventory	New Zealand’s Greenhouse Gas Inventory for 1990–2022.	Latest available: New Zealand’s Greenhouse Gas Inventory 1990–2022 .
New Zealand Unit (NZU) price (real 2023 NZ\$)	Increases to NZ\$75 in 2030, then falls to NZ\$50 by 2035 (in 2023 dollars).	The initial rising price reflects observed forward market prices and expected short-run supply shortfalls. The long-run price of \$50 reflects Ministry for Primary Industry (MPI) analysis of the long-run costs of generating NZUs from land-use change from sheep and beef farming to forestry.
Transport vehicle kilometres travelled	Ministry of Transport (MoT) projections.	The MoT modelling projections have been used, as the Emissions in New Zealand (ENZ) model does not cover vehicle kilometres travelled (VKT) projections to the level of detail required to project fuel use. The MoT projections were derived from its vehicle fleet model which uses historical data and domestic research in its modelling approach. The VKT projections are a key factor for determining the amount of fuel consumed (by vehicle type and fuel type) and, hence, related GHG emissions.
Electric vehicle (EV) uptake	MoT projections.	The latest MoT modelling projections have been used, as the ENZ model focuses mainly on EV demand without supply constraints. MoT projections consider overall demand for vehicle imports, as well as feedback and inputs obtained from motor vehicle import industry and global trends, to account for related supply constraints. The EV uptake rate is another key driver for gross transport GHG emissions, as it will affect future vehicle fleet composition.
Fossil gas supply limits	Modelled via closure date assumptions for methanol production (see below).	Methanol is the major swing consumer of gas.

Parameter	Assumptions or input data	Rationale
Coal demand	Modelled endogenously in the ENZ model, but Huntly Rankines assumed to switch from coal to biomass fuel from 2028, with assumption of price parity with coal on a \$/GJ basis and a potential of up to 300 kt per year of black pellets available. NZ Steel electric arc furnace from 2026.	Company announcements and market commentary used for fuel and technology switching assumptions.
Methanol production	Methanex closes Motunui trains end of 2027 and 2029 (when existing gas supply contracts end). Other chemical production is constant.	Based on current gas reserves and supply projections and the relative value of gas for electricity generation vs methanol production.
Aluminium production	Production continues at current levels.	Reflects the new 20-year electricity supply contract.
Steel production	Electric arc furnace starts operation from 2026 and reduces emissions by 1 Mt CO ₂ -e per year.	Company announcements.
Low- and medium-temperature heat	Coal phased out by 2037; fossil gas use continues.	Consistency with national direction on industrial process heat.
Renewable generation	Endogenously modelled to meet demand.	
Geothermal reinjection	100% reinjection rate at the Ngāwhā geothermal plant (across all four units).	Based on company announcements.
Post-1989 production forests	Long-term average carbon stock.	Assumes a 23-year, long-term average for post-1989 production forests. Based on a Ministry for the Environment (MfE) 2024 commissioned Scion report on long-term average carbon stock. ⁵⁸
Afforestation	Baseline total afforestation 228.1 kha from 2024–30.	Baseline from Ministry for Primary Industries (MPI) central projection. Afforestation projections are based on the annual Afforestation and Deforestation Intention Surveys . The lower afforestation and removals scenario has been revised in response to ERP2 discussion document feedback. The revised lower scenario is based on the 2023 afforestation intentions survey findings but limits exotic afforestation from 2024–26 to the levels at the lower range of estimates.

⁵⁸ Wakelin SJ, Paul TSH. 2024. *Accounting for Post-1989 Forests under the Paris Agreement: Long-Term Average Carbon Stock and Reference Level*. Prepared for Ministry for the Environment by Scion.

Parameter	Assumptions or input data	Rationale
		The proposed policy for limiting whole-farm conversions to forestry on high-quality land is not expected to impact emissions, based on the baseline afforestation projections. This is because we do not expect the Land Use Capability (LUC) class 6 annual hectare limit to be fully subscribed, based on current afforestation intentions.
Deforestation	Total deforestation 12.8 kha from 2024–30.	Baseline from MPI central projection. Exotic deforestation projections are sourced from the annual Afforestation and Deforestation Intention Surveys . Native deforestation projections assume similar rates as contained in New Zealand’s Greenhouse Gas Inventory 1990–2022 .
Livestock	% change from 2024 and 2030 is –2.7% for dairy cattle, –0.4% for beef cattle and –3.9% for sheep.	Baseline from MPI central projection. Livestock forecasts up to 2028 use estimates from MPI’s <i>Situation and Outlook for Primary Industries</i> (SOPI) report. ⁵⁹ Dairy: Numbers after 2029 were modelled by assuming reductions in stock numbers due to water policy and land lost to horticulture and settlement and/or urban development. Beef and sheep: Numbers after 2029 were estimated by assuming additional reductions in stock numbers due to afforestation. The Inventory team estimated a stocking rate for this afforested land using data provided by Beef + Lamb NZ and the MPI Geospatial Analysis Team. See also productivity assumptions.
Livestock productivity	The trend of meat and milk productivity improvements are assumed to continue.	Baseline from MPI central projection, based on outputs from the Pastoral Supply Response Model (PSRM) in MPI’s SOPI output. ⁶⁰
Fertiliser	Total nitrogen fertiliser decreases 2% by 2030. Urease inhibitor use increases from 63% to 80%.	Baseline from MPI central projection, developed from discussions with the Fertiliser Association of New Zealand, and advice from subject-matter experts within MPI. Fertiliser use per ha for dairy, and sheep and beef farming is projected to partly recover to 2021 (pre-2022 price rise) levels. Fertiliser use will be lower due to greater use of urease inhibitor, decreases in agricultural land, and the effect of freshwater policy and the nitrogen cap.

⁵⁹ Ministry for Primary Industries. 2024. *Situation and Outlook for Primary Industries*. Wellington: Ministry for Primary Industries.

⁶⁰ Ministry for Primary Industries. 2024. *Situation and Outlook for Primary Industries*. Wellington: Ministry for Primary Industries

