Ministry for the Environment
Manatū Mō Te Taiao

PROACTIVE RELEASE COVERSHEET

Minister	Hon Simon Watts Hon Todd McClay	**Portfolio**	Minister of Climate Change Minister of Agriculture
Name of package	Regulatory impact statement: Updating the 2050 domestic climate change emissions target	**Date to be published**	18 November 2025

List of documents that have been proactively released

Date	*Title*	*Author*
18 September 2025	1. Regulatory impact statement: Updating the 2050 domestic climate change emissions target	Ministry for the Environment and Ministry for Primary Industries

Information redacted **YES X** **NO**

Any information redacted in this document is redacted in accordance with the Ministry for the Environment's policy on proactive release and is labelled with the reason for redaction. This may include information that would be redacted if this information was requested under Official Information Act 1982. Where this is the case, the reasons for withholding information are listed below. Where information has been withheld, no public interest has been identified that would outweigh the reasons for withholding it.

Summary of reasons for redaction

Some information has been withheld to maintain legal privilege, protect the confidentiality of advice tendered by officials, protect the privacy of natural persons, protect confidential information received by foreign governments, protect the security or defence of New Zealand or the international relations of the Government of New Zealand and policy decisions still under consideration.

Ministry for the Environment
Manatū Mō Te Taiao

Ministry for Primary Industries
Manatū Ahu Matua

Regulatory Impact Statement: Updating the 2050 domestic climate change emissions target

Decision sought	Analysis produced for the purpose of informing final Cabinet policy decisions to update the 2050 domestic climate change emissions target in the Climate Change Response Act 2002.
Agency responsible	Ministry for Primary Industries Ministry for the Environment
Proposing Ministers	Hon Todd McClay, Minister of Agriculture Hon Simon Watts, Minister of Climate Change
Date finalised	4 September 2025

The Minister of Climate Change and the Minister of Agriculture propose to amend the biogenic methane component of the 2050 domestic emissions target in the Climate Change Response Act 2002 (CCRA) to require biogenic methane emissions be reduced by 14 to 24 per cent below 2017 levels by 2050. Other aspects of the current target will remain as they are.

Summary: Problem definition and options

What is the policy problem?

New Zealand's 2050 domestic climate change emissions target (2050 target) is legislated under the Climate Change Response Act 2002 (CCRA) and is a significant part of the climate policy architecture.

The purpose of the CCRA includes providing a framework by which New Zealand can develop and implement *clear and stable* climate change policies that contribute to the global effort under the Paris Agreement to "pursue efforts" to limit global warming to 1.5°C, and to hold the increase to "well below" 2°C. The 2050 target supports this by setting the level of New Zealand's domestic efforts to reduce greenhouse gas emissions.

The current target was established in 2019 and is net zero of all-gases other than biogenic methane by 2050, and a reduction of 10 per cent in 2030 and 24 to 47 per cent below 2017 levels of biogenic methane emissions by 2050.

The Climate Change Commission (the Commission) has a legislative role to review this target every five years, as per the criteria prescribed in the CCRA. The Commission's first review occurred in 2024, which resulted in the Commission recommending increasing New Zealand's domestic efforts to address climate change and including emissions from international shipping and aviation in our domestic target.

In parallel with the Commission's review, the Government appointed an independent Ministerial advisory panel (the Panel) to review the biogenic methane science and targets for consistency with the principle of 'no additional warming' (Methane Review) from a 2017 base year. The Panel identified a number of possible targets consistent 'no additional warming' under different global warming scenarios. The Government clearly signalled that it intended to consider this work alongside the Commission's review, and for it to inform its consideration of the 2050 target.

The Government is required under the CCRA to respond to the Commission's 2050 target advice this year. The Government's consideration of the target is not constrained by the same criteria as the Commission's advice. If the Government departs from the Commission's advice, reasons for departure must be included in its response. While this is the first review of the 2050 target, there will be opportunities for future reviews. As required by the CCRA, this process will be repeated every five years.

The policy problem is therefore whether or not the current 2050 target in the CCRA remains appropriate, in light of the recent advice from the Commission, the Methane Review and relevant Government objectives (these objectives are discussed below).

What is the policy objective?

The primary role of the 2050 target is to set the long-term trajectory of New Zealand's domestic efforts to reduce greenhouse gas emissions, within the context of contributing to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5°C. Addressing climate change generally requires policy measures to influence activity by firms and households. The target plays an important role in setting a clear long-term policy direction that supports investment decisions.

The objectives adopted for this work are as follows:

- **Alignment with the Government's economic growth agenda**
    - This objective will assess economic and sectoral impacts of different target options through economic modelling and qualitative analysis
- **Contribution to limiting global temperature rise to 1.5°C**
    - This objective will assess New Zealand's contribution to global warming under different target options as well as alignment with international partner countries
- **Target can be feasibly implemented**

- This objective will evaluate actual or likely technological developments and their implications for current policy and achieving different target options.

What policy options have been considered, including any alternatives to regulation?

Options for changes to the 2050 target are essentially a spectrum from a reduced to an increased contribution to addressing global warming. The options considered as part of this process are drawn from the Commission's review of the 2050 target and the Methane Review. These options have been analysed against criteria to determine a preferred option. While some of the options were informed by the Methane Review, the criteria and overall assessment framework do not take a 'no additional warming' approach.

The main options identified are as follows:

- **Option 1:** Status quo would keep the 2050 target the same. This is to reduce biogenic methane emissions by 24 to 47 per cent less than 2017 emissions by 2050 and each subsequent year and reduce emissions of greenhouse gases (other than biogenic methane) to net zero or lower by 2050 and beyond.
- **Option 2:** Reduce the biogenic methane target to a 14 per cent reduction from 2017 levels and maintain the current net zero target for long-lived gases. The Methane Review frames this as a 'no additional warming' approach that was modelled using a background mid-range global emissions scenario (2.0°C - 2.7°C).
- **Option 3:** Reduce the biogenic methane target to a range of 14 to 24 per cent reduction from 2017 levels and maintain the current net zero target for long-lived gases. The Methane Review frames this as a 'no additional warming' approach modelled using background mid-range (2.0°C - 2.7°C) and 1.5°C global emission scenarios. The upper end of this range (24 per cent) is in line with the lower end of the current biogenic methane target. **This option is the preferred option in the Cabinet paper.**
- **Option 4:** Clarify the current biogenic methane target by removing the upper range (i.e. a 24 per cent reduction from 2017 levels only); maintain the current net zero target for long-lived gases. The Methane Review frames this as a 'no additional warming' approach that was modelled using a background global emissions scenario that limited temperature increase to 1.5°C. A 24 per cent reduction in biogenic methane emissions is also the lower end of the existing biogenic methane target range**. This option is the preferred option in the RIS.**
- **Option 5:** Clarify the biogenic methane target (24 per cent reduction from 2017 levels), strengthen the target for long-lived gases (to net negative 10Mt CO_2-e by 2050). This option was framed by the Methane Review (as above) and also includes increasing the level of New Zealand's domestic climate contribution for long-lived gases.
- **Option 6:** Increase both the biogenic methane and long-lived gases components of the target (a 35-47 per cent reduction in biogenic methane, net negative 20Mt CO_2-e for long-lived gases by 2050). This is as recommended by the Commission in its 2050 target review.

Other options are also possible; the RIS has been designed to provide relevant analysis across the spectrum of possibilities. Fundamental changes to the target, such as a move

away from the split-gas approach, or removing the target altogether were ruled out of scope. Likewise non-regulatory options were also considered out of scope. 9(2)(f)(iv) [redacted]

What consultation has been undertaken?

Ministers have taken into account several previous consultations that have provided insight into how New Zealand stakeholders perceive climate change and what the Government response should be. Informed by these they have decided to progress decisions on the 2050 target without further public consultation. These consultations or engagements include:

- The Commission's consultation on the 2050 target
- The Panel sought submissions of relevant scientific evidence for their review, but did not carry out public consultation (note: the Panel were asked not to make any conclusions or recommendations beyond performing the scientific review in their Terms of Reference)
- Consultation on the second Emissions Reduction Plan (ERP2)
- Public feedback to inform decisions on the second Nationally Determined Contribution (NDC2)
- Insights from other engagement with iwi/Māori
- 2018 consultation on the Zero Carbon Bill

Is the preferred option in the Cabinet paper the same as preferred option in the RIS?

No. **Table 1** provides a side-by-side comparison of the options, and their respective pros and cons, in relation to each other. The options are organised around three underlying criteria - economic implications, contribution towards the global effort to limit temperature increase to 1.5°C, and their feasibility of achievement. Based on the analysis in this RIS, Officials preferred option is option four - a 24 per cent reduction of biogenic methane emissions below 2017 levels and retaining the current target for long-lived gases by 2050. This option strikes a balance between economic growth and climate change objectives, is feasible, and also provides for a greater level of long-term policy stability and certainty than other options.

The preferred option in the Cabinet paper is option three - a 14 to 24 per cent reduction of biogenic methane emissions below 2017 levels and retaining the current target for long-lived gases by 2050.

Summary: Ministers' preferred option in the Cabinet paper

Costs (Core information)

Outline the key monetised and non-monetised costs, where those costs fall (e.g. what people or organisations, or environments), and the nature of those impacts (e.g. direct or indirect)

- The baseline for analysis of the costs and benefits of the Minister's preferred option is the current trajectory of emissions reductions in this Government's second emissions reduction plan (ERP2). This options upper end of the range is consistent with the biogenic methane emissions target at the lower end of the current range (24 per cent).
- This option does not have any costs beyond the costs of implementing ERP2, which were taken into account as part of the ERP2 development process. For completeness, we note that the impact on real GDP of ERP2 was modelled as a reduction of 0.02 percent in 2030 and 0.15 per cent in 2050.
- Amending the target to a 14 – 24 per cent reduction in biogenic methane emissions below 2017 levels has a negligible overall economic impact when compared with our current trajectory of emissions reductions. The results of economic modelling were that in 2050, GDP is between 0 to 0.01 per cent higher depending on which end of the range is achieved. This change leads to small reductions in economic activity in some sectors (e.g. forestry and mining) and regions (e.g. Auckland and Nelson). These reductions are offset by increases in other sectors and regions (discussed below).
- 9(2)(h) [redacted]
- Amending the target to a 14 – 24 per cent reduction in biogenic methane emissions below 2017 levels may dampen the ambition of mitigation actions and behaviours (including investment decisions by businesses). If the lower end of the target (14 per cent) is achieved, it will increase the warming caused by New Zealand by ~3.3 per cent by 2050 and by ~6.2 per cent by 2100 when compared with our current trajectory of emissions reductions. If the upper end of the target is achieved (24 per cent), it will have no impact on the warming caused by New Zealand when compared with our current trajectory of emissions reductions. However, it is important to note that the target does not constrain the Government, or businesses and households, from undertaking more ambitious action. Therefore, the ultimate impact on climate change objectives is uncertain.
- 9(2)(g)(i) [redacted]

9(2)(g)(i)

- If the 14 per cent end of the biogenic methane range is achieved by Government policies; this option could increase the existing gap in emissions budget 3 from approximately 9Mt CO_2-e to 18Mt CO_2-e (at the time of writing). This will either require the Government to consider policy change to address this shortfall, or to amend this emissions budget (which is a stepping stone to the 2050 target) in line with the amended target.

Benefits (Core information)

Outline the key monetised and non-monetised benefits, where those benefits fall (e.g. what people or organisations, or environments), and the nature of those impacts (e.g. direct or indirect)

- The primary beneficiary of this option is the agriculture sector. Policies that drive a lower biogenic methane reduction are likely to be less costly for the agriculture sector from an economic perspective than policies associated with a higher biogenic methane target.
- Economic modelling showed that when compared to the status quo, option three will lead to small increases in economic activity in some sectors (notably agriculture and electricity generation) and regions (notably Northland, Bay of Plenty, and Southland).
- While economic modelling to 2050 offers valuable insights, it is inherently uncertain particularly when forecasting sectoral impacts. The near-term economic outlook for the agriculture sector projects strong growth. This suggests managing this transition will be essential, not only to support the sector's economic contribution but also to harness innovation and technology to support climate outcomes.

Balance of benefits and costs (Core information)

Does the RIS indicate that the benefits of the Ministers' preferred option are likely to outweigh the costs?

The results of economic modelling showed that the total economic impact of the Ministers' preferred option is likely to be negligible. However, there are a range of other non-monetised costs and benefits identified. These are summarised above and discussed in more detail in the analysis in this paper and in Table 2. Ultimately, whether or not the benefits of the Ministers' preferred option exceed the costs will depend on how these non-monetised costs and benefits are weighted.

Implementation

How will the proposal be implemented, who will implement it, and what are the risks?

- Changing the 2050 target will require amending the CCRA. The legislative vehicle for this amendment is to be determined but will be passed by the end of 2025 as a Ministerial priority.
- Changing the 2050 target may also require a number of transitional and consequential legislative changes to CCRA, including work to support this year's Emissions Trading Scheme (ETS) settings process not being disrupted, as well as to timeframes for setting emissions budget 4.

- The new target will be implemented through decisions under the CCRA in relation to emissions budgets, the New Zealand Emissions Trading Scheme settings and emissions reductions plans, as well as related policies.

Limitations and Constraints on Analysis

- The analysis in this paper draws heavily on previous work by the Commission, the Methane Review, and work completed for ERP2.
- Setting a target for emissions reduction out to 2050 is an uncertain exercise. Some additional modelling was undertaken to shed light on the economic impact of the target options identified. The limitations associated with this modelling are discussed in this paper, including the fact that it largely extends New Zealand's current economic structure out to 2050 and does not account for the impacts of climate change on the economy or society, or the long-term benefits of reducing climate risks.
- Likewise, there is uncertainty associated with projecting emissions over a long time period in a diverse, trade-dependent economy. Projections used in this analysis were drawn from work undertaken for ERP2.
- The advice and analysis presented in this document was prepared ahead of the Ministerial decision to remove the commitment for an agricultural emissions pricing system by 2030. This policy decision is likely to impact several aspects of the analysis, such as the economic impact and feasibility of the agriculture sector to meet the various target options, given that ERP2 assumes an agricultural emissions pricing system to be in place from 2030 (although no policy decisions have yet been taken about the design of that system, as was noted in ERP2).
- Ministers have taken into account several previous consultations that have provided insight into how New Zealand stakeholders perceive climate change and what the Government response should be. Informed by these they have decided to progress decisions on the 2050 target without further public consultation. Therefore, the options in the RIS have not been publicly consulted on.
- The analysis in this paper is based on 2024 projections as 2025 projections were not yet finalised.

Summary: Agencies' preferred option

Costs (Core information)

Outline the key monetised and non-monetised costs, where those costs fall (e.g. what people or organisations, or environments), and the nature of those impacts (e.g. direct or indirect)

- The baseline for analysis of the costs and benefits of the recommended option is the current trajectory of emissions reductions in this Government's ERP2. This option does not have any costs beyond the costs of implementing ERP2, which were taken into account as part of the ERP2 development process.
- Given the biogenic methane target is currently a range, clarifying the target at the lower end may have a dampening effect on the ambition of mitigation actions and behaviour change (9(2)(h)

9(2)(h)). This could have a negative impact on climate change objectives. However, it is important to note that the target does not constrain the Government, or companies, from undertaking more ambitious action.

- This target may be perceived by some as an inadequate domestic contribution to addressing global warming. This is because the 2050 target does not achieve equivalent to net zero of all-gases in 2050, whereas the targets set by international partners do (although the warming impact of net zero all-gases targets is uncertain). This may be perceived as out of step with some comparable international partners. The likelihood or magnitude of international responses are uncertain – 9(2)(g)(i) .

Benefits (Core information)

Outline the key monetised and non-monetised benefits, where those benefits fall (e.g. what people or organisations, or environments), and the nature of those impacts (e.g. direct or indirect)

- A key benefit of the proposed clarification of the biogenic methane emissions target at the lower end of the current range, compared to status quo, is provision of greater certainty about the emissions reductions that are expected. This benefit accrues primarily to the agriculture sector.
- Benefits associated with increased certainty, particularly for the agriculture sector, have not been quantified. However, policies that drive a reduction of 24 per cent in biogenic methane emissions are likely to be less costly for the agriculture sector from an economic perspective than policies associated with a 47 per cent reduction (noting there is no obligation, currently, under status quo policy settings to achieve emissions reductions at the upper end of the current target range, and the Government's current emissions reduction plan projects emissions reductions of ~25 per cent below 2017 levels).

Balance of benefits and costs (Core information)

Does the RIS indicate that the benefits of the preferred option are likely to outweigh the costs?

- The overall economic impact of agencies' preferred option is the same as the status quo, i.e. there are no additional monetised costs or benefits identified. However, there are a range of other non-monetised costs and benefits. These are summarised above and discussed in more detail in the analysis in this paper and in Table 3. Ultimately, whether or not the benefits of agencies' preferred option exceed the costs will depend on how these non-monetised costs and benefits are weighted.

Implementation

How will the proposal be implemented, who will implement it, and what are the risks?

- The implementation of the recommended option will be the same as the Ministers' preferred option (see analysis above).

Limitations and Constraints on Analysis

- Limitations and constraints of the recommended option are the same as those detailed for the Ministers' preferred option (see analysis above).

I have read the Regulatory Impact Statement and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the preferred option.

Responsible Director(s) signature:

9(2)(a)

Jane Chirnside
Director, Resources and Rural Communities, Ministry for Primary Industries
4 September 2025

Responsible General Manager(s) signature:

Hemi Smiler
General Manager, Climate Change Mitigation, Ministry for the Environment
4 September 2025

Quality Assurance Statement ***[Note this isn't included in the four-page limit]***	
Reviewing Agency: Ministry for the Environment, Ministry for Primary Industries, Ministry for Regulation	**QA rating:** Meets
Panel Comment:	

Section 1: Diagnosing the policy problem

What is the context behind the policy problem and how is the status quo expected to develop?

New Zealand's current 2050 target

1. In 2019, the Climate Change Response Act 2002 was amended to set New Zealand's 2050 target. The 2050 target was established as New Zealand's domestic contribution to the global effort to limit the global average temperature increase to 1.5°C above pre-industrial levels, as set out in the Paris Agreement on climate change.

2. The 2050 target sets the level of domestic efforts to mitigate climate change and provides *certainty* to the economy about the long-term direction of climate change policy. Setting a long-term target can drive steady progress in reducing emissions, support economic stability, send predictable market signals and support alignment with international partners.

3. New Zealand's 2050 target requires:

- net accounting emissions of greenhouse gases in a calendar year, other than biogenic methane, are zero by the calendar year beginning on 1 January 2050 and for each subsequent calendar year; and
- emissions of biogenic methane in a calendar year are 10 per cent less than 2017 emissions by the calendar year beginning on 1 January 2030; and are 24 to 47 per cent less than 2017 emissions by the calendar year beginning on 1 January 2050 and for each subsequent calendar year.

New Zealand's split-gas approach

4. New Zealand adopted a split-gas approach to the 2050 target based on scientific evidence that biogenic methane, as a short-lived gas, does not have to reduce to zero emissions to limit global warming. The biogenic methane component of New Zealand's current 2050 target was informed by evidence and analysis, including the central range of modelled pathways for methane emissions from the agriculture, forestry and other land use (AFOLU) sectors from scenarios that limit warming to 1.5°C[1] in the Intergovernmental Panel on Climate Change's (IPCC) 2018 Special Report on Global Warming of 1.5°C (SR1.5).

5. Although the IPCC range was not intended as a target for any individual country, New Zealand adopted a target consistent with this range (a 24–47 per cent reduction in biogenic methane emissions) to signal alignment with the 1.5°C temperature goal and a commitment to strong global action. This range was also considered an appropriate starting point in light of the uncertainty surrounding the global reductions required to meet the temperature goal of the Paris Agreement and the availability of technological developments in New Zealand to reduce biogenic methane emissions over the next three decades. Other key issues that were

[1] The 1.5°C global temperature goal that is referred to in the purpose of the CCRA and the Paris Agreement is based on limiting global warming to 1.5°C by the end of the century (2100). The world is currently heading for warming above the 1.5°C global goal. Returning warming to 1.5°C, known as 'overshoot', will require at least achieving net negative emissions of long-lived GHGs and increased reductions of short-lived GHG emissions. The higher the overshoot of 1.5°C, the greater the reliance on net negative emissions after peaking, and the higher the risk of irreversible impacts and climate tipping points.

considered in the final setting of the target included the feasibility of achieving the target, what the target would represent in terms of New Zealand's contribution to global warming, economic impacts and our national circumstances.[2] This process also set an interim goal to reduce gross biogenic methane emissions by 2030 (see above).

6. Since the target was originally set in 2019, the IPCC has compiled and assessed a broader and more comprehensive set of global scenarios in its Sixth Assessment Report (AR6). Compared to the earlier dataset used in SR1.5, the AR6 scenario ensemble represents a significantly larger compilation of global mitigation pathways. Notably, many of the scenarios submitted for AR6 focus on mitigation options within a "middle-of-the-road" socioeconomic pathway (SSP2), rather than spanning the full range of alternative futures, such as those emphasizing sustainability (e.g. SSP1). As a result of this choice made by economic modellers — along with other methodological updates — the summary statistics derived from the AR6 dataset differ from those presented in SR1.5.

7. The IPCC did not publish the median or central range of modelled methane emissions pathways from the AFOLU sector in scenarios that limit warming to 1.5°C with no or limited overshoot in AR6. However, applying the same methodology to the publicly available database yields a median reduction of 21 per cent by 2050 relative to 2020 levels, with a central range of 11–44 per cent. These figures - like the central range and median reported in SR1.5 — reflect average reductions for global least-cost mitigation strategies and should not be interpreted as central estimates or national targets. Scientific assumptions about mitigation options and their cost for the agricultural sector have not changed substantially between the SR1.5 and AR6, and scenarios generally do not include any novel agricultural mitigation technologies, even in the long run. The shift in the median and central range of AFOLU methane reductions between SR1.5 and AR6 is largely attributable to modelling decisions, including the dominant use of the "middle-of-the-road" SSP2 pathway and decisions by modelling groups on how many and what types of scenarios to submit to the IPCC database,[3] which affects reported statistics. Both of these materially influence the scenario ensemble. Therefore, this change in global statistics should not be interpreted in isolation as a signal that lesser reductions in biogenic methane are now considered possible globally or required at the national level to contribute to limiting global warming to 1.5°C.

8. The IPCC has been consistently clear that global average reductions in mitigation pathways do not constitute requirements or measures of what contributions towards global efforts would be fair at the national level. Global average emissions reductions can serve as a reference point but cannot themselves determine appropriate emission reduction targets at the national level, as these are generally considered by the IPCC and UNFCCC to depend on equity considerations and national circumstances consistent with the principle of common but differentiated responsibilities and respective capabilities.[4,5]

Science and value judgements are needed to set climate targets

[2] Biological Emissions Reference Group report 2018; Parliamentary Commissioner for the Environment (PCE) report from New Zealand Agriculture Greenhouse Gas Centre on "The contribution of methane emissions from New Zealand livestock to global warming" 2018.
[3] Other factors that may have impacted the global statistics include updated baselines and improvements to the underlying modelling.
[4] Sixth Assessment Report — IPCC
[5] The Paris Agreement | UNFCCC

9. The latest IPCC Sixth Assessment cycle (AR6) key findings, which were released between 2021 and 2023, emphasise that limiting global warming to 1.5°C or 2°C requires immediate, deep, and sustained reductions in greenhouse gas emissions across all sectors. Delays in mitigation will make future pathways more costly, risky, and technologically demanding. The report emphasises that every fraction of a degree of additional warming increases risks to human and natural systems, and that the choices made in this decade are critical for determining future climate outcomes.[6]

10. However, climate science cannot pinpoint an exact emissions reduction target; rather, it provides a foundation for decision-making. Science provides insight on the direction of travel required to meet global temperature goals, the urgency with which emissions must decline, and the consequences of exceeding these thresholds. It helps frame the range of contribution needed to avoid the most severe climate impacts.

