Our journey towards net zero

New Zealand's second emissions reduction plan 2026–30

Tā Aotearoa mahere whakaheke tukunga tuarua

Technical annex

Amended January 2026

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

January 2026 amendment to the second emissions reduction plan

This section summarises the changes made to the second emissions reduction plan (ERP2) across three documents to reflect the January 2026 amendment. It also explains how to read this document in light of the amendment.

In 2025, the Government revised our approach to reducing agricultural emissions. In particular, we have decided not to proceed with implementing an on-farm agricultural emissions pricing system by 2030. The Government remains committed to a technology-led approach to reducing emissions and will leverage market-led schemes that support farmers to adopt new ways of reducing emissions.

ERP2, originally published in December 2024, has been amended to reflect this revised approach.

Summary of changes and how to navigate the amended ERP2

The amendment consists of an updated ERP2, to be read alongside a new addendum. These documents can be read in conjunction with the ERP2 technical annex, and latest official greenhouse gas emissions projections. Changes across the three documents are as follows.

ERP2

- The agriculture chapter of ERP2 has been fully updated to reflect the revised approach to reducing agricultural emissions.
- Elsewhere in ERP2, references to agricultural emissions pricing that are impacted by this amendment are highlighted in grey and prefaced with <Superseded by January 2026 amendment>.
- A new box at the beginning of the executive summary and the start of chapter 2 highlight that references to projections reflect 2024 data and refer readers to the latest official projections.

Addendum

- A new addendum sets out how the amended ERP2 will meet the second emissions budget, in light of the revised approach to reducing agricultural emissions.
- It further notes the impact of the amendment on the third emissions budget and 2030 and 2050 biogenic methane targets.
- The addendum is based on 2025 projections. An appendix to the addendum includes technical information on the modelling used for 2025 projections.

Technical annex (this document)

- A note in the new 'January 2026 amendment' section and the executive summary explain that projections within the technical annex are accurate as at December 2024 and refer readers to the latest official projections.
- References to agricultural emissions pricing are highlighted in grey and prefaced with <Superseded by January 2026 amendment>.

How to read this document

This document (technical annex) reflects 2024 greenhouse gas emissions projections. Emissions projections are updated annually and can vary each year due to changes in inventory methods, assumptions, changes in government policy and economic conditions as well as updated information about actual emissions. For the latest official greenhouse gas emissions projections, see the Ministry for the Environment's webpage, New Zealand's projected greenhouse gas emissions to 2050.

Throughout this document, references to agricultural emissions pricing have been prefaced by **<Superseded by January 2026 amendment>** and are highlighted in grey.

The January 2026 ERP2 amendment reflects updated 2025 projections, based on revised assumptions across all sectors, including shifts in baseline emissions. It is therefore not possible to reflect the impact of this amendment simply by subtracting agricultural pricing impacts from projections and modelling throughout the ERP2 and technical annex. Refer to the new addendum for further information about the impact of this amendment and how the amended ERP2 will contribute to meeting New Zealand's targets and budgets, based on 2025 projections.

The modelling of macroeconomic and distributional impacts in this document (part 4) has not been updated. This modelling was undertaken using a computable general equilibrium (CGE) framework that differs from, but draws on, the emissions projections modelling undertaken in the Emissions in New Zealand model. By design, CGE models take a high-level, top-down approach and make some simplifying assumptions on how policy impacts play through the economy. The CGE modelling undertaken at the time that ERP2 was published remains representative of the expected macroeconomic and distributional impacts of the amended ERP2.

Executive summary

All references to projected emissions and emissions reductions in this document reflect 2024 greenhouse gas emissions projections. The latest official emissions projections can be found on the Ministry for the Environment's webpage, New Zealand's projected greenhouse gas emissions to 2050.

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 CO_2-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 CO_2-e below EB1 and 1.9 Mt CO_2-e below EB2. Meeting EB3 remains challenging. Using the central estimate, net emissions are projected to be 9.2 Mt CO_2-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 CO_2-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
<Superseded by January 2026 amendment> 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.

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),

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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]

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[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 review[8]) 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.

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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.
- **<Superseded by January 2026 amendment>** 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 survey[12] 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).

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[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
- **<Superseded by January 2026 amendment>** 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 CO_2-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 ($Mt\ CO_2$-e)

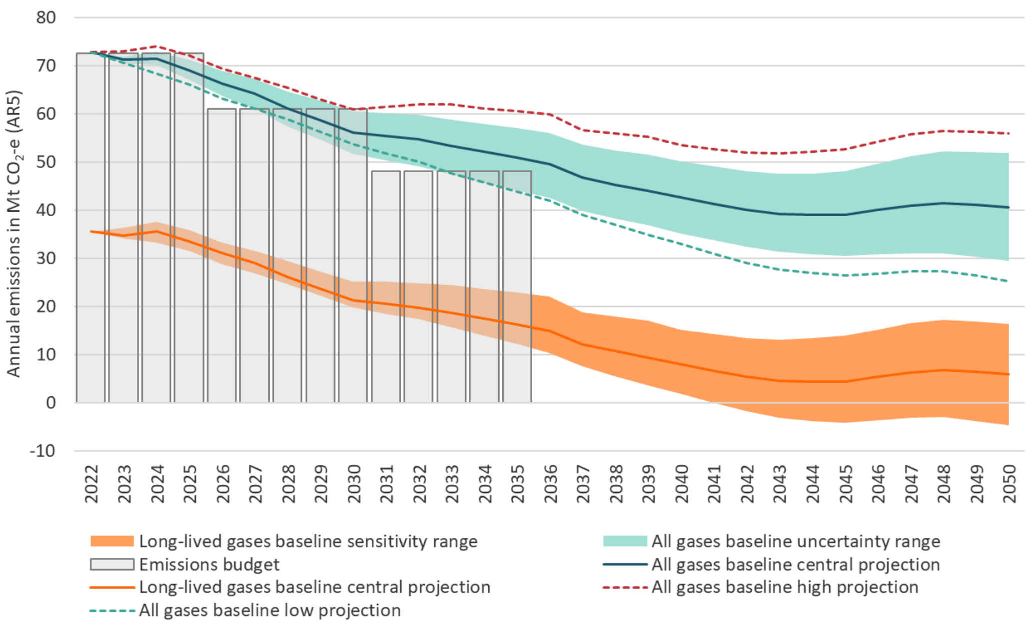
Budget period	Category	Budget	Discussion document baseline	Final ERP2 baseline
EB1	**Net emissions**	**290**	**284.0 ± 4**	**284.5 ± 7**
	Gross emissions		307.4	309.7
	Removals		–23.2	–25.2
EB2	**Net emissions**	**305**	**307.1 ± 18**	**306.3 ± 17**
	Gross emissions		368.4	367.0
	Removals		–61.3	–60.7
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 CO_2-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 CO_2-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 CO_2-e)

	Sector							
Source of difference	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.

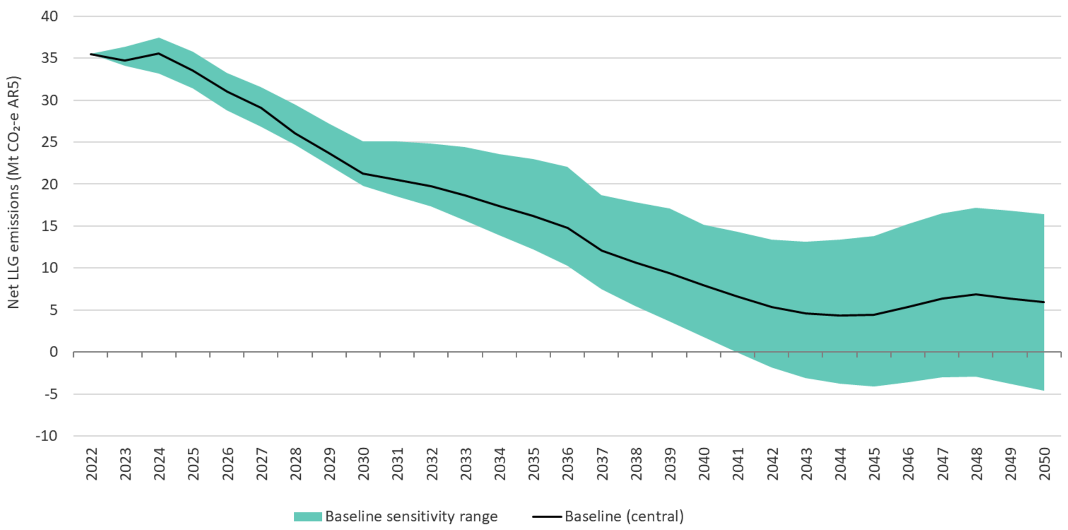
Progress relative to emissions targets

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 CO_2-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 CO_2-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 CO_2-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

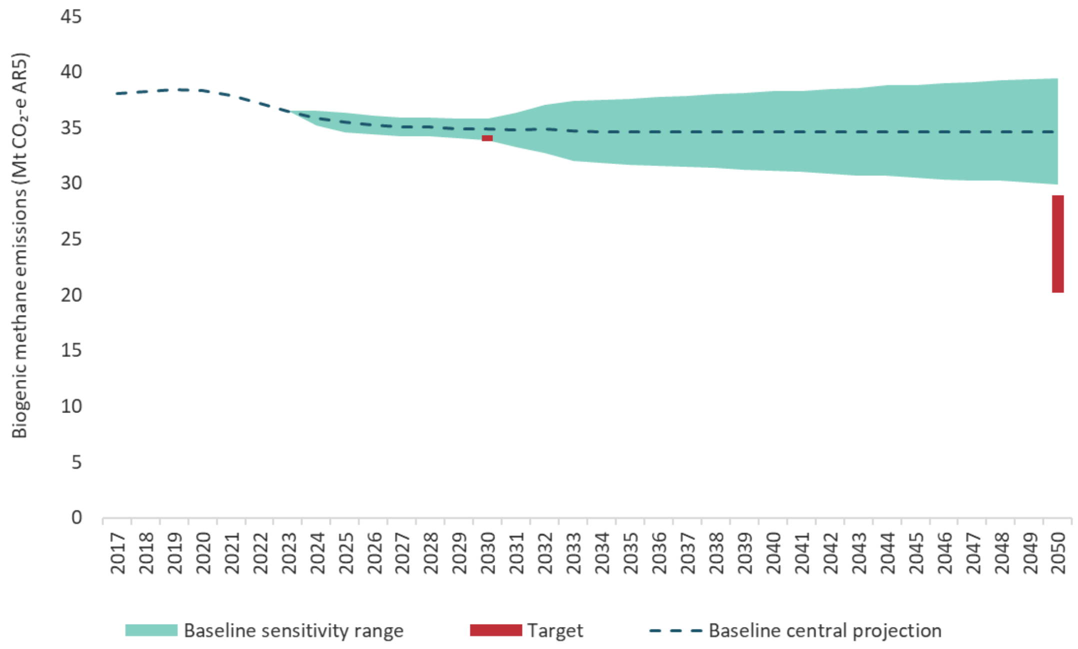


Table 7: Baseline for biogenic methane compared with interim ERP2 projections, per target year (Mt CO_2-e)

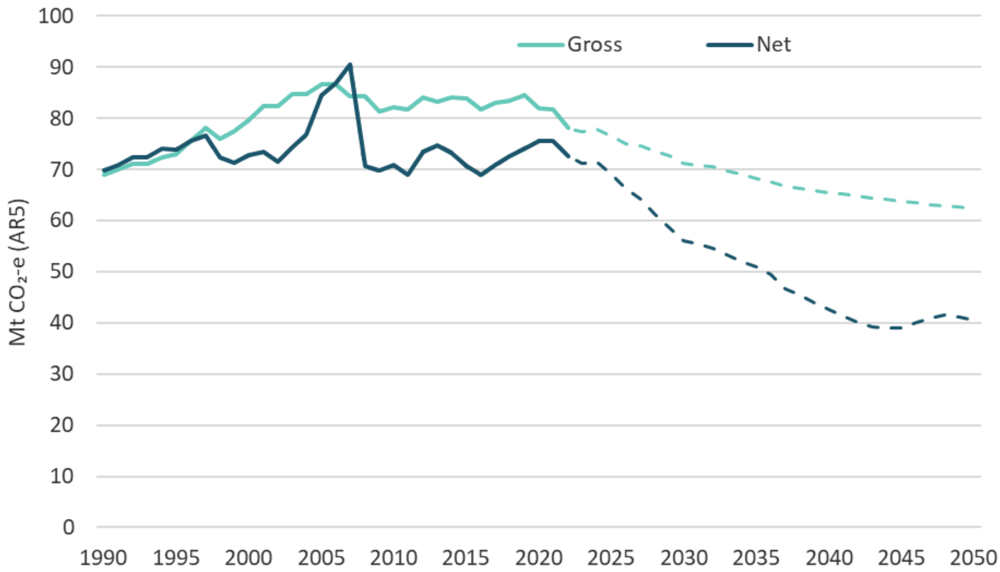
Target year	Targets	Interim ERP2 baseline	ERP2 baseline (central)	ERP2 baseline (low)	ERP2 baseline (high)
2030	34.3 (–10%)	34.3 (–9.9%)	34.9 (–8.4%)	33.9 (–10.9%)	35.9 (–5.8%)
2050	20.2–29.0 (–24–47%)	33.1 (–13.2%)	34.6 (–9.1%)	29.9 (–21.4%)	39.5 (3.6%)

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.