Parameter	Assumptions or input data	Rationale
Low CH ₄ breeding in baseline	<p>Dairy: Efficacy up to 13% by 2050. Available 2029, peak adoption 4% by 2042.</p> <p>Sheep: Efficacy up to 17% by 2050. Available 2026, peak adoption 4% by 2041.</p> <p>Beef: Efficacy up to 8% by 2050. Available 2035, peak adoption 1% by 2052.</p>	<p>Efficacy calculated using gene flow model.</p> <p>To determine the assumptions for modelling mitigation technologies, the MPI Inventory team consulted with experts on efficacy, cost, date available to farmers, farmer attitudes and circumstance, learnability characteristics of the mitigations and the relative advantage of the mitigations.</p> <p>This expert feedback was then used to develop estimates of start dates, and efficacy rates for each technology.</p> <p>The expert feedback was input into the Adoption and Diffusion Outcome Prediction Tool (ADOPT) to estimate peak adoption of mitigation technologies and to generate adoption curves for different technologies and pricing scenarios. ADOPT incorporates sets of factors that studies have shown to commonly influence the rate and peak level of adoption within a population.</p>
Methane inhibitors in baseline	<p>Dairy: Efficacy 45%. Available 2028, peak adoption 3% by 2042.</p> <p>Beef: Efficacy 45%. Available 2028, peak adoption 2% by 2047.</p>	As for low CH ₄ breeding.
EcoPond in baseline	Dairy: Efficacy 92%. Available 2025, peak adoption 2% by 2038.	As for low CH ₄ breeding.
Optimal landfill gas (LFG) capture systems	<p>Baseline: Municipal open landfills have a constant LFG efficiency of 68%.</p> <p>Municipal closed landfills have a constant LFG efficiency of 52%.</p> <p>Municipal facilities with no LFG maintain no LFG until 2050.</p>	Baseline from waste central projection. Assumption figures derived from New Zealand's Greenhouse Gas Inventory 1990–2022 , informed by Eunomia. ⁶¹
Composting	Baseline: Diversion to composting increases (per year) from 495 kt in 2025, 553 kt in 2035, and 595 kt (17%) in 2050.	Baseline from waste central projection (based on GDP and population growth).
Waste placement	<p>Baseline: Municipal landfills (per year) – 3,380 kt in 2020, 3,414 kt in 2030, 3,448 kt in 2040, and 3,545 kt in 2050.</p> <p>Non-municipal landfills (per year) – 5,090 kt in 2020 and constant until 2050.</p>	Baseline from waste central projection (based on GDP, population growth and historical waste placements).

⁶¹ Eunomia. 2020. *Improvements to Estimates of Greenhouse Gas Emissions from Landfills*. Project 1060-01-CSO. Prepared for the Ministry for the Environment by Eunomia Consulting.

Parameter	Assumptions or input data	Rationale
Refrigerants recovery rate Percentage of retired volumes	<p>Baseline high: 15% in 2025, 17% in 2030, 20% in 2035, 20% in 2040, and 20% in 2050.</p> <p>Baseline low: 30% in 2025, 35% in 2030, 40% in 2035, 45% in 2040 and 50% in 2050.</p>	Total hydrofluorocarbon (HFC) recovery rate assumptions based on modelling and validations by Verum Group Ltd with collection agents. Projection estimates have high uncertainty for this fluid market. The uncertainty is in part reflected through a conservative (low) and wide (high/low) range.

Table A1.2: Assumptions varied in sensitivity analysis

Factor	Central	Low emissions	High emissions
Oil and coal prices	Oil: US\$65/bbl long run Coal: US\$100/t	Oil: US\$100/bbl long run Coal: US\$140/t	Oil: US\$40/bbl long run Coal: US\$60/t
Methanol production	One methanol train at Motunui closes 2028 and the second in 2030	One methanol train at Motunui closes in 2024 and the second in 2030	One methanol train at Motunui closes 2030 and the second in 2040
Population and GDP growth	StatsNZ central	StatsNZ low	StatsNZ high
Battery prices	Cost reductions	Larger cost reductions	Smaller cost reductions
International EV prices	Baseline	Lower	Higher
EV supply constraints	To align with MoT VFM 2024	Reduced	No change
Vehicle kilometres travelled	MoT VFM 2024	No increase	Higher increase
Livestock numbers	2024 MPI projections	Lower stocking rate*	Higher stocking rate
Afforestation levels	27 kha pa long run	36 kha pa long run [^]	18 kha pa long run
Waste	MfE projections	Lower tonnage and more diversion	Higher tonnage and less diversion, LFG 20%

* Stocking rate trends were calibrated so that the emissions range aligned with agriculture projections range [^]as per forestry projections.

Appendix 2: Intervention logic mapping

Table A2.1: Logic maps explaining links between selected policies in the second emissions reduction plan (ERP2) and emissions impacts

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
<p>New Zealand Emissions Trading Scheme (NZ ETS)</p> <p>Supporting NZ ETS credibility and confidence</p> <p>NZ ETS unit supply and price control settings (NZ ETS settings)</p> <p>Manage NZ ETS impacts</p>	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> commit to no vintaging of (putting expiry dates on) New Zealand Units (NZUs) and no differential treatment of NZUs from forestry work to strengthen NZ ETS market governance provide NZ ETS settings annually for the next five years (ie, how many NZUs will be made available at auction, and under which range of price controls) manage the impacts of the NZ ETS (ie, risks associated with high rates of land-use change) by limiting NZ ETS registrations for whole-farm conversions to new exotic forestry on productive agricultural land. 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> improved transparency of market information, so market participants have a greater understanding of how the market works predictability for future NZ ETS auction settings increased confidence in the NZ ETS market, which increases participation and improves incentives to reduce emissions and increase removals continued NZ ETS incentives for lowest-cost abatement (eg, exotic afforestation) reduced whole-farm conversions to exotic forestry, protecting productive farmland <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> to continue to incentivise increased emissions reductions at their source from businesses and households. 	<p><i>... and then in the second emissions budget (EB2), this will lead to:</i></p> <ul style="list-style-type: none"> net emissions reductions made up of a mix of removals from forestry and emissions reductions at their source from businesses and households <p>(Note: The ability to bank NZUs does create some uncertainty about the timing of emissions and emissions reductions)</p> <p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> additional removals from forestry and emissions reductions at their source from businesses and households removals from forestry playing an increasingly important role in reducing net emissions to achieve net zero. 	
	<p>Assumptions and dependencies</p>	<ul style="list-style-type: none"> Broader conditions beyond the NZ ETS are highly relevant for investments in forestry removals and emissions reductions at their source. For example, wood prices also factor into decisions on afforestation and harvest times; and for emitters, the price of emissions reduction technology and the age of an investment or infrastructure will factor into decisions about when to invest in or replace technology. 		
	<p>Other benefits</p>	<ul style="list-style-type: none"> Limiting NZ ETS incentives for whole-farm conversions to forestry is intended to manage the impact of NZ ETS incentives and balance productive land uses between forestry and agriculture. 		
	<p>Why this is complementary to the NZ ETS</p>	<ul style="list-style-type: none"> This policy mix is intended to support the function and role of the NZ ETS by providing the regulatory predictability and confidence in the NZ ETS which is needed and desired to support investment in net emissions reductions (in removals or reductions at their source). 		