11. Science alone cannot determine what is fair, achievable, and/or consistent with a country's national circumstances. In addition to science, value judgements are needed. These judgements may involve considerations such as the level of climate related risk we wish to collectively tolerate at the national and international level, fairness across generations and between countries, as well as what is required to align with existing international commitments.

12. When making decisions on emissions reductions targets, Parties to the Paris Agreement generally weigh their national circumstances and respective capabilities.[7] This includes impacts on the economy, society and environment, the costs, benefits and feasibility of emissions reductions, and the potential for change.[8] Existing climate policy frameworks and institutions also shape what is possible within the target period. Ultimately, setting a climate target is about combining the best available scientific evidence with value judgements that reflect national context and responsibilities.

13. The impact of a changing climate on future generations is a central consideration in climate change policy around the world. As the world moves further off track from limiting warming to 1.5°C, and as the impacts of climate change are more severe and widespread than previously understood, future generations are likely to bear a greater burden of impacts. They will face more intense and frequent climate-related events and will likely need to take stronger and more urgent action to reduce emissions.[9] Since the 2050 target was first set, we now also have an improved understanding of the financial costs of climate change, such as damage to infrastructure, loss of productivity, increased healthcare costs, and ecosystem disruption, which will fall disproportionately on future generations. New Zealand's 2050 target is only part of our climate change response and sits alongside our adaptation approach and international commitments (discussed below). However, changes to our 2050 target that increase our domestic response can generally be seen as doing more to address

[6] Sixth Assessment Report — IPCC
[7] ADOPTION OF THE PARIS AGREEMENT - Paris Agreement text English
[8] Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023. Addendum. Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session | UNFCCC
[9] https://www.ipcc.ch/sr15/

concerns about intergenerational equity, while changes that reduce our domestic response would do less to address concerns about intergenerational equity.

Implementing New Zealand's targets

14. New Zealand's 2050 target is implemented through emissions budgets (EBs), emissions reduction plans (ERPs) and the New Zealand emissions trading scheme (NZ ETS). While the legislated budgets and targets guide Government action and play an important role in providing investment and planning certainty, they do not preclude the private sector or Government from taking more ambitious action.[10]

15. ERP2 was launched in December 2024 and projected New Zealand to be tracking toward meeting the 2030 biogenic methane and 2050 target (at the lower end of the biogenic methane target range), while acknowledging uncertainty associated with modelling and projections.[11]

Relationship between our domestic and international targets

16. The 2050 target is New Zealand's domestic contribution to the collective global achievement of the long-term temperature goal under the Paris Agreement. Nationally determined contributions (NDCs) are the main mechanism in the Paris Agreement to limit global temperature increases. Under the Paris Agreement, each country's NDC must represent the "highest possible ambition" in light of national circumstances, informed by the outcomes of the latest Global Stocktake and with a view to achieving the purpose of the Paris Agreement. Successive NDCs must be a progression on previous NDCs. NDCs can be achieved through domestic action as well as international cooperation.

17. New Zealand's domestic 2050 target is separate from our NDCs under the Paris Agreement, although the two are linked in that domestic efforts to reduce emissions support achieving our international commitments. We have not yet set our NDC for 2050, so do not know how it aligns with our domestic target. However, we have set two NDCs already:

- NDC1, a target of a 50 per cent reduction of net emissions below our gross 2005 levels by 2030, was set at a level that would require international cooperation (measures to achieve emissions reductions offshore in addition to domestic actions); and
- NDC2, a target of a 51 to 55 per cent reduction of net emissions below our 2005 levels by 2030 was set as a range, the lower end of which has been aligned with

[10] An emissions budget is a total quantity of emissions that is allowed to be released during an emissions budget period. EBs will act as stepping-stones, or interim targets, to reaching our 2050 emissions reduction targets. For each emissions budget period, the Minister must prepare and make publicly available a plan setting out the policies and strategies for meeting the relevant emissions budget – an emissions reduction plan. EBs also inform the number of New Zealand Units that can be supplied into the NZ ETS, by limiting the quantity of emissions that businesses participating in the NZ ETS can emit.

[11] ERP2 modelling projected net zero emissions from long-lived gases will be reached as early as 2044 and maintained from 2050; biogenic methane emissions are projected to have reduced by 24.9 per cent in 2050, which is within the target band of a 24 to 47 per cent reduction - https://environment.govt.nz/publications/second-emissions-reduction-plan-technical-annex/ These projections included key policies such as agricultural pricing system that incentivised the uptake of mitigation technology, Afforestation on Crown Land and the NZ ETS.

projected domestic action and the third emissions budget (EB3).[12] NDC2 is expressed as a range to enable New Zealand to reflect our highest possible ambition based on current expectations of commercial feasibility of emission reduction technologies, including agricultural mitigation technologies, while also allowing for flexibility to achieve greater emissions reductions if these technologies become subject to widespread commercial application sooner than expected. The range enables New Zealand to respond to evolving national circumstances and to reflect uncertainty over the NDC period.

18. The NDC2 represents an effort to better align New Zealand's commitment to the Paris Agreement with domestic emissions budgets set under the CCRA. If a change to our 2050 target were to result in a change to EB3 there could be implications for how New Zealand intends to meet NDC2 and the degree to which it can be met domestically or if international purchasing costs are required to meet any projected domestic shortfall.

The importance of a clear and stable 2050 target in providing certainty to regulated sectors

19. The 2050 target can provide certainty to the economy about the long-term direction of climate change policy, but to do so it needs to be set out to clearly outline the level of emissions reductions that are needed.

20. A clear target sets direction for subsequent policy decisions in relation to EBs, ERPs, and specific policies such as pricing mechanisms. In setting this direction, having a target avoids the need to relitigate a decision about the overall level of emissions reductions that are needed. If regulated sectors and households have clarity about the emissions reductions needed, with adequate support from policy settings, then firms and households are able to decide how to best meet these targets at the lowest possible cost.

21. An unclear target may mean that subsequent policy development in relation to EBs, ERPs and pricing mechanisms may need to revisit and make decisions about the overall emissions reductions that are required. This can create an uncertain regulatory environment that may impede business decisions, as households and businesses may delay or cancel their investments until they obtain more information about the operating environment and the costs of emissions reductions they face.

22. In addition to clarity, policy stability supports a more certain regulatory environment. Any changes to the 2050 target are likely to require adjustments to implementation mechanisms, with flow-on impacts to the costs faced by businesses and households. Changes may also give rise to regulatory uncertainty, which could negatively impact investment and planning decisions. Although the CCRA provides for regular five-yearly reviews of the target, our view is that there should be a "high bar" for changes given their impact on policy stability and regulatory certainty.

[12] In setting NDC2, Cabinet noted that the decision "…will not constrain Cabinet's ability to take future decisions, resulting from the independent review the biogenic methane component of the 2050 climate targets, on an approach to reflect New Zealand's unique emissions profile". [CAB-25-MIN-0006 refers]

Our approach to net zero greenhouse gas emissions

23. New Zealand's approach to net zero greenhouse gas emissions differs from other countries that include all greenhouse gas emissions in their net zero targets. New Zealand takes a 'split gas' approach and treats biogenic methane separately to other greenhouse gases due to its short-lived nature and differing warming impact (see section below). The target therefore excludes biogenic methane from 'net zero'. This means New Zealand will have residual emissions in 2050 under our current target.

24. Under a net zero all-gases target, all greenhouse gas emissions are reduced to zero on a net basis. However, it is possible to offset methane emissions through carbon removals. As a result, the warming impact of a net zero all-gases target will depend on how an individual country achieves this target and the extent to which they use carbon removals to offset gross emissions of different greenhouse gases (GHGs). Note, the IPCC Sixth Assessment Report (AR6) scenarios that limit global warming to 1.5°C with no or limited overshoot found that deep reductions in emissions of methane are needed (more information on the difference in warming from short and long-lived greenhouse gases is detailed below).[13]

25. In addition to the above, not all countries calculate net emissions in the same way for tracking progress towards climate change targets. New Zealand accounts for net emissions for climate change targets using net target accounting,[14] which is different from the net emissions captured in New Zealand's Greenhouse Gas Inventory.[15]

26. A 'net negative' target means a country is removing more greenhouse emissions from the atmosphere (for example, by planting trees) than it is emitting. The warming impact of net negative emissions is cumulative, for example, if New Zealand adopted a -20Mt by 2050 long-lived gases target and sustained it, then every year post 2050 we would be removing 20Mt of long-lived gases on a CO_2-e basis from the atmosphere, effectively reducing New Zealand's global warming impact each successive year.

Treatment of short-lived and long-lived greenhouse gases

27. The differential treatment of short-lived gases in comparison to long-lived gases is highly relevant. Methane is a short-lived gas, whereas carbon dioxide and nitrous oxide are long-lived gases.

28. Long-lived gases can persist in the atmosphere for centuries, contributing to long-term warming. Future emissions of long-lived gases will add further to the warming caused already until those emissions are reduced to net zero (previously emitted gases will continue

[13] Sixth Assessment Report — IPCC refers
[14] Net target accounting emissions are a version of net emissions which include all our gross emissions, but only a subset of emissions and removals in the land use, land use change and forestry (LULUCF) sector. New Zealand's net target accounting approach for the LULUCF sector recognises additional action. This approach creates incentives for the establishment of new forests, recognises permanent, long-term enhancements of carbon sinks resulting from forest management activities, and takes responsibility for deforestation, while accommodating the long-term cycles in net emissions and removals that arise from management of production forests.
[15] The net emissions presented and quantified annually in New Zealand's Greenhouse Gas Inventory represent emissions and removals from all sectors of New Zealand's economy, including all categories of the land use, land-use change and forestry (LULUCF) sector.

to warm the atmosphere). Methane is a short-lived but potent gas with an average atmospheric lifetime of ~12 years,[16] where the warming caused by past and current methane emissions will largely disappear within the next few decades. The contribution from methane to future global warming therefore depends almost entirely on future emissions of this gas.[17]

29. The nature of greenhouse gases can influence how we might want to mitigate each of them. The long-lived nature of carbon dioxide and nitrous oxide means we need to eliminate almost all sources of emissions to avoid further warming of our climate. However, at a global level, the short-lived nature of methane means that only a moderate decline in the rate of emissions is needed to avoid further atmospheric warming from methane. Reductions beyond this point will contribute to decreasing the global warming impact associated with historic and current methane emissions in the future.

30. Short-term reductions in the rate of methane emissions could also help lower global temperatures within years and 'buy time' for the world to reduce harder to abate long-lived gases which need to reach net zero to avoid causing further warming. Conversely, the much more powerful heating effect of methane in the short term means that increases could have a big impact in driving us toward climate tipping points.[18,19, 20, 21]

31. Methane emissions are emitted by other sectors as well as agriculture and waste – such as industrial processing and energy – that can also be reduced to avoid causing future warming. However, agriculture is hard to fully abate for all countries due to the complexities of the sector and a lack of available and cost-effective mitigation technologies.[22] It is particularly difficult for New Zealand to abate, given there are currently limited mitigation technology solutions compared to non-pastoral based systems, we are already an efficient producer, and the sector has a large positive impact on the domestic economy. More context on New Zealand's domestic agriculture sector is detailed below.

32. In New Zealand, methane is predominantly produced by the agriculture and waste sectors (contributing 89.8 and 8.5 per cent of domestic methane emissions respectively).[23] The industrial processes and product use sector also produces small amounts of methane from methanol production, as well as the energy sector through fugitive emissions and fuel

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[16] Tonne-for-tonne methane is estimated to be 28 times more effective at trapping heat in the atmosphere than carbon dioxide averaged over 100 years, and 84 times more effective over 20 years (without climate feedbacks) - AR5 Climate Change 2013: The Physical Science Basis — IPCC

[17] Fossil methane emissions return geological carbon to the atmosphere which adds to the atmospheric concentration of carbon dioxide, as well as causing additional warming as methane. Biogenic methane emissions do not add to the atmospheric concentration of carbon dioxide because biogenic methane is produced from biological sources, where the carbon is recently derived from carbon dioxide present in the atmosphere.

[18] In climate science, "tipping points" are critical thresholds that, when crossed, can lead to large, accelerating, and potentially irreversible changes in the climate system, with potentially severe impacts on human society and ecosystems.

[19] OECD. Climate Tipping Points. 2022.

[20] IPCC. Impacts of 1.5ºC global warming on natural and human systems. 2018.

[21] World Economic Forum. Methane emissions must fall to hit temperature targets. 2022.

[22] Conflict and insecurity, weather extremes, and economic shocks continue to drive acute food insecurity. According to the 2025 Global Report on Food Crises, acute hunger has grown in 2024 for the sixth consecutive year. Around 295 million people are now facing high levels of acute food insecurity, with the most people experiencing the most severe forms of acute food insecurity (IPC/CH5) and famine living in countries affected by conflicts.

[23] https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2022/

combustion; however these are not accounted for in our biogenic methane target as per the CCRA, and rather are included under our net-zero target.[24]

Consideration of the agriculture sector

33. New Zealand's gross emissions are led by the agriculture sector, which accounted for 53 per cent of emissions in 2023. This is to be expected, as New Zealand's food and fibre sector is a large component of New Zealand's economy accounting for 81 per cent of goods exported and contributing 12.4 per cent of overall employment in the year to March 2023.[25]

34. Between 2022 and 2023, New Zealand's gross emissions fell by 2 per cent and net emissions fell by 4 per cent. Notably, the 2025 Greenhouse Gas Inventory showed that the agriculture sector reduced emissions by over 5 per cent in the three years between 2020 and 2023. Total biogenic methane emissions from waste and agriculture are now sitting at 4.1 per cent below 2017 levels. Overall forecast growth for the agriculture sector remained positive on average throughout this period.

35. Comparator economies such as Ireland, Denmark and Australia have set targets that aim for net zero 'all gases' by 2050. However, other countries' policy approach for agriculture differs from New Zealand, and is generally more geared towards supporting and subsidising measures to ease the burden of emissions reductions in the agriculture sector. An OECD analysis of policy progress on climate mitigation in the agriculture, forestry and other land use sectors released in December 2024 found that two thirds of instruments used by Governments to incentivise actions were economic instruments, with 96 per cent being subsidies.[26]

36. Subsidies are commonly used instruments by countries in the OECD to support farmers. Although they are not necessarily aimed at emissions reduction, they can affect production decisions and therefore influence GHG emissions. The amount of support that countries provide to their agricultural producers are measured annually by the OECD with the Producer Support Estimate (PSE) metric.[27] Over the 2021-2023 period, total support to the agricultural sector across 54 countries (OECD countries plus key agricultural producing countries) averaged USD 842 billion per year.[28] However, net producer support across all 54 countries has declined as a share of gross farm receipts (per cent PSE) over the past 20 years.

37. Agricultural support in New Zealand consistently ranks among the lowest in the OECD, although overall OECD PSE continues to decline relative to its 2021 peak. During the 2021-

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[24] Information sourced from New Zealand's Greenhouse Gas Inventory 1990-2022 - https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2022/

[25] MPI. Situation and Outlook for Primary Industries. December 2024. These figures account for New Zealand's entire food and fibre sectors including dairy, meat and wool, forestry, horticulture, seafood, arable, processed food and other products.

[26] OECD (2024). *Measuring policy progress on climate change mitigation in the agriculture, forestry and other land use (AFOLU) sectors*, OECD Publishing, Paris, https://www.oecd.org/en/publications/measuring-policy-progress-on-climate-change-mitigation-in-the-agriculture-forestry-and-other-land-use-afolu-sectors_a6b2bd00-en.html

[27] PSE includes government transfers and market price support (measured by the gap between the domestic and the world price a difference created by trade measures i.e. tariffs or non-tariff barriers).

[28] OECD (2024), *Agricultural Policy Monitoring and Evaluation 2024: Innovation for Sustainable Productivity Growth*, OECD Publishing, https://www.oecd.org/en/publications/2024/11/agricultural-policy-monitoring-and-evaluation-2024_b4c72370.html

2023 period, PSE in New Zealand averaged 0.7 per cent of gross farm receipts. Although this was slightly higher than was reported at the beginning of the century (previously 0.5 per cent in 2000-2002), it is far below the OECD average of 14 per cent across OECD countries and 6.5 per cent in emerging economies over the same period.[29]

The Commission's review of the 2050 target

38. The Commission provides independent, expert advice to the Government on mitigating climate change. The Commission is required by the CCRA to review the 2050 target every five years. In November 2024, the Government received the first review of the 2050 target. This also included advice on whether to include emissions from international shipping and aviation in the 2050 target. The Government intends to address this issue in a subsequent process which could result in a further amendment to the 2050 target.

39. The Commission can recommend a change to the 2050 target only if significant change has occurred or is likely to occur as described under section 5T of the CCRA, and if the Commission is satisfied that the significant change justifies the change to the target.[30] The Commission must also take a range of other factors into consideration in performing its functions and duties (section 5M CCRA); including considerations such as (but not limited to) Crown-Māori relationship, te ao Māori and specific effects on iwi and Māori and the distribution of benefits, costs, and risks between generations.

40. The Commission recommended increasing domestic efforts to address climate change. The main points made to justify a change to the 2050 target were:

- *Scientific understanding*: The impacts of global warming are greater in both severity and scale than was understood by the global science community when the target was set. Research has found that greater impacts are being felt at lower temperature levels than previously expected. Harmful impacts from climate change are becoming more severe and more widespread as the planet warms. Scientific understanding of these impacts has advanced since the 2050 target was first set.
- G*lobal action:* The world is off-track to meet the Paris temperature goals of limiting warming to 1.5°C. The UN Emissions Gap Report 2023 shows that in its most optimistic scenario where all commitments and pledges under the Paris Agreement are implemented, the world only has a 66 per cent chance of limiting warming to 2.0°C (range: 1.8°C to 2.5°C). Maintaining only current policies would give the world a 66 per cent chance of limiting warming to 3.0°C (range: 1.9°C to 3.8°C). This proves that much greater reductions in global emissions are needed in the near and

[29] On average in 2021-23 levels of agricultural producer support in the UK and EU were below 20 per cent (but still above the average of 16%). Countries such as Norway, Switzerland and Japan all offer support greater than 30 per cent of gross farm receipts. Lower levels of producer support were provided in Australia and net producer support was less than 1 per cent in New Zealand. OECD (2024), *Agricultural Policy Monitoring and Evaluation 2024: Innovation for Sustainable Productivity Growth*, OECD Publishing, Paris https://www.oecd.org/en/publications/2024/11/agricultural-policy-monitoring-and-evaluation-2024_b4c72370.html

[30] 5T CCRA defines significant change as: global action; scientific understanding of climate change; New Zealand's economic or fiscal circumstances; New Zealand's obligations under relevant international agreements; technological developments; distributional impacts; equity implications (including generational equity); the principal risks and uncertainties associated with emissions reductions and removals; social, cultural, environmental, and ecological circumstances.

longer terms to limit as much as possible the amount by which the world exceeds 1.5°C, and then to bring the temperature down again.

- *New Zealand's fair share:* Many comparable countries have now set net zero "all-gases" domestic emissions targets that are more ambitious than New Zealand's split gas approach (see further detail in Appendix 1). IPCC equitable burden sharing principles suggest New Zealand should do more and our national circumstances do not warrant reduced effort.
- *Intergenerational equity:* Delaying increased action transfers costs and risks to future generations. Future generations will face a greater burden from climate change, as there is a decreasing likelihood that the world is on track to limit average warming to 1.5°C above pre-industrial levels, and the impacts of climate change are more severe and widespread than previously understood.[31] Not only are they likely to face more severe climate impacts, it is likely they will also have to do more to reduce emissions.

41. The Commission's recommended target is:

- reaching at least net negative 20Mt CO_2-e by 2050, including emissions from international shipping and aviation; and
- reducing biogenic methane emissions by at least 35 – 47 per cent by 2050 (relative to 2017 levels)
- there are further reductions and removals of greenhouse gases after 1 January 2050.

42. The Government must respond to the Commission's advice within 12 months of receiving a recommendation to amend the 2050 target. The Minister of Climate Change must advise the Commission in writing of the Government's response and must include any reasons for departure from the Commission's recommendations. The response must be made publicly available and a copy must be presented to Parliament.

Independent methane science and target review

43. The National-ACT Coalition agreement included a commitment to "*review the methane science and targets in 2024 for consistency with no additional warming from methane emissions*". In June 2024, an independent Ministerial advisory panel (the Panel) was appointed to review the science of methane and provide an evidence-based report on what a target (or range) consistent with the principle of 'no additional warming' would look like for New Zealand, from a 2017 base year. The principle of 'no additional warming' requires the warming contribution of emissions to stabilise.

44. The Panel's review was published in December 2024. The Panel tested multiple methane reduction targets to assess what levels of reduction in New Zealand's biogenic methane emissions would meet the principle of 'no additional warming' from 2017 levels across global emissions scenarios. Its key results were:

[31] Figure 4.3 (pg.81) of the Commissions 2050 review, shows the change in risks across several domains between the 5th(AR5) and 6th (AR6) IPCC assessment reports. AR6 shows that there are now high or very high risks across key domains (e.g. distribution of impacts, extreme weather events) that are more likely at lower temperatures- the heightened risk level occurs at slightly different temperatures for each domain.

- In a global emissions scenario of limiting temperature increases to 1.5°C, New Zealand biogenic methane emissions reduced by 24 per cent by 2050;
- For a mid-range global emissions scenario (holding average temperatures to 2.0-2.7°C), New Zealand's biogenic methane emissions reduced by 14-15 per cent by 2050; and
- In a high global emissions scenario (with a temperature increase well over 2.0°C and as high as approximately 4.5°C), New Zealand's biogenic methane emissions levels can remain at 2022 levels.[32]

45. In its Terms of Reference, the Panel was specifically asked not to make conclusions or recommendations beyond performing the scientific review.

46. The principle of 'no additional warming' is a useful concept to understand the longer-term warming impact of New Zealand's emissions. In particular, it shows that even to stabilise the warming impact of biogenic methane emissions at 2017 levels, emissions must reduce considerably; by as much as 24 per cent below 2017 levels if the world takes a path consistent with 1.5°C.