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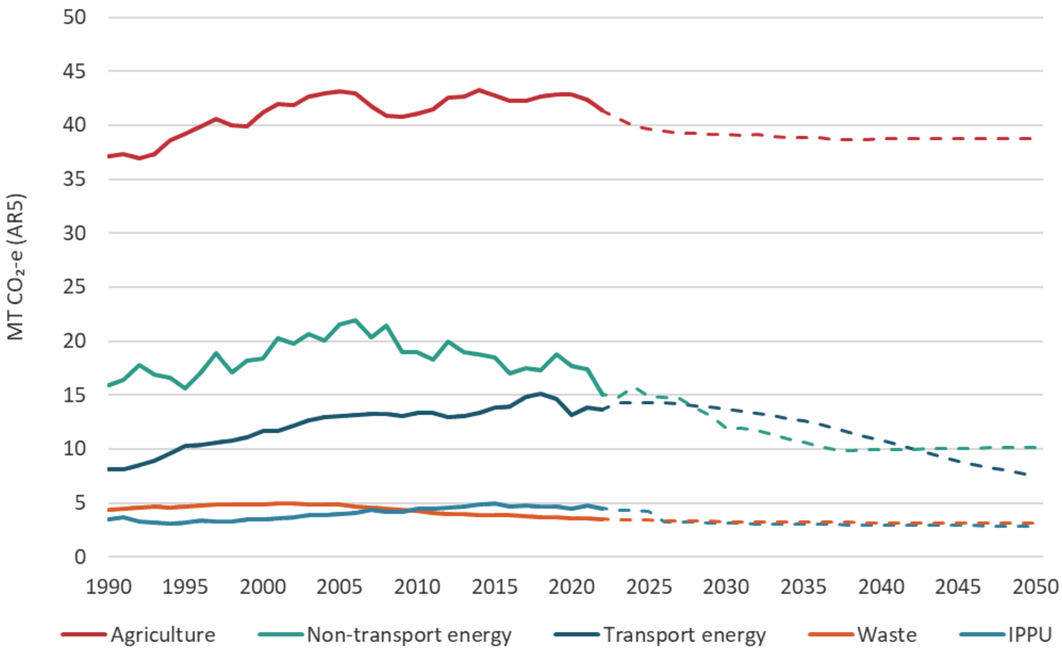
[14] Target accounting emissions include gross emissions, along with a subset of forestry and land-use emissions and removals. Target accounting is designed to be compatible with net emissions targets, under which business-as-usual removals from pre-1990 forests are not counted. Only emissions and removals 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 CO_2-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.

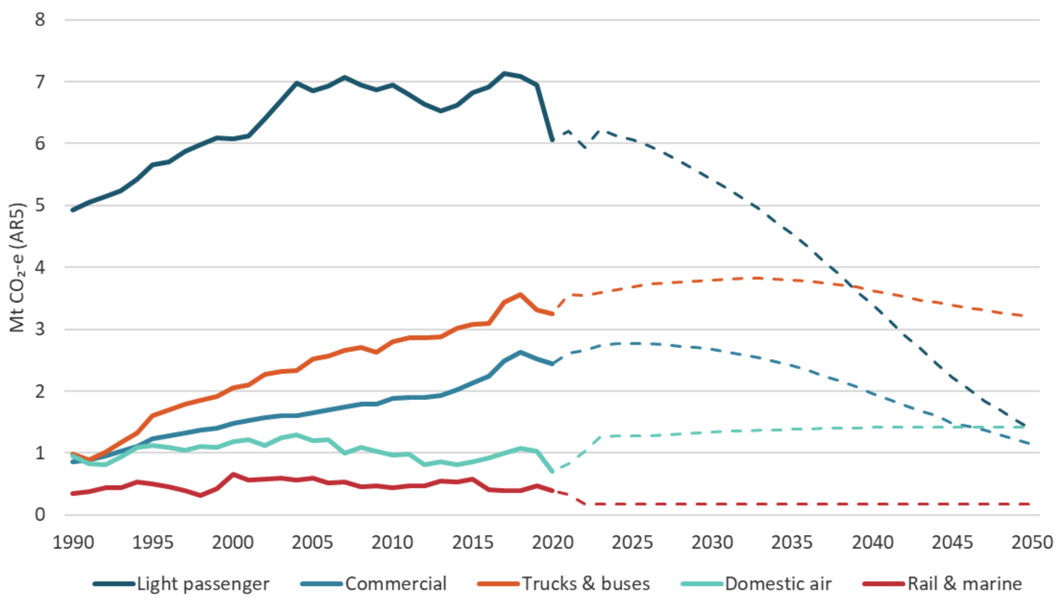
Transport energy

Transport emissions have risen by 61 per cent since 1990 (figure 5) and peaked in 2018 at 15.1 Mt CO_2-e, before falling to 13.2 Mt CO_2-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 CO_2-e in 2035), before falling to approximately 7.5 Mt CO_2-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

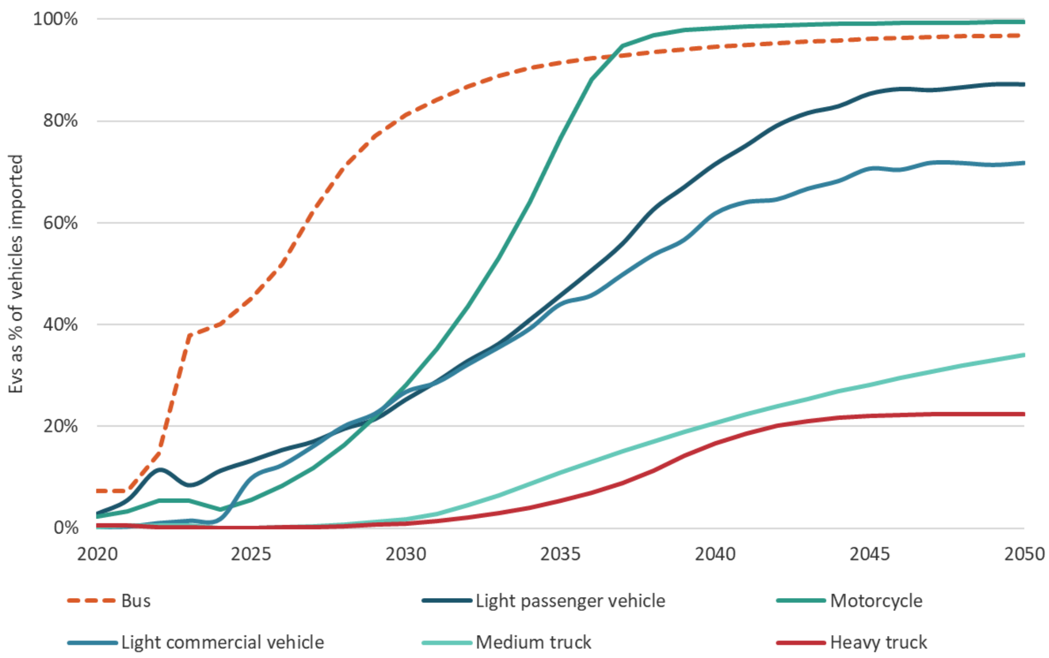
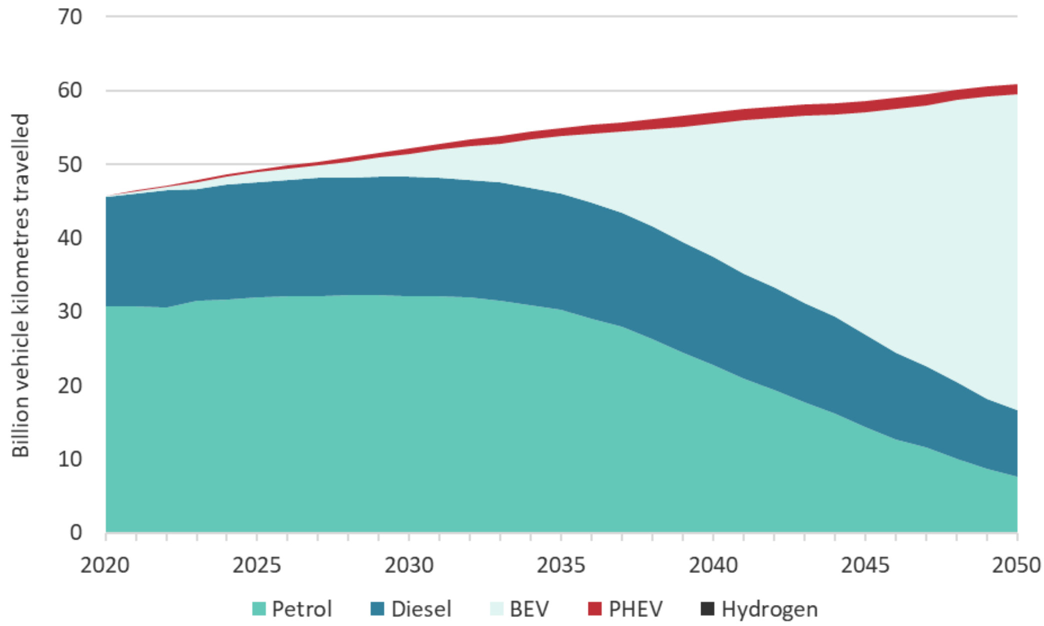


Figure 8: Projected travel distance by vehicle type (all road vehicles), 2020–50

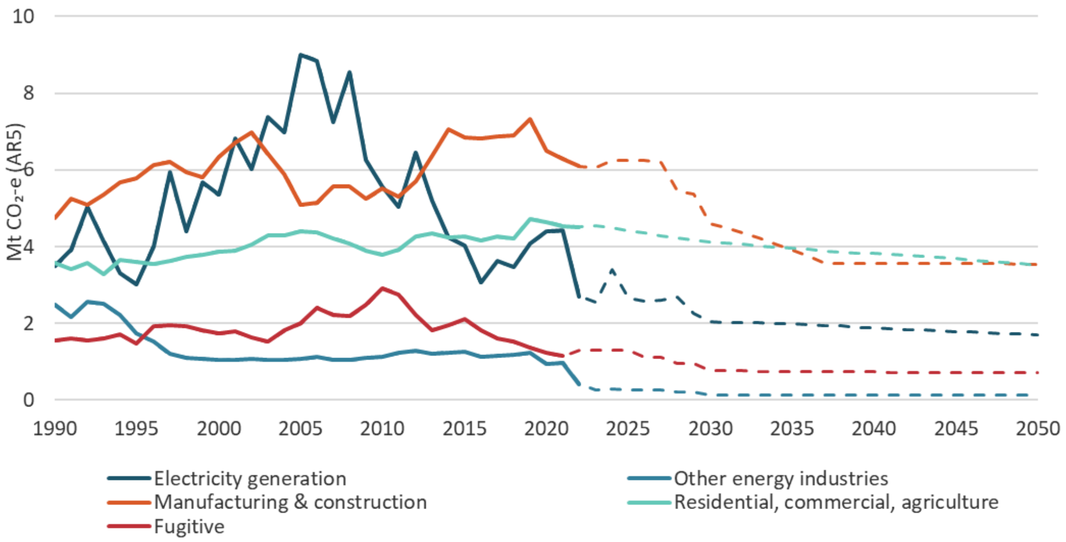


Note: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle.