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Energy Electrify NZ	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> • create a more enabling consenting environment for renewable energy projects by: <ul style="list-style-type: none"> – improving consent duration, consent lapse times and decision-making timeframes through Resource Management Act 1991 (RMA) amendments – amending national direction for renewable electricity generation and transmission to ease consenting barriers – passing fast-track legislation • amend cost recovery rules for lines companies. 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> • reduced time and cost and increased likelihood of consents and re-consents being granted for renewable electricity generation and transmission projects, and increased revenue available to support additional transmission and local lines • more support for renewables projects to become viable faster, and more existing renewables assets to stay in service for longer,⁶³ which may accelerate displacement of coal- and gas-fired generation, particularly for baseload and intermediate generation⁶⁴ • more renewable electricity may be available to support electrification of transport and process heat compared with the counterfactual, helping to mitigate price spikes or security disruptions that could affect the pace of electrification. <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> • the same as above. 	<p><i>... and then in EB2, this will lead to:</i></p> <ul style="list-style-type: none"> • an expected reduction in energy emissions due to accelerated renewables development.⁶⁵ We anticipate re-consenting decisions could have immediate emissions impacts in EB2 by reducing risk of further reliance on thermal generation to replace any decommissioned assets. At the same time faster and/or additional consented projects could have emissions impacts later in the EB2 period or beyond, following construction and commissioning • if additional geothermal is consented, the possibility that any emissions reduced from displacing fossil fuels may be partly offset by geothermal production emissions if they are not captured and stored. <p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> • the same as above.
	Assumptions and dependencies	<ul style="list-style-type: none"> • Emissions impacts depend materially on private investment decisions. 	

⁶³ For example, Waitaki and Manapouri dams would need re-consenting during the EB2 period.

⁶⁴ Thermal generation accounted for 2.5 Mt CO₂ in the year to December 2023. Some firming and/or peaking generation could be displaced if renewables are able to free up flexible baseload hydroelectricity capacity. Emissions information from quarterly electricity and liquid fuel emissions data tables: Ministry of Business, Innovation and Employment. [New Zealand energy sector greenhouse gas emissions](#). Retrieved 5 November 2024.

⁶⁵ The Infrastructure Commission has advised that consenting delays can have a significant impact on delaying infrastructure that enables emissions reduction in transport and energy. New Zealand Infrastructure Commission | Te Waihangā. [Infrastructure consenting for climate targets](#). Retrieved 5 November 2024.

	<ul style="list-style-type: none"> Private investment decisions in turn depend on the extent to which wider market settings and commercial conditions are sufficient to drive renewables investment and incentivise fuel switching (eg, NZ ETS settings, wider market failures, demand for renewables, access to firming, cost of capital).
Other benefits	<ul style="list-style-type: none"> Lower consent costs and greater renewable electricity supply can help to manage electricity prices and security of supply risks, compared with the counterfactual.
Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> The NZ ETS is the main tool the Government will use to drive emissions reductions in the energy sector. The purpose of Electrify NZ is to complement the NZ ETS. Lowering consenting costs will lower total project costs and encourage faster deployment of renewables in response to NZ ETS price signals.

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Energy Enable carbon capture, utilisation and storage (CCUS)	<i>If we do the following now:</i> <ul style="list-style-type: none"> recognise and reward CCUS emission reductions and removals in the NZ ETS create a regulatory regime to set out consenting, monitoring and long-term liability arrangements for CCUS 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> CCUS to be recognised as an effective option for reducing emissions, supporting its uptake long-term liability arrangements to be in place to provide assurance that CO₂ storage sites will be closed properly, which will reduce the risk of CO₂ leaks and help make sure the CO₂ stays in the ground monitoring arrangements to be in place to provide consumers, businesses and international trading partners with confidence in the integrity of the emissions reductions from CCUS potential uptake of CCUS in some gas production processes due to greater economic incentives to use CCUS, because: <ul style="list-style-type: none"> emissions reductions and removals through CCUS would be recognised and rewarded, creating a level playing field for CCUS compared with other emissions reduction options like forestry removals. This would support businesses to choose the most cost-effective way to reduce emissions 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> where deployed, reduced emissions in some natural gas production through: <ul style="list-style-type: none"> uptake of CCUS assurance that CCUS is implemented in a way that provides genuine emissions reductions, with the risk of CO₂ leakage managed <i>... and then in future emissions budgets, this will lead to:</i> <ul style="list-style-type: none"> the same as above, with the potential for further emissions reductions from harder-to-abate uses, if there is greater uptake across more industries.

		<ul style="list-style-type: none"> – businesses could be rewarded for capturing CO₂ for third parties <p>... <i>and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> • the same as above, with potentially greater uptake across more industries, depending on the cost of CCUS relative to carbon prices and other factors 	
	<p>Assumptions and dependencies</p>	<ul style="list-style-type: none"> • Emissions impacts depend on private investment decisions to deploy CCUS and to continue operating emissions-intensive industries in New Zealand. • Private investment decisions depend on market settings and commercial conditions, including: <ul style="list-style-type: none"> – carbon prices – the cost of CCUS technology across different industries – the cost of alternatives to lower emissions (eg, making methanol from renewable resources) – the specific obligations, liabilities and detailed design features of the regulatory regime for CCUS – commercial opportunities for businesses to shift emissions-intensive industries outside New Zealand. • The timing of CCUS deployment in relation to EB2 is uncertain. We have estimated the amount of CO₂ that could be stored out to 2035 based on a series of assumptions about uptake of CCUS across this period. • We have assumed that CCUS is commercially and technically viable from 2027 for gas production from a high-CO₂ gas field. The commercial viability will be driven by the cost of CCUS compared with NZ ETS carbon prices, and natural gas prices. 	
	<p>Other benefits</p>	<ul style="list-style-type: none"> • CCUS could support energy security by reducing the emissions intensity of natural gas production, which would make gas production more viable. This could in turn support the security of electricity supply because of the role gas plays in peaking generation. • CCUS could support economic development by enabling businesses to choose the most cost-effective way to reduce emissions. 	
	<p>Why this is complementary to the NZ ETS</p>	<ul style="list-style-type: none"> • The NZ ETS is the main tool the Government will use to drive emissions reductions in the energy sector. • Enabling CCUS to compete on a level playing field with other emissions reduction technologies would allow more efficient responses to NZ ETS price signals. • If the NZ ETS recognises and rewards CCUS emissions reductions, then this may result in the creation of new emissions units or decreased demand for existing emissions units. 	