47. However, taking a 'no additional warming' approach has limitations in a target-setting context, including:

- A 'no additional warming' approach cannot easily be reconciled with a particular global temperature goal. This is because stabilising warming at a base year (in the case of the Methane Review, 2017) does not address the question of what action is required or practicable to achieve a temperature goal such as limiting global warming to 1.5°C. A global scenario in 'no additional warming' modelling that is consistent with limiting global warming to 1.5°C (e.g. SSP1-1.9) provides no information about whether the derived target itself is an adequate contribution to this temperature goal.[33]
- The amount by which New Zealand's methane emissions must be reduced to achieve 'no-additional warming' is not a single fixed number and strongly depends on actions undertaken by the rest of the world. Adopting a 'no additional warming' approach would require updating the target to make sure the principle continues to be met as global emissions change over time.
- In general, the greater the levels of methane in the atmosphere (along with other GHGs such as nitrous oxide), the less New Zealand alone would need to reduce domestic emissions to achieve 'no additional warming' by 2050.[34] This highlights the challenge of taking a 'no additional warming' approach, as scientific consensus,

[32] The NZ Greenhouse Gas Inventory states that in 2022, NZ's methane emissions were 38,339.3 kilo tonnes of carbon dioxide equivalent or 1.369 mega tonnes of methane.
[33] This is because a 'no additional warming' approach to methane only considers what level emissions of methane need to be in the future to stabilise warming based on choices that relate to the reference year and assumptions about the future composition of the atmosphere (i.e., the global background scenario used) rather than an assessment of what level of emissions reductions of methane is required or practicable to contribute to limiting global warming to 1.5°C at the national level given equity considerations and national circumstances consistent with the principle of common but differentiated responsibilities and respective capabilities.
[34] The effectiveness of methane as a GHG decreases with increasing concentrations of methane (and some other GHGs such as nitrous oxide that overlap with some of the methane absorption bands) as the absorption bands become saturated.

including the latest reports from IPCC, recognises that deep reductions in all gases are required to limit the impact of climate change. Greater reductions will be required in the future to limit global warming to 1.5°C if less action is taken now to reduce gross emissions.

What is the policy problem or opportunity

48. As set out above, New Zealand's domestic 2050 emissions target is legislated under the CCRA and is a significant part of the climate policy architecture. The target has recently been reviewed by the Commission, and in parallel the Panel has reviewed the biogenic methane science and targets for consistency with 'no additional warming'.

49. The policy problem is therefore whether the current 2050 target remains appropriate in light of the recent advice from the Commission and the Panel, as well as relevant Government objectives (these are discussed below).

What objectives are sought in relation to the policy problem?

50. The primary role of the 2050 target is to set the level of New Zealand's domestic efforts to reduce greenhouse gas emissions. Addressing climate change requires policy measures to influence behaviour. The target plays an important role in setting a clear long-term policy direction that supports planning and investment decisions. While measures to address climate change have the potential to give rise to environmental and other benefits, they also impose costs on firms and households. Therefore, confirming a target requires striking a balance across a number of relevant objectives.

51. The objectives we have adopted for this work are set out in the table below.

Objectives	Criterion
Alignment with the Government's economic agenda	Economic impact
	Key impacts on sectors
The 2050 target contributes to limiting the global average temperature increase to 1.5°C	Contribution to limiting warming to 1.5°C
	International partners comparison
The target can be feasibly implemented and support NZ's transition to 2050 (including likely availability of technologies and consistency with current Government policy)	Achievable pathway: ERP2 modelled technological developments, likely policy implications

Objective 1: Alignment with the Government's economic agenda

52. The Government's 'Going for Growth' economic agenda is a strong priority. Any changes to New Zealand's 2050 target will aim to align with the Government's economic agenda, so that climate action supports sustained economic growth. This alignment will require a careful balance of reducing emissions while considering economic impacts and international competitiveness.

53. To assess economic implications, officials have commissioned computable general equilibrium (CGE) analysis to help understand the macroeconomic impacts of different target options. The CGE analysis was an extension of the modelling developed for New Zealand's ERP2.[35] The model was calibrated with the policies and technology assumptions used in ERP2. Emission prices were then adjusted in order to achieve different 2050 targets to determine the economic and sectoral impacts these different targets could have. More details on this modelling are included in Appendix 5.

54. As with all modelling, this CGE analysis can provide insights into where impacts are likely to occur and in what direction, but the magnitude of the impacts is uncertain. The model largely extends New Zealand's current economic structure as of ERP2 and out to 2050, and does not predict what the future economy could look like. Development of unanticipated technologies or major economic shifts could make achieving targets less costly than indicated by the model.

55. The modelling also does not account for the impacts of climate change on the economy or society, or the long-term benefits of reducing climate risks and successfully transitioning New Zealand's economy.

56. Recent reports have found the economic costs of climate change to be significant and that there are strong net economic benefits for mitigation policies.[36] The OECD reports that accelerating well-designed climate policy measures does not hinder economic growth and investing in clean energy and energy efficiency increases productivity and innovation.[37] Actions to reduce emissions can also have significant co-benefits, such as decarbonising transport which provides substantial health co-benefits due to reductions in pollutants.[38]

57. Additionally, the modelling does not factor the potential trade impacts of changes to our targets or impacts on the competitiveness of our sectors.[39] This may be seen in two ways - firstly the measures supporting targets impose costs on firms, and could thus impact competitiveness. Secondly, New Zealand's climate credentials matter for New Zealand's reputation internationally on trade and sustainability, for our trading partners as well as consumers and retail platforms.

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[35] See 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.

[36] For example, a recent report from Boston Consulting Group and Cambridge University found that cumulative global economic output could be reduced by 15 per cent to 34 per cent if the global average temperature is allowed to rise by 3°C by 2100, rather than being limited to below 2°C, see *Landing the Economic Case for Climate Action with Decision Makers*, by Amine Benayad, Annalena Hagenauer, Lars Holm, Edmond Rhys Jones, Sahradha Kämmerer, Hamid Maher, Kamiar Mohaddes, Sylvain Santamarta, and Annika Zawadzki, March 2025.The Commission's 2050 target review identified the following potential economic benefits in relation to climate mitigation: productivity, energy security and independence, innovation, resilience.

[37] See OECD March 2025 report *Investing in Climate for Growth and Development.*

[38] See NZTA's Monetised benefits and costs manual, https://www.nzta.govt.nz/resources/monetised-benefits-and-costs-manual

[39] This was a theme identified in the public engagement done for NDC2 in 2024. A summary of the themes identified were proactively released by MfE at this link.

58. Due to these limitations, this CGE analysis was supplemented with qualitative analysis to take account of these wider costs and benefits.

59. As discussed earlier, the 2050 target can play an important role in providing certainty to regulated sectors of the economy about the level of emission reductions that are needed. A clear target sets direction for subsequent policy decisions in relation to EBs, ERPs and specific policy mechanisms such as pricing mechanisms. If regulated sectors and households have clarity about the emissions reductions that are needed (and there are policy settings in place to implement them) then they are free to make decisions on this basis.

Objective 2: The 2050 target contributes to limiting the global average temperature increase to 1.5°C

60. The purpose of the CCRA includes contributing to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5°C above pre-industrial levels.[40] As a developed country with historically high emissions, Parties to the Paris Agreement, international trading partners, and Pacific neighbours will expect New Zealand to make a meaningful contribution to lowering global temperatures [CAB-25-MIN-0006 refers]. While it is difficult to define this and derive an exact contribution, this objective works to incorporate different considerations that could help to assess our contribution to the 1.5°C goal.

61. This objective will examine New Zealand's contribution to 1.5°C by analysing temperature outcomes using temperature response modelling and the emissions impacts of each option. The temperature response modelling calculates the global warming impact of New Zealand's historic and future emissions under each option and is used to derive a percentage increase or decrease of each option. The variation is calculated in comparison with New Zealand's modelled contribution to global warming under the status quo in both 2050 and 2100. Warming outcomes are given for 2100 because the 2050 target has a warming impact that extends beyond 2050. The 1.5°C global temperature goal that is referred to in the purpose of the CCRA and the Paris Agreement is based on limiting global warming to 1.5°C by the end of the century (although 2100 is not directly referenced in the CCRA).

62. The current 2050 target, as legislated under the CCRA, does provide information on what emissions reductions may be required after 2050 and currently has no provision for further reductions in GHG emissions after 2050. The Commission recommend in their review of the 2050 target that the 2050 target is updated to require that there are further reduction and removals of GHGs beyond their recommended target levels after 2050. The assumption of whether emissions continue to reduce beyond 2050 substantially affects New Zealand's modelled contribution to global warming by the end of the century. Consideration of post-2050 emissions reductions has been deferred until later this year. For the temperature response modelling we have assumed that emissions of all gases remain constant at 2050 levels for all options (see Appendix 3 for details).

[40] The purpose of the Climate Change Response Act 2002 is outlined in section 3 Climate Change Response Act 2002 No 40 (as at 26 November 2024), Public Act 3 Purpose – New Zealand Legislation

63. The trajectory of how a target is met also has a substantial impact on New Zealand's contribution to global warming pre- and post-2050 - earlier action will lead to better warming outcomes than delayed action when achieving the same target level in 2050. The target options considered still leave flexibility on the pathway to meet them, and those choices will affect the contribution that New Zealand makes to global warming.

64. The analysis will also compare the country's 2050 target with those of key international partners. This analysis will support understanding of alignment with global efforts while accounting for national circumstances, including New Zealand's high proportion of agricultural emissions and its split-gas approach.

65. It is important to note that when comparing New Zealand's split-gas target with other countries, an all-gas net zero target is unclear about the extent to which biogenic methane emissions are offset by greater reductions in other gases, or removals, unless a biogenic methane target is also specified. However, the biogenic methane component of New Zealand's 2050 target requires a gross reduction in biogenic methane that cannot be offset by removals or reductions in other gases, and as a result, there is a level of certainty around the expected level of warming from biogenic methane emissions over the long-term. The rationale for why New Zealand adopted a split-gas target is outlined in *Our approach to net zero greenhouse gas emissions* section above.

Objective 3: The target can be feasibly implemented and support New Zealand's transition to 2050

66. The 2050 target must be feasible to implement to work in practice. The analysis of this objective will consider policy measures and technologies that are likely to be needed to achieve target options, including whether EBs and relevant ERPs need to be amended, and implications for the NZ ETS.

67. Given the timeframe to achieve the 2050 target, there are a range of risks and uncertainties that apply to all options including (but not limited to):[41]

- Unpredicted technological developments – we have accounted for technology we currently know about. However, there could also be future breakthrough developments which we have not accounted for.
- External factors that may impact climate outcomes, such as population changes, natural disasters and climatic events such as droughts, international factors oil and commodity prices, supply of key abatement technology such as EVs.
- Risks/ uncertainties associated with private sector activity and investment. For instance, energy emissions impacts depend materially on private investment decisions.
- Impacts on the ETS – there is an ongoing need to manage risks associated with rates of land use change, and marginal effects from cost pass through (e.g. to energy pricing).
- Risks/ uncertainties from climate change impacts that affect mitigation opportunities over time (e.g. wildfire risk for forests).

[41] Risks and uncertainties adapted from ERP2 technical annex

- Risks around interventions not having a specialist or qualified workforce available in time.
- Risk/uncertainties associated with long-term social licence of the overall approach to climate mitigation, impacts of the transition, specific policies and technologies.

Emissions budgets and emissions reduction plans

68. An emissions budget (EB) is a total quantity of emissions that is allowed to be released during an emissions budget period. EBs are set on an 'all-gas basis', meaning there is not a specified separate amount of biogenic methane or long-lived gases to reduce in each budget period. EBs cover a period of five years and act as stepping-stones, or interim targets, to reaching our 2050 target.

69. Under current legislation, EBs that have been set may only be revised if the Commission recommends a revision. The Commission can choose to review EBs if there is a change to the 2050 target. NZ ETS settings must be strictly in accordance with the 2050 target and in accordance with emission budgets.

70. ERPs set out the initiatives and policies for the corresponding EBs, and balance the NZ ETS alongside other policies to drive climate action which achieves New Zealand's EBs. New Zealand recently published ERP2 which sets out the plan to achieve emissions budget 2. Achieving the 2050 target will require EBs and the corresponding ERPs (for example, ERP3-6 to reach 2050) to be set.

71. The 2050 target is designed to contribute to policy stability to maintain strategic direction in New Zealand's response to climate change. While the CCRA provides for target reviews every five years to allow for changing circumstances, frequent or substantial shifts in direction risk undermining this stability.

NZ ETS context for feasibility of options

72. The NZ ETS is an important tool to incentivise emissions reductions. However, net emissions in sectors covered by the NZ ETS are expected to approach but not quite reach zero from the late 2030s onwards. At this point in time, the supply of units into the NZ ETS is expected to mostly come from forestry units (i.e. NZ ETS compliance demand of gross emissions will be matched by an offsetting removal). However, based on current eligibility settings and phase-down rates, the Government would still be issuing a small volume of industrial allocation units that allow emissions without an offsetting removal.[42] Furthermore, not all long-lived gases are currently covered by the NZ ETS, notably nitrous oxide from agriculture.

73. These factors mean that the NZ ETS in its current structure cannot achieve the net zero long-lived gases target by itself and needs to be complemented by other policies outside of the NZ ETS. Although there are currently other policies being introduced, they will need to continue to be developed for the NZ ETS to achieve net zero. Future emissions reduction plans will be the vehicle for setting out more specifically the desired balance of effort between the NZ ETS and complementary policies in achieving future EBs.

[42] March Baseline Update 2025 forecasts project industrial allocation at 3.5M units in 2040, falling to 1.8M units by 2050.

74. A desire to drive net zero or net negative emissions in sectors covered by the NZ ETS would likely require some change to the structure and/or coverage of the NZ ETS. Alternatively, additional policies outside of the NZ ETS may be needed to achieve net negative emissions. For the NZ ETS to drive sustained net negative emissions, a mechanism needs to be introduced to incentivise emissions removals in excess of compliance demand. In the absence of this mechanism, the NZ ETS may temporarily achieve net negative emissions (likely due to forestry sequestration cycles) but subsequent downwards pressure on price would rebalance the market towards net zero or small net positive emissions over the long run.

What consultation has been undertaken?

75. Ministers have taken into account several previous consultations that have provided insight into how New Zealand stakeholders perceive climate change and what the Government response should be. Informed by these they have decided to progress decisions on the 2050 target without further public consultation These consultations covered multiple engagements by different organisations, such as the Commission, the Panel, and the Ministry for the Environment with key stakeholders, the general public, and iwi/Māori.

The Commission's consultation on the 2050 target

76. The Commission called for evidence to support three pieces of advice related to New Zealand's climate targets between 31 March and 31 July 2023. The Commission then publicly consulted including with iwi and Māori on their draft advice for the 2050 target review from 8 April to 31 May 2024.[43] The consultation's feedback informed their final advice to the Government which was published November 2024.[44] The consultation's feedback is included under relevant sections of the final report and a summary of responses where consent had been given was publicly released.[45]

Independent methane science and target review

77. The Panel sought submissions of relevant scientific evidence for their review, but did not carry out consultation. There was some direct engagement with AgriZero NZ and the Methane Science Accord, the latter due to the number of submissions associated with the group.

78. Although the Panel was not required to meet with stakeholders as part of its Terms of Reference, a process was provided where interested parties could submit relevant evidence. Several organisations have publicly expressed their perspectives on the Panel's review. This includes:

- Greenpeace Aotearoa stated adopting the 'no additional warming' concept would lead to a weakening of the biogenic methane components of the target and "lowering New Zealand's climate ambitions would in itself seriously compromise commitments

[43] Discussion document: 2024 Review of Aotearoa New Zealand's 2050 emissions reduction target » Climate Change Commission
[44] Climate-Change-Commission-Target-and-ISA-Final-Advice-04Dec2024-with-errata-message.pdf
[45] Consultation: Review of the 2050 emissions reduction target - He Pou a Rangi » Climate Change Commission - Citizen Space

made under the Paris Agreement to reduce our climate footprint as an individual country."

- DairyNZ welcomed the Methane Science and Target Review and expressed a preference for a swift decision on revised biogenic methane targets to give farmers certainty.[46]
- Lawyers for Climate Action New Zealand (LCANZ) criticised the potential adoption of 'no additional warming' stating that a change of this kind "would effectively allow New Zealand to maintain its current share of warming from methane into the future, rather than seeking the deep reductions that the IPCC has made clear are needed now".[47]
- Beef + Lamb NZ publicly welcomed the findings of the Methane Science and Target Review, noting that it is an important contribution to the conversation about emissions, warming and science-based targets. It encouraged the Government to make a swift decision so that farmers have certainty. Since the report's release, they have often reiterated a call to the Government to "urgently amend New Zealand's domestic biogenic methane targets based on the principle of 'no additional warming' and align that with our international commitments [a comment that was made following the release of NDC2] so that farmers have certainty about what they are being asked to do and that is no more or less than other sectors in New Zealand".[48] It reiterated its call to amend the biogenic methane target based on 'no additional warming' in its bottom lines on climate change policy.[49]
- Federated Farmers have publicly advocated for a biogenic methane target that is lower than 24 per cent, noting that they have significant concerns about the assumptions underlying Government projections that have New Zealand meeting the lower end of the current target (24 per cent).[50]

Emission Reduction Plan 2 consultation

79. The ERP2 consultation concluded in August 2024. Some key generalised findings relevant to the 2050 review are:

- Scope and ambition: strong calls for proposals to go further, and to include more activities and policies to increase the likelihood of meeting budgets and targets.
- Use of technology: reliance on technological solutions to meet near-term budgets is a high-risk strategy.
- Agriculture: more should be done to reduce emissions, drive technological solutions, explore opportunities for research and development, and progress pricing agricultural emissions before 2030. These views may not align with those expressed by the agriculture sector.
- Iwi/ Māori: will be affected in similar ways to other New Zealanders, but are more vulnerable to job loss and reduced household income, some impacts are unique to

[46] https://www.dairynz.co.nz/news/dairynz-urges-swift-decisions-on-biogenic-methane-targets-to-give-farmers-certainty/
[47] Lawyers for Climate Action New Zealand, Methane Matters - And So Do Metrics
[48] https://www.ruralnewsgroup.co.nz/rural-news/rural-opinion/farmers-certainty-acland-beef-lamb-nz
[49] https://beeflambnz.com/news/blnzs-bottom-lines-climate-change-policy
[50] https://www.carbonnews.co.nz/news/34492/fed-farmers-ready-to-go-into-battle-over-methane-target

iwi/Māori that need to be carefully managed and considered.

Nationally Determined Contribution 2 engagement

80. An opportunity for public feedback was provided between 19 November and 8 December 2024 and found:

- Priorities were alignment with the Paris agreement, the Global Stocktake and highest possible ambition.
- A range of economic issues, such as inflation and the cost of living, the importance of exports to the New Zealand economy, and opportunities for electrification in the future.
- New Zealand's "fair share" includes our status as a developed country, ability and capacity to take action, high per capita emissions, the need to set a benchmark for other countries to follow, and leadership in the Pacific.

81. An online survey ran between 22 November and 2 December 2024 and key findings included:

- A strong sense of commitment to meeting our targets.
- Prioritising a feasible target, doing our fair share, while minimising economic impact and cost to businesses and households.
- Accelerating agriculture technology and innovation, uncertainty about the timeframe, effectiveness and uptake of future technology.

82. There was also targeted engagement with Treaty partners and stakeholders on NDC2 which showed:

- Pou Take Āhuarangi, the climate-focused branch of National Iwi Chairs Forum (NICF), supports Aotearoa to reduce emissions at pace to minimise climate impacts on vulnerable communities such as iwi and hapū.
- Te Rarawa's feedback highlighted clear timeframes and achievable goals are essential. They also noted the importance of the voluntary carbon market, agritech, and the need for mitigation measures to be realistic for Māori.
- Rangitāne Tū Mai Rā focused on climate adaptation and regional development noting the importance of research and development in technology, opportunities from wider removals including blue carbon and continued native afforestation.
- Youth groups highlighted a high ambition approach, where New Zealand would lead by example in the Pacific, demonstrate strong climate leadership and upholding its international commitments and integrate intergenerational equity and children's rights.
- Agriculture sector stakeholder submissions reinforced the need to take into account the short-lived nature of methane and called for thorough consideration of the outcomes of the independent review of biogenic methane science and targets.
- Land-based primary sector stakeholders also highlighted the need to balance climate mitigation with food production and regional economies and community needs. For

example, over-reliance on afforestation risks displacing productive farmland and impacting rural communities and jobs.

Insights from other engagement with iwi/Māori

83. Previous consultation relevant to this proposal highlighted the following insights:[51]

- Changes to the 2050 target may have a disproportionate impact on Māori given the concentration of employment and collectively held Māori assets in the agriculture and forestry sectors.
- Strong action on climate change is cost-effective and will mitigate worst costs of climate change for future generations. The effects of climate change may cause further economic disparity for those working in these sectors.
- The need for better, meaningful collaboration and engagement with Māori as Treaty partners in response to climate change.
- The need to acknowledge the unique and disproportionate impacts of climate change on hapori Māori (Māori communities), including effects on traditions and knowledge systems, and vulnerability of taonga and wāhi (places) to severe weather events and sea level rise.

Consultation on the Zero Carbon Bill

84. The Zero Carbon Bill was consulted on in July 2018. Most submitters (91 per cent) supported an all-gas net zero target (with 5 per cent of submitters supporting the split-gas approach implemented), and broadly agreed it could be revised under exceptional circumstances. Businesses favoured a flexible approach, whereas other groups stated the target should not be allowed to be made less ambitious as a general approach due to the seriousness of climate change.[52]

Next steps and opportunity for feedback on the 2050 target

85. Updating the 2050 target will require legislative change. Normal legislative processes provide opportunity for public submissions and engagement as part of the Select Committee process. Decisions are yet to be made on the preferred legislative process.

[51] This includes consultation on the Zero Carbon Bill, the first and second ERPs, NZ ETS legislation (Governance of the NZ ETS 2023, Proposals to redesign the permanent forest category in the New Zealand Emissions Trading Scheme 2023) and the Commission's consultation on their review of the 2050 target.

[52] The full Zero Carbon Act summary of submissions can be found here - https://environment.govt.nz/assets/Publications/Files/Zero-Carbon-Bill-Summary-of-Submissions-FINAL.pdf

Section 2: Assessing options to address the policy problem

What criteria will be used to compare options to the status quo?

86. The objectives and criteria discussed above will be used to assess the options. These are summarised in the table below.

Objectives	Criterion	Description
Alignment with the Government's economic agenda	Economic impact	Economic impact and how costs differ between groups, sectors, and regions
	Key impacts on sectors	Sectoral impact analysis based on projection or current policies
The 2050 target contributes to limiting the global average temperature increase to 1.5°C	Contribution to limiting warming to 1.5°C	Temperature outcomes and emissions impact
	International partners comparison	Comparison to international partners often aligned with New Zealand and warming/emissions impact analysis
The target can be feasibly implemented and support NZ's transition to net-zero by 2050	Achievable pathway: ERP2 modelled technological developments, likely policy implications	ERP2 modelled technological developments, risks and uncertainties associated with emissions reductions and removals

What scope will options be considered within?

87. Options to amend the 2050 target are a spectrum from a reduced to an increased contribution to addressing global warming. On this spectrum, some options only change the biogenic methane component of the 2050 target and others amend the long-lived gases component of the target, or both components. Variations of the options that express the target as a *range* of emissions reductions are also possible and included in some of the options.

88. Officials identified six options to amend the 2050 target that sought to illustrate the key trade-offs for Ministers. The options are drawn from both the Commission's report and the Methane Review. While some of the options identified are consistent with targets discussed in the Methane Review, the framework and criteria used to analyse the options do not take a 'no additional warming' approach.