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.

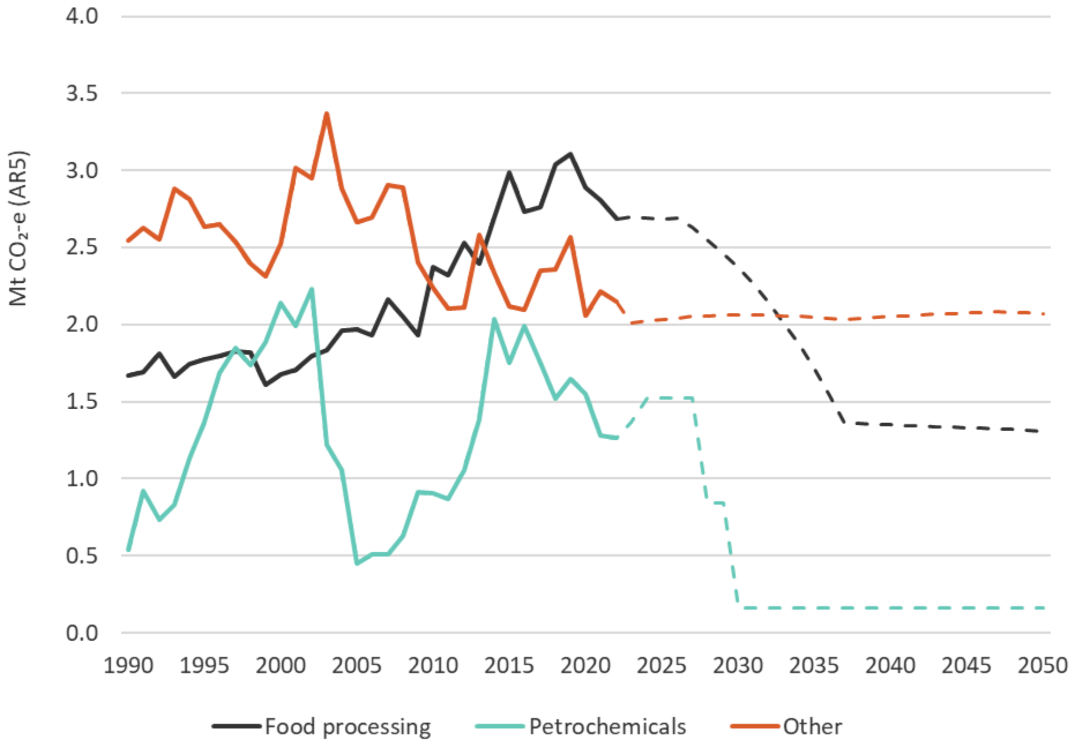
The largest projected contribution to total reductions is from the manufacturing and construction sectors (table 9), reflecting the shift away from fossil fuels towards electricity for industrial heat – particularly in food processing (including the response to national direction on industrial process 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 CO_2-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.

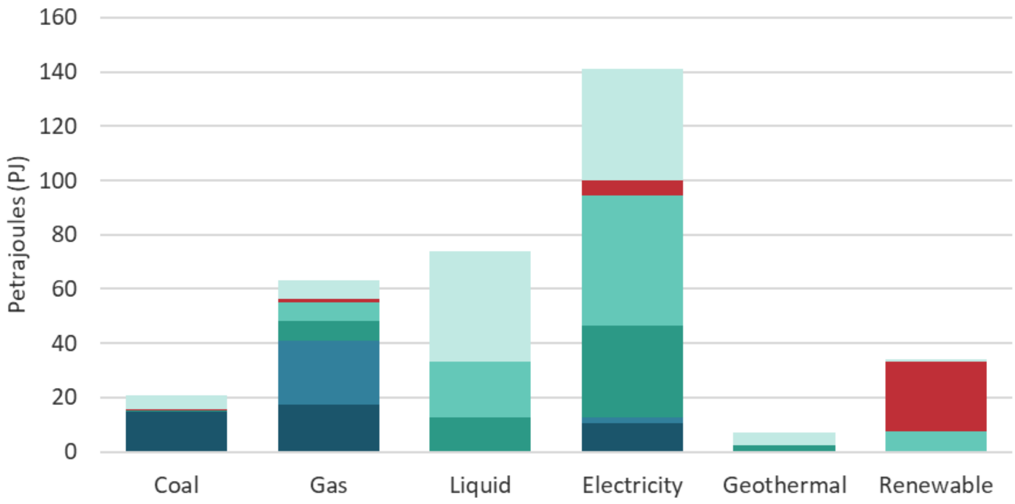
Figure 10: Historical and projected baseline manufacturing and construction energy emissions, 1990–2050



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.

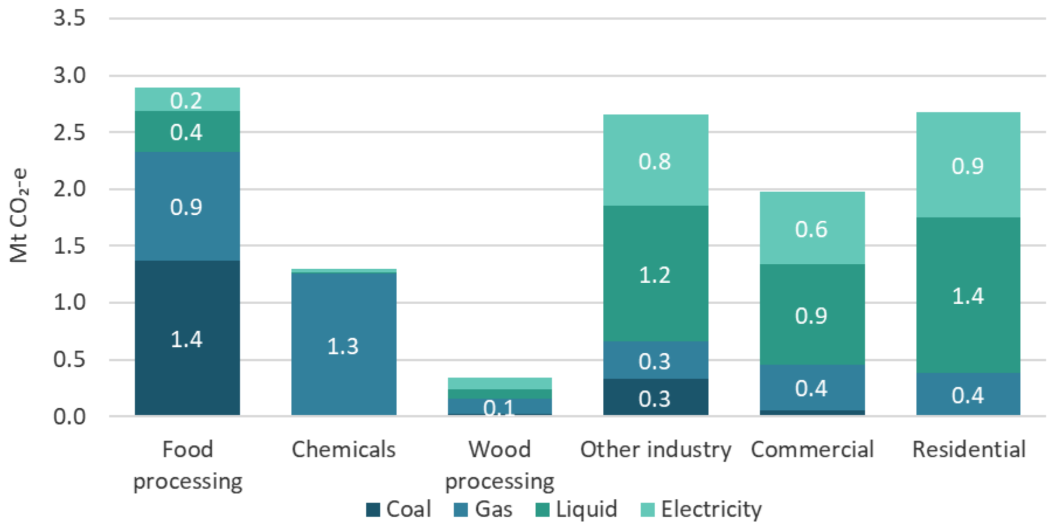
Figure 11: Energy use by fuel and sector, 2022



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 CO_2-e in 2022 (excluding electricity emissions) to 2.4 Mt CO_2-e in 2030, and to 1.4 Mt CO_2-e in 2037 (when the coal phase-out in the national direction ends). Additional emission reductions (of

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17 See Ministry for the Environment. 2023. *National Direction for Greenhouse Gas Emissions from Industrial Process Heat: Industry factsheet*. Wellington: Ministry for the Environment.

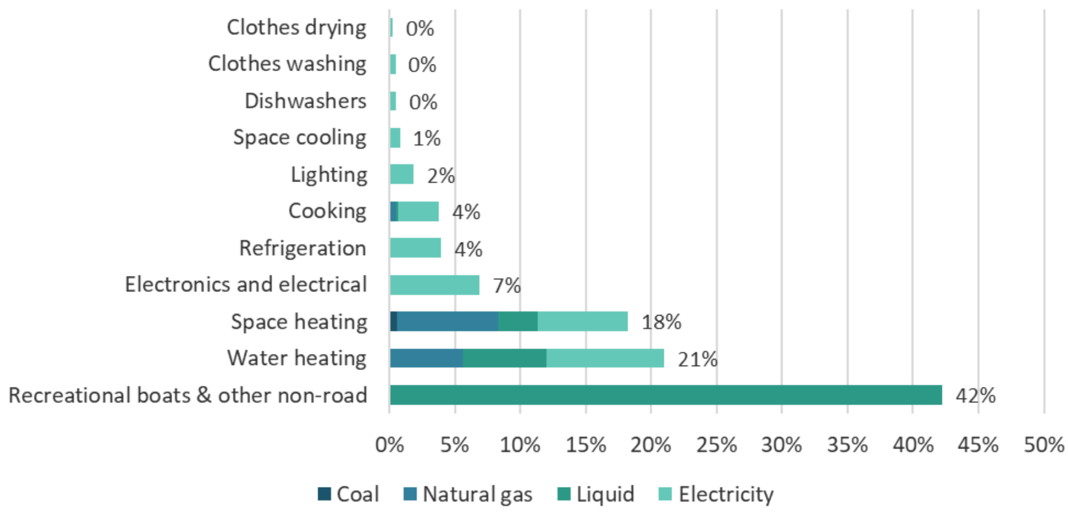
around 0.95 Mt CO_2-e per year) would be achieved by also replacing natural gas for food processing with electricity or biomass.

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 CO_2-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 CO_2-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.

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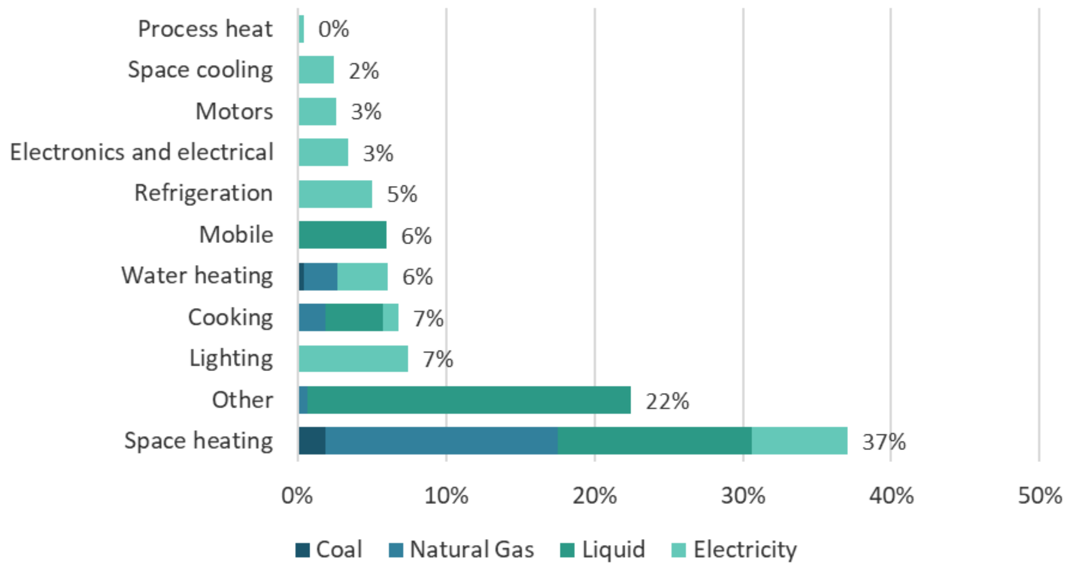
18 See, for example, Greed A, Byers T, Van Barneveld A, Field B, Fanselow M. 2021. *Off-road liquid fuel insights. Quantifying off-road diesel and petrol use in New Zealand*. Prepared for Energy Efficiency and Conservation Authority by Martin Jenkins.

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.