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
<p>Transport</p> <p>Targeting a network of 10,000 public electric vehicle (EV) charging points, set Clean Vehicle Standard to 2029, and transition all light vehicles to road user charges (RUC)</p>	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> facilitate private investment in EV charging infrastructure review the Government public EV charging co-investment approach to ensure it is fit for purpose and targeted make the installation of public EV charging points a permitted activity under the RMA ensure the Clean Vehicle Standard is effective and targets are achievable transition all light vehicles to road user charges (RUC). 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> to have a network of 10,000 public EV charging points, which will reduce the impact range anxiety can have on suppressing uptake of light EVs the Clean Vehicle Standard will continue to progressively improve the emissions efficiency of light vehicles imported into New Zealand out to 2029 all light vehicles (EVs and internal combustion engine (ICE) vehicles) will be on a level playing field for RUC <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> a comprehensive nationwide network of EV charging infrastructure that enables New Zealanders to charge their vehicles easily across the country higher uptake of light EV and lower-emitting ICE vehicles fewer higher-emitting ICE vehicles remaining in use. 	<p><i>... and then in EB2, this will lead to:</i></p> <ul style="list-style-type: none"> reduced transport emissions from the light vehicle fleet, as the Clean Vehicle Standard's targets progressively lower to 2029 <p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> continued emissions reductions, as older higher-emitting vehicles exit the fleet.
	<p>Assumptions and dependencies</p>	<ul style="list-style-type: none"> The main current barrier to light EV uptake is the high upfront cost. Assumptions include that the cost disparity with light ICE vehicles will decline as technology improves, and therefore this barrier will also decline. A secondary barrier to light EV uptake, which directly influences consumers, is 'range anxiety' (fear of not being able to charge a vehicle while travelling longer distances). It is assumed that a denser network of public EV charging points will reduce range anxiety. A minor barrier to EV uptake is EVs paying higher RUC compared to the Fuel Excise Duty (FED) paid by high-efficiency hybrids. In the case of used EV imports, the rate of uptake is limited by the global supply of used EVs available for import. 	
	<p>Other benefits</p>	<ul style="list-style-type: none"> EVs can provide energy cost savings. As a result, consumers save money on energy costs, and the EV uptake results in a net reduction in costs for society. Light ICE vehicles contribute to air and noise pollution, and the associated impacts on health. Transitioning from diesel (and to a lesser degree, petrol) vehicles to light EVs will lessen this negative health impact. 	

	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> The EV charging points policy is aimed at addressing the range anxiety barrier to the uptake of EVs. Retention of the Clean Vehicle Standard motivates vehicle suppliers towards lower CO₂ vehicles, increasing the number of models available in New Zealand. However, as transport is covered by the NZ ETS, the waterbed effect may apply, resulting in no impact on net emissions.⁶⁶ Shifting all vehicles to RUC would remove incentives in the road-funding system for consumers to purchase high-efficiency ICE vehicles over EVs, overcoming a barrier to EV uptake. 	
Sector and ERP2 proposed policy			
	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Transport Transport pricing mechanisms	<i>If we do the following now:</i> <ul style="list-style-type: none"> return to regular FED and RUC increases from January 2027 enable regional time-of-use charging schemes. 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> that increased FED and RUC and introducing time-of-use charging would support more efficient use of the existing roading network and reduce congestion, which can support emissions goals <i>... and by 2050 we can expect:</i> <ul style="list-style-type: none"> the same as above, and continued increases in FED and RUC charges could amplify longer-term effects. 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> some reduced transport emissions from light and heavy vehicles <i>... and then in future emissions budgets, this will lead to</i> <ul style="list-style-type: none"> greater reduction in the above.
	Assumptions and dependencies	<ul style="list-style-type: none"> Time-of-use schemes encourage some users to change their travel habits, so there are fewer people on the roads at the busiest times. They aim to improve traffic flow across an entire network, enhancing reliability and productivity overall. The effectiveness of such schemes will depend on the specific settings and charges, which will need to be developed with local authorities after the initiative progresses through Parliament. At this stage, it is assumed that the settings and charges are effective in these goals. There is an interdependency between time-of-use schemes and public transport availability that can enhance the effectiveness of both policies. 	
	Other benefits	<ul style="list-style-type: none"> Time-of-use pricing can support greater productivity and reduce congestion (which is its primary purpose). The increased FED and RUC will also support the ongoing funding and maintenance of the roading network and enhance resilience (which is its primary purpose). 	

⁶⁶ If you jump on a waterbed, it sinks in one place and rises in another, but the amount of water in the bed remains the same. The waterbed effect applies the same concept to emissions in an emissions trading scheme. If emissions are reduced by one participant, this frees up allowances for another participant to increase their emissions, such that total net emissions remain the same.

	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> While NZ ETS price signals have an impact on fuel prices, they do not influence when people choose to use the travel network, which is the purpose of time-of-use pricing. 		
Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
Transport Heavy vehicles (freight and related sectors) regulatory change	<i>If we do the following now:</i> <ul style="list-style-type: none"> review regulatory barriers to low- and zero-emissions heavy vehicles (ZEHV), including the Vehicle Mass and Dimension rule and driver licence weight categories provide grants to support purchase of ZEHVs or conversion of heavy vehicles to hybrid or zero-emissions technology. 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> industry to have a better understanding of how use of ZEHVs will impact its payload capacity industry to be able to purchase a wider range of ZEHVs than currently meet New Zealand regulations. This could avoid costs of manufacturers' modifications to vehicles to meet New Zealand standards. the above two outcomes should combine to enable industry to operate more ZEHVs in New Zealand <i>... and by 2050 we can expect:</i> <ul style="list-style-type: none"> industry to have purchased more ZEHVs. 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> some reduced transport emissions from heavy vehicles <i>... and then in future emissions budgets, this will lead to:</i> <ul style="list-style-type: none"> greater reductions in the above. 	
	Assumptions and dependencies	<ul style="list-style-type: none"> Currently, the main barrier to ZEHV uptake is the high upfront cost of these vehicles. Assumptions include that, as technology improves and global production increases in the longer term, the cost disparity of ICE vehicles and the payload disadvantage will decline. This policy area depends on work being undertaken in the energy sector, particularly to establish regulatory measures relating to the costs and processes to connect to electricity networks (currently a barrier to investment in EV charging infrastructure). 		
	Other benefits	<ul style="list-style-type: none"> In the transport sector, diesel heavy vehicles are major contributors to air pollution and the associated impacts on health. Transitioning from ICE heavy vehicles to ZEHVs will lessen this negative health impact. ZEHVs can provide energy cost savings. This could result in lower energy costs for businesses, although this will depend on how payloads compare with ICE heavy vehicles. However, there are potential cost implications from increased wear and tear on the roads. 		
	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> These options are aimed at addressing regulatory barriers that may limit the availability of ZEHVs in New Zealand or increase the cost compared with other jurisdictions. However, as transport is covered by the NZ ETS, the waterbed effect may apply, resulting in no impact on net emissions. 		