89. Fundamental changes to the 2050 target, such as a move away from a split-gas approach, or removing the target altogether, were ruled out of scope. This is because there is broad understanding of the impacts of climate change and ongoing support for action. Retaining the split-gas approach reflects New Zealand's unique emissions profile and recognises the distinct characteristics of short- and long-lived gases.[53]

[53] New Zealand takes a 'split gas' approach and treats long-lived and short-lived gases separately due to their differing warming impacts (see section below) and so excludes biogenic methane from 'net zero'.

90. Changes to accounting metrics and the factors used for converting different gases to a single metric were ruled out of scope because New Zealand is required to use the GHG metric GWP100 using AR5 factors for international reporting. The biogenic methane component of the 2050 target does not require the use of a GHG metric as the target requires an absolute percentage reduction in biogenic methane emissions (relative to 2017).

91. Non-regulatory options were also considered out of scope. The primary issue lies in the level at which the 2050 target is set in legislation and its subsequent effects. For instance, this includes the impacts on long-term warming levels and the distribution of efforts to reduce emissions across the economy. Non-regulatory options such as investment or initiatives to encourage voluntary action would not directly address these issues but are still available under the legislative framework for responding to climate change.

92. Option 1 in the RIS is the status quo which includes our current legislated target and how it is implemented through ERP2. This essentially serves as a counterfactual. All proposed options are assessed against the status quo. All options also maintain the status quo for the 2030 biogenic methane reduction (10 per cent reduction from 2017 levels by 2030).

93. The Commission's recommendation included making further emissions reductions post 2050 (i.e. as outlined in option six). While this is technically a consideration that could be applied to all options, we have deferred consideration of a post-2050 target until later this year.

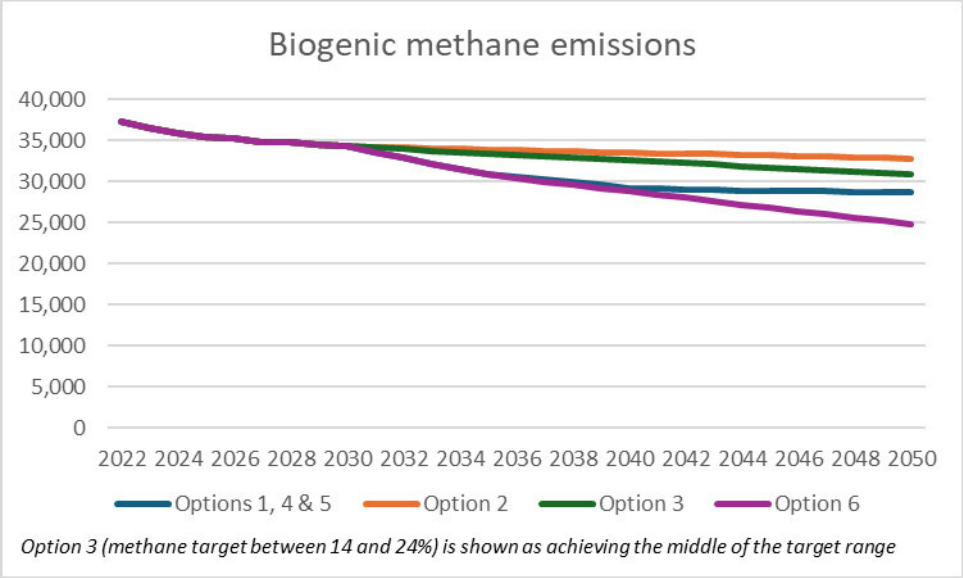
What options are being considered?

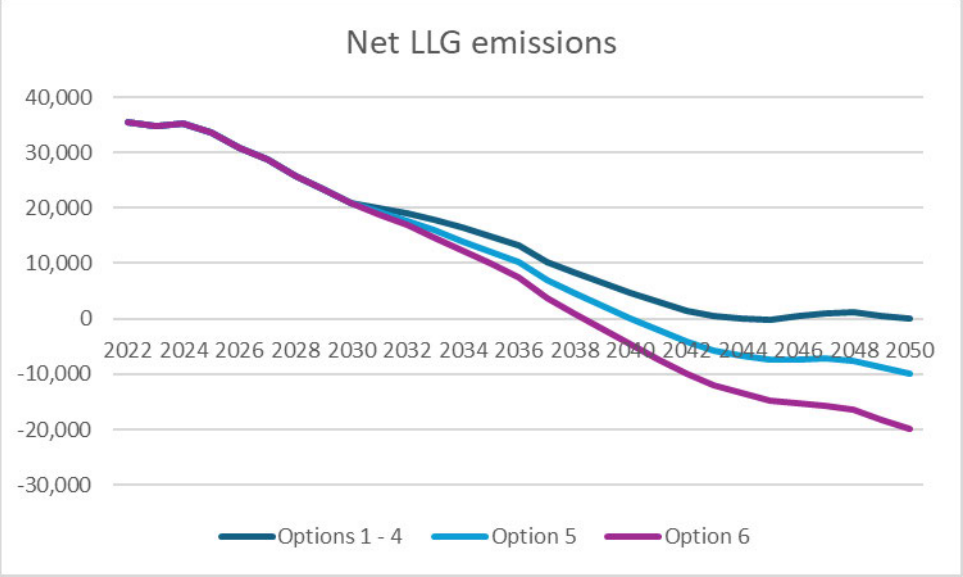
94. The following options reflect a spectrum of changes to New Zealand's domestic climate change contribution by potentially amending the 2050 target.

Option 1 (status quo)	**Option 2**	**Option 3**	**Option 4 (preferred option)**	**Option 5**	**Option 6**
Our baseline for this analysis is the current targets in the CCRA and assumed policy mix as part of Emissions Reduction Plan 2	Reduced biogenic methane component of 2050 target (14 per cent less than 2017 emissions), status-quo for long-lived gases (net zero)	Reduce biogenic methane target 14-24 per cent below 2017 levels; status quo for long-lived gases (net zero)	Clarify biogenic methane component of 2050 target at the lower end of the current range (24 per cent less than 2017 emissions); status quo for long-lived gases (net zero)	Clarify biogenic methane component of 2050 target (24 per cent less than 2017 emissions), Strengthen target for long-lived gases (net negative 10Mt CO_2-e emissions).	Increase ambition of 2050 target as recommended by the Commission (35–47 per cent less than 2017 for biogenic methane; negative 20Mt CO_2-e for long-lived gases; further reductions and removals beyond 2050)

95. In order to model the impacts of these options, it is necessary to make assumptions about how emissions will change over time under different 2050 targets. The graphs below show what has been assumed in this analysis for the different options.

96. For options one, three (at the upper end of the biogenic methane range, 24 per cent), four and five, biogenic methane emissions are based on the ERP2 new measures projections[54] – reaching a 24.9 per cent reduction against 2017 levels by 2050. Under option two and three (at the lower end of the biogenic methane range, 14 per cent), methane emissions are based on ERP2 projections until 2030 and then start to decline more slowly, whereas under Option six biogenic methane emissions are based on ERP2 projections until 2035 and then decline linearly to the lower end of the 2050 target (35 per cent). This linear reduction begins in 2035, rather than 2030, because methane decreases more rapidly in the ERP2 projections than it would under a linear pathway beginning in 2030.





[54] Details of the policy assumptions used in these projects are included in the ERP2 technical annex, https://environment.govt.nz/assets/publications/climate-change/ERP2/New-Zealands-second-emissions-reduction-plan-2026-30-Technical-Annex.pdf

97. In terms of long-lived gases, options one, two, three and four are based on ERP2 projections – reaching net zero in 2044 and -42kt CO_2-e in 2050.[55] Under Options five and six, net long-lived gases are based on ERP2 projections until 2030 and then start to decline more quickly, reaching -10Mt and -20Mt CO_2-e in 2050, respectively.

98. As discussed in the ERP technical annex,[56] there is uncertainty in projecting emissions over long time horizons in a diverse economy. For ERP2 net long-lived gases emissions in 2050 ranged from -4.3Mt CO_2-e (in a low emission scenario) to 15.6 Mt (in a high emissions scenario), with a central estimate of 0.0 Mt. For methane, emissions in 2050 ranged from 25.1Mt CO_2-e to 32.0Mt CO_2-e, with a central estimate of 28.6Mt CO_2-e.

99. We have used the ERP2 central projections as the basis for our modelling as this represents our best current understanding of New Zealand's future emissions. However, the costs, opportunities and difficulties of achieving a given 2050 target are inherently uncertain and will be influenced by factors such as population growth, technological changes and commodity prices.

Option 1: Status Quo

100. The status quo is the 2050 target currently legislated in the CCRA, which has two components:

- Net zero emissions of greenhouse gases (i.e. long-lived gases) other than biogenic methane, by 2050 and for each subsequent calendar year; and
- Emissions of biogenic methane – are 10 per cent less than 2017 emissions by calendar year beginning on 1 January 2030; and are 24 per cent to 47 per cent less than 2017 emissions by 2050 and for each subsequent calendar year.

101. As discussed above, when the 2050 target was first set New Zealand's biogenic methane target was informed by the central (interquartile) range for biogenic methane in the IPCC Special Report on Global Warming of 1.5°C. In practice, the range provides flexibility for potential advancements over the 2050 target period which means New Zealand could take greater action if new technologies, scientific understanding, and changes in practices materialise. The range allows for different levels of ambition based on these developments.

102. However, the range causes ambiguity on the level of emissions reductions required, leading to uncertainty which can impact potential investments in regulated sectors. This uncertainty stems from the implication that policy measures will be developed to meet the emissions reduction target range (24-47 per cent), potentially resulting in additional imposed costs.

103. The lower end of the range represents the minimum reduction that New Zealand has committed to achieve, confirming a base level of action and accountability. The upper end of the range is intended to provide for more ambitious efforts, such as the adoption of new technologies or more effective practices, and could drive innovation.

[55] This pattern of net long-lived gases emissions increasing after 2044 is due to projected fluctuations in annual forestry removals.
[56] Second emissions reduction plan technical annex. Pg 12. New-Zealands-second-emissions-reduction-plan-2026-30-Technical-Annex.pdf

104. The baseline for this analysis is the legislated target in the CCRA and the assumed policy measures outlined ERP2. Accordingly, the options analysis will treat the legislated target and ERP2 as the status quo, as it represents the most recent set of projections and has been agreed upon by Government. All options assume the 2030 biogenic methane target is met and retain status quo for that target. Options two, three and four retain status quo for long-lived gases.

Option 1 analysis against the objectives and criteria

Alignment with the Government's economic agenda

105. The status quo has no economic costs beyond the costs of implementing ERP2, which were considered as part of the ERP2 development process.

106. For completeness this section sets out some impacts of implementing ERP2.

107. At an economy-wide level, the CGE 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. When compared to an existing measures pathway (including the assumed impact of the NZ ETS and other ongoing policies that predated ERP2), the impact on real GDP of ERP2 is a reduction of 0.02 in 2030 and 0.15 per cent in 2050.[57]

108. ERP2 policies for specific sectors include:

- The 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.
- Energy policies presented in ERP2 are:
    i. 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. Improvements to electricity generation consenting processes will help reduce energy cost pressures in the long-term.
    ii. Enabling carbon capture, utilisation and storage (CCUS): This recognises and rewards CCUS emission reductions and removals in the NZ ETS. It also creates a regulatory regime to set out consenting, monitoring and liability arrangements for individual projects.
    iii. Transport: Reducing transport emissions by supporting more electric vehicles through development of a network of 10,000 electric vehicle charging points by 2030.

[57] Second emissions reduction plan technical annex. Pg 50. New-Zealands-second-emissions-reduction-plan-2026-30-Technical-Annex.pdf

- Agriculture: The main agriculture policy in ERP2 is agricultural emissions pricing, which 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 (however no policy decisions have been made on this mechanism and the modelling is/was subject to high uncertainty). Implementing a pricing system by 2030 will increase costs for the sector, with the exact impacts depending on its design. Compared to a hypothetical 'without measures' counterfactual, agriculture is the most impacted sector. 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. 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).
- Forestry: Forestry output is expected to be 12 per cent higher in 2050 than it would have been without any mitigation actions, in part due to incentives set through the NZ ETS. ERP2 proposed two new forestry policies:
    i. 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 is expected to reduce land-use change to forestry.
    ii. 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 policies presented in ERP2 are:
    i. The 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.
    ii. Organic waste management and landfill gas capture: Regulatory changes that improve the management of organic waste and the average efficiency of landfill gas capture.

109. Waste and agricultural emissions reduction policies suggest New Zealand can meet its biogenic methane target at the lower end of the current range (24 per cent).

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

110. Maintaining the current 2050 target would not result in any changes to our current contribution to limiting global warming to 1.5°C. In its recommendation to amend the 2050 target, the Commission advised that significant changes have occurred which warrant an increased contribution in addition the status quo. The UN Global Stocktake echoed this message for all countries, acknowledging that progress has been made but there is a need for urgent and deep cuts in emissions aligned with 1.5°C.[58]

111. Meeting the lower end of the biogenic methane component of the 2050 target range and the net zero target in 2050 (modelled based on the projected emissions from ERP2) will

[58] Outcome of the first global stocktake | UNFCCC

likely mean that New Zealand's domestic contribution to warming will be above current levels by the end of the century.[59] Meeting the upper end of the biogenic methane target in 2050 would return warming to approximately 2008 levels by the end of the century,[60] essentially reducing New Zealand's contribution to global warming by ~13.4 per cent (relative to the warming projected at the end of the century under ERP2).

112. Current policies as per ERP2, assume we are tracking toward ~25 per cent reduction of biogenic methane in 2050 and reaching net zero long-lived gases in 2050.[61] Because New Zealand's approach to net zero excludes biogenic methane and does not reach 0 Mt CO_2-e in 2050, the status quo means there will be residual emissions of 28.9-20.2Mt CO_2-e in 2050. If biogenic methane reached a 47 per cent reduction in 2050, it would result in 8.4Mt CO_2-e less emissions than currently projected as per ERP2 (Appendix 4).

113. The status quo does not achieve net zero emissions for all-gases in 2050, meaning it is not aligned with international partners, such as Australia, Japan, Canada, the European Union (EU), United Kingdom (UK) and Ireland (Appendix 1). However, it is important to note that New Zealand's domestic target approach requires gross emission reductions of biogenic methane which cannot be offset by carbon removals [see *Our approach to net zero greenhouse gas emissions section* above].

The target can be feasibly implemented and support NZ's transition to 2050

114. The current policy measures in ERP2 under the status quo can be feasibly implemented:

- Key policies that drive the transition to 2050 include; the NZ ETS, an agricultural emissions pricing system that is modelled to drive uptake of agricultural mitigation technologies,[62] removing barriers to renewable electricity development, enabling CCUS, the development of a network of electric vehicle charging points and afforestation on Crown land.[63]
- ERP2 includes assumptions we have confidence in about the development and uptake of new technologies including electric vehicle/ zero emissions heavy vehicle uptake; new agriculture emissions mitigation technologies (e.g. nitrification and methane inhibitors); carbon capture, utilisation and storage.

115. ERP2 has policies and initiatives for the second emissions budget (EB2) period, although some policies have impacts beyond this, but contains projections out to 2050. ERP2 notes that New Zealand is projected to have 9.2Mt shortfall to meet EB3. Therefore,

[59] The warming outcomes are given for 2100 because the 2050 target has a warming impact that extends beyond 2050 and the 1.5°C global temperature goal that is referred to in the purpose of the CCRA and the Paris Agreement is based on limiting global warming to 1.5°C by the end of the century (2100).
[60] Modelled based on the projected emissions from ERP2 adjusted to meet the 47% biogenic methane component of the 2050 target, with adjustments made from 2035 onwards.
[61] Driven by trends in removals, ERP2 projections suggests net zero will be first achieved in 2044 but sustained from 2050.
[62] The Government has invested over $400 million to accelerate the development and commercialisation of tools and technologies to reduce emissions.
[63] Implementation details of some policies are yet to be confirmed by Cabinet.

additional or enhancement of existing policies will need to be developed for ERP3 that address this gap.

116. To achieve the net zero long-lived gases target, the NZ ETS in its current structure will need to be complemented by other policies as set out in ERP2 such as afforestation on Crown-owned land. Alternatively, changes to the NZ ETS could bring it into closer alignment with the net zero long-lived gases target. Structural changes to the NZ ETS such as bringing in agricultural emissions into the NZ ETS or treating New Zealand Units (NZUs) from forestry differently from other NZUs do not align with decisions made by the Government in 2024.

117. The current 2050 target provides long-term policy stability to guide climate action and is supported by a five-yearly review that allows for updates in response to new science, technology, and national circumstances. This framework aims to balance predictability with adaptability, which some consider helps to maintain broad political and public support over time. However, we note there is some uncertainty associated with the wide range of the biogenic methane component of the 2050 target.

Option 2: Reduced biogenic methane target (14 per cent less than 2017 emissions), status-quo for long-lived gases (net zero)

118. Option two proposes to amend the biogenic methane component of the 2050 target to a reduction of 14 per cent below 2017 levels by 2050. The Panel found that for a mid-range global emissions scenario of limiting temperature increase to approximately 2.0°C - 2.7°C reducing New Zealand's biogenic methane emissions by 14-15 per cent by 2050 would meet the principle of 'no additional warming'. The Panel stated that this scenario is closest to current global emissions as well as the NDCs in place at the time (2024). While this option draws from the Panel's finding, this does not imply we are adopting a 'no additional warming' approach to setting a 2050 target.

119. The long-lived gases component of the 2050 target would remain at status quo.

Option 2 analysis against the objectives and criteria

Alignment with the Government's economic agenda

120. Compared to ERP2, agricultural output will be higher as policies to address agricultural emissions may be less stringent and less likely to negatively impact agriculture sector growth and international competitiveness. However, output from other sectors will generally be lower since resources (employment, investment, etc) are diverted from other sectors to the agricultural sector to support its higher output. The increased output from agriculture effectively "crowds out" activity elsewhere.

121. Overall, the modelled impact on GDP is negligible – only a 0.01 per cent increase from status quo in 2050. However, other economic variables are slightly more impacted, with employment being 0.1 per cent higher than status quo in 2050 and wages 0.2 per cent higher. This indicates that the aggregate economic impact of a lower biogenic methane target is small, although it does have important sectoral impacts.[64]

[64] It is possible different models would show a more positive overall GDP impact – though we would still expect the overall impact to be small. The basic conclusion that higher output for agriculture crowds out activity elsewhere in the economy is in line with our expectations.

122. This change in sectoral output flows into regional impacts – regions with significant agricultural sectors (such as Northland and Southland) gain more GDP compared to ERP2 projections, while regions where agriculture is less significant (such as Auckland and Nelson) are projected to have lower GDP in 2050.

123. This option proposes that the net zero 2050 target remains at net zero long-lived gases. However, as EBs are set on an all-gas basis, reducing efforts to lower biogenic methane emissions would require a corresponding reduction in the NZ ETS cap. This means sectors covered by the NZ ETS would need to reduce more emissions than currently expected, unless EBs are also adjusted. If the budgets are not amended, lowering the NZ ETS cap would likely increase NZU prices and lead to an overall reduction in GDP. To illustrate this, we modelled a situation where the biogenic methane target was reduced to 14 per cent, but long-lived gases abatement increased to avoid net impact on EBs. In this scenario, GDP in 2050 was about 0.1 per cent lower than the status quo.

124. As with option one, the assumed emissions profile used in the modelling for this option exceeds EB3. As set out above, actions to close the gap so the third budget is achieved might have an additional, albeit small, economic impact.

9(2)(h)

9(2)(h)

9(2)(h)

9(2)(h)

6(a), 9(2)(g)(i)

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

129. Option two would reduce New Zealand's contribution to the international goal of limiting global warming to 1.5°C. Under this option, biogenic methane emissions would be reduced by 14 per cent, while the net zero 2050 target would be maintained. Our modelling assumes that net emissions of all GHGs other than biogenic methane follow the projected ERP2 trajectory to 2050 and then remain constant. As a result, New Zealand's contribution to global warming would likely continue to increase to the end of the century. The extent of this warming impact could vary depending on whether, and how, EBs are amended.

130. Compared to the status quo, this option would increase New Zealand's contribution to global warming by ~6.2 per cent by the end of the century relative to the warming associated with projected emissions under ERP2 and by ~22.7 per cent relative to meeting the upper end (47 per cent) of the biogenic methane component of the 2050 target (Appendix 3, Table 2).

131. A 14 per cent biogenic methane target would result in 32.7Mt CO_2-e in 2050, which is 4.1Mt CO_2-e higher than currently projected as per ERP2 (Appendix 4).[66] In comparison to

6(a), 9(2)(g)(i)

[66] Compensating for the additional warming caused by lowering the 2050 biogenic methane component of the 2050 target to 14% would require net negative emissions of all GHGs excluding biogenic methane prior to 2050, with estimates suggesting compensating for this additional warming would require cumulative gross CO_2 reductions between now and the end of the century of ~502-1512

countries like Australia, Japan, Canada, the EU, UK, and Ireland, that will reach 0Mt CO_2-e in 2050, and others like Finland and Germany, which are setting even more ambitious targets, this option will further reduce alignment with international partners committed to net zero all-gases targets.

132. A 14 per cent biogenic methane target built on a scenario of a background 2.0-2.7°C temperature increase may be seen as inconsistent with proactively pursuing efforts to limit global warming to 1.5°C under the Paris Agreement, 6(a) .

The target can be feasibly implemented and support NZ's transition to 2050

133. This option is more feasible than maintaining the status quo, as it would involve a lower biogenic methane target. However, achieving this lower target would still likely require a rapid uptake of new technologies. It would also improve certainty in terms of what level of emissions reduction is required. From 2030, this option would require a 0.2 per cent decrease in methane per year to reach the 2050 target. The possible impacts on emissions of long-lived gases are discussed below.

134. Like the status quo, option two assumes a system to support the uptake of agricultural mitigation technology is in place by 2030 to meet a 14 per cent reduction in biogenic methane. In the absence of support or incentives for agricultural technology uptake, baseline biogenic methane reductions from ERP2 were modelled to be between 8.3 per cent in 2030 and 9.1 per cent by 2050, which are not sufficient to meet the biogenic methane component of this option.

135. If the biogenic methane component was reduced, there would be an emissions gap of 18.4Mt CO_2-e in the EB3 period. If no adjustments are made to the EBs to reflect the new target, the shortfall in the EB3 period would need to be made up by reductions of long-lived gases. This would need to be addressed in ERP3. However, if EB3 is reduced to accommodate this, it may reopen the gap between our domestic and international targets, as NDC2 was set to align with EB3. As a result, we may need to increasingly rely on offshore mitigation to meet NDC2.[67]

136. If the biogenic methane component was reduced and the burden to address the 18.4Mt CO_2-e gap shifted to ETS sectors, the impacts on the NZ ETS would either include tighter settings or other actions in ETS covered sectors to make up for the lower biogenic methane reductions during EB3. 9(2)(f)(iv)

137. The change could also potentially further widen the gap between domestic efforts and our NDCs. There may be some impact as a result of how the NZ ETS interacts with non-ETS

Mt CO_2 (relative to achieving the lower and upper end of the current biogenic methane target) (see Appendix 3, Table 1).

[67] Based on NDC2 scenario analysis, 18.4Mt CO_2-e of offshore mitigation would cost approximately NZ$900M-2.6B.

sectors. For example, there could potentially be more long-lived gases emissions outside of the NZ ETS (mostly from agriculture) that require offsetting to meet the net zero target.