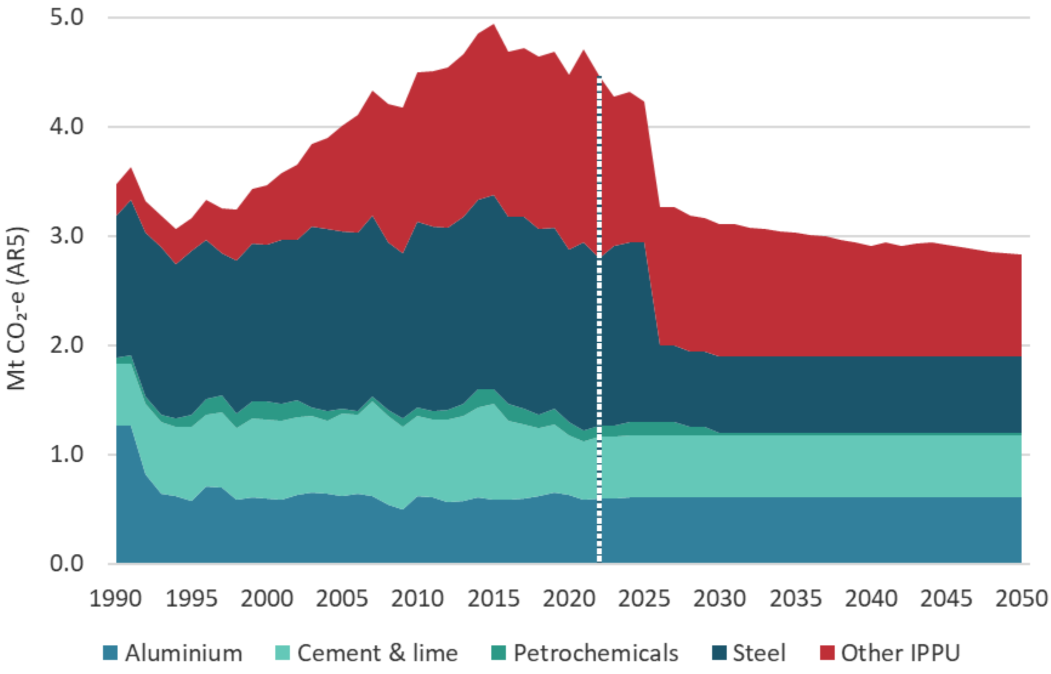
Industrial processes and product use

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 CO_2-e of abatement in EB2 and 0.7 Mt CO_2-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



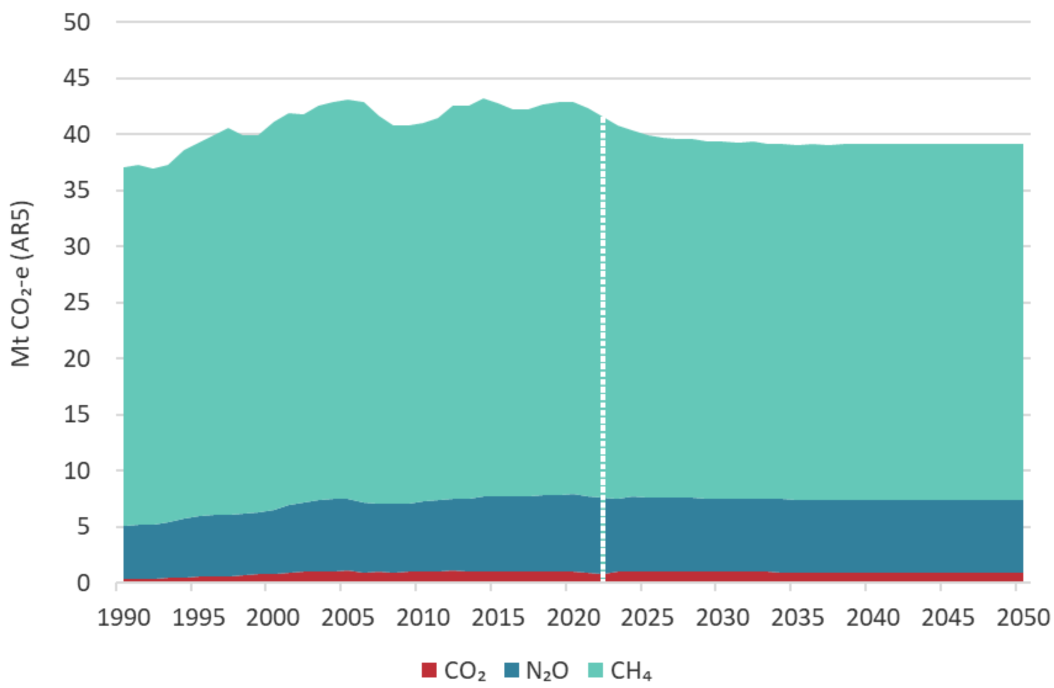
Note: Projections are to the right of the dashed line.

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 (

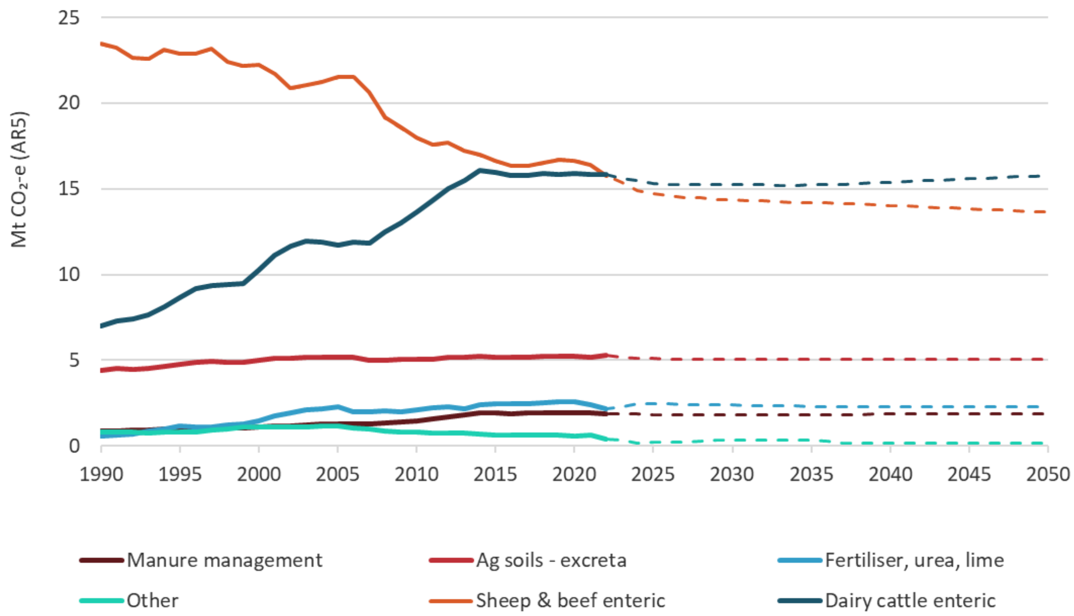
figure 17). These trends are associated with projected downward trends in animal numbers (figure 18).

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



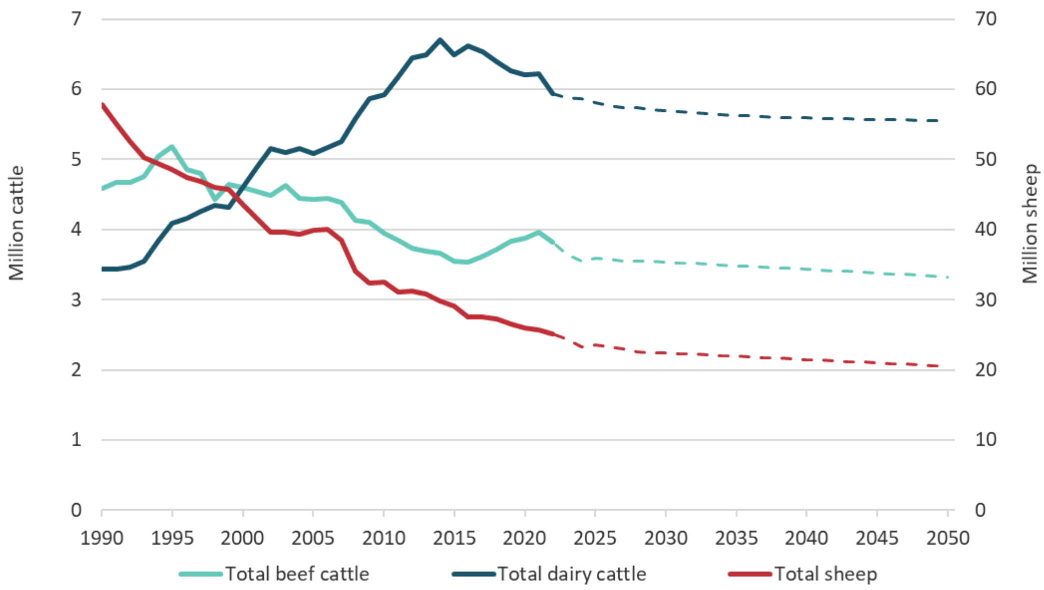
Note: Projections are to the right of the dashed line.

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



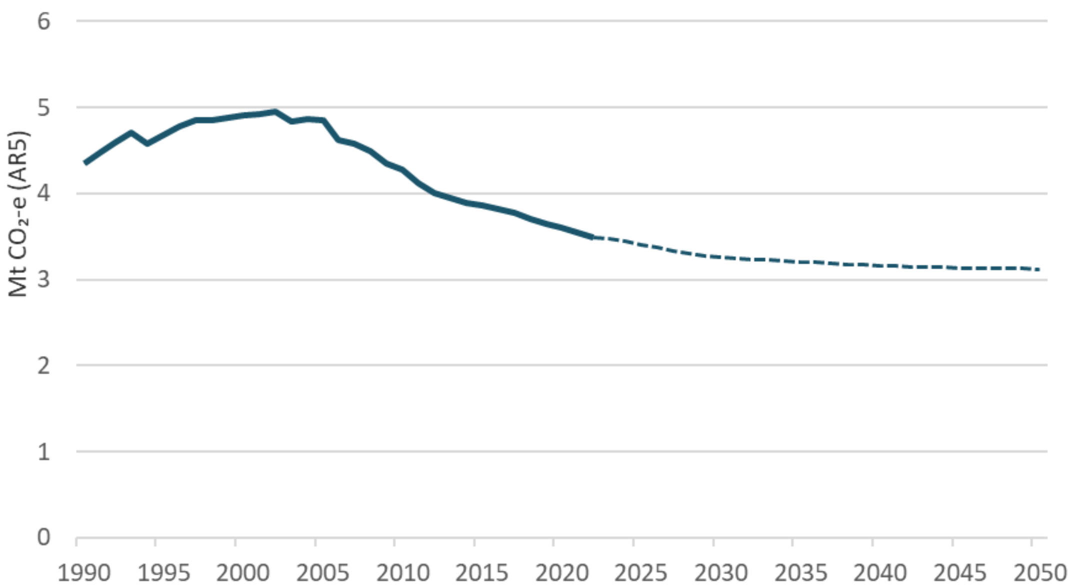
Note: Solid lines = historical data; dashed lines = projections.

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.