Sector and ERP2 proposed policy				
	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
Transport Supporting aviation and shipping decarbonisation	<i>If we do the following now:</i> <ul style="list-style-type: none"> engage with industry to address regulatory barriers to the uptake of sustainable aviation fuel (SAF) and encourage engagement with other countries continue working with like-minded countries to put in place the conditions to allow low- or zero-carbon shipping on key trade routes by 2035 review the domestic application of international carbon intensity requirements to coastal shipping. 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> the New Zealand Government to be aware of international developments related to SAF and sustainable shipping fuels sector decarbonisation to be limited, as decarbonisation technologies and fuels are not yet widely available at commercially meaningful scales and/or economically competitive prices <i>... and by 2050 we can expect:</i> <ul style="list-style-type: none"> global production of SAF and sustainable shipping fuels to have scaled up and New Zealand industry to have begun adopting these fuels. 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> a limited impact on emissions (unquantified) <i>... and then in future emissions budgets, this will lead to:</i> <ul style="list-style-type: none"> some reduction in emissions for aviation and shipping, to the extent that industry begins to adopt these fuels. 	
	Assumptions and dependencies	<ul style="list-style-type: none"> This approach assumes that industry will take the lead to decarbonise these sectors. It also recognises that for industry to take the lead, global production of SAF and sustainable shipping fuels needs to scale significantly, and New Zealand companies need to be able to access supply of such fuels. There is a high degree of uncertainty for this assumption. Under a NZ ETS-led approach to reduce emissions, it is assumed that hard-to-abate sectors like aviation and shipping will decarbonise later than other sectors in which decarbonisation technologies are more mature. 		
	Other benefits	<ul style="list-style-type: none"> Not applicable. 		
	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> These options are aimed at international cooperation for hard-to-abate sectors to provide supply of alternative low-emissions fuel sources. They are not covered by the NZ ETS or current emissions budgets. Domestically purchased conventional jet fuel is covered by the NZ ETS, and the waterbed effect may apply, resulting in no impact on net emissions. 		
Sector and ERP2 proposed policy				
	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
Transport Public transport	<i>If we do the following now:</i> <ul style="list-style-type: none"> progress the following major public transport projects: <ul style="list-style-type: none"> Auckland City Rail Link Eastern Busway 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> completion of some of these public transport projects and substantial progress on planning and delivering the remainder of them corresponding increases in public transport patronage 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> reductions in transport emissions to the extent that travel by zero-emissions public transport displaces travel by private transport 	

	<ul style="list-style-type: none"> – Northwest Rapid Transit – Airport-to-Botany busway – rail upgrades in the lower North Island <ul style="list-style-type: none"> • accelerate public transport authorities' transition to zero-emissions buses through funding assistance and keeping the requirement for all new public transport buses to be zero emissions from 2025 onwards • make better use of existing public transport infrastructure. 	<ul style="list-style-type: none"> • more efficient use of existing transport infrastructure in Auckland and Wellington • existing public transport in major centres to be more optimised and more likely to run on lower- or zero-emissions fuels <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> • completion of remaining major public transport projects listed and improved optimisation of public transport services • more zero-emissions public transport. 	<p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> • further reductions in emissions from the public transport fleet • uncertain impact beyond this, because the share of travel done by low-emissions public transport also depends on factors such as urban form and uptake of other transport modes. 	
	Assumptions and dependencies	<ul style="list-style-type: none"> • Delivery of these projects depends on funding, availability of a qualified workforce and infrastructure maintenance. 		
	Other benefits	<ul style="list-style-type: none"> • Public transport improves access to social and economic opportunities for households. Depending on the quality and cost of public transport, services may reduce transport disadvantage (eg, for those who do not drive). • Public transport can have co-benefits in reducing air pollution and road congestion on the transport network, which has a corresponding economic benefit related to health and productivity. Where more people use public transport, greater optimisation and efficiency gains can be generated from past investments. • The decarbonisation of the public transport fleet will support its greater operational efficiency and could enhance national energy resilience to rising oil prices. 		
	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> • These options are aimed at addressing non-price barriers to responding to NZ ETS price signals. However, as transport is covered by the NZ ETS, the waterbed effect may apply, resulting in no impact on net emissions. 		
Sector and ERP2 proposed policy				
	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
Agriculture Accelerate the development and commercialisation of agricultural mitigation tools	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> • invest in the development and commercialisation of emissions mitigation technologies suited to New Zealand • support effective regulatory pathways so that new technologies for reducing on-farm emissions are safely and efficiently processed through New Zealand's inhibitor regulatory systems 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> • more mitigation tools ready for on-farm use • a streamlined process for mitigation tools to be approved for use in New Zealand • new technologies able to efficiently enter New Zealand's Greenhouse Gas Inventory, meaning the emissions reduction benefit of the technologies can be counted towards climate targets 	<p><i>... and then in EB2, this will lead to:</i></p> <ul style="list-style-type: none"> • reduced on-farm greenhouse gas emissions driven by availability of some mitigation technologies in New Zealand. Most activity in EB2 is spent improving availability of mitigation tools, with emissions reductions expected to ramp up in future emissions budgets 	

	<ul style="list-style-type: none"> assist technology groups to understand New Zealand’s regulatory requirements so the technology can be used on New Zealand farms and counted towards our targets provide information so that technology companies understand what is required to be incorporated into the Greenhouse Gas Inventory and that processes are set up to support this. 	<ul style="list-style-type: none"> additional technologies potentially starting to be used in New Zealand <p>... and by 2050 we can expect:</p> <ul style="list-style-type: none"> a range of safe and trusted technologies to be implemented and used in New Zealand to achieve a low-emissions agriculture sector. 	<p>... and then in future emissions budgets, this will lead to:</p> <ul style="list-style-type: none"> increased biological emissions reductions compared with EB2 – driven by many safe, adoptable on-farm emissions mitigation technologies being available to farmers.
Assumptions and dependencies	<ul style="list-style-type: none"> New Zealand can upscale successful mitigation technologies efficiently. Regulations must include thorough checks and balances so that new technologies are safe for farmers and consumers, and maintain market access. Technology is available and companies are seeking to enter the New Zealand market. There is a driver, such as agricultural emissions pricing and/or market demands, that incentivises the uptake of mitigation technologies. 		
Other benefits	<ul style="list-style-type: none"> Supporting international reporting on targets and market claims about low-emissions or emissions-efficient food and fibre products. Technologies may have co-benefits, such as supporting improved freshwater outcomes. Ensuring companies understand how to navigate regulatory processes will enable companies to invest in New Zealand’s market, and will encourage investment in research, development and innovation of new tools and technology in New Zealand. 		
Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> Agricultural emissions are outside of the NZ ETS. 		
Sector and ERP2 proposed policy			
	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Agriculture On-farm emissions measurement and support services	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> develop a standardised calculation methodology for on-farm emissions, as well as the structures required to keep the method transparent, up to date, and scientifically robust demonstrate the method is compliant with applicable New Zealand and international standards 	<p>... by 2030 we can expect:</p> <ul style="list-style-type: none"> farmers can make informed greenhouse gas management decisions that address their individual needs all farmers to have access to tools that support investment decisions, farm management and farm reporting increased confidence in processors’ greenhouse gas reporting and market claims 	<p>... and then in EB2, this will lead to:</p> <ul style="list-style-type: none"> most activity in EB2 being to improve understanding of what mitigation tools will work for each farm, with emissions reductions ramping up in future emissions budgets <p>... and then in future emissions budgets, this will lead to:</p> <ul style="list-style-type: none"> increased biological emissions reductions compared with EB2, as many safe, adoptable on-farm emissions mitigation technologies are used by

	<ul style="list-style-type: none"> make the methodology available for use in farm and processor-facing calculator tools provide farmers access to on-the-ground support for emissions reduction changes 	<p>... and by 2050 we can expect:</p> <ul style="list-style-type: none"> farmers and processors to have accurate understandings of their on-farm emissions, and how mitigation tools will reduce their emissions. 	farmers. Improved understanding of mitigation impact(s) on farms.
Assumptions and dependencies	<ul style="list-style-type: none"> International frameworks for calculating the impact of technologies are developed and agreed upon. New Zealand can upscale successful mitigation technologies efficiently. Emissions measurement informs emissions management. 		
Other benefits	<ul style="list-style-type: none"> New Zealand's products are seen as trustworthy and making environmental claims that are backed by data and science. Increased robustness of processors' market claims. 		
Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> Agricultural emissions are outside of the NZ ETS. 		