138. Option two proposes a reduction in one component of the target which could provide short-term flexibility, particularly in response to sector-specific concerns. Compared to the status quo, this option would result in less policy intervention for agriculture. However, it also carries risk to policy stability as substantial changes to the target are disruptive and can lead to diminished support for New Zealand's climate commitments.

Option 3: Reduce biogenic methane target 14-24 per cent below 2017 levels; status quo for long-lived gases (net zero)

139. Option three amends the biogenic methane component of the 2050 target to a range of reductions of 14-24 per cent below 2017 levels by 2050. The Methane Review on a 'no additional warming' target found that a 14-24 per cent reduction in biogenic methane emissions is consistent with stabilising the warming contribution of New Zealand's biogenic methane emissions at 2017 levels under global temperature scenarios of low (1.5°C) and mid-range (2.0°C-2.7°C), noting this would depend on which end of the target is met. This option is informed by the Methane Review and the Panel's findings, but does not imply New Zealand is adopting a 'no additional warming' approach to setting a 2050.

140. The net zero (long-lived gases) component of the 2050 target would remain at status quo.

Option 3 analysis against the objectives and criteria

Alignment with the Government's economic agenda

141. The economic impact of this option is likely to be small in 2050 as GDP is 0 (with a 24 per cent target) - 0.01 per cent (with a 14 per cent target) higher than the status quo. Similar to option two, other economic variables are slightly more impacted such as 0-0.1 per cent change in employment, and 0-0.2 per cent change in wages in 2050 compared to the status quo. As with option two, this indicates that the aggregate economic impact of a lower biogenic methane target is small, although it does have important sectoral impacts. The actual economic impact of this option will depend on where within the range the target is ultimately met in 2050, as well as the specific policies introduced to achieve the target.

142. Amending the biogenic methane target can alter sectoral output flows, which result in regional impacts. The impacts of this option will be somewhere between option one – no change from status quo – and option two where some regions experience higher GDP, notably Northland and Southland, while regions where agriculture is less significant, such as Auckland and Nelson, would have lower GDP.

143. This option proposes that the net zero 2050 target remains at net zero for long-lived gases. Depending on which end of the biogenic methane range is achieved through Government policies, this option would either maintain the gap in EB3 or would result in a shift in the emissions reduction burden to the ETS sectors (~ 9Mt CO_2-e), unless EB3 is revised based on the new 2050 target. This would result in an overall emissions gap of 18.4Mt CO_2-e to achieve EB3.

9(2)(h)

145. Trade policy considerations as outlined in paragraphs 126-128 for option two (14 per cent reduction in biogenic methane) also applies to option three.

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

146. The impact of this option on New Zealand's overall emissions and contribution to global warming will depend on what reduction is achieved within the range.

147. If a 14 per cent reduction in biogenic methane is achieved, New Zealand's contribution to global warming at the end of the century would be increased by ~6.2 per cent relative to the warming associated with projected emissions under ERP2 and by ~22.7 per cent relative to meeting the upper end (47 per cent) of the biogenic methane component of the 2050 target. At a midpoint of this range, New Zealand's contribution to warming would be increased by ~3.4 per cent relative to the warming associated with projected emissions under ERP2, and ~19.4 per cent relative to meeting the upper end (47 per cent) of the biogenic methane component of the 2050 target.

148. If a 24 per cent reduction is achieved, it would be similar to the status quo under ERP2 as New Zealand is currently projected to reduce biogenic methane emissions by ~25 per cent in 2050.

149. Calculated as an "all-gases" target, this option would be 32.7 to 28.6Mt CO_2-e depending on what reduction is achieved within the range. As with option two, in comparison to countries like Australia, Japan, Canada, the EU, UK and Ireland (Appendix 4), that will reach 0Mt CO_2-e in 2050, and others like Finland and Germany, which are setting even more ambitious targets, this option may risk appearing less aligned with international partners committed to net zero all-gases targets (noting all-gas net zero targets are unclear as to the level of gross methane reductions).

The target can be feasibly implemented and support NZ's transition to 2050

150. The feasibility of option three is similar to option two, discussed above. While both 14 per cent and 24 per cent are feasible with the current pipeline of mitigation technologies, a 14 per cent reduction in biogenic methane is more feasible than the status quo as meeting the target would require less change in the agriculture sector with the current pipeline of technology and policies identified in ERP2. A range at this level would require a 0.2 per cent per annum reduction in methane from 2030, up to a 0.7 per cent per annum reduction.

151. This option assumes policies or other actions of some kind are in place to support the sustained uptake of agricultural mitigation technology in order to meet a 14 per cent reduction in biogenic methane by 2030. In the absence of support or incentives for agricultural technology uptake, baseline biogenic methane reductions from ERP2 were modelled between 8.3 per cent in 2030 and 9.1 per cent by 2050 which are not sufficient to meet the lower or upper range of the biogenic methane component of this option.

152. Similar to option two, amending the biogenic methane target to 14 per cent could create an additional shortfall in EB3 which may impact the alignment between EB3 and NDC2. As discussed above, there will also be impacts on the NZ ETS settings and actions covered in

ETS sectors to make up for the lower biogenic methane reductions unless budgets were revised.

153. The range of this target could impact policy stability as it might be unclear what the agriculture sector should aim to achieve. However, it is a comparatively condensed range which may improve the certainty of achieving the biogenic methane target compared to the status quo. This option may result in less policy intervention for agriculture but could carry risks, as substantial changes to the target are disruptive and may impact support for New Zealand's climate commitments.

Option 4: Clarify the biogenic methane target at the lower end of the current range (24 per cent less than 2017 emissions): status quo for long-lived gases (net zero)

154. Option four clarifies the biogenic methane component of the 2050 target to a reduction of 24 per cent of 2017 levels by 2050. The Methane Review found that a 'no additional warming' target that was modelled using a background global emissions scenario that limited temperature increase to 1.5°C and is the lower end of the existing biogenic methane target range. While this option draws from the Panel's finding, New Zealand's target setting does not take a 'no additional warming' approach.

155. The net zero (long-lived gases) component of the 2050 target would remain at the status quo.

Option 4 analysis against the objectives and criteria

Alignment with the Government's economic agenda

156. This option may have a very small positive impact on the economy compared to ERP2. Future emissions in this option are unchanged from the status quo, so the CGE modelling does not show any economic impact from clarifying the biogenic methane target. However, there may be a small unquantified positive effect on agricultural businesses from having a more certain biogenic methane target and reducing the likelihood of stronger policies that aim to achieve the higher impact of the current target range.

157. As per ERP2, policies addressing agriculture sector emissions will still be needed to achieve a 24 per cent biogenic methane reduction. However, clarifying the target range may provide certainty to the agriculture sector about its contribution to New Zealand's climate change goals which may in turn have positive flow-on effects on investment (noting that this is not certain).

158. Policies that drive a reduction of 24 per cent in biogenic methane emissions are likely to be less costly for the agriculture sector from an economic perspective than policies associated with higher methane reductions (noting there is no obligation under status quo to achieve emissions reductions at the upper end of current target). To explore this, we modelled a scenario where biogenic methane emissions were reduced by 35 per cent (with no change in abatement for long-live gases). In this case, GDP was around 0.2 per cent lower in 2050 (compared to the status quo, where methane reduces to around 24 per cent).

159. The assumed emissions profile used for this option exceeds EB3. As set out above, actions to close the gap so the budget is achieved might have an additional small economic impact.

9(2)(h)

9(2)(h)

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

162. Option four proposes clarifying the biogenic methane target at the lower end of the current range by removing the upper end.

163. When evaluating the range, it could be helpful to assess the implications of achieving both the low and upper ends of the biogenic methane component of the 2050 target, and what each scenario means for emissions. This is as follows:

- At the lower end of the range, 24 per cent biogenic methane target would result in 28.9Mt CO_2-e in 2050, which is similar to current ERP2 projections (28.6Mt CO_2-e). Therefore a 24 per cent reduction in biogenic methane would be similar to the status quo.
- At the upper end of the range, by not achieving a 47 per cent reduction of biogenic methane, there would be an additional ~8.4Mt CO_2-e in 2050 and an increase in emissions between now and 2050 than currently projected as per ERP2.[68]

164. Under the status quo, there is only an obligation to achieve a 24 per cent reduction of biogenic methane, as the minimum legislated target. However, the range provides flexibility within policy settings to accommodate, for example, the latest available science on biogenic methane reductions, emerging technologies, and gearing policy settings towards higher levels of required gross reductions. Removing the upper end of the range may make it harder for future Governments to justify stronger policy signals to meet a higher level of methane reduction by 2050, if this was considered desirable, although it does not preclude this from occurring.

165. This option would result in the same contribution from New Zealand to global warming to the status quo under ERP2 as New Zealand is currently projected to reduce biogenic methane emissions by ~25 per cent in 2050.

166. Option four is lower than comparable countries with all-gas net zero targets, such as Australia, Japan, Canada, the EU, UK, and Ireland. Other countries, like Finland and Germany, have increased their net zero targets. Clarifying the biogenic methane component of the 2050 target would have a relatively small impact compared to the status quo but could

[68] For the modelling we have assumed that removing the upper end of the biogenic methane target range will not impact the current trajectory for biogenic methane under ERP2. However, it's possible that reducing the target range could lead to a deviation from the ERP2 projected trajectory which may lead to increased emissions over the 2022-2050 period.

be seen as less aligned with international partners that have committed to net zero of all-gases in 2050 or who are increasing their contribution to reducing emissions (noting that an all-gases net zero target is unclear as to the level of gross methane reductions).

The target can be feasibly implemented and support NZ's transition to 2050

167. Option four is equally feasible as the status quo with the current pipeline of technology and policies assumed in ERP2, which are set to achieve the lower end range of biogenic methane reductions. Achieving a 24 per cent biogenic methane reduction is more feasible when compared to the upper end of the status quo range which would require additional policy and systems change.

168. Meeting a 24 per cent reduction requires approximately a 0.7 per cent per annum reduction from 2030, and we consider this is achievable with the current pipeline of agriculture emissions technologies and a mechanism to support the uptake of these. This option is not likely to result in a material departure from existing EBs, noting ERP3 will need to close the existing gap to meet EB3, as outlined in ERP2. However, EBs could be reviewed if considered necessary given they were set within the policy context of a 24-47 per cent biogenic methane target.

169. Since agricultural emissions are outside of the NZ ETS, removing the range and clarifying the biogenic methane target will not directly impact the NZ ETS. Similar to the status quo, sectors covered by the NZ ETS will face the same price signals. There will still be the outstanding issue of reaching sustained net zero with the NZ ETS alone. Complementary policies to the NZ ETS may be required (such as those set out in ERP2), and potentially changes to the industrial allocation settings and overall coverage of the NZ ETS.

170. As this option is unlikely to result in material departure from existing EBs, it is unlikely to pose risk to NZ ETS settings' accordance with emission targets, or impact the 2025 settings process.

171. Option four provides a similar level of policy stability as the status quo. The key difference is removing the range of the biogenic methane target, which could increase long-term certainty for the agriculture sector by providing a single target level to achieve. This change helps clarify expectations and support investment decisions. As the target for long-lived gases remains unchanged, other sectors would continue to operate under the same policy settings as ERP2, maintaining stability across the broader economy.

Option 5: Clarify the biogenic methane target at the lower end of the current range (24 per cent less than 2017 emissions), strengthen target for long-lived gases to net negative 10Mt CO_2-e[69]

172. Option five clarifies the biogenic methane component at 24 per cent, the lower end of the current range, while increasing ambition for long-lived gases to net negative 10Mt CO_2-e by 2050.

173. The difference in emissions reductions between the biogenic methane range of 24 per cent and 47 per cent is ~9Mt CO_2-e by 2050. Option four provides a way to rebalance

emissions reductions to avoid additional residual emissions as a result of removing the upper end of the range. 9(2)(h) .

174. This option of rebalancing short-lived and long-lived gases (based on their carbon dioxide equivalent values using the GHG metric GWP100) effectively results in similar emissions levels emissions by 2050 as achieving the status quo at the upper end of the current target range.[70]

Option 5 analysis against the objectives and criteria

Alignment with the Government's economic agenda

175. This option would have a small economic impact – modelling indicates that GDP in 2035 would be around 0.1 per cent lower than the status quo and around 0.3 per cent lower by 2050. This decline in economic activity is broad-based, with most sectors experiencing some fall in output – the notable exception being electricity generation, which is significantly increased. This is consistent with the more ambitious target driving higher levels of electrification in the economy.

176. As noted earlier, this increased electrification of the economy would have associated co-benefits that are not included in the modelling. These include higher energy security (as New Zealand would be less reliant on imports of fossil fuels) and health benefits from lower transport emissions.

177. In addition, as with option four, clarifying the biogenic methane target range may provide certainty to the agricultural sector, which could have a small positive impact on business confidence and investment by farmers – and therefore sector growth and international competitiveness.

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

178. Option five would strengthen New Zealand's contribution to global efforts to limit the global average temperature increase to 1.5°C, as it would aim to reduce net emissions of gases other than biogenic methane to -10Mt CO_2-e, which is more ambitious than the current target of net-zero. A 24 per cent biogenic methane target and net negative 10Mt of long-lived gases would result in 18.6Mt CO_2-e in 2050, which is ~10Mt CO_2-e less than currently projected as per ERP2 projections.

179. This option is likely to lead to greater reductions in total emissions over the 2022-2050 period, increasing alignment from an all-gases perspective, but would change the alignment when considering biogenic methane and all other gases separately. Based on the specific emission trajectories chosen here, this option would reduce New Zealand's contribution to global warming by an additional ~7.4per cent than projected under ERP2 by the end of the century. However, option five would result in a higher contribution from New Zealand to global warming of ~6.9 per cent than under the current target by the end of the century, but

[70] This rebalancing is only based on the emissions in 2050 and is not based on compensating for the increase warming which would require substantial cumulative reductions in carbon dioxide and/or increased carbon removals between now and the end of the end of the century (see Appendix 3, Table 1).

only if the upper end of the current biogenic methane target range (47 per cent) were achieved (see Appendix 3, Figure 1).[71]

180. From a greenhouse gas emission perspective, option five does not achieve net zero emissions for all-gases in 2050 (Appendix 1 refers). However, this option goes beyond the current target and reduces emissions further in 2050 compared to the status quo. This is better aligned with countries who have also increased their net zero targets, such as Germany and Finland, and those who require all-gas net zero like Australia, Japan, Canada, the EU, UK, and Ireland.

The target can be feasibly implemented and support NZ's transition to 2050

181. This option will require a mechanism to incentivise emissions reductions beyond compliance under the NZ ETS to achieve net negative emissions. This could include afforestation outside the NZ ETS, or more substantial changes within the NZ ETS, or a combination of both. If this option was achieved using substantial changes within the NZ ETS, it would likely result in NZ ETS sectors shouldering a higher burden for reducing long-lived gases to make up the difference. This change could risk the ability for NZ ETS settings to strictly accord with our 2050 target. The Minister for Climate Change may need mechanisms outside of the NZ ETS, or significant reductions to auction volumes in order to meet this accordance test.

182. Option five would require policies beyond those planned under the status quo. This could be a large burden on ETS sectors who would have to further increase emission reductions to help achieve net negative. This may affect investor confidence, raise concerns about fairness or feasibility, and risk undermining the broad political consensus that supports the current framework. However, by clarifying the biogenic methane target, this option could enhance long-term policy stability for the agriculture sector.

Option 6: Strengthening both the biogenic methane and long-lived gases targets as recommended by the Commission; by 2050 reduce biogenic methane to 35-47% from 2017 levels and by 2050 reduce all other gases (long-lived) to net negative 20Mt CO_2-e

183. As part of the 2050 review required under the CCRA, the Commission found there have been significant changes since 2019 which impact the effectiveness of the target and that in their view, justify amending it. In the Commission's view, these significant changes indicate New Zealand should accelerate efforts to reduce emissions by amending the 2050 target as follows:

- net accounting emissions of greenhouse gases other than biogenic methane are at least negative 20Mt CO_2-e by the calendar year beginning on 1 January 2050
- emissions of biogenic methane in a calendar year are:

[71] Achieving the more ambitious end of the current biogenic methane target and achieving and maintaining the net-zero target in 2050 would likely result in a lower contribution to global warming from New Zealand by the end of the century than achieving a 24% reduction in biogenic methane and net-negative emissions of -10Mt CO_2-e of gases other than biogenic methane by 2050. This is because methane is a powerful and short-lived GHG, were significant reductions before 2050 can contribute to reducing New Zealand's contribution to global warming in the near-term.

i. at least 10 per cent less than 2017 emissions by the calendar year beginning on 1 January 2030 (status quo), and

ii. at least 35–47 per cent less than 2017 emissions by the calendar year beginning on 1 January 2050

iii. There are further reductions and removals of greenhouse gases after 1 January 2050.

184. Consideration of post-2050 emissions reductions has been deferred until later this year.

185. The Commission summarised its approach to the biogenic methane component of 2050 target as follows: "*For biogenic methane, the lower end of the recommended target range reflects a pathway that, according to our analysis, is largely possible with current technologies. The higher end reflects what is likely to be possible with significant changes in technology, in particular if methane inhibiting technologies become available in Aotearoa New Zealand...Biogenic methane accounts for more than half of the warming impact from Aotearoa New Zealand's greenhouse gas emissions. Reducing these emissions would have an immediate impact on Aotearoa's contribution to global efforts to limit warming. The recommended target reflects the importance of every sector contributing to Aotearoa New Zealand's efforts to cause less warming*".[72] See feasibility section below for more information.

Option 6 analysis against the objectives and criteria

Alignment with the Government's economic agenda

186. Under option six, significant reductions in emissions are required which results in moderate economic costs. Modelling suggests that GDP in 2035 would be about 0.4 per cent lower than it would otherwise be, and in 2050 it would be about 2.2 per cent lower. The GDP impacts in the 2040s are particularly high, as very high emissions prices in the model are required in order to achieve to the -20Mt CO^2-e 2050 target for long-lived gases. This impact may be overstated, as in reality we would expect the high emissions prices to drive innovation and result in new emissions-reduction technologies. This dynamic is not captured in the modelling because of the inherent uncertainty of technological development.

187. In the modelling, we assumed that afforestation rates remain unchanged compared to the status quo. However, achieving the -20Mt CO_2-e long-lived gas target would likely require very high ETS prices, which would result in very strong afforestation incentives, particularly for exotic forestry. This option could therefore significantly impact land-use decisions not fully captured in the modelling. However, the extent of this impact and feasibility of this option would also depend on other Government policies, notably the policy to limit afforestation entering the ETS on certain land use classes.

188. If there were higher afforestation rates than modelled, the GDP impact would be somewhat improved depending on the return associated with the removals (GDP would still reduce compared to the status quo, but by less). However, there would be greater sectoral

[72] Climate Change Commission 2050 report. pg 25. Climate-Change-Commission-Target-and-ISA-Final-Advice-04Dec2024-with-errata-message.pdf

impacts, with reduced output from sheep and beef and increased output from the forestry sector.

189. As with option five, this option would bring about co-benefits not captured in the modelling due to improved energy security and health benefits from lower transport emissions. As this option involves larger emissions reductions than option four, these co-benefits would likely be larger.

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

190. Option six would strengthen New Zealand's contribution to global efforts to limit the global average temperature increase to 1.5°C compared to the current target range and ERP2. Under this option, emissions are close to net zero all-gases in 2050 and New Zealand's contribution to global warming by the end of the century is much lower compared to all other options considered, returning warming to pre-2000 levels by the end of the century (see Appendix 3, Figure 1).

191. Under this option (modelled based on the trajectory of ERP2 up to 2030 for long-lived gases and up to 2035 for biogenic methane), New Zealand's warming impact would peak in the mid-late 2030s similar to option four, but would return warming to between ~1988 and ~1997 levels (reflective of achieving the lower (35 per cent) or upper (47 per cent) end of the biogenic methane range as recommended by the Commission).

192. Meeting this target, based on the specific emission trajectories chosen here, would result in a lower contribution from New Zealand to global warming by the end of the century by ~19.9 to 26.6 per cent relative to ERP2 and by ~7.5 to 15.2 per cent relative to meeting upper end of the biogenic methane component of the current 2050 target (47per cent) (Appendix 3, Table 2).

193. A 35-47 per cent biogenic methane target as recommended by the Commission along with a net negative target for all other GHGs of -20Mt CO_2-e, would result in 4.8-0.2Mt CO_2-e in 2050 which is 23.8-28.4Mt CO_2-e less emissions than currently projected as per ERP2 (see Appendix 4). This would lead to a substantial reduction in emissions between now and 2050.

194. Since 2019, some international partners, such as Australia, Japan, Canada, the EU, UK, and Ireland have amended their target to require net zero for all-gases, while others like Germany and Finland have increased their targets (Appendix 1 refers). Achieving the upper end of the biogenic methane target and net negative emissions of 20Mt CO_2-e in 2050 will place New Zealand very close to meeting net-zero for all gases, which would be more aligned with the net zero all-gases targets set by other countries, but still have set clear expectations of what the overall emissions reductions would be from biogenic methane due to the split-gas approach.

195. The Commission also recommended that the 2050 target be clarified to specify that further reductions in both components of the 2050 target are required after 2050. While the Commission did not specify the level of reductions, this recommendation is aligned with evidence from the IPCC Sixth Assessment Report and UNEP Gap Report, which support that further reductions in GHGs and net-negative emissions of carbon dioxide will be required after 2050 to limit global warming to 1.5°C by the end of the century. This

recommendation is not considered within option six, and the emissions modelling for temperature response were modelled as remaining constant from 2050 onwards. A post-2050 target will be considered in subsequent advice.

The target can be feasibly implemented and support NZ's transition to 2050

196. Option six is least feasible due to the significant policy change, market drivers, and private sector action required to achieve the technological uptake and system shifts. As well as significant policy change, this option would require significant implementation action from the market.

197. While the Commission did not discuss specific policy approaches, officials consider this may involve greater intervention from Government in incentivising innovation and uptake of existing and new technologies by the private sector (e.g. shift in pricing signals for long-lived gases, and stronger pricing for agricultural emissions). The risks and uncertainties of this option have been inferred from the Commission's impact analysis on the Commission's recommendation (summarised in Appendix 2).[73]

198. A stronger biogenic methane target provided measures of some kind are in place, is likely to give rise to changes in on-farm practices change (for example to improve efficiency) and to drive the uptake of available mitigation technology. However, such measures could also potentially give rise to negative impacts on agricultural production and sector profitability, and may incentivise land use change.[74]

199. Similar to option five, the NZ ETS is not currently configured to deliver net negative emissions and would require a mechanism inside or outside of the NZ ETS to incentivise emissions removals in excess of compliance demand. This change could risk the ability for NZ ETS settings to strictly accord with our 2050 target. The Minister of Climate Change may need mechanisms outside of the NZ ETS, or significant reductions to auction volumes in order to meet the accordance test. NZ ETS sectors would face increased price signals under this option to reduce long-lived gases. The specific impacts, such as afforestation response (and any further impacts from signalled ETS restrictions) and energy transition, will likely depend on policy settings.