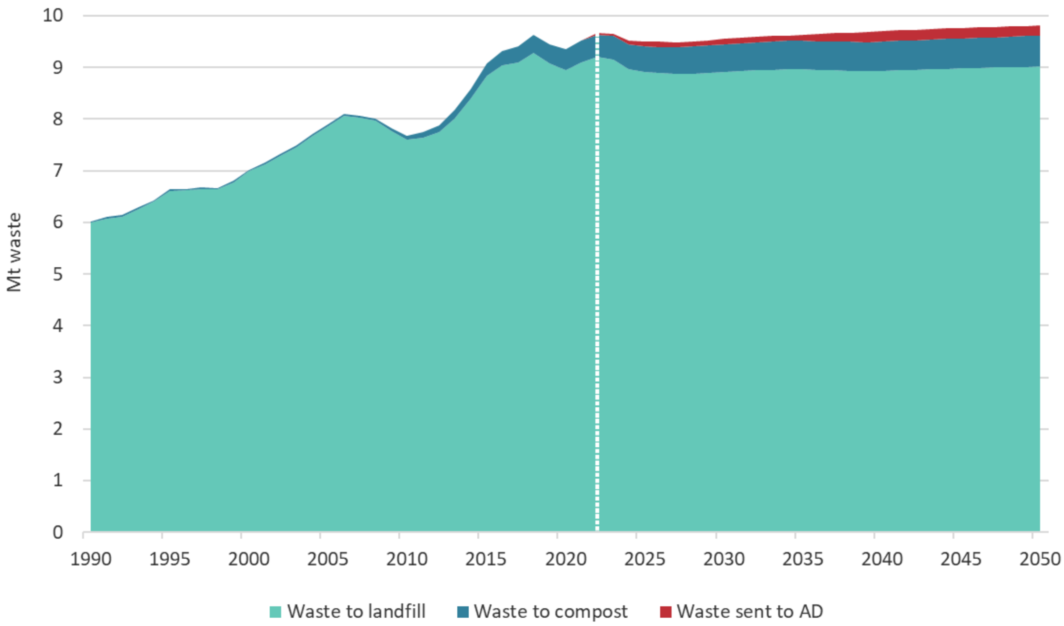
Figure 19: Historical and projected baseline waste emissions, 1990–2050



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 CO_2-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.

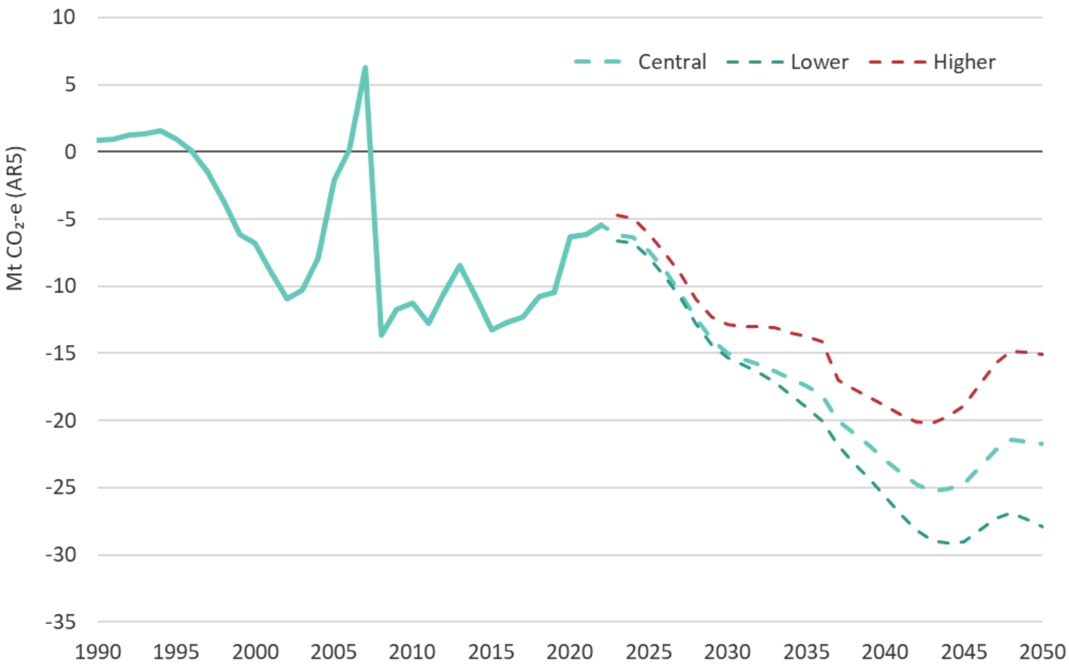
21 The lower scenario results are revised from the ERP2 discussion document. They result in about 29,000 fewer hectares of exotic afforestation over 2024–26, and removals reduced by about 0.3 and 1.9 Mt CO_2-e for the lower scenario during the EB2 and EB3 respectively.

Table 10: 2024 baseline projections of forestry's contribution to emissions targets using target accounting (Mt CO_2-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.

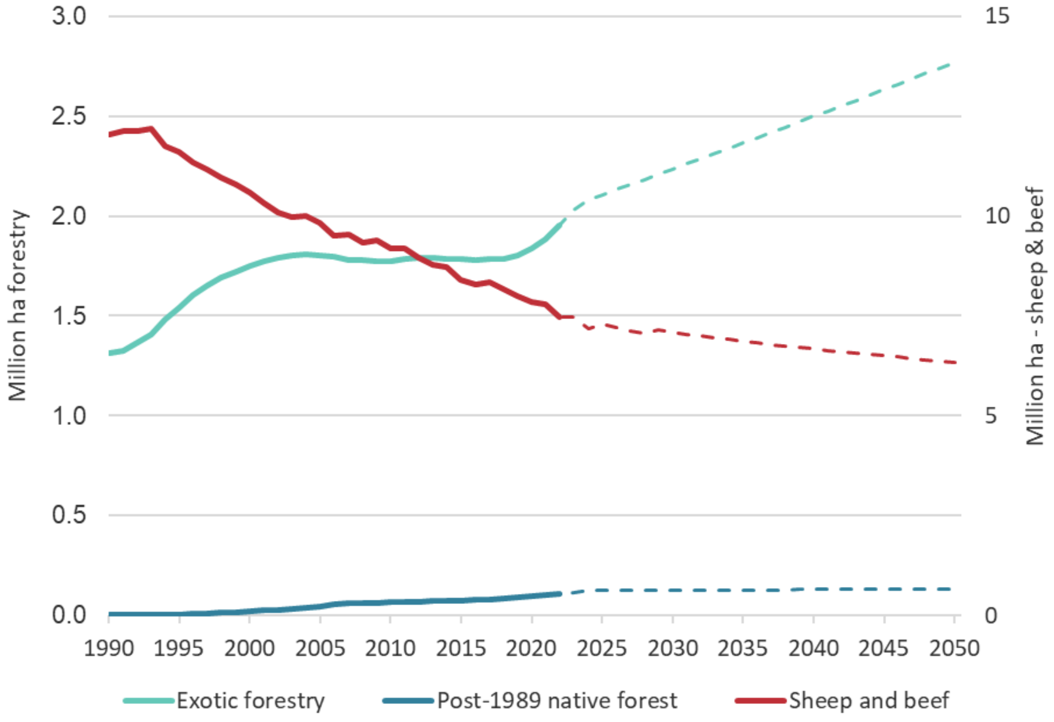
Figure 21: Historical and projected forestry removals, 1990–2050



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

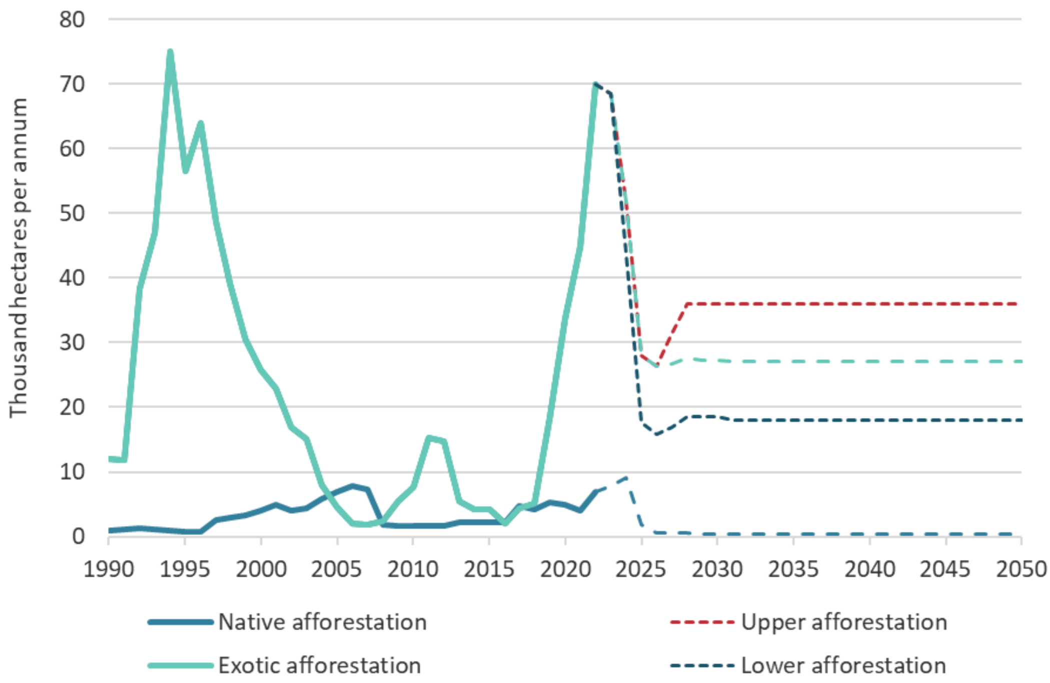
The increasing contribution of removals reflects the ongoing extent of land-use change, mainly from sheep and beef farming to exotic forestry (figure 22).

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.
<Superseded by January 2026 amendment> 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.

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.

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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 CO_2-e in EB2 and 3.1 Mt CO_2-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 CO_2-e in EB2 and 1.0 Mt CO_2-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]

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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.

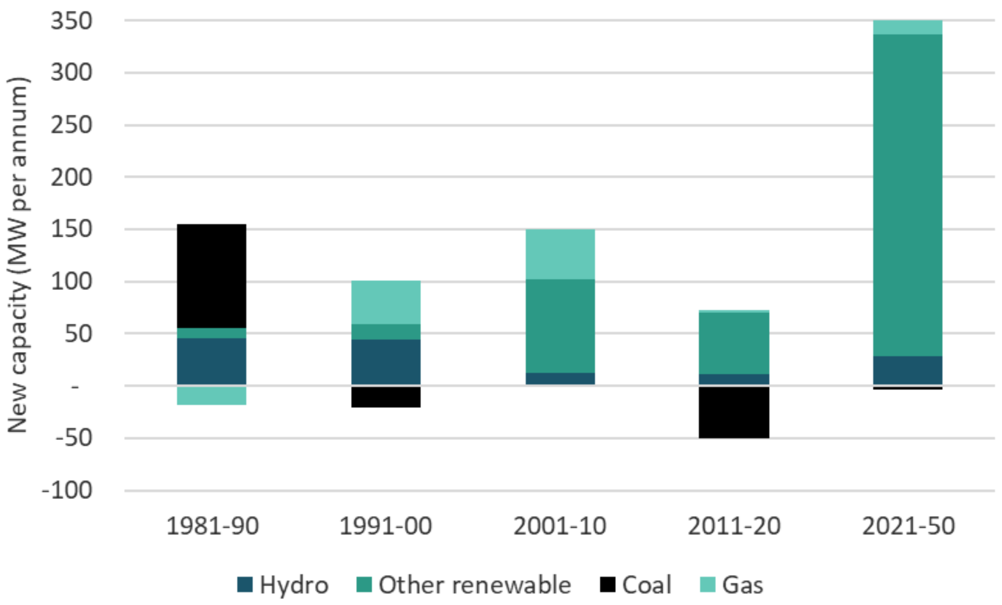
28 For example, see the 'For visibility' calculations throughout the Climate Change Commission's NZ ETS unit limits and price controls advice. 2024. *Advice on NZ ETS unit limits and prices control settings for 2025–2029. Technical Annex 1: Unit limit settings*. Wellington: Climate Change Commission.

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 CO_2 that can be captured during gas production in a high-CO_2 field and the potential injection rate at the storage site.

Three potential scenarios[31] 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 CO_2 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 CO_2 gas fields. One producer stores CO_2 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 CO_2 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 .

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 CO_2-e (AR5))

2027	2028	2029	2030	2031	2032	2033	2034	2035
51	106	134	131	127	147	137	153	152

<Superseded by January 2026 amendment> 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). 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.

Table 15: <Superseded by January 2026 amendment> Mitigation technology assumptions

Technology	Target emissions source	Efficacy	Date available to farmers	Baseline: Date of peak adoption	Baseline: Peak adoption level	With emissions pricing: Date of peak adoption	With emissions pricing: 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 .