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Agriculture A fair and sustainable pricing system for on-farm emissions by 2030	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> get the policy settings right for a fair and sustainable pricing system for on-farm emissions by 2030. 	<p>... by 2030 we can expect:</p> <ul style="list-style-type: none"> a fair and sustainable pricing system is in place that reduces emissions without causing emissions leakage <p>... and by 2050 we can expect:</p> <ul style="list-style-type: none"> a wide range of mitigation technologies are available to be used on-farm, so that farmers are producing high-value, low-carbon products. 	<p>... and then in EB2, this will lead to:</p> <ul style="list-style-type: none"> most activity in EB2 being to get the system settings right, with emissions reductions ramping up in future emissions budgets <p>... and then in future emissions budgets, this will lead to:</p> <ul style="list-style-type: none"> significant emissions reductions compared with EB2, driven by the uptake of technologies (production is assumed to not be impacted).
Assumptions and dependencies	<ul style="list-style-type: none"> We invest in the development and commercialisation of mitigation technologies. We prepare farmers with standardised on-farm emissions measurement tools and advice tailored to their farms. A range of tools and technologies are available across farm types by 2030. 		
Other benefits	<ul style="list-style-type: none"> Potential reputational benefits to New Zealand, noting we could be among the first in the world to implement an agricultural policy of this kind. 		
Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> Agricultural emissions are outside of the NZ ETS. 		

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Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
<p>Waste</p> <p>Organic waste and landfill gas (LFG) capture investigation, resource recovery infrastructure investment, refrigerant regulated product stewardship (RRPS) scheme</p>	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> investigate best-practice LFG capture and determine appropriate regulatory pathways for better managing both LFG capture and the disposal of organic materials invest in resource recovery infrastructure for target waste streams through the Waste Minimisation Fund (WMF) introduce a regulated product stewardship scheme for refrigerants (F-gases). 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> an improved regulatory framework for the management and reporting of LFG capture more efficient best-practice LFG capture to be more widely used across the industry improved management of organic waste – including considering which landfill types accept which types of organic waste, with the aim of ensuring that the most efficient landfill options receive these materials. Infrastructure starts to be developed and built LFG capture to improve and expand overall a growing number of resource recovery and diversion opportunities available through WMF-funded infrastructure development enabling regulations for a RRPS from 2025 <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> ongoing consistent reporting due to improvements to the reporting framework that make requirements clear and aligned with best practice LFG capture to continue to improve and expand organic waste management options to be implemented, and infrastructure that diverts and recovers organic materials to be in place residual waste to be managed by the most appropriate landfill types for efficient emissions reduction diverse resource recovery infrastructure to be available across the country to address target organic waste streams 	<p><i>... and then in EB2, this will lead to:</i></p> <ul style="list-style-type: none"> a reduction in biogenic methane emissions from the waste sector a reduction in emissions from the refrigerants sector <p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> potential energy recovery opportunities that may displace the need for non-renewable energy in specific applications (eg, with appropriate feedstocks), reducing emissions in other sectors additional reduced biogenic methane emissions in the waste sector.

		<ul style="list-style-type: none"> • a regulated product stewardship scheme led by the industry, regulated by the Ministry for the Environment, achieving emissions reductions by capturing, recycling and reusing materials. 	
	Assumptions and dependencies	<ul style="list-style-type: none"> • The expected impact assumes increased efficiency of LFG capture, through changing the NZ ETS regulations for landfills, introducing further controls for organic waste disposal, and lowering the current landfill size thresholds where LFG capture systems must be installed. • Any additional benefits from possible opportunities for emissions reduction through other landfill disposal activities (ie, class 2 construction and demolition disposal sites) have not been modelled for this scenario. • WMF action assumes that the Government invests \$30 million from the WMF into resource recovery infrastructure for target waste streams annually for the ERP2 period, and that this investment builds on the existing pipeline of committed projects. • Cabinet approves a RRPS scheme in late 2024, and regulations are enacted in 2025, with abatement impacts occurring from 2027 onwards. 	
	Other benefits	<ul style="list-style-type: none"> • Improved effectiveness and efficiency of LFG capture systems would expand opportunities for energy recovery from landfill disposal, as well as bringing a range of other benefits such as improving odour and vector control, and reducing health and environmental risks. Potential policy options designed alongside industry may ‘level the playing field’ for landfill operators by recognising their differing facility capacity to efficiently manage organic materials. • We will improve our understanding of the overall impacts and volume of emissions produced by landfilling in New Zealand, delivering on recommendations by United Nations Framework Convention on Climate Change expert reviewers to justify our current LFG capture recovery rates (as reported in New Zealand’s Greenhouse Gas Inventory 1990–2022). • Improving the availability and distribution of resource recovery infrastructure will address the infrastructure deficit (estimated at \$2.1 to \$2.6 billion in 2020) and enable households and businesses to recycle or recover more, rather than sending resources to landfill. • A RRPS scheme may also have safety benefits, associated with having accredited operators handling the destruction of materials that can be flammable. 	
	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> • Improvements to the regulatory framework for landfills and LFG capture systems would help to appropriately recognise operators’ efforts to reduce emissions through the NZ ETS framework and to ensure that the disposal sector is operating within a well-balanced regulatory system for landfill emissions. 	

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets	
Forestry and wood processing Boosting wood processing	<i>If we do the following now:</i> <ul style="list-style-type: none"> improve the consenting framework for wood-processing facilities to provide the market with the certainty it needs to expand production of harvested wood products (HWPs) ensure the Wood Processing Growth Fund continues to support commercial investment in expanded domestic wood processing. 	<i>... by 2030 we can expect:</i> <ul style="list-style-type: none"> reduction in the cost and time taken to get consented for building or upgrading wood-processing facilities higher commercial investment in expanded domestic wood processing increased domestic production of long-lived HWPs such as structural timber and engineered wood products the above trends to increase the availability and affordability of wood products, particularly for use as low-emissions building materials <i>... and by 2050 we can expect:</i> <ul style="list-style-type: none"> further expanded domestic wood processing and increased long-lived HWPs greater uptake of engineered wood products and mass timber buildings in construction. 	<i>... and then in EB2, this will lead to:</i> <ul style="list-style-type: none"> stronger support for increased production and therefore greater availability of long-lived HWPs greater uptake of lower-emissions building materials in construction a potential increase in carbon storage in long-lived HWPs⁶⁷ <i>... and then in future emissions budgets, this will lead to:</i> <ul style="list-style-type: none"> increased production and therefore greater availability of long-lived HWPs transition towards low-emissions building materials in construction increased carbon storage in long-lived HWPs. 	
	Assumptions and dependencies	<ul style="list-style-type: none"> Production of long-lived HWPs as low-emissions building materials can displace existing emissions-intensive building materials. 		
	Other benefits	<ul style="list-style-type: none"> By supporting increased processing capacity, the growth in domestic demand and production supports the Government's goal to double the value of exports. 		
	Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> These are enabling policies that address known barriers to increasing production (cost of investment in processing, access to capital) and that improve the regulatory process for consents. These policies can help increase the supply and availability of low-emissions building products, particularly engineered timber. 		