200. Option six would require stronger EBs[75] and emission reduction plans to deliver the necessary target levels for biogenic methane and long-lived gases, together with stronger policies and strategies to achieve these budgets. While this would signal a strong increase in climate ambition, it would also challenge policy stability compared to the status quo. Achieving a higher level of emissions reductions in both biogenic methane and long-lived gases would require substantial new policies and a broader distribution of effort across

[73] As a part of emission budget advice, the Commission are required to advise the Minister of Climate Change on the principal risks and uncertainties associated with emissions reductions and removals.
[74] Pressure for land use change will be driven by the relative economics between sheep and beef farming, dairy, forestry and horticulture.
[75] Note budgets are set and revised according to a range of criteria outlined in the CCRA including how the budget and 2050 target may be realistically met. See Section 5ZC Matters relevant to advising on and setting emissions budgets. Climate Change Response Act 2002 No 40 (as at 26 November 2024), Public Act 5ZC Matters relevant to advising on, and setting, emissions budgets – New Zealand Legislation

sectors. This could create uncertainty for businesses and investors, especially in the ETS sectors.

The Commission's assessment of option six feasibility

201. The Commission developed a set of scenarios to demonstrate the range of actions that could be taken to reduce emissions, using dimensions of technology and systems change across sectors of the economy. This scenario analysis focuses on what might be possible rather than defining an optimal mix of actions. As such, the Commission does not comment on the 'likelihood' of future scenarios, although the Commission does note that the Government's policy choices are directly relevant to this.

202. This option is the Commission's recommended target based on a 'High technology high systems change (HTHS)' scenario. This scenario implements both new and emerging technologies and systems. Modelling of scenarios found the HTHS scenario achieves net zero in late 2030's followed by a steep decline in long-lived gases, and continues to reduce emissions to –20Mt CO_2-e by 2050 (see Appendix 2 for a summary of impacts).

203. While this is the least feasible of options considered in this assessment due to the scale of change required, the Commission concluded the target remained possible to achieve under the HTHS scenario.[76] Although the Commission did not provide an assessment of the likelihood of this scenario arising, it did note that the scenario's necessary technology uptake and systems change (such as further land-use change and the uptake of methane reduction technologies) will be influenced to some extent by policy and corresponding individual decision-making.[77]

General context – Impacts on Iwi and Māori

204. The Crown is committed to giving effect to the principles of Te Tiriti o Waitangi (Treaty of Waitangi) - partnership, participation, and protection. These principles underpin Māori involvement in New Zealand's low-emissions transition to 2050 and future policy proposals to support this transition. This could be demonstrated by, for example, forming partnership with iwi, hapū and Māori groups, ensuring Māori participate in decision-making, and protecting Māori rights and interests throughout the 2050 transition.

205. Upholding Treaty principles requires that Māori perspectives are included in climate mitigation action and policies recognise the unique role of iwi, hapū and Māori groups as kaitiaki of the environment. This could include enabling Māori leadership and participation, with Māori knowledge systems helping to inform and shape climate responses. Engaging Māori as active partners supports equitable outcomes and strengthens New Zealand's transition to a low emissions future.

Iwi, hapū and Māori groups play a key role in the New Zealand economy

206. Iwi, hapū and Māori groups are contributing to New Zealand's 2050 transition by addressing climate change through low-emissions investments. Māori hold significant investment potential and will continue to play a leading role in the economy with an

[76] Climate Change Commission, 2050 report. Table 6.2 pg 109. Climate-Change-Commission-Target-and-ISA-Final-Advice-04Dec2024-with-errata-message.pdf
[77] He Pou a Rangi Climate Change Commission 2024 Review of the 20arget of international shipping and aviation emissions, page 113

estimated asset base worth NZ$126 billion and an estimated contribution of $32 billion to GDP in 2023.[78,79]

207. In particular, the primary industries (agriculture, forestry and fishing) make up a significant part of the Māori economy, with an estimated asset base of $39 billion. Māori exports were dominated by the primary sector in 2023, along with manufacturing exports, with estimated exports from both industries valued at $1.9 billion.[80]

208. The concentration of collectively held Māori assets in the agriculture and forestry sectors means climate change policies are likely to disproportionately impact Māori. This is due to the higher asset exposure to forestry, higher proportion of ownership of lower-quality land, barriers in obtaining capital due to the inability to use land as collateral, variations in ownership structures, and greater representation in lower-income groups making it harder to absorb rising costs.

209. Iwi, hapū and Māori groups have a deep connection to land and natural resources which is central to identity, wellbeing, and cultural practices. Climate impacts can damage or restrict access to these places, threatening ancestral ties and cultural heritage which are passed down through generations.

210. The Māori Affairs and Finance and Expenditure Committees in their recent reports[81,82] referenced the first national climate change risk assessment,[83] which found the following impacts that are likely to have disproportionate impact on Māori or certain Māori groups include (but are not limited to) risk to:

- social cohesion and community wellbeing from displacement
- exacerbating existing inequities, and creating new inequities, due to differential distribution of climate change impacts
- mental health, identity, autonomy, and sense of belonging and wellbeing
- potable water supplies
- buildings due to extreme weather events and ongoing sea-level rise

[78] Te Ohanga Maori 2023 report
[79] The Commission found that Iwi/Māori asset base estimated to be worth NZ$70 billion and a projected growth rate of 5% per annum. November 2024.
[80] 2018 Māori economy report (published in 2021).
[81] Final report available at: Briefing on Māori climate adaptation. The Government Response to the Māori Affairs Committee recommendations was proactively released by the Ministry for the Environment online: https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/proactive-release-of-government-response-to-the-report-of-the-maori-affairs-committee-on-the-briefing-on-maori-climate-adaptation/
[82] Details about the inquiry are available at: https://www.parliament.nz/en/pb/sc/committees-press-releases/climate-adaptation-inquiry-completed/. The Government Response to the recommendations of the inquiry is available at: https://bills.parliament.nz/v/4/b5788d9e-e092-48c8-6ed9-08dd3fefce00
[83] The first national climate change risk assessment is available online: https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/adapting-to-climate-change/first-national-climate-change-risk-assessment-for-new-zealand/

- democratic decision-making processes under pressure from an increasing frequency and scale of compounding and cascading climate change impacts.

Considerations of the 2050 target objectives and options on iwi, hapū and Māori groups

Impacts on iwi/Māori in the ERP2 (status quo in the RIS)

211. To support the Crown's obligation to iwi, hapū and Māori groups, ERP2 sets out actions and policies to mitigate impacts with Māori. These include:

- Fostering partnership in climate action. Engage with Māori on a partnership basis to integrate their insights and priorities in shaping responsive and inclusive climate policies. This includes the Ministry for the Environment and the National Iwi Chairs Forum climate change pou (group) - Pou Take Āhuarangi, having a joint climate change work programme.

- Supporting Māori-led solutions. Empower Māori communities through targeted support and funding, via the Māori Climate Platform, to develop and lead their own climate solutions.

- Building resilient communities. Enhance the adaptive capacity of Māori communities to respond to the impacts of climate change, promoting sustainability and resilience through tailored capacity-building and resource allocation

Alignment with the Government's economic agenda

212. Iwi, hapū and Māori groups are more likely to be affected by economic transitions, as they start from a position of greater socio-economic disadvantage. Iwi, hapū and Māori groups are disproportionately affected by land-use change due to high involvement in agriculture and forestry, and disproportionate ownership of lower-quality land.

213. The unique circumstances of Māori land result in increased costs for both Māori farmers and communities. This issue is particularly concerning for Māori sheep and beef farmers, who face higher emissions relative to production, and have limited options to reduce emissions other than by lowering stock numbers. A reduction in sheep and beef production could affect Māori employment in meat processing, with Māori comprising 40 per cent of the meat processing workforce. 6(a), 9(2)(d) .

214. These challenges highlight a fundamental value judgement between the short-term economic impacts on iwi, hapū and Māori groups against the long-term risks of climate inaction. While protecting current livelihoods and land-based economic activities is important, so is safeguarding the future wellbeing of iwi/Māori, including the resilience of their land, assets, and cultural identity. Any transition must carefully balance the need for immediate economic preservation around the use of land with the long-term goals of 'future generations, along with equity, and good environmental and social practices.'[84]

[84] The Commission. November 2024.

215. As part of the economic modelling, we considered the potential impact of these options on Māori and non-Māori households. Under option two, there was negligible difference in impact, and under option five the difference was slight (with Māori households being impacted more). Option six showed a more substantial difference, again with Māori households facing the larger impact. This analysis, however, is only indicative. The actual impacts on different groups, including the impact on iwi/Māori, will be influenced by the policies and strategies that are put in place to meet the 2050 target.

216. Opportunities for investment in existing iwi, hapū and Māori groups' climate strategies or initiatives to reduce emissions may exist under options that increase the target as the Government would need to source greater emissions reductions. Investment could span multiple areas to support the transition to a low emissions economy, including funding for facilities, infrastructure, and workforce training to better outcomes for iwi, hapū and Māori groups. Opportunities or benefits from options five and six have not been quantified in general (per limitations section) or for iwi, hapū and Māori groups specifically.

The 2050 target contributes to limiting the global average temperature increase to 1.5°C

217. Options which result in a greater contribution to limit warming could support the Crown's Treaty obligation to protect Māori partners. These options could have a positive impact on iwi/Māori-owned assets and land, which are often particularly vulnerable to the effects of climate change. These are areas that are highly exposed to climate-related risks like drought, flooding, and sea-level rise.

218. The impacts of climate change will affect iwi/Māori traditions, knowledge systems, taonga, and cultural sites.[85] Protecting these aspects is essential for maintaining intergenerational knowledge, cultural identity, and the ability of iwi/Māori to exercise kaitiakitanga (guardianship). Without meaningful action to reduce emissions, these taonga face increasing threats.

219. Some iwi/Māori support increasing the Government's contribution to the 2050 target. This view reflects an understanding that the costs of taking decisive action to reduce emissions now are likely to be lower than the long-term costs of continued inaction. It also aligns with a broader intergenerational perspective of environmental stewardship and the responsibility to protect and nurture the environment for future generations.

220. Options that reduce the 2050 target may be less burdensome for iwi/Māori to implement, given their significant holdings in farming and forestry (i.e. less stringent target to meet). However, it would depend on existing practices and planned investments to reduce biogenic methane emissions.

The target can be feasibly implemented and support NZ's transition to 2050

221. Under options with increased abatement, an additional 10 to 20Mt CO_2-e of emissions reductions would need to be sourced via gross reductions and removals. This could present both a burden and an opportunity depending on what policies are developed to deliver additional abatement. The Government would need to work with iwi/Māori to ensure new policies were effective and equitable.

[85] Climate and Māori Society | NIWA

222. A key consideration in these changes is the impact on iwi/Māori, who often take an intergenerational perspective when making long-term decisions. For iwi/Māori, the effects of land use on current and future generations along with principles of equity, and strong environmental and social practices are foundational to decision-making and feasibility.

223. Options that tighten ETS settings could place upward pressure on NZU prices which would be felt disproportionately by Iwi/Māori. Higher emissions costs disproportionately impact lower socio-economic groups in which Māori are over-represented. With respect to ETS participants, this could drive behaviour change such as innovation, less emitting, or the closure of firms and businesses, especially when seeking units for surrender obligation. On the other hand, these options could be beneficial for Māori forest owners or owners of land suitable for afforestation because of the likelihood of an increase in the NZU price.

224. In addition to the discussion in this section, the Commission undertook analysis on the impacts to iwi/Māori and verbatim from the report found:[86]

- Emissions targets do not disproportionately affect Māori directly, the implementation of policy has resulted in poor outcomes for Iwi/Māori.
- Support for an intergenerational, long-term perspective from iwi/Māori. The impacts of land use on current and future generations, along with equity, and good environmental and social practices, are foundational to decision-making for many iwi/Māori.
- Historic land policy restricts the economic use cases for much of the Māori land estate. Afforestation policy in the past has disadvantaged iwi/Māori whose forests are often ineligible for crediting under the NZ ETS while subject to liabilities if they change land use.
- Given investments of Māori landowners or collectives, land-use change towards lower emissions land uses may have specific negative impacts on iwi/Māori, and Māori businesses may need further support to transition.
- Increasing the biogenic methane contribution should consider cultural values in the deployment of methane technologies such as inhibitors, and the general unwillingness to incorporate these into pastoral farming. If this option were implemented, there would need to be support available for iwi/Māori to enable methane reductions in a way that aligns with tikanga.
- Further, the Commission’s recommendation includes making further unspecified level of reductions and removals after 2050. This would have to be managed so that it does not exacerbate impacts on iwi/Māori.

Waitangi Tribunal kaupapa inquiry into climate change

225. The Waitangi Tribunal has commenced a kaupapa inquiry into whether the New Zealand Government's climate change policies align with the principles of the Treaty of Waitangi. Following its inquiry, the Tribunal will provide its recommendations which the Government can consider in the development of climate change policies.

[86] Climate-Change-Commission-Target-and-ISA-Final-Advice-04Dec2024-with-errata-message.pdf

226. This claim marks the first global instance where a commission of inquiry is examining the impact of climate change policies on an Indigenous population. This presents the Tribunal an opportunity to provide non-binding recommendations to the Government, with a report expected in 2026.[87]

227. The inquiry is focused on four overarching issues:

- What are the physical, spiritual, cultural, social, health, and economic impacts of climate change on Māori? This includes present impacts and likely impacts in the future.
- What relevant Tiriti/Treaty principles should the Crown consider when addressing the impacts of climate change on Māori?
- Has the Crown's conduct (including actions and omissions) in response to climate change been consistent with Tiriti/Treaty principles?
- What recommendations should the Tribunal make in terms of how the Crown should conduct itself consistently with Tiriti/Treaty principles when forming future climate change policies? (this included, for instance, what amounts to meaningful consultation and engagement).

[87] Waitangi Tribunal Kaupapa Inquiry into Climate Change

Table 1: How do the options compare to the status quo/counterfactual?

Objectives	Criteria	Option 1 (Status Quo)	Option 2	Option 3	Option 4	Option 5	Option 6
		Net Zero long-lived gases 10% reduction of biogenic methane emissions from 2017 levels by 2030, and a 24-47% reduction from 2017 levels by 2050	Reduced biogenic methane target (14% less than 2017 emissions), status-quo for long-lived gases (net zero)	Reduce biogenic methane target 14-24 per cent below 2017 levels; status quo for long-lived gases (net zero)	Clarify biogenic methane target at the lower end of the current range (24 per cent less than 2017 emissions): status quo for long-lived gases (net zero)	Clarify biogenic methane target at the lower end of the current range (24 per cent less than 2017 emissions), strengthen target for long-lived gases to net negative 10Mt CO_2-e[88]	Strengthening both the biogenic methane and long-lived gas targets as recommended by the Commission; by 2050 reduce biogenic methane to 35-47% from 2017 levels and by 2050 reduce all other gases (long-lived) to net negative 20Mt CO_2-e
Economic implications	GDP impact *Note: The benefits of climate mitigation have not been quantified or included in available modelling; nor have the co-benefits of mitigation policies*	**0** Economic impact unchanged from the impact of implementing ERP2. Modelling suggests that, when compared to a "with existing measures" pathway, the impact of ERP2 on real GDP is a reduction of 0.15 per cent in 2050.	**0** Modelling indicates negligible impact on GDP, 0.01% higher than status quo in 2050. 9(2)(g)(i)	**0** Modelling indicates negligible impact on GDP, 0-0.01% higher than status quo in 2050. 9(2)(g)(i)	**0** Economic impact unchanged from the impact of implementing ERP2.	**-** Small impact on GDP. Compared to status quo, modelling indicates that GDP could be 0.3% lower in 2050.[89]	**- -** Moderate impact on GDP. Compared to option 1, modelling suggests that GDP could be 2.2% lower in 2050.[90,91]
	Key impacts on sectors	**0** ERP2 policy package aligns w/ Government's economic agenda. Agriculture most affected sector under ERP2 economic modelling. Other sectors less affected but still experience some change.	**+** Overall, this change is likely to be positive for the agricultural sector, as policies to address agriculture emissions will still be needed but may be less stringent. May shift sectoral emissions reduction burden towards long lived gases (unless EBs are also amended). 9(2)(h)	**+** Overall, this change is likely to be positive for the agriculture sector as policies to address agriculture emissions will still be needed but may be less stringent. Depending on which end of the target is met, may shift sectoral emissions reduction burden towards long lived gases (unless EBs are also amended). 9(2)(h)	**+** Overall, this change is likely to be positive for the agricultural sector as policies to address emissions will still be needed but may be less stringent. Slightly improved certainty for agriculture sector as a result of reduced target range, minimal impact on other sectors.	**0** May provide certainty for agriculture sector as a result of reduced target range. Sectors contributing to long-lived gases emissions will need to reduce emissions further than status quo by 2050.	**-** Likely to require additional policies across a range of sectors including energy, forestry and agriculture. Sectors contributing to long-lived gases emissions, will need to reduce emissions further than status quo by 2050.
Contribution to 1.5°C	Contribution to limiting warming to 1.5°C	**0** No change to our current contribution relative to ERP2. Potential to further decrease warming impact by the end of the century by	**- -** Reduces contribution. Results in 32.7Mt CO_2-e in 2050 which is 4.1Mt CO_2-e	**- -** Reduces contribution if the lower end of the target is met. Similar to status quo if the higher end of the target is met.	**-** Similar to status quo, plus forgone potential if the biogenic methane target was met at the at upper end of the	**+** Increases contribution. Result in 18.6Mt CO_2e in 2050 which is 10Mt CO_2-e less than	**++** Significant contribution.

[89] Potentially offsetting (positive) innovation impacts on GDP are not quantified
[90] Potentially offsetting (positive) innovation impacts on GDP are not quantified
[91] As noted above, this 2050 impact is likely overstated. In reality, we would expect high emissions prices to drive technological developments that enable emissions reductions with a lesser GDP impact.

		meeting the upper range (47%) of the current biogenic methane target.	higher than currently projected as per ERP2. Increased global warming impact by end of century	Impact on global warming by end of century is the same as option 2 and 4 depending on which end of the target is met.	2050 target (equivalent to additional 8.4Mt CO_2-e by 2050) (noting there is no obligation to achieve the upper end of the range and there is still potential to exceed a single number target). Likely similar global warming impact to ERP2 (option 1). Potential to increase global warming impact by the end of the century compared to meeting upper range (47%) of the current biogenic methane target.	currently projected as per ERP2. Potential to reduce global warming impact by the end of the century relative to ERP2 (but would be a slight increase relative to meeting upper range (47%) of the current biogenic methane target).	Result in 4.8-0.2Mt CO_2-e in 2050 which is 23.8- 28.4Mt CO_2-e less emissions than currently projected as per ERP2. Decreased global warming impact by the end of the century.
	International partners comparison	**0** Current target is less aligned with international partners, most of whom have set net zero all-gases targets	**- -** Less aligned with international partners.	**-** Less aligned with international partners.	**0** As for status quo	**+** Improved alignment with international partners.	**++** Most aligned with international partners.
Feasibility	Achievable pathway: ERP2 modelled technological developments and policy package, likely policy implications.	**0** Policies in place modelled to meet targets, some complementary policies needed or changes to NZ ETS to align with net zero. Policy stability maintained but some uncertainty around biogenic methane. Note: a range of policy decisions still need to be taken on ERP2 agreed policies. Further decisions need on ERP2 policies assumed in modelling e.g. a system to incentivise the uptake of agricultural emissions technology.	**0** More feasible than status quo as the biogenic methane target is lower and requires less change for agricultural sector. Less policy intervention but risks to stability due to substantial changes. Impact to the NZ ETS requiring tighter settings or other actions in ETS sectors to make up for additional biogenic methane emissions in EB3. EB3 gap widens to approx. 18.3Mt CO_2-e. Without adjustment, long-lived gases would need to increase reductions to offset by 2035.	**0** More feasible than status quo as the biogenic methane target is lower and requires less change for agricultural sector. Less policy intervention but risks to stability due to substantial changes. If lower end of the target is met - impact to the NZ ETS requiring tighter settings or other actions in ETS sectors to make up for additional biogenic methane emissions in EB3. EB3 gap widens to approx. 18.3Mt CO_2-e. Without adjustment, long-lived gases would need to increase reductions to offset by 2035.	**+** Equally feasible as status quo with current pipeline of technology and policies identified in ERP2. However, achieving the 24% biogenic methane target will be more feasible than achieving the upper end of the range under the status quo. Unlikely to result in material departure from EBs but could be reviewed if necessary. No direct impact on NZ ETS as agriculture emissions already outside of the NZ ETS. Unlikely to pose a risk to settings accordance. Policy stability similar to status quo.	**-** Likely to require some new policy measures in addition to ERP2 for long-lived gases, as the NZ ETS is not currently configured to deliver net negative emissions, risk to settings accordance. Impact to policy stability for long lived gas sectors, some benefit for agriculture due to clarified target Some further innovation and technology uptake by the private sector likely needed.	**- -** Least feasible option as significant policy change needed across both technologies and systems, the NZ ETS is not currently configured to deliver net negative emissions, risk to settings accordance. Impact to policy existing policy stability, compared to the status quo. Adjustment to EB3 likely needed to manage increased abatement required out to 2050. Note Commission assessed its option as feasible against a broad range of criteria.
Overall assessment		**0**	**-3**	**-2**	**1**	**0**	**-1**

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

228. Each of the options involves a different contribution of pros and cons. **Table 1** provides a framework for considering the options, and their respective pros and cons, in relation to each other. For the purpose of this analysis, we have considered each option in relation to the three policy objectives.

229. Options five and six would increase New Zealand's domestic contribution towards the global effort to address climate change. They would also require more stringent climate change policy settings and result in a small to moderate economic impact compared to the other options. Options two, three and four require less system change than the other options, therefore fewer stringent policy settings to drive required behaviour change. Options two, three, and four have a negligible economic impact, similar to the status quo. These three options also result in a lower contribution to the global effort to address climate change compared to the status quo.

230. Based on this analysis, the preferred option is **Option four – clarifying the biogenic methane target at the lower end of the current range (24 per cent) and retaining our current net zero target for long-lived gases**. This option strikes a balance between economic growth and climate change objectives, is feasible, and also provides for a greater level of long-term policy stability and certainty than other options.

231. The 24 per cent biogenic methane target requires an approximate 0.7 per cent annual reduction in biogenic methane emissions from 2030-2050. This target is achievable with the current pipeline of technologies and can be met alongside sustained agriculture sector growth. The agriculture sector has demonstrated its ability to reduce emissions, having achieved a 5 per cent reduction in 2020-2023.

232. Option four aligns with the current trajectory of emissions reductions and policies. This includes action or policy to support uptake of agriculture emissions technologies. 9(2)(g)(i) . This option may improve certainty about the emissions reductions the Government expects, which could result in increased confidence to invest in emissions reduction activities.

233. The Commission has a legislated role to review the 2050 target every five years, taking into account how New Zealand is tracking toward climate change both domestically and internationally. This means that there will be future opportunities to adjust New Zealand's targets if needed. Ministers could also review the target separately to this process if they consider it desirable, for example to take into account domestic mitigation technology availability or international progress towards climate commitments.

234. While the 2050 target is important in setting the level of emissions reductions required, the CCRA does not prevent the Government or the private sector from taking actions that would drive further reductions than what is needed to meet the target.

Is the Minister's preferred option in the Cabinet paper the same as the agency's preferred option in the RIS?

235. The preferred option in the Cabinet paper and the agencies preferred option differ and are discussed in the table below.

What are the marginal costs and benefits of the preferred option in the Cabinet paper?

236. The preferred option in the Cabinet paper is Option 3: a 14 – 24 per cent reduction of biogenic methane emissions below 2017 levels and retaining the current target for long-lived gases.