Table 16: <Superseded by January 2026 amendment> 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 CO_2-e per year (1 Mt CO_2-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 CO_2-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 CO_2-e (with a 1.0 Mt CO_2-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 CO_2-e (0.80 Mt CO_2-e), with a range of 0.39–1.10 Mt CO_2-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 8 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 CO_2-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
<Superseded by January 2026 amendment> 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.

Table 19: Projections of emissions and removals including effects of proposed new measures, per budget period (Mt CO_2-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

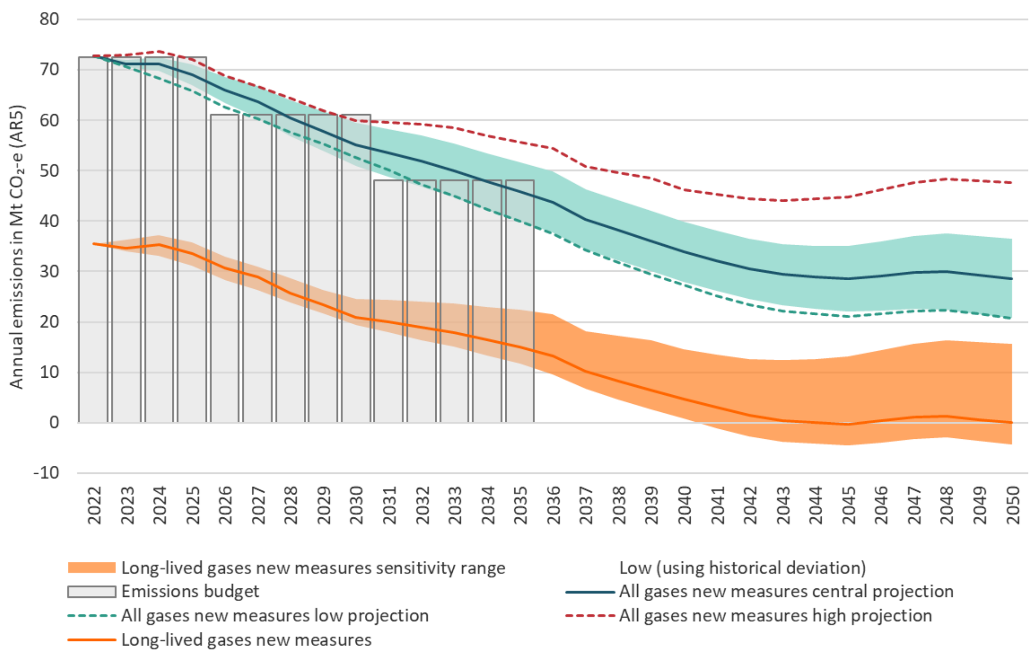


Table 20: ERP2 projections with new measures, per budget period (Mt CO_2-e)

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

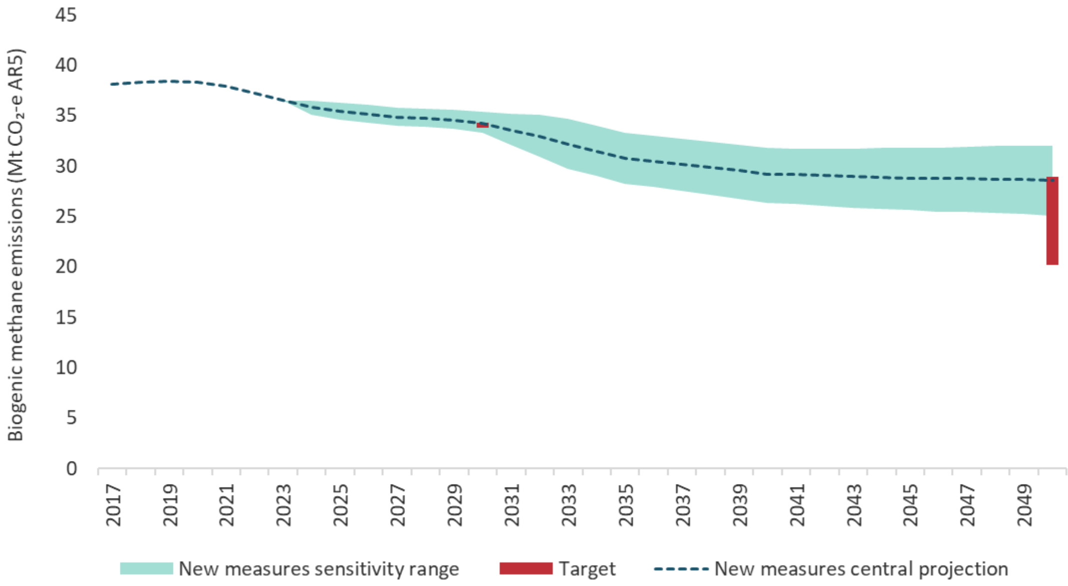


Table 22: Biogenic methane projections, per target year (Mt CO_2-e)

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 CO_2-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.

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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.

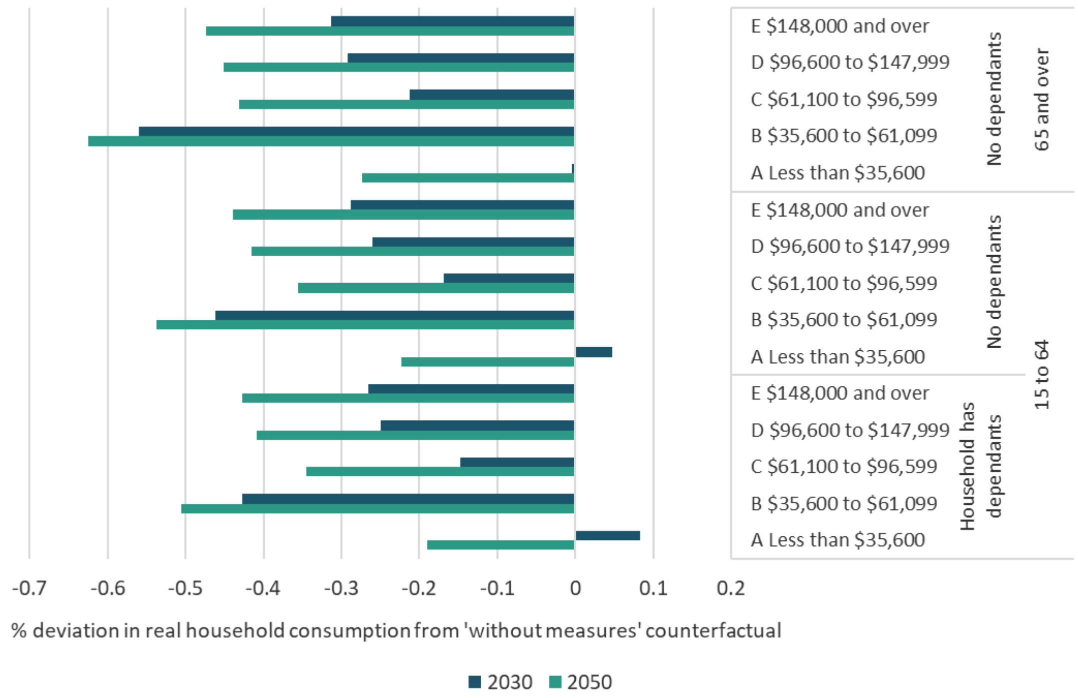
When compared to the existing measures pathway, real GDP is 0.02 per cent lower in 2030 and 0.15 per cent lower in 2050 as a result of ERP2 actions.

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.

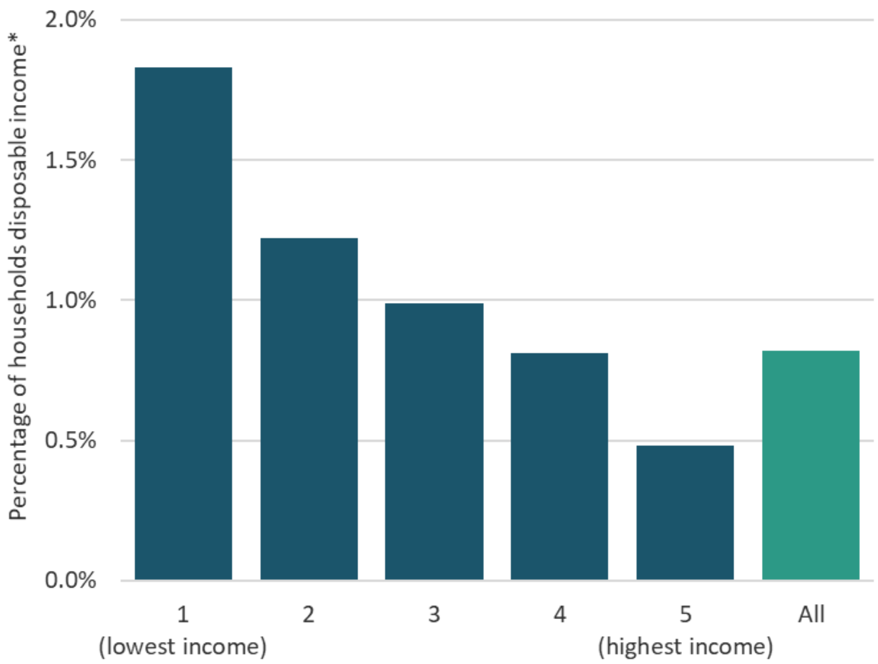
This is because lower-income households spend a relatively greater portion of their income on emissions-intensive items and have less capacity to substitute those items for low-emissions options, particularly in the short term. The lower incomes of these households mean they feel the additional costs 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 CO_2-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.

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[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]

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43 Ministry of Business, Innovation & Employment. *Energy prices*. Retrieved 5 November 2024.

44 The Treasury. Internal analysis – Treasury Analytical Reports 365 and 367.

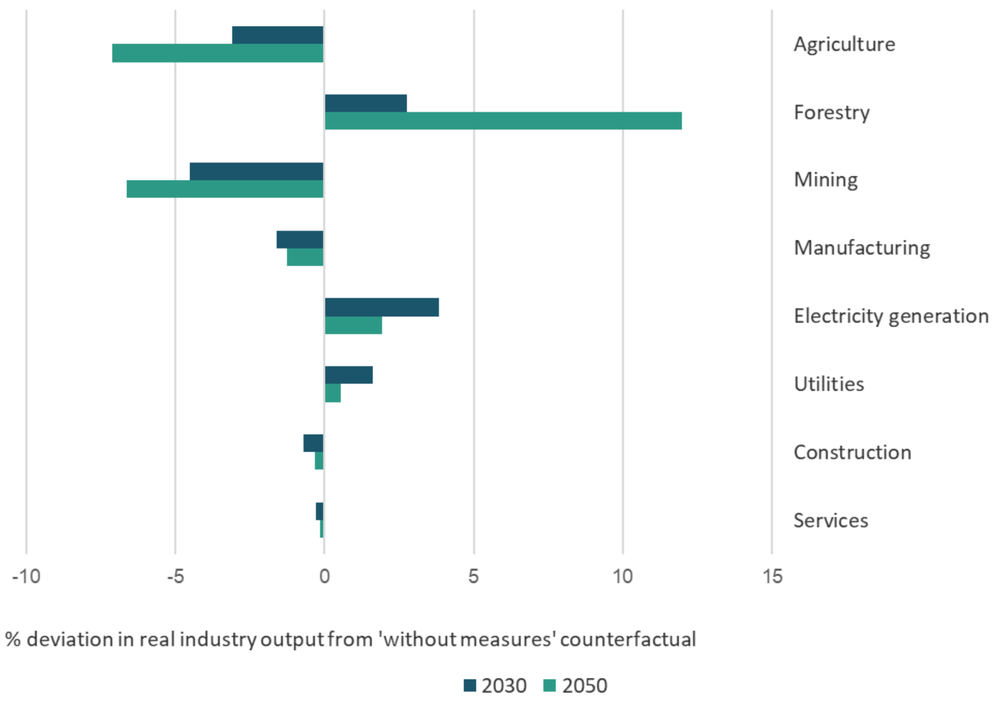
45 Qualitative research published in 2022 found that 40% of people aged 65 and over rely solely on their income from NZ Superannuation. Gamble J. 2022. *Older People's Voices: Qualitative Research with New Zealanders Aged 65 or Older*. Prepared for Te Ara Ahunga Ora | Retirement Commission.