⁶⁷ Longer-lived HWPs such as structural timber or engineered wood products delay release of carbon capture by trees by many decades. At the end of a product's life, stored carbon is released back into the atmosphere. An overall move towards more use of long-lived wood products is recorded as higher emissions removals in New Zealand's international carbon accounting.

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
<p>Non-forestry removals</p> <p>Recognise non-forest carbon removals</p>	<p><i>If we do the following now:</i></p> <ul style="list-style-type: none"> develop a framework to assess non-forest removals' readiness for recognition expand target accounting in the Nationally Determined Contribution (NDC) to include non-forest land uses develop methodologies to measure and report non-forestry removal activities identify and develop appropriate mechanisms to recognise non-forest sequestration activities regardless of whether they are accounted for in New Zealand's NDCs 	<p><i>... by 2030 we can expect:</i></p> <ul style="list-style-type: none"> increased interest from land owners and businesses to invest in non-forest removal activities this increased interest could lead to increased investment in these types of removal activities incentives to protect existing removal land categories <p><i>... and by 2050 we can expect:</i></p> <ul style="list-style-type: none"> all land-use categories to be measured, accounted for and incentivised through suitable, high-integrity mechanisms restoration of degraded land categories such as wetlands and peatlands. 	<p><i>... and then in EB2, this will lead to:</i></p> <ul style="list-style-type: none"> the beginnings of increased actual removal of emissions through non-forest activities potential increased, reported net emissions compared with the base year as recent increases in net emissions of non-forest land uses are accounted for, depending what choices the Government makes. This can be mitigated by adopting a phased approach that first recognises activities that do not result in a net increase for this period and then expands the activities recognised over time <p><i>... and then in future emissions budgets, this will lead to:</i></p> <ul style="list-style-type: none"> increased removal of emissions through non-forestry activities reported in the New Zealand's Greenhouse Gas Inventory and NDCs reduced reported net emissions from land-use removal categories an overall decrease in net emissions compared with the base year as a result of the above changes.
Assumptions and dependencies	<ul style="list-style-type: none"> Methodologies appropriate for New Zealand, and internationally aligned, can be developed and tested to begin measuring and reporting before 2030. Incentives and rewards are established for land owners. Net emissions have increased overall across non-forest land uses since the base year. 		
Other benefits	<ul style="list-style-type: none"> Improved ecosystem services deliver biodiversity and resilience outcomes through restoration and development of land categories such as mangroves. 		
Why this is complementary to the NZ ETS	<ul style="list-style-type: none"> The NZ ETS is one potential mechanism to recognise non-forest carbon removals. Over time, additional removals will be developed that could contribute to New Zealand meeting its NDC. 		

Appendix 3: Assumptions used in policy modelling

Table A3.1: Assumptions used for modelling proposed policies for the second emissions reduction plan (ERP2)

Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
New Zealand Emissions Trading Scheme (NZ ETS) settings	Used the ETS Market model to estimate price and change in afforestation based on projected NZ ETS market dynamics, including updated unit and price control settings. Used these as inputs in Emissions in New Zealand (ENZ) model to get the impact on net target accounting.	Projected gross emissions and price elasticities.	The NZ ETS price will adjust to ensure sufficient supply of New Zealand Units (NZUs) to meet demand. Prices are assumed to peak in 2030, around the time that forestry units are expected to become the dominant sources of NZUs, before falling. Participants will draw down surplus stockpiled units first, before using other stockpiled units if it is economic to do so.	Partly included in baseline and partly in integrated analysis.	ETS Market model picks up the supply and demand dynamics in the NZ ETS, including the interaction with the stockpile of NZUs.
Electrify NZ	Modelled in ENZ.	Private investment decisions depend on the extent to which electricity demand is sufficient to drive renewables investment and incentivise fuel switching.	Halved consenting costs (about 2% to 5% of capital costs) for renewables generation. Base consenting cost assumptions (\$ per kW): hydro \$116; geothermal \$98; onshore wind \$116; offshore wind \$139; solar \$69.	0.1 Mt CO ₂ -e	
Electric vehicle (EV) charging points	Modelled in ENZ.	Baseline projections of EV uptake. Cabinet agreeing to future design of the EV charging point roll-out and subsequent funding.	The lack of EV charging points is currently a moderate constraint that reduces uptake by 10%, that this is factored into the baseline, and the impact of the 10,000 EV charging points include those to be provided under the baseline.	0.01 Mt CO ₂ -e	

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Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
Agricultural emissions pricing system	Used given assumptions of mitigation uptake and effectiveness in the ENZ model. Assumed no impact on production or stock numbers.	Development of an agricultural emissions pricing policy with implementation starting in 2030 (legislative, funding and administrative dependencies), and availability of mitigation technologies to deliver the assumed uptake. Mitigation technologies working as described, and genetic trends progressing as anticipated.	No impact on production or stock numbers (reductions achieved through incentivising uptake of certain mitigation technologies with other technologies possibly available out to 2050). Several assumptions were used to model the impact because no detailed policy decisions have been taken on an agricultural emissions pricing scheme, including an assumption that an emissions pricing policy would begin in 2030. The policy will ensure that major emissions reduction technologies have at least a small profit advantage when used by farmers. As no detailed policy decisions have been taken, the impacts of the future pricing mechanism could vary significantly from what has been modelled.	0.2 Mt CO ₂ -e	
	Low CH₄ breeding As per baseline, but with dairy peak adoption 96% by 2042, sheep peak adoption 92% by 2041, beef peak adoption 91% by 2052.	Availability of mitigation technologies	With pricing, uptake starts from 2030 at the earliest – later if the technology is available after 2030, because the price cannot act on uptake before then. Before 2030 we always use the baseline uptake. After 2030, in the new policy scenario, we use the larger of the baseline or policy scenario uptake in any given year to create a smooth transition between the two curves.	Included in agricultural pricing.	