Table 2: Cost benefit analysis of the Ministers' preferred option in the Cabinet paper (Option 3)			
Affected groups *(identify)*	**Comment** *nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.*	**Impact** *$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.*	**Evidence Certainty** *High, medium, or low, and explain reasoning in comment column.*
Additional costs of the preferred option compared to taking no action			
Regulated parties	Overall economic impact	Negligible overall economic impact (Between 0 and 0.01 per cent increase in GDP in 2050 depending on where in the target range is met). Economic modelling showed a reduction in economic activity in some sectors (such as forestry and mining) and regions (Auckland and Nelson), but these reductions were offset by increases in other sectors and regions. See Appendix 5 for further detail.	Medium. See Appendix 5 for discussion of the limitation of the economic modelling undertaken.
Regulators	No direct or indirect costs identified as the structure / purpose of the CCRA is remaining as status quo.	None	High
New Zealand trade	9(2)(h)	9(2)(h)	9(2)(h)

	9(2)(h)		9(2)(h)
New Zealand international relationships	Uncertain how the international community will respond to revising the 2050 target. May be seen as out of step with partner countries who have all gas net zero targets.	6(a)	6(a)
Society	May have a dampening effect on the ambition of mitigation actions and behaviour change. Likely to lead to a small increase in the climate risk associated with increased warming impacting all of society.	Medium	Medium
Iwi/Māori	Potential for increased climate risk which could disproportionately impact iwi/ Māori communities. 6(a), 9(2)(d)	Low	Medium
Total monetised costs	None		
Non-monetised costs	As above	Low	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Overall economic impact	Negligible overall economic impact (Between 0 and 0.01 per cent increase in GDP depending on where in the target range is met in 2050). Economic modelling showed an increase in economic activity in some sectors (such as electricity generation and agriculture) and regions (such as Northland, Bay	Medium. See Appendix 5 for discussion of the limitation of the economic modelling undertaken.

		of Plenty and Southland) were offset by decreases in other sectors and regions. See Appendix 5 for further detail	
Agriculture sector	Policies that drive a reduction of 14 – 24 per cent are likely to be less costly for the agriculture sector from an economic perspective than the status quo.	Medium	Medium
Regulators / wider Government	No direct or indirect benefits identified as the structure / purpose of the CCRA is remaining as status quo.	None	High
Iwi/Māori	Could be beneficial for iwi/ Māori economy with significant assets in primary industries.	Low	Medium
Total monetised benefits	None	None	Medium
Non-monetised benefits	As above	Low	Medium

Agencies' preferred option in the RIS (Option 4)

237. Agencies' preferred option in the RIS is Option four: clarify biogenic methane target at the lower end of the current range (24 per cent less than 2017 emissions): status quo for long-lived gases (net zero).

Table 3: Cost benefit analysis of agencies' preferred option in the RIS (Option 4)			
Affected groups *(identify)*	**Comment** *nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.*	**Impact** *$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.*	**Evidence Certainty** *High, medium, or low, and explain reasoning in comment column.*
Additional costs of the preferred option compared to taking no action			
Regulated parties	Does not have any costs beyond the costs of implementing ERP2. ETS sectors: No direct impact as agriculture outside of ETS. Non-ETS sectors: Likely small positive economic impact compared to the status quo, although the benefits of a more certain policy environment for the agriculture sector have not been quantified.	ETS sectors: None Non-ETS sectors: Low	ETS sectors: Med-high, no changes proposed for long lived gases, covered by ETS. Non ETS sectors: Low. The proposed change clarifies the target in line with our current trajectory of emissions reduction. However, the impact of removing the upper end of the target range on future policy setting is less clear. Benefits unquantified.
Regulators	No direct or indirect costs identified as the structure / purpose of the CCRA is remaining as status quo.	None	High
Iwi/ Māori	There are no additional costs compared to the status quo.	Low	Medium
Wider Government	May be perceived by some stakeholders as reducing New Zealand's	Low	High

	contribution to efforts to limit global warming, 9(2)(h) [redacted] May also be perceived by some stakeholders as an inadequate domestic contribution to addressing global warming, as it departs from the Commission's advice to strengthen the target and is out of step with international partners. This is also the case for maintaining the status quo.		
New Zealand trade	9(2)(h) [redacted]	9(2)(h) [redacted]	9(2)(h) [redacted]
Total monetised costs	None		
Non-monetised costs	As above	Low	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Providing certainty as to what level of emissions reductions are required. Policies that drive for a 24 per cent reduction in biogenic methane emissions are likely to be less costly for the agriculture sector than policies that aim to achieve the upper end of the current target range.	ETS sectors N/A Non ETS sectors Medium	ETS Sectors N/A Non ETS sectors: High – a point year target is clearer about the level of action required

Regulators	No direct or indirect benefits identified as the structure / purpose of the CCRA is remaining as status quo.	None	High
Wider Government	No direct or indirect benefits identified as the structure / purpose of the CCRA is remaining as status quo.	None	High
Iwi/ Māori	Iwi/ Māori interests in the agriculture sector may benefit from a clarified target (as described above in relation to the agriculture sector more generally)	Low	Medium
Total monetised benefits	None	None	Medium
Non-monetised benefits	As above	Low	Medium

Section 3: Delivering an option

How will the proposal be implemented?

238. This proposal will be implemented through an amendment to the CCRA. The timing of this change is yet to be confirmed but will be passed by the end of 2025 as a Ministerial priority.

239. Changing the 2050 target gives rise to a number of transitional and consequential issues that may also require further changes to the CCRA, depending on the timing of the law change. These are:

- Provisions relating to setting emissions budget four (EB4)
- Transitional issues regarding the 2025 ETS setting process

240. We note these issues briefly below for completeness. The Minister of Climate Change will be advised of these issues as required.

Possible change to provisions relating to setting EB4

241. Under s5X(3)(d) of the CCRA, the fourth emissions budget for the period 2036 to 2040 must be set by 31 December 2025. The Commission provided the government its advice on EB4 (and revisions to EBs 1-3 based on methodological and other significant changes) in November last year, based on the current 2050 target. Amending the target means this advice may no longer be relevant to the proposed updated target.

242. Under the CCRA, the Commission has a significant role in relation to EBs. The Commission is required to advise the Minister of Climate Change on EBs, while the Minister must make final decisions on the budgets and respond to the Commission in relation to their advice.

243. If the 2050 target is to be amended before EB4 must be set, the following approach may be appropriate:

- The Commission is asked to update its advice on EB4 (and revisions to EBs 1-3), once the target is changed
- The date by which EB4 must be set is extended by 24 months to 31 December 2027
    i. This would allow adequate time for both the Commission to revise its work and the Government to consider its advice and make final decisions. Changing the date by which EB4 must be set would require a minor change to the CCRA that could be progressed at the same time as amending the 2050 target.

Possible transitional provisions regarding the 2025 NZ ETS setting process

244. Public consultation on 2025 NZ ETS settings is currently underway, with final decisions due to be gazetted in September 2025. These proposals are based on the current 2050 target.

245. If the 2050 target is changed before the final NZ ETS settings decisions are gazetted, it creates a risk that these settings may not accord with the new target. It also means that advice from the Commission and consultation, both required under the CCRA, would be based on a different 2050 target, which could have material impact on NZ ETS Settings. 9(2)(h) .

246. There is not sufficient time to amend 2025 NZ ETS settings to address these risks before the statutory deadline of 30 September 2025. If legislation to advance a target change is progressed before this date, transitional provisions could also be included in the Bill that amends the 2050 target to exempt the 2025 NZ ETS settings from the amended 2050 target. The target change would then begin to influence the NZ ETS through the 2026 ETS settings process.

How will the proposal be monitored, evaluated, and reviewed?

247. Other elements of the CCRA that regulate how our 2050 target is implemented will remain as they are now. This includes subsequent legislative reviews of the 2050 target.

248. The CCRA requires the Commission to review the 2050 target when preparing advice on setting an EB for an EB period beginning on or after 2036 (and therefore every five years), and at any other time the Minister of Climate Change requests a review. With the exception of any other requests from the Minister of Climate Change, the next legislated review by the Commission will be in 2030.

249. Under the CCRA, the Minister of Climate Change is required to prepare EBs that act as stepping stones towards our target through to 2050. The Minister must also prepare ERPs

for each EB period that must be sufficient to meet that budget period. The Minister may also at any time, request that the Commission prepare reports to the Government on matters related to reducing emissions of greenhouse gases and adapting to the effects of climate change.

250. The Government is responsible for meeting EBs and climate change targets. The Climate Change Chief Executives Board reports and provides advice on the progress of New Zealand's emissions reduction plans and Target 9 – which covers the EB1 and EB2.[92]

251. Target 9 is a Government wide target to reduce net greenhouse gas emissions in line with EB1 and EB2, and is reported on quarterly by the Climate Change Chief Executives Board. The first report was published in December 2024 and showed Target 9 is achievable, and that we are in turn are tracking towards our 2050 target.[93]

252. As outlined in ERP2, the Government has an adaptive management approach to meeting EB2. This includes:

- Tracking policy delivery and leading indicators,
- Reviewing projections and risks, and evaluating progress against the EBs,
- Responding when necessary to stay on track for EB2.

253. The Commission will also monitor progress towards meeting EBs and will regularly monitor and report on progress towards meeting an EB and the 2050 target (in accordance with sections 5ZK and 5ZL of the CCRA).

[92] The Climate Change Chief Executives board, is a board established under the Public Service Act 2020. Climate-Change-Chief-Executives-Board-Statement-of-Intent-2023-2027.pdf
[93] The first quarterly report on Target 9 can be found here - https://environment.govt.nz/news/first-report-on-government-target-9-released/

Appendix 1: International comparison of climate targets

	Domestic targets (for comparison)		International targets (for information)		Agricultural emissions as a percentage of total gross emissions	Methane proportion of emissions (including non-biogenic methane) as a percentage of total gross emissions
Countries	**Net Zero target**	**Methane target**	**NDC1 target (by 2030)**	**NDC2 target (by 2035)**		
New Zealand	Legislated - Split gas: Net Zero of long-lived gases (other than biogenic methane) by 2050	Legislated - by 2030: reduce biogenic methane by 10% (2017 levels) Legislated - by 2050 and beyond: reduce biogenic methane 24–47% (2017 levels)	50% below gross 2005 levels	51–55% below gross 2005 levels	53% from agriculture in 2023	48% from methane in 2023
Developed countries often compared to New Zealand						
Canada	Legislated - All gases: Net Zero by 2050	Methane strategy - by 2030: reduce methane by more than 35% (2020 levels)	40-45% below 2005 levels	45-50% below 2005 levels	10% from agriculture in 2023	17% from methane in 2022
United States	All gases: Net Zero by 2050	50-52% below 2005 levels		61-66% below 2005 levels[94] Reducing methane emissions by at least 35% (2005 levels) by 2035 (set as part of the updated NDC)	11% from agriculture in 2022	12% from methane in 2022
Australia	Legislated - All gases: Net Zero by 2050		43% below 2005 levels	Suggested[95] 65-75% below 2005 levels; or 49%-53% below 2005 levels	19% from agriculture in 2024	30% from methane in 2024
United Kingdom	Legislated - All gases: Net Zero by 2050		68% below 1990 levels	81% below 1990 levels	12% from agriculture in 2022	14% from methane in 2022
European Union	Legislated - All gases: Net Zero by 2050[96]		55% below 1990 levels	6(b)(i)	11% from agriculture in 2022	12% from methane in 2022
Japan	Legislated - All gases: Net zero by 2050		46% below 2013 levels	60% below 2013 levels by 2035 73% below 2013 levels by 2040	3% from agriculture in 2022	2.6% from methane (including LULUCF) in 2022
Small advanced economies (similar population size and economic framework to New Zealand)						
Denmark	Legislated - All gases: Net Zero by 2050 Proposed Net Zero by 2045, net negative by 2050	EU NDC- 55% below 1990 levels		s6(b)(i)	24% from agriculture in 2021	24% methane in 2023

[94] The United States is still currently a Party to the Paris Agreement. However, the new administration has signed an executive order to withdrawal from the Paris Agreement. Article 28 requires Parties to submit a formal withdrawal notification which becomes effective one year after the depositary receives the notification.
[95] The Australian Climate Change authority suggests an ambitious and achievable target of 65-75% reduction by 2035 compared to 2005 levels. The Department of Climate Change, Energy, the Environment and Water suggests a range of 49%-53% reduction by 2035 compared to 2005 levels, based on BAU modelling.
[96] The EU also has an effort sharing regulation which sets different 2030 targets for member states - https://climate.ec.europa.eu/eu-action/effort-sharing-member-states-emission-targets/effort-sharing-2021-2030-targets-and-flexibilities_en
[97] European Scientific Climate Advisory Board recommended 90% below 1990 levels by 2040. In practice, this means drawing a straight line from the 2030 target to the 2040 target and using the middle value as the NDC goal for 2035. This would amount to roughly a 73% below 1990 levels by 2035.

Ireland	Legislated - All gases: Net Zero by 2050	Sectoral emissions ceiling (as part of legally binding all gases carbon budgets) - by 2030: reduce agriculture emissions 25% (2018 levels)	EU NDC- 55% below 1990 levels	6(b)(i)	38% from agriculture in 2023	29% methane in 2023
Switzerland	Legislated - All gases: Net Zero by 2050		50% below 1990 levels	65% below 1990 levels	16% from agriculture in 2022	15% methane in 2023
Countries increasing net zero contributions						
Germany	Legislated – All gases: Net Zero by 2045		EU NDC- 55% below 1990 levels	6(b)(i)	9% from agriculture in 2022	6% methane in 2022
Finland	Legislated - All gases: Net Zero by 2035 Net negative soon after		EU NDC- 55% below 1990 levels	6(b)(i)	13% from agriculture in 2022	10% methane in 2023
Countries that do not require net zero emissions						
Norway	All gases: 90-95% reduction by 2050 (1990 levels)		55% below 1990 levels	Consulting on a 55-80% range	9% from agriculture in 2021	10% methane in 2023

Appendix 2: Key assumptions and implications of the Commission's advice on the 2050 target

The table below identifies key assumptions and implications of the Commission's advice on the 2050 target for the economy and society. Option 5 provides an assessment of the Commission's advice based on the criteria adopted in this advice. An assessment of the Commission's advice on International Aviation and Shipping will be provided when decisions are sought on those matters.

Key assumptions	***Economic implications***	***Sector specific implications***	***Social, cultural and ecological implications***	***Long-term implications***
Key modelling assumptions - CCC focus on what is possible rather than defining an optimal mix of actions. - Overall assumption that Government policy will incentivise gross emissions reductions to counterbalance the ETS incentive to use afforestation. - Modelling of mitigation technologies after 2040 is less certain. - Benefits and co-benefits are not quantified alongside costs. - Economic modelling does not include economic damage from warming, and we can expect this to be higher if warming is not limited **Key technology assumptions** - Adoption and uptake of new methane-reducing technologies (low-methane breeding, methane vaccines and methane inhibitors) - hydrogen steel production from 2040 - green carbon anodes for aluminium production from 2035 - 100% adoption of sustainable airline fuels from 2050 - Tiwai Point remains open until at least 2040. - A reduction in fossil gas production and a decline in estimated gas reserves. - conversion from coal use to biomass in electricity generation	- CCC finds their recommendations are consistent with economic growth - by 2040 GDP growth would be around 1% lower than the current target scenario - Costs and benefits fall unevenly across sectors (see sectoral implications column for more). - A wide range of co benefits of climate action identified across households, industry and business e.g. for the EB4 period CCC advice suggests health benefits valued at $2bn/pa by the end of EB4 from improved air quality - R&D, innovation and adoption of available technology important to limit negative impacts on economic growth. - Potential productivity gains from innovation due to signals from a strengthened target - Potential for strengthened target to support firms to respond to global customers' demands for lower emissions products. - On emissions leakage - CCC assessment is that risk of emissions leakage is highly uncertain but appears to be low for agriculture in New Zealand in the near term.	*Transport* - Decrease to 42bn in vehicle kilometres travelled vs 47bn in 2022. - Phase out of ICE light and bus vehicles from 2030. - Household public transport travel increases from 6% in reference scenario to 17% in recommended target by 2050 *Energy* - NZ has capacity potential to meet most of its electricity needs from domestic resources (incl. high levels of RE generation) /within national borders. This could significantly reduce emissions associated with prolonged reliance on fossil fuels used in the energy sector. - Climate can impact renewable electricity generation and therefore there is a need to build resilience from extreme weather events *Forestry* - Exotic forestry increases under recommended target range from present day level to 2050, but slightly less in 2050 than compared to reference scenario. - Native forests (post 1989) increase under recommended target range between current day and 2050, slightly higher than reference scenario in 2050. *Agriculture and horticulture* - Dairy production is steady to 2050 under recommended target, slightly higher production in reference scenario. Land area remains steady under recommended target at 35% level, decreased marginally at 47% end. - Sheep and beef numbers follow current trends (decline in reference scenario, slightly higher declines in recommended target scenario). Dairy stock numbers peaked in 2014, sheep in 1982. - Horticulture has rapid increase in revenues from land use change, from $4bn-7.3bn (based on meeting lower or upper end of methane target respectively). - Opportunity to be a global leader e.g. food and biogenic methane reductions	*Regional impacts* - Most regions would experience more jobs rather than fewer. Pattern of employment changes for the most part expected to happen gradually, opportunities for workers to transition through normal turn over and retirement. - Reduced employment in Taranaki and West Coast (due to reduction in oil, fossil gas and mining sectors). CCC suggest recent offshore renewables and hydrogen interest could offset job losses. *The distribution of benefits, costs and risks between generations* - Current population would need to do more to reduce emissions, reducing impact of warming on future generations - Reduces amount of warming caused by NZ, lowers risk of impacts of warming on future generations - Meeting modelled pathway could improve intergenerational distribution of co-benefits e.g. health from reduced transport related air pollution - Increased reliance on afforestation in recommended target may decrease future generations land-use choices *Crown-Māori relationship, te ao Māori and specific effects on iwi and Māori* - CCC consider recommended target more consistent with what they have heard from iwi/Māori to date than status quo. - Land use change away from sheep and beef, towards lower emission land use may have negative impacts on iwi, Māori and Māori business may need further transition support. - Through engagement CCC heard-impacts of land-use on current and future generations,	- Further emissions reductions beyond 2050 will be required to stay within a 1.5°C warming goal - The Commission's recommended target would reduce New Zealand's contribution to warming from 0.0025°C in 2050 to 0.0023°C in 2100. - Action past 2050 combined with earlier signalling of long-term goals, smooths transition/ transition costs across generations - Most countries are working towards 2050 commitments; three non-annex I countries under the UNFCCC framework have climate targets or commitments post 2050 (China, Brazil and Singapore).

		- Improving farm management practices can lower emissions while maintaining, or in some cases increasing farm profit	equity and good environmental, social practices are foundational decision making for many iwi, Māori. *Ecological impacts* - Modelling assumes large increase in new native afforestation on marginal and erosion prone land (planting and reversion). There are associated environmental co-benefits (water, biodiversity).	

Appendix 3: Results of temperature response modelling

Table 1. Quantitative assessment of the warming impact of changing the biogenic methane component of the 2050 target and the equivalent reductions in fossil carbon dioxide that would be required to compensate for the relative change in warming impact between now and the end of the century. See section on temperature response modelling assumptions and limitations below for further details.

Change considered for the biogenic methane component of the 2050 target	**Current biogenic methane target for comparison**	**Cumulative emissions reductions of fossil carbon dioxide to compensate for change in biogenic methane target to achieve a similar level of warming as the current target range (Mt CO_2)*** [*annual average reduction over period Mt CO_2*]**		
		2022-2050	**2051-2100**	**Total (2022-2100)**
Decreasing the biogenic methane target to 14%	24%*	283.3 *[10.1]*	219.0 *[4.4]*	502.4
	47%	514.3 *[18.4]*	997.6 *[20.0]*	1,511.9
Reclarifying the biogenic methane target to 24% (removing upper range – 47%)**	24%	-	-	-
	47%*	231.0 *[8.2]*	778.6 *[15.6]*	1,009.5

*Based on a comparison of the trajectory of biogenic methane from New Zealand's second emission reduction plan (ERP2) (which achieves ~24.9% reduction in biogenic methane by 2050 relative to 2017 levels).

**This row illustrates the additional equivalent emissions of fossil carbon dioxide that would be avoided from meeting the upper end of the 2050 biogenic methane target range (47%) relative to meeting the lower end of the 2050 biogenic methane target range (24.9%, based on the ERP2 trajectory of biogenic methane).

***Note this is simplified way to communicate the relative warming impact between different biogenic methane target levels in 2050 - the cumulative and average annual rates of reduction presented in Table 1 do not represent the exact temperature equivalence in any given year. The actual warming impact associated with New Zealand's biogenic methane emissions will depend on the trajectory of emissions reductions to the 2050 target level and whether additional reductions are made after 2050. In addition, the warming impact of methane in the future is highly dependent on the future composition of the atmosphere. As a result, the cumulative emissions reductions of fossil carbon dioxide and average annual reductions over the given time periods should be seen as illustrative only. The results are expressed based on cumulative or annual average reductions of fossil carbon dioxide – the compensation for the change in warming impact does not necessarily need to be from greater fossil carbon dioxide reductions and could be offset by reductions in other GHGs or greater carbon removals (e.g., through afforestation). The values given here are not directly interchangeable with reductions from other GHGs.

Table 2. Relative percentage change in New Zealand's global warming impact (all gases) of the different 2050 options considered relative to the global warming impact of (1) ERP2 and (2) ERP2 adjusted to achieve the upper end of the current biogenic methane target (47%).

Positive percentages given in bold represent an increase in warming impact, negative percentages represent a decrease in warming impact. See section on temperature response modelling assumptions and limitations below for further details.

2050 Target Options and relevant Commission comparison pathways from the 2050 Target Review/EB4 advice	**Relative change in New Zealand's warming impact relative to ERP2 (all gases)**		**Relative change in New Zealand's warming impact relative to ERP2 achieving upper end of biogenic methane range (47%) (all gases)**	
	By 2050 (%)	**By 2100 (%)**	**By 2050 (%)**	**By 2100 (%)**
Option 1 (Status Quo)**	-	-	-	-
Option 2 (14%, net-zero LLGs)	**3.3**	**6.2**	**6.3**	**22.7**
Option 3 (14-24%, net-zero LLGs)**	0 [24%] to **3.3** [14%]	0 [24%] to **6.2** [14%]	**2.9** [24%] to **6.3** [14%]	**15.5** [24%] to **22.7** [14%]
Option 4 (24%, net-zero LLGs)**	-	**-**	**2.9**	**15.5**
Option 5 (24%, -10Mt CO_2-e LLGs)**	*-1.0*	*-7.4*	**1.9**	**6.9**
Option 6 (35-47%, -20Mt CO_2-e LLGs)	*-3.1* to *-4.9*	*-19.9* to *-26.6*	*-0.3* to *-2.1*	*-7.5* to *-15.2*
Commission's EB4 Demo Pathway*	*-3.4*	*-22.0*	*-0.7*	*-9.9*
Commission's HTHS Pathway*	*-8.6*	*-39.6*	*-6.0*	*-30.2*

*Based on the Commission's temperature response modelling results for these pathways (https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/preparing-advice-on-emissions-budgets/advice-on-the-fourth-emissions-budget/modelling-and-data-final-report)

**For the temperature response modelling, the input emissions of biogenic methane for these options are assumed to follow the trajectory of ERP2 (Option 1/Status Quo) to 2050 achieving a 24.9% reduction by 2050 relative to 2017 levels.