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,

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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.

<Superseded by January 2026 amendment> 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.

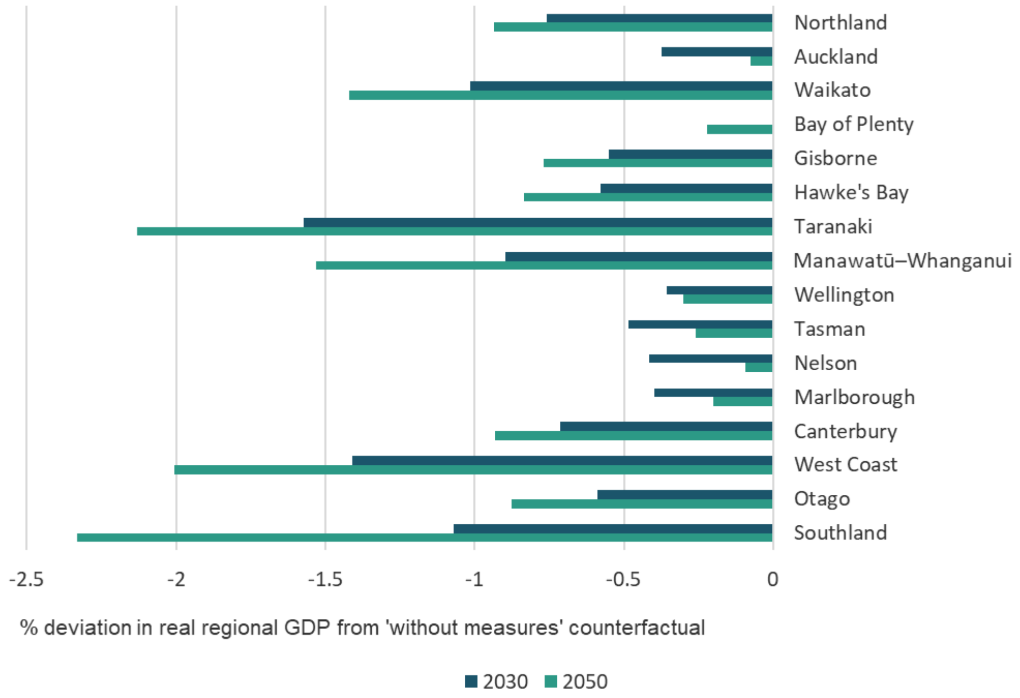
Impacts on other sectors

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.

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48 PwC New Zealand – Economic Impact of Forestry in New Zealand. May 2020.

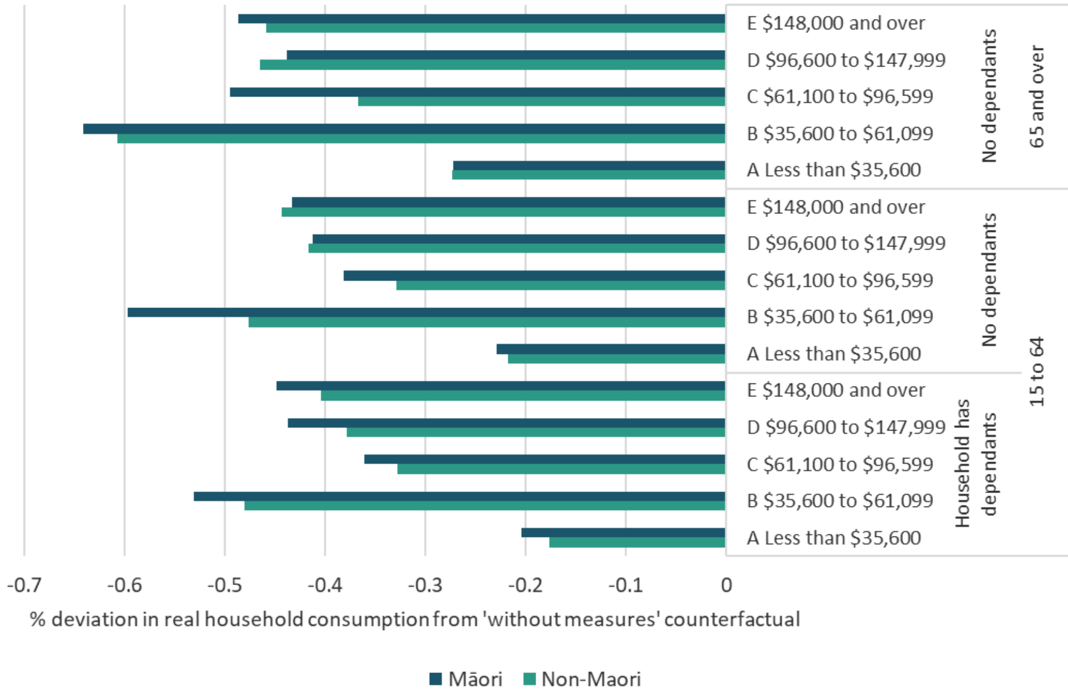
49 BakerAg – Socio-economic impacts of large-scale afforestation on rural communities in the Wairoa District – August 2019 https://beeflambnz.com/sites/default/files/Wairoa%20Afforestation_FINAL.pdf

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 manufacturing[52] 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.

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[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

- **<Superseded by January 2026 amendment>** 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 CO_2 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 µm[54] ($PM_{2.5}$) and nitrogen dioxide (NO_2). 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 NO_2.[56] Data have also been collated on projected changes in vehicle emission rates for both CO_2 and local pollutants,[57] which allows us to estimate the health co-benefits of lower CO_2 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 NO_2 are forecast to fall over time with regulatory-driven improvements in vehicle technology.

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54 A micrometre (µm) is a millionth of a metre.

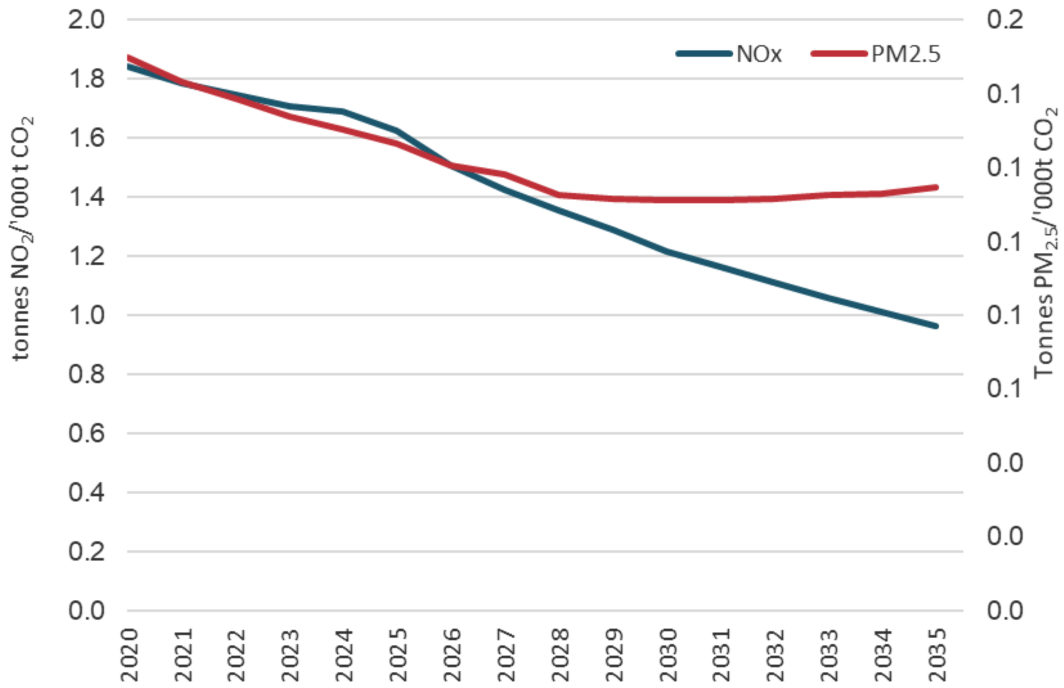
55 Kuschel G, Metcalfe J, Sridhar S, Davy P, Hastings K, Mason K, Denne T, Berentson-Shaw J, Bell S, Hales S, Atkinson J and Woodward A (2022). *Health and air pollution in New Zealand 2016 (HAPINZ 3.0): Volume 2 – Detailed methodology*. Reports prepared for Ministry for the Environment, Ministry of 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 NO_2 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.

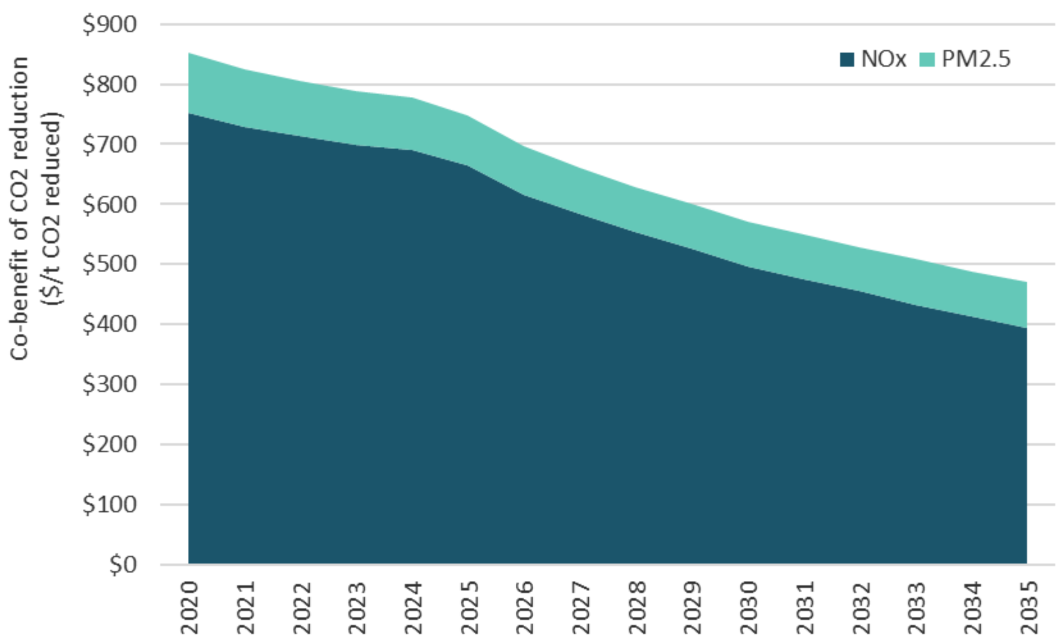
The co-benefits of transport emission reductions are very significant, estimated at several hundred dollars per tonne of CO_2 reduced.

Figure 32: Tonnes of local pollutant per thousand tonnes of CO_2 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 CO_2 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 *Situation and Outlook for Primary Industries* (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	**Dairy**: Efficacy up to 13% by 2050. Available 2029, peak adoption 4% by 2042. **Sheep**: Efficacy up to 17% by 2050. Available 2026, peak adoption 4% by 2041. **Beef**: Efficacy up to 8% by 2050. Available 2035, peak adoption 1% by 2052.	Efficacy calculated using gene flow model. 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. This expert feedback was then used to develop estimates of start dates, and efficacy rates for each technology. 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.
Methane inhibitors in baseline	**Dairy**: Efficacy 45%. Available 2028, peak adoption 3% by 2042. **Beef**: Efficacy 45%. Available 2028, peak adoption 2% by 2047.	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	**Baseline**: Municipal open landfills have a constant LFG efficiency of 68%. Municipal closed landfills have a constant LFG efficiency of 52%. Municipal facilities with no LFG maintain no LFG until 2050.	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	**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. Non-municipal landfills (per year) – 5,090 kt in 2020 and constant until 2050.	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	**Baseline high**: 15% in 2025, 17% in 2030, 20% in 2035, 20% in 2040, and 20% in 2050. **Baseline low**: 30% in 2025, 35% in 2030, 40% in 2035, 45% in 2040 and 50% in 2050.	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
New Zealand Emissions Trading Scheme (NZ ETS) Supporting NZ ETS credibility and confidence NZ ETS unit supply and price control settings (NZ ETS settings) Manage NZ ETS impacts	*If we do the following now:* • 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 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.	*… by 2030 we can expect:* • 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 *… and by 2050 we can expect:* • to continue to incentivise increased emissions reductions at their source from businesses and households.	*… and then in the second emissions budget (EB2), this will lead to:* • net emissions reductions made up of a mix of removals from forestry and emissions reductions at their source from businesses and households (Note: The ability to bank NZUs does create some uncertainty about the timing of emissions and emissions reductions) *… and then in future emissions budgets, this will lead to:* • 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.
	Assumptions and dependencies	• 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.	
	Other benefits	• 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.	