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Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
	Methane inhibitors As per baseline, but with dairy peak adoption 69% by 2042, beef peak adoption 15% by 2047.			Included in agricultural pricing	
	Low-emissions feed As per baseline, but with dairy peak adoption 6% by 2035.			Included in agricultural pricing	
	EcoPond As per baseline, but with dairy peak adoption 3% by 2037.			Included in agricultural pricing	
Resource recovery through Waste Minimisation Fund (WMF)	Modelled by the Ministry for the Environment (MfE), results used as an input to the ENZ model for the integrated scenario. Reduced from up to 1.3 Mt CO ₂ -e in the ERP2 discussion document, with the adoption of mid-point assumption.	WMF investment signals remain aligned to emissions reduction outcomes, and project proposals continue to come forward in response to those signals.	The estimate of an average 200 kt per year (1 Mt to 2030) builds on the current WMF portfolio of committed projects and is based on the investment of an additional \$30 million of waste minimisation funding every year to 2030. Early WMF investment has greater cumulative impact across EB2. The level of abatement is broadly proportional to the level of funding, which also assumes co-investment (from industry and local government). The central scenario uses the mid-point estimate for WMF dollar invested per tonne of CO ₂ -e abated. The impact estimate assumes that WMF co-funding is allocated to eligible projects.	-1 Mt CO ₂ -e	Among the scenarios modelled, a central scenario has been used based on an additional \$30 million per year and building on the current WMF portfolio of committed projects. Analysis of abatement impact per WMF dollar invested and the timing of abatement for approved projects combined, estimate that for \$30 million per year over EB2, the range is from 0.81–1.30 Mt CO ₂ -e (1.01 Mt CO ₂ -e mid-point). For a \$20 million scenario, the range is 0.688–1.07 Mt CO ₂ -e (mid-point 0.87 Mt CO ₂ -e).

Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
					For a \$40 million scenario, the range is 0.95–1.55 Mt CO ₂ -e (mid-point 1.24 Mt CO ₂ -e).
Organic waste management and landfill gas (LFG) capture	Modelled within the MfE waste model, results used as an input to the ENZ model for the integrated scenario. Reduced from up to 1.1 Mt CO ₂ -e in the ERP2 discussion document, with the adoption of mid-point assumption.	Future detailed decisions on the optimal mix of policy and regulatory changes. A number of regulatory tools are available in addition to the modelled scenario assumption settings, including extending the NZ ETS to a wider range of landfills, and consideration of controls on organic waste disposal at differing landfill classes.	The central modelled scenario assumes a 5% average LFG efficiency increase and expanding LFG capture to all class 1 disposal facilities over 10 kt per year. The range uses a higher and lower LFG efficiency increase uplift (0.22 Mt CO ₂ -e [3%] to 0.51 Mt CO ₂ -e [7%], mid-point of 0.37 Mt CO ₂ -e [5%]), and adjusting the class 1 LFG requirement tonnage thresholds (from all facilities to none, using facilities over 10 kt per year as a mid-point scenario [0.17–0.59 Mt CO ₂ -e, mid-point of 0.4 Mt CO ₂ -e]). Combining both provides a central estimate of 0.76 Mt CO ₂ -e, with a range of 0.39 –1.1 Mt CO ₂ -e.	–0.8 Mt CO ₂ -e	Among the scenarios modelled, a central scenario has been used. Note that some very small class 1 landfills may not be viable for retrofit installation of LFG capture technology. Also note that regulatory tools are available to enable an increase in overall system efficiency, and the detailed decisions will be taken in the future. Potential changes to NZ ETS regulations could improve the effectiveness, fairness and accuracy as a market incentive for landfill operators to reduce emissions. A 5% average efficiency uplift is considered an achievable increase by 2030, resulting from a combination of efficiencies achieved being more fairly recognised and, where less-efficient systems are operating or absent, the NZ ETS providing a stronger market incentive to invest in LFG capture. The abatement may also be achieved

Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
					through controls on organic waste disposal.
Carbon capture, utilisation and storage (CCUS)	Input from Ministry of Business, Innovation and Employment (MBIE) based on information from potential user consultation.	Decision to progress depends on private investment decisions to deploy CCUS, which in turn will depend on a range of factors, including NZU prices, cost of technology and gas production volumes.	CCUS is used by a major gas producer to capture emissions during gas production from 2027 for a high CO ₂ gas field.	-1.0 Mt CO ₂ -e	Officials assessed the central scenario as the most likely.
Refrigerants regulated product stewardship (RRPS) scheme	Hydrofluorocarbon (HFC) abatement estimates by Verum Group Ltd. The impacts of an RRPS were updated to reflect impacts sooner than 2030. The policy was also removed from the baseline and added to the 'new measures' scenario, along with the revised timing.	Refrigerants and other synthetic greenhouse gases are already a declared priority product which enables regulation to mandate participation in an accredited priority product scheme. Cabinet will consider enabling regulations in 2024.	Central impact estimates assume regulations come into force in 2025, with impact on emissions budgets from 2027 onwards.	-0.4 Mt CO ₂ -e	
Crown-owned land afforestation	The afforestation scenario includes a mix of indigenous and exotic planting up to 320,000 hectares of Crown-owned land, inside and outside the NZ ETS. Indicative amounts of forest planting were run through the ENZ model to estimate emissions removals.	Enabling afforestation on Crown-owned land will likely require legislative changes. Key modelling assumptions will be tested during market engagement in 2024 and 2025. This includes private sector interest and willingness to partner with the Government	The assumed annual planting rates are high and are equal to the average annual rate of exotic afforestation between 1990 and 2022. Abatement was calculated using national level yield tables and NZ ETS returns were calculated using the default tables for Canterbury and/or the West Coast. It is assumed private sector partners receive a modest financial return where additional	0.4 Mt CO ₂ -e	The afforestation scenario was developed to produce the emissions removals needed to offset the estimated emissions projected to be outstanding in 2050.

Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
		and plant on Crown-owned land.	profits from forests registered in the NZ ETS are re-invested by investors to fund afforestation outside the NZ ETS.		

Appendix 4: Provisional allocation of projected emissions to sectors within and outside the NZ ETS

In determining the unit and price control settings in the New Zealand Emissions Trading Scheme (the NZ ETS settings) each year, one aspect of the methodology is to specify the proportion of emissions budgets allocated to NZ ETS sectors (the NZ ETS cap). Being clear on how the Government intends to allocate the emissions budget between NZ ETS and non-NZ ETS sectors will provide greater regulatory certainty to the market, enhancing its credibility and supporting participants to make investment decisions.

For the second emissions budget (EB2), the Government proposes to align the NZ ETS cap with projected emissions from NZ ETS sectors as outlined in this technical annex. Table shows how this has been provisionally estimated. The NZ ETS cap will be consulted on as part of the NZ ETS settings process in 2025.

Table A.3.2: Provisional allocation of projected emissions to NZ ETS and non-NZ ETS sectors for EB2

	Projected emissions in EB2 (Mt CO ₂ -e)
Gross emissions	363.4
Net emissions	303.1
Non-NZ ETS allocation	
Agriculture	196.1
Waste (non-municipal landfills)	10.2
F-gases (not subject to the SGG levy)	3.3
IPPU	1.3
LULUCF – Biomass combustion	0.6
LULUCF – P89 forestry	0.4
Net emissions outside NZ ETS	211.8
NZ ETS allocation	
Net emissions inside NZ ETS	91.3

Note: F-gases = fluorinated gases; SGG = synthetic greenhouse gas; IPPU = industrial processes and product use; LULUCF = land use, land-use change and forestry; P89 forestry = post-1989 forests.



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