Temperature response modelling assumptions and limitations

As part of the assessment criteria for New Zealand's contribution to the limiting global warming to 1.5°C we have modelled the warming from the country's past and possible future emissions. The main assumptions and limitations of this modelling are provided here; further details are available upon request.

Temperature response modelling uses a simplified climate model to convert emissions of greenhouse gases into concentrations, and then to the temperature effect directly. This allows us to compare the warming outcome from different targets and pathways and reflect how emissions of each gas contribute to warming. The temperature modelling relies on a relatively simple climate emulator, which does not represent all biogeochemical processes and feedbacks, including the temperature response to carbon dioxide emissions and removals from forestry and other land-uses compared to fossil carbon dioxide. The results presented are only for the best-estimate temperature outcome, and no analysis was undertaken of 'likely' ranges.

MfE used the FaIR model (Finite-amplitude Impulse Response simple climate model) to model the temperature response of ERP2 and the 2050 target options considered. MfE setup the model to mirror the input assumptions used by the Commission in their 2050 Target Review described in their technical annex to allow comparison between results (the relevant input assumptions for the model setup can be found here: Technical-Annex-Final-reports-on-the-fourth-emissions-budget-and-2050-target-review-Dec-2024.pdf – noting that while the assumptions applied by MfE to the input emissions data are the same as applied by the Commission, there are differences in the historical and projected input emissions data used by MfE compared to the modelling by the Commission). Input emissions data are based on the 2024 publication of New Zealand's Greenhouse Gas Inventory. Carbon dioxide removals are based on modified activity-based accounting, not using the methods applied in New Zealand Greenhouse Gas Inventory (noting that the 2025 publication of New Zealand's Greenhouse Gas Inventory does contain the LULUCF accounting quantities for 2020-23 in the annex).

It is important to note that both the Commission's and MfE's temperature response modelling excludes historic deforestation emissions, i.e., emissions associated with land clearing since human settlement until 1990, and replanting prior to 1990.

FaIR is a simple climate model that can give an indication of the warming outcome from New Zealand's historic and future emissions and should be seen as an estimate only. This is because (1) the results are based on the best estimate of warming, not the uncertainty range of modelled results from FaIR and (2) FaIR is a simple climate model that emulates the response of complex models but cannot be claimed to fully reproduce all aspects.

The temperature response modelling was undertaken using the global background scenario SSP1-2.6. A sensitivity analysis was undertaken using the global background scenarios SSP1-1.9 and SSP2-4.5. While there was a marginal difference in the absolute warming for the individual options modelled using the different global background scenarios, the general trend and relative benefit to the climate at strengthened target levels is similar regardless of the global background scenario used.

The quantitative assessment of the warming impact of changing the biogenic methane component of the 2050 target and the equivalent reductions in fossil carbon dioxide that would be required to compensate for the relative change in warming up to 2050 and between 2051-2100 (presented in Appendix 3, Table 1) were calculated using the modelled differences in the global warming impact from biogenic methane under different target levels from FaIR. To convert this difference into equivalent fossil carbon dioxide emissions we used a simple approach based on the transient climate response to cumulative CO_2 emissions (TRCE) metric, adjusted to produce similar results in FaIR when the annual adjustments in fossil carbon dioxide emissions are run back and compared to the base scenario (i.e., ERP2).

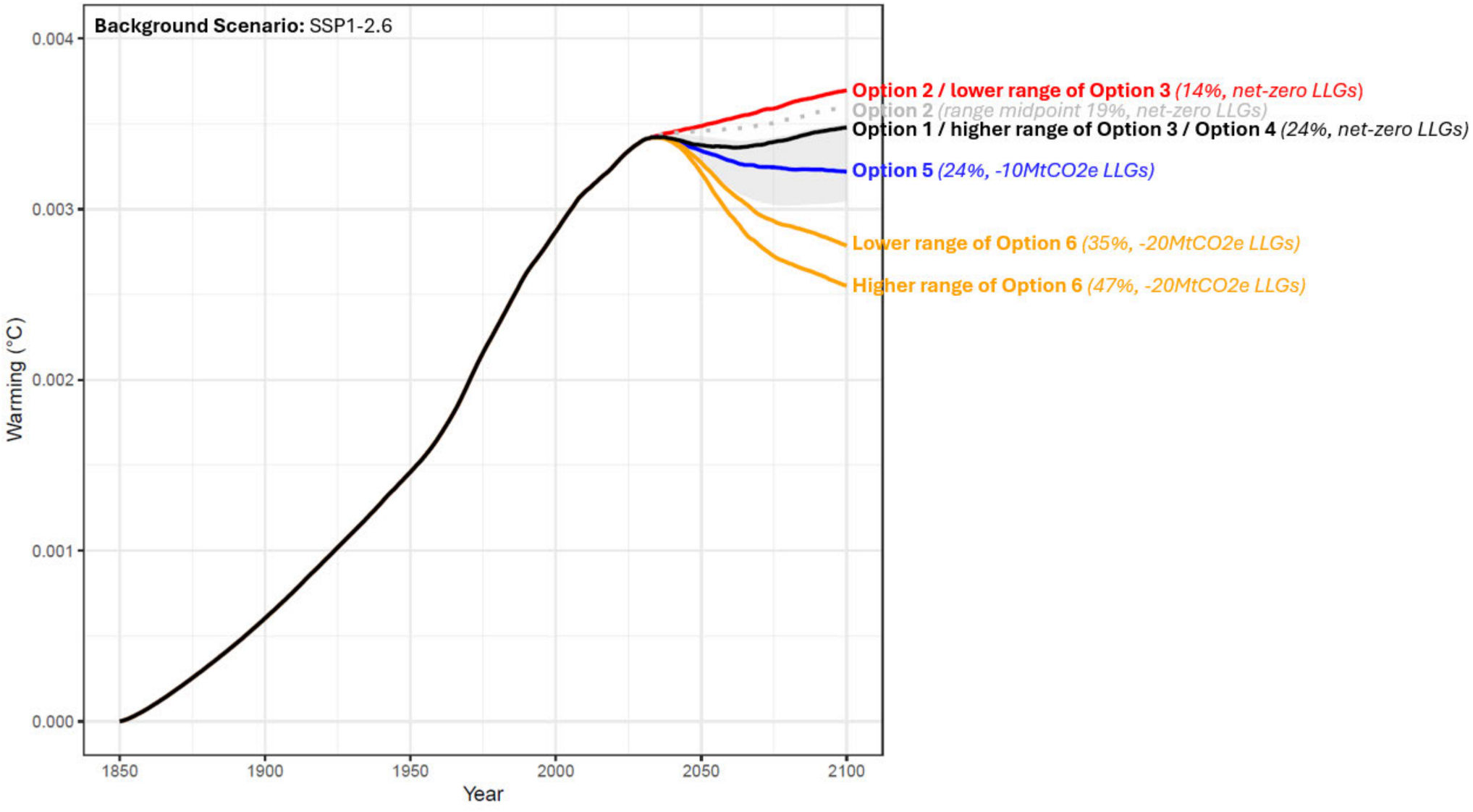
The trajectory of how a target is met has a substantial impact on warming outcomes pre- and post-2050 - earlier action will lead to better warming outcomes than delayed action when achieving the same target level in 2050. The target options considered still leave flexibility on the pathway to meet them, and those choices will affect the contribution that New Zealand makes to global warming.

The input emissions scenarios for temperature response modelling post-2022 are based on the projected emissions modelled in ENZ for ERP2. The emissions trajectory for each option has been adjusted to closely match the input data for the CGE modelling (which is projected to 2050, here assuming no changes to emissions in the third emissions budget period) and assumptions used to calculate the emissions impact, which are based on linear trajectories to respective target levels rather than the impact of policy assumptions or policy impacts. Due to these assumptions, the results presented here should be viewed as illustrative only, and the actual warming impact of New Zealand future emissions will vary depending on the trajectory of individual GHGs and the future composition of the atmosphere. Because the options for the CGE modelling were derived based on adjustments to the biogenic methane and aggregated gross long-lived GHGs – rather than at the level of individual GHGs – assumptions were also required to estimate reductions for individual GHGs (other than biogenic methane) to meet the given 2050 target levels. Further details of these assumptions are available upon request.

The current 2050 target has no provision for further reductions and removals after 2050 (the Commission has recommended that the 2050 target is amended to reflect that further reductions and removals are required after 2050). Emissions reductions and removals before and after 2050 can have a substantial impact on the warming impact of New Zealand's emissions by the end of the century. All options have been modelled based on the assumption that emissions remain at a constant level after 2050, reflecting both the structure of the current 2050 target (and that this structure is not proposed to change under the options considered in this briefing due to deferral of this decision).

Figure 1. Warming from emissions in New Zealand 1850-2100 under different 2050 target options.

A sensitivity analysis was undertaken using different global background scenarios and there was minimal difference in the relative global warming impact of New Zealand's emissions between options under the different global background scenarios modelled. Grey highlighted area shows the warming impact based on a linear trajectory to the biogenic methane target range (24 per cent and 47 per cent) from 2030 to 2050 (assuming all other GHGs follow the trajectory as per ERP2) – representative of the upper and lower bound of the current 2050 target taken at face value. See section on temperature response modelling assumptions and limitations below for further details. The warming outcomes are given for 2100 because the 2050 target has a warming impact that extends beyond 2050, and the 1.5°C global temperature goal that is referred to in the purpose of the CCRA and the Paris Agreement is based on limiting global warming to 1.5°C by the end of the century (2100). Considering warming to 2100 is widely adopted and enables a clearer understanding of the long-term consequences of climate change and progress in relation to the global temperature goal. Alongside the Commission, international bodies such as the IPCC and the UNFCCC use modelling out to 2100 and facilitate international agreements based on projections to 2100. These long-term projections support policy planning, risk assessment, and guide international negotiations.



Appendix 4: Greenhouse gas emission impacts

2050 Target Options	Changes in net target accounting greenhouse gas emissions in tonnes of carbon dioxide equivalent (Mt CO_2-e)							
	2022–25	2026–30	2031–35	2036–40 (Difference from 47% biogenic methane target)[3]	2041–45 (Difference from 47% biogenic methane target)[3]	2046–50 (Difference from 47% biogenic methane target)[3]	Total (Difference from 47% biogenic methane target)[3]	Total net target accounting emissions in 2050
ERP2 with additional measures (reference scenario) – **absolute emissions**	284.1	303.1	249.2	192.2	149.5	146.9	1,324.9	28.6
Option 1 (Current 2050 target, 24-47% biogenic methane, net-zero LLGs) [1,2]	0	0	0	0	0	0	0	20.2 – 28.6
Option 2 (14% for biogenic methane and net-zero for LLGs by 2050)	0	0	9.2	19.0 (24.9)	21.6 (40.7)	21.0 (56.5)	70.7 (131.4)	32.7
Option 3 (14-24% for biogenic methane and net-zero LLGs by 2050) [1,2]	0	0	0 – 9.2	0 – 19.0 (5.9 – 24.9)	0 – 21.6 (19.2 – 40.7)	0 – 21.0 (35.6 – 56.5)	0 – 70.7 (60.7 – 131.4)	28.6 – 32.7
Option 4 (24% for biogenic methane and net-zero LLGs by 2050) [1]	0	0	0	0 (5.9)	0 (19.2)	0 (35.6)	0 (60.7)	28.6[1]
Option 5 (24% for biogenic methane and net-negative 10Mt CO_2-e for LLGs by 2050) [1]	0	0	-7.9	-17.4 (-11.4)	-29.7 (-10.5)	-43.9 (-8.4)	-98.9 (-38.2)	18.6
Option 6 (35-47% for biogenic methane and net-negative 20Mt CO_2-e for LLGs) [1,23]	0	0	-15.4	-38.7 – -43.3	-69.1 – -81.3	-104.6 – -124.5	-228.0 – -264.5	0.2 – 4.8

[1] These options assume that emissions reductions of biogenic methane follow the projected trajectory from New Zealand's second emission reduction plan (ERP2) to 2050. The central estimate from the ERP2 projects that biogenic methane emissions will be ~24.9 per cent below 2017 levels by 2050. For options with the biogenic methane target reclarified at 24 per cent this assumes a slight overachievement of the given biogenic methane target (by ~0.9 per cent). Exact achievement of a biogenic methane target set at 24 per cent would increase total net target accounting emissions in 2050 by ~0.3Mt CO_2-e (28.9Mt CO_2-e) and would also change the total cumulative change in emissions over the 2022-2050 period.

[2] Range represents the total net target accounting emissions in 2050 achieved based on the low and high end of the given option target range for biogenic methane in 2050.

[3]The numbers in brackets represent the difference between emissions under the relevant option and a scenario where biogenic methane emissions reductions achieved the top end of the current target (a 47 per cent reduction), with the trajectory of net long-lived gases emissions based on projected emissions under ERP2.

Appendix 5: Results of economic modelling

This appendix sets out the impacts of different 2050 targets in more detail. These costs have been estimated using the same computable general equilibrium (CGE) model used for ERP2. No additional policies are imposed beyond those in ERP2. Emissions reductions are achieved by varying emissions prices to drive abatement technology uptake. Technology assumptions are consistent across all scenarios.

The modelling assumed that removals from forestry would be the same as projected under ERP2. Increased removals from relatively cheap exotic forestry could reduce the effort and cost required from other parts of the economy, although exotic forestry comes with other trade-offs.

As with all modelling, this work has limitations and there are many uncertainties. A key uncertainty is technological developments – if emissions reduction technologies become available sooner than expected (such as a methane inhibitor for dairy cows) or at a lower cost (such as significant price reductions for EVs) then the cost of a given level of emissions reductions would be lower.

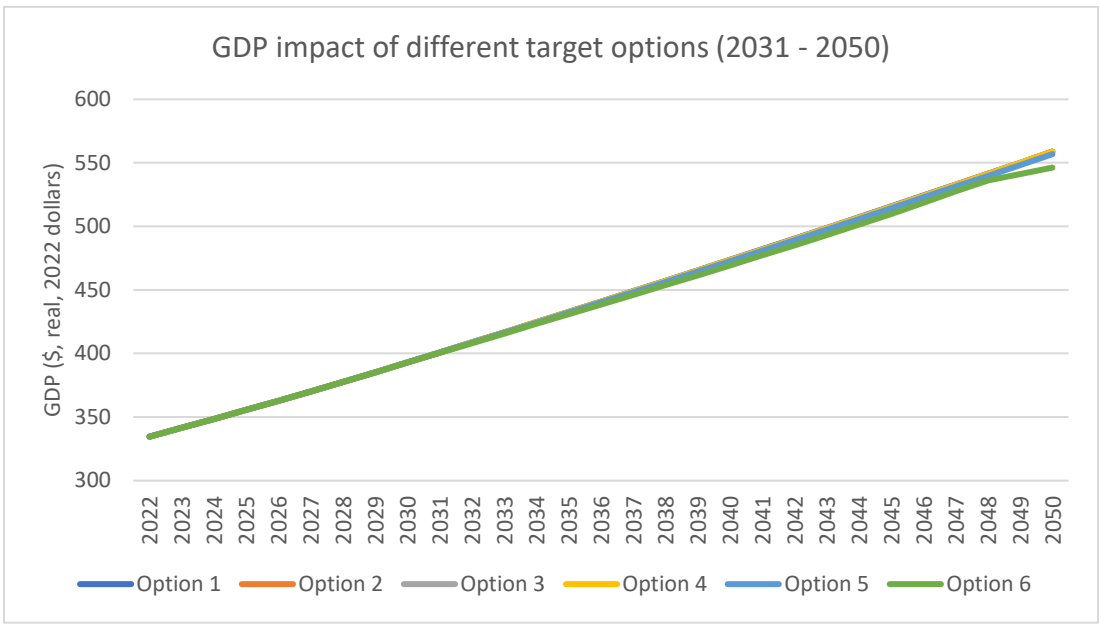
In addition, the modelling does not include any co-benefits such as from reduced air pollution from decarbonising transportation. As noted in the body of the RIS, these co-benefits can be substantial.

Modelling results

The graph and table below show modelled GDP levels across the options at various points in the future. Across all options the economy is expected to continue to grow – so GDP in 2050 is substantially higher than it is currently.

Overall, there is negligible difference in GDP between Option 1 (the status quo) and Option 2. In the modelling, there is no difference in expected emissions between Option 4 and the status quo, because the status quo projections are already consistent with both 2050 targets (24 per cent for methane, net zero for long-lived gases). There is therefore no difference in model outputs.

The modelling shows a small difference between Option 5 and the status quo, and a moderate difference between Option 6 and the status quo (about $12.5 billion in 2050).



	GDP ($b, 2022 prices)			
	2035	**2040**	**2045**	**2050**
Option 1 (status quo)	432.7	473.6	515.7	558.7
Option 2 (14% methane + net zero)	432.7	473.3	515.3	558.8
Option 3 (14-24% methane + net zero)	432.7	473.3	515.3-515.7	558.8-558.7
Option 4 (24% methane + net zero)	432.7	473.6	515.7	558.7
Option 5 (24% methane + net -10Mt CO_2-e)	432.1	472.5	514.2	556.8
Option 6 (35-47% methane + net -20Mt CO_2-e)	430.8	469.3	509.8	546.3
	Change in GDP (compared to Option 1)			
Option 2	0.0%	-0.1%	-0.1%	0.01%
Option 3	0.0%	-0.1% - 0.0%	-0.1% - 0.0%	0.0% - 0.01%
Option 4	0.0%	0.0%	0.0%	0.0%
Option 5	-0.1%	-0.2%	-0.3%	-0.3%
Option 6	-0.4%	-0.9%	-1.1%	-2.2%

The model results for employment and wages are broadly similar to the overall GDP impacts. Option 2 shows increases in wages and employment compared to Option 1, while Options 5 and 6 show decreases.

	Change in employment (compared to Option 1)			
	2035	**2040**	**2045**	**2050**
Option 2	0.0%	0.0%	0.0%	0.1%
Option 3	0.0%	0.0%	0.0%	0.0% - 0.1%
Option 4	0.0%	0.0%	0.0%	0.0%
Option 5	-0.2%	-0.2%	-0.1%	-0.1%
Option 6	-0.4%	-0.6%	-0.6%	-1.6%

	Change in wages (compared to Option 1)			
	2035	**2040**	**2045**	**2050**
Option 2	0.1%	0.1%	0.1%	0.2%
Option 3	0.1%-0.0%	0.1%-0.0%	0.1%-0.0%	0.2%-0.0%
Option 4	0.0%	0.0%	0.0%	0.0%
Option 5	-0.2%	-0.7%	-1.1%	-1.3%
Option 6	-0.6%	-2.0%	-3.4%	-5.6%

Impact by sector

The table below shows how output of different sectors of the economy are modelled to change across the different options, as compared to Option 1 (the status quo). In Option 2, the agricultural sector has higher output owing to the lower biogenic methane target. In this option, electricity generation and utilities (which are gas and electricity supply) are also higher. Modelled emissions under Option 4 are the same as they are in the status quo, and so there is no difference in sector output.

In options 5 and 6, output in most sectors of the economy is lower as compared to Option 1, with the notable exception of electricity generation (especially in the case of Option 6). This is because higher emissions prices under these options drives electrification of the economy, resulting is significant increases in electricity demand. The utilities sector likewise increases, since this includes electricity distribution.

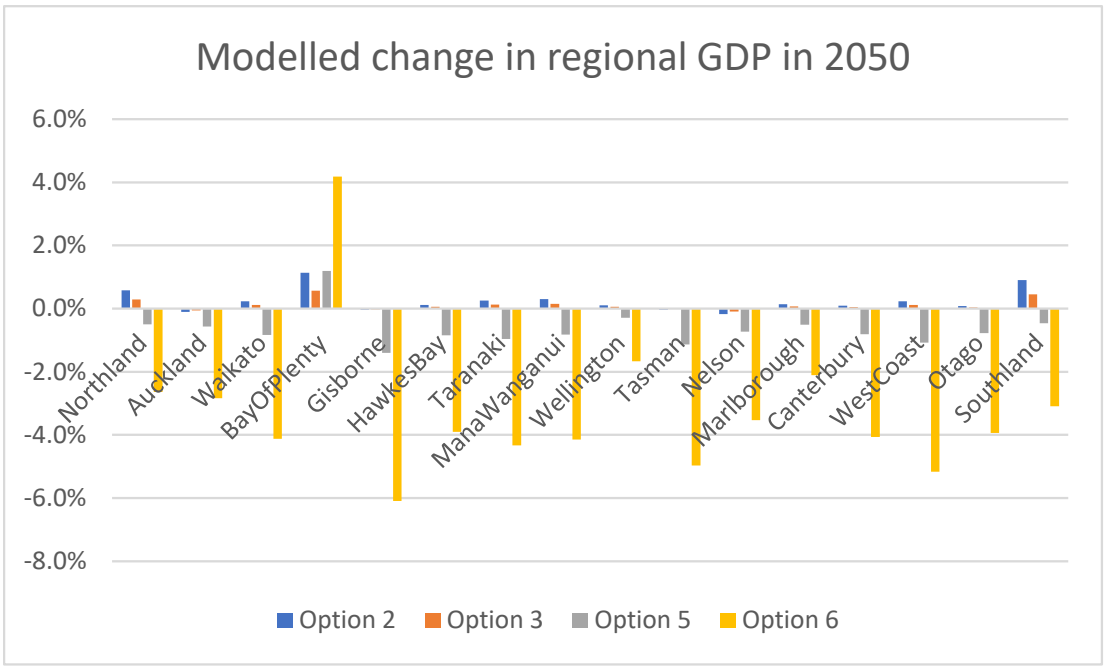
It is important to highlight that these modelled results are only indicative of the potential impact of different target options – the actual economic impacts on different sectors will depend on the specific policies implemented in order to achieve the targets. The impact on agriculture, for example, would be impacted by the specific design of the agricultural pricing system.

	Sector impact in 2050 - compared to Option 1		
	Option 2	**Option 5**	**Option 6**
Agriculture	1.1%	-3.8%	-17.0%
Construction	0.0%	-0.7%	-4.4%
Electricity Generation	7.6%	13.2%	51.9%
Forestry	-0.3%	0.4%	3.5%
Manufacturing	0.1%	-1.3%	-4.1%
Mining	-3.3%	-4.2%	-11.2%
Services	-0.2%	-0.6%	-3.2%
Utilities	5.5%	9.0%	35.0%

Impact by region

The graph below shows the modelled changes in regional GDP in 2050 (compared to the status quo).[98] For Option 2, some regions experience higher GDP compared to Option 1 – most significantly Northland and Southland. Other regions (such as Auckland and Nelson) experience small decline. Nevertheless, the overall impact of Option 2 on different regions is small - owing to the small overall impact this option was modelled to have. Modelled emissions under Option 4 are the same as the status quo, and so there is no difference in impact by region – for this reason, Option 4 is not shown on the graph.

Options 5 and 6 show lower modelled regional GDP for all regions except for the Bay of Plenty (which benefits due to its geothermal electricity resources, and to a lesser extent because of increased forestry activity).



[98] For option 3 (a biogenic target range of between 14 and 24%), the average result between a 14% target and 24% target was graphed.