	Why this is complementary to the NZ ETS	• 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	*If we do the following now:* • create a more enabling consenting environment for renewable energy projects by: – 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.	*… by 2030 we can expect:* • 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 generation[64] • 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. *… and by 2050 we can expect:* • the same as above.	*… and then in EB2, this will lead to:* • 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. *… and then in future emissions budgets, this will lead to:* • the same as above.

63 For example, Waitaki and Manapouri dams would need re-consenting during the EB2 period.

64 Thermal generation accounted for 2.5 Mt CO_2 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 Waihanga. Infrastructure consenting for climate targets. Retrieved 5 November 2024.

	Assumptions and dependencies	• Emissions impacts depend materially on private investment decisions. • 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	• 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	• 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)	*If we do the following now:* • 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	*… by 2030 we can expect:* • 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 CO_2 storage sites will be closed properly, which will reduce the risk of CO_2 leaks and help make sure the CO_2 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: – 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	*… and then in EB2, this will lead to:* • where deployed, reduced emissions in some natural gas production through: – uptake of CCUS – assurance that CCUS is implemented in a way that provides genuine emissions reductions, with the risk of CO_2 leakage managed *… and then in future emissions budgets, this will lead to:* • the same as above, with the potential for further emissions reductions from harder-to-abate uses, if there is greater uptake across more industries.

		– support businesses to choose the most cost-effective way to reduce emissions – businesses could be rewarded for capturing CO_2 for third parties *… and by 2050 we can expect:* • the same as above, with potentially greater uptake across more industries, depending on the cost of CCUS relative to carbon prices and other factors
	Assumptions and dependencies	• 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: – 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 CO_2 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-CO_2 gas field. The commercial viability will be driven by the cost of CCUS compared with NZ ETS carbon prices, and natural gas prices.
	Other benefits	• 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.
	Why this is complementary to the NZ ETS	• 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.

<table>
<tr><th>Sector and ERP2 proposed policy</th><th>Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="3">Transport

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)</td><td>If we do the following now:
• 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).</td><td>… by 2030 we can expect:
• 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
… and by 2050 we can expect:
• 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.</td><td>… and then in EB2, this will lead to:
• reduced transport emissions from the light vehicle fleet, as the Clean Vehicle Standard’s targets progressively lower to 2029
… and then in future emissions budgets, this will lead to:
• continued emissions reductions, as older higher-emitting vehicles exit the fleet.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="2">• 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.</td></tr>
<tr><td>Other benefits</td><td colspan="2">• 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.</td></tr>
</table>

<table>
<tr><td></td><td>Why this is complementary to the NZ ETS</td><td colspan="2">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 CO_2 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.</td></tr>
<tr><th>Sector and ERP2 proposed policy</th><th>Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="4">Transport
Transport pricing mechanisms</td><td>If we do the following now:
return to regular FED and RUC increases from January 2027
enable regional time-of-use charging schemes.</td><td>… by 2030 we can expect:
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
… and by 2050 we can expect:
the same as above, and continued increases in FED and RUC charges could amplify longer-term effects.</td><td>… and then in EB2, this will lead to:
some reduced transport emissions from light and heavy vehicles
… and then in future emissions budgets, this will lead to
greater reduction in the above.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="2">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.</td></tr>
<tr><td>Other benefits</td><td colspan="2">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).</td></tr>
<tr><td>Why this is complementary to the NZ ETS</td><td colspan="2">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.</td></tr>
</table>

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.

<table>
<tr><th>Sector and ERP2 proposed policy</th><th>Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="4">Transport

Heavy vehicles (freight and related sectors) regulatory change</td><td>If we do the following now:
• 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.</td><td>… by 2030 we can expect:
• 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

… and by 2050 we can expect:
• industry to have purchased more ZEHVs.</td><td>… and then in EB2, this will lead to:
• some reduced transport emissions from heavy vehicles

… and then in future emissions budgets, this will lead to:
• greater reductions in the above.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="2">• 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).</td></tr>
<tr><td>Other benefits</td><td colspan="2">• 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.</td></tr>
<tr><td>Why this is complementary to the NZ ETS</td><td colspan="2">• 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.</td></tr>
</table>

<table>
<tr><th>Sector and ERP2 proposed policy</th><th colspan="2">Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="4">Transport
Supporting aviation and shipping decarbonisation</td><td colspan="2">If we do the following now:
• 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.</td><td>… by 2030 we can expect:
• 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
… and by 2050 we can expect:
• global production of SAF and sustainable shipping fuels to have scaled up and New Zealand industry to have begun adopting these fuels.</td><td>… and then in EB2, this will lead to:
• a limited impact on emissions (unquantified)
… and then in future emissions budgets, this will lead to:
• some reduction in emissions for aviation and shipping, to the extent that industry begins to adopt these fuels.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="3">• 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.</td></tr>
<tr><td>Other benefits</td><td colspan="3">• Not applicable.</td></tr>
<tr><td>Why this is complementary to the NZ ETS</td><td colspan="3">• 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.</td></tr>
</table>

<table>
<tr><th>Sector and ERP2 proposed policy</th><th>Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td>Transport
Public transport</td><td>If we do the following now:
• progress the following major public transport projects:
– Auckland City Rail Link
– Eastern Busway</td><td>… by 2030 we can expect:
• 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</td><td>… and then in EB2, this will lead to:
• reductions in transport emissions to the extent that travel by zero-emissions public transport displaces travel by private transport</td></tr>
</table>

	– Northwest Rapid Transit – Airport-to-Botany busway – rail upgrades in the lower North Island • 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.	• 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 *… and by 2050 we can expect:* • completion of remaining major public transport projects listed and improved optimisation of public transport services • more zero-emissions public transport.	*… and then in future emissions budgets, this will lead to:* • 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	• Delivery of these projects depends on funding, availability of a qualified workforce and infrastructure maintenance.	
	Other benefits	• 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	• 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	*If we do the following now:* • 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	*… by 2030 we can expect:* • 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	*… and then in EB2, this will lead to:* • 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

	processed through New Zealand's inhibitor regulatory systems • 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.	reduction benefit of the technologies can be counted towards climate targets • additional technologies potentially starting to be used in New Zealand *… and by 2050 we can expect:* • a range of safe and trusted technologies to be implemented and used in New Zealand to achieve a low-emissions agriculture sector.	*… and then in future emissions budgets, this will lead to:* • increased biological emissions reductions compared with EB2 – driven by many safe, adoptable on-farm emissions mitigation technologies being available to farmers.
	Assumptions and dependencies	• 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 **<Superseded by January 2026 amendment>** agricultural emissions pricing and/or market demands, that incentivises the uptake of mitigation technologies.	
	Other benefits	• 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	• 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	*If we do the following now:* • 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	*… by 2030 we can expect:* • farmers can make informed greenhouse gas management decisions that address their individual needs	*… and then in EB2, this will lead to:* • 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 *… and then in future emissions budgets, this will lead to:*

<table>
<tr><td rowspan="4">and support services</td><td>demonstrate the method is compliant with applicable New Zealand and international standards
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</td><td>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
… and by 2050 we can expect:
farmers and processors to have accurate understandings of their on-farm emissions, and how mitigation tools will reduce their emissions.</td><td>increased biological emissions reductions compared with EB2, as many safe, adoptable on-farm emissions mitigation technologies are used by farmers. Improved understanding of mitigation impact(s) on farms.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="2">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.</td></tr>
<tr><td>Other benefits</td><td colspan="2">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.</td></tr>
<tr><td>Why this is complementary to the NZ ETS</td><td colspan="2">Agricultural emissions are outside of the NZ ETS.</td></tr>
<tr><th>Sector and ERP2 proposed policy</th><th>Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="3"><Superseded by January 2026 amendment>
Agriculture
A fair and sustainable pricing system for on-farm emissions by 2030</td><td>If we do the following now:
get the policy settings right for a fair and sustainable pricing system for on-farm emissions by 2030.</td><td>… by 2030 we can expect:
a fair and sustainable pricing system is in place that reduces emissions without causing emissions leakage
… and by 2050 we can expect:
a wide range of mitigation technologies are available to be used on-farm, so that farmers are producing high-value, low-carbon products.</td><td>… and then in EB2, this will lead to:
most activity in EB2 being to get the system settings right, with emissions reductions ramping up in future emissions budgets
… and then in future emissions budgets, this will lead to:
significant emissions reductions compared with EB2, driven by the uptake of technologies (production is assumed to not be impacted).</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="2">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.</td></tr>
<tr><td>Other benefits</td><td colspan="2">Potential reputational benefits to New Zealand, noting we could be among the first in the world to implement an agricultural policy of this kind.</td></tr>
</table>

	Why this is complementary to the NZ ETS	• Agricultural emissions are outside of the NZ ETS.

Sector and ERP2 proposed policy	Current possible actions	Expected outcomes	Impacts on future emissions budgets
Waste Organic waste and landfill gas (LFG) capture investigation, resource recovery infrastructure investment, refrigerant regulated product stewardship (RRPS) scheme	*If we do the following now:* • 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).	*… by 2030 we can expect:* • 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 *… and by 2050 we can expect:* • 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	*… and then in EB2, this will lead to:* • a reduction in biogenic methane emissions from the waste sector • a reduction in emissions from the refrigerants sector *… and then in future emissions budgets, this will lead to:* • 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.

		• diverse resource recovery infrastructure to be available across the country to address target organic waste streams • 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	• 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	• 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	• 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	*If we do the following now:* • 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.	*… by 2030 we can expect:* • 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 *… and by 2050 we can expect:* • further expanded domestic wood processing and increased long-lived HWPs • greater uptake of engineered wood products and mass timber buildings in construction.	*… and then in EB2, this will lead to:* • 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 HWPs[67] *… and then in future emissions budgets, this will lead to:* • 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	• Production of long-lived HWPs as low-emissions building materials can displace existing emissions-intensive building materials.	
	Other benefits	• 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	• 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.

<table>
<tr><th>Sector and ERP2 proposed policy</th><th colspan="2">Current possible actions</th><th>Expected outcomes</th><th>Impacts on future emissions budgets</th></tr>
<tr><td rowspan="4">Non-forestry removals
Recognise non-forest carbon removals</td><td colspan="2">If we do the following now:
• 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</td><td>… by 2030 we can expect:
• 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
… and by 2050 we can expect:
• 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.</td><td>… and then in EB2, this will lead to:
• 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
… and then in future emissions budgets, this will lead to:
• 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.</td></tr>
<tr><td>Assumptions and dependencies</td><td colspan="3">• 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.</td></tr>
<tr><td>Other benefits</td><td colspan="3">• Improved ecosystem services deliver biodiversity and resilience outcomes through restoration and development of land categories such as mangroves.</td></tr>
<tr><td>Why this is complementary to the NZ ETS</td><td colspan="3">• 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.</td></tr>
</table>

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	

Policy	Approach to estimating impacts	Key dependencies	Key assumptions	Impact on the second emissions budget (EB2)	Rationale for chosen scenario
<Superseded by January 2026 amendment> 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 CH_4 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.	

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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