He Pou a Rangi
Climate Change Commission

Technical Annex

to the Monitoring report: Emissions reduction

Approach, modelling, and analysis for assessing progress towards meeting Aotearoa New Zealand's emissions budgets and the 2050 target

July 2025

Contents

1. Introduction

He Pou a Rangi Climate Change Commission (the Commission) is publishing this technical annex to provide further information on the modelling, data, and analysis that underpins our 2025 *Monitoring report: Emissions reduction – Assessing progress towards meeting Aotearoa New Zealand's emissions budgets and the 2050 target*.

This technical annex should be read alongside the full report and other supporting material published on our website, including:

- report figures and data
- Stats NZ Quarterly greenhouse gas emissions by sector: December 2024 quarter.

The supporting material can be found on the webpage for the 2025 emissions reduction monitoring report: climatecommission.govt.nz/ERM-2025

1.1. About this document

This document provides further technical information for readers who want to learn more about the method, analysis and modelling underpinning our monitoring report.

It covers the following aspects of our analysis and findings that support our recommendation:

- our approach to monitoring including: the role of monitoring; our framework and tools; how we consider emissions, removals and projections; and how we assess progress, adequacy, and new opportunities for emissions reduction plans
- how we monitor emissions by sector
- detail about progress in reducing emissions
- detail on new opportunities
- information gaps that affected our analysis.

2. Our approach to monitoring

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

To create its first report in 2024, He Pou a Rangi Climate Change Commission (the Commission) developed and applied a framework for monitoring. The approach and tools we created provide a clear view of how the country is tracking to its emissions reduction goals. This report has built on the foundation created last year repeating the core methodology with improvements. We will continue to build on this approach through future reporting cycles.

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

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

Drawing connections is key to our monitoring work. Our analysis considers the many links between government policies, economy, industry, people and the environment. Taking this kind of 'systems view' means we also consider adaptation to climate change alongside emissions reduction.[i]

This recognises that work in one area can benefit the other or conversely make it more difficult to achieve. Making the links between different approaches can reduce the cost of action and avoid working at cross purposes. The strength of this systems approach to monitoring will build over time, enhanced through engagement and future work to deepen our understanding of these complex interdependencies and connections.

2.1. Working from evidence: research, analysis and engagement

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

In designing the approach for emissions reduction monitoring we reviewed international research as well as other countries' reporting of emissions reductions and progress against their policy goals. The examples we have drawn on include other monitoring systems used within Aotearoa New Zealand, and some international examples in use by independent climate bodies.

Our approach is based, in particular, on work by the UK Climate Change Committee, which has produced an annual emissions reduction progress report since 2009, evolving its framework considerably in this time.[1]

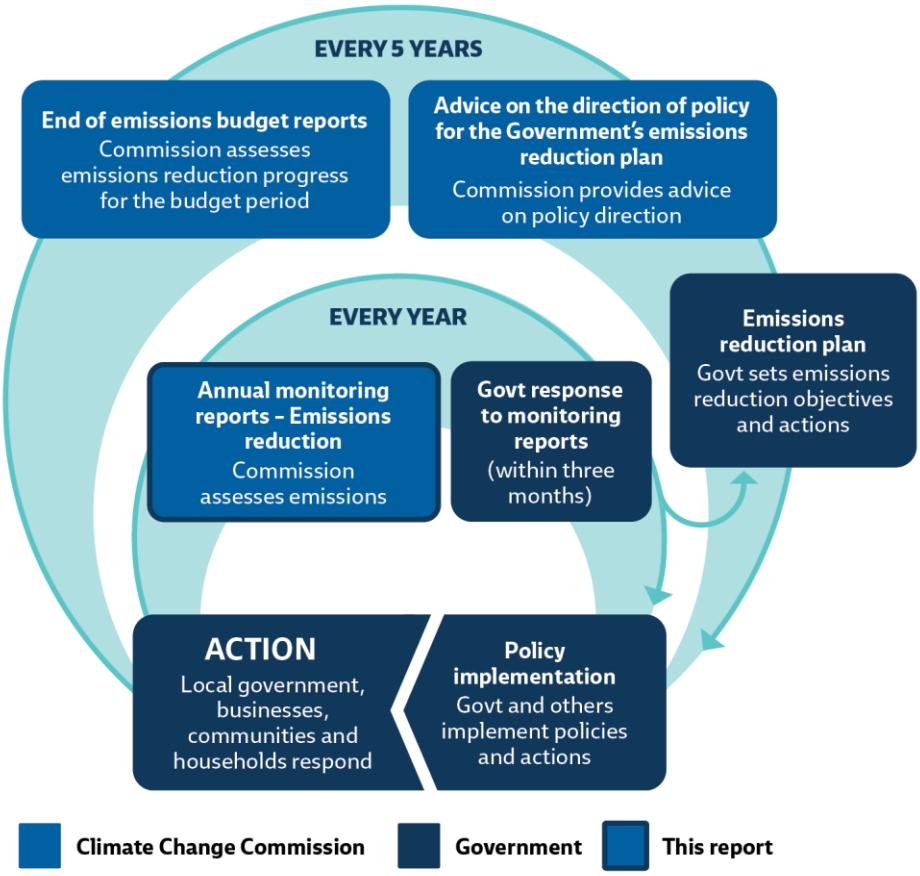
While our work is evidence based, that does not just mean quantitative data. To assess progress on emissions reduction, and the adequacy of the plan and its implementation, we have combined a review of the available data on greenhouse gas reductions with analysis of the effects of government policy and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

[i] Section 5ZG(3)(b) of the Act requires the emissions reduction plan to include a multi-sector strategy to meet emissions budgets and improve the ability of those sectors to adapt to the effects of climate change.

2.2. Role of monitoring

The Commission has two distinct functions under the Act, we provide independent advice and a monitoring role. Both support successive governments to achieve the country's climate change goals. **Figure 1** shows how our monitoring work feeds into the wider policy cycle. The annual cycle of monitoring, and the reporting at the end of emissions budget periods, will inform our policy advice. The Commission will next provide advice on the direction of policy for the third emissions reduction plan (2031–2035) in 2028.

Figure 1: Emissions reduction planning and delivery cycle



Source: Commission analysis

2.3. Our monitoring framework and tools

This section sets out the Act's requirements for monitoring emissions reduction. As set out in the full report in *Chapter 1: Introduction*, the Commission is required under the Act to regularly monitor and report on progress to meet emissions budgets and the 2050 target. The Act outlines the reports that have to be delivered and lists matters that must be considered.

The Act requires annual monitoring reports to include these elements:

- measured emissions and removals for the most recent year where data are available from New Zealand's Greenhouse Gas Inventory (GHG Inventory)
- the latest projections for current and future emissions and removals
- an assessment of the adequacy of the emissions reduction plan and progress in its implementation, including any new opportunities to reduce emissions.

The Act requires monitoring and reporting of progress towards meeting emissions budgets and the 2050 target, and must consider, where relevant, these issues and impacts:

- current available scientific knowledge
- existing technology and anticipated technological developments, including the costs and benefits of early adoption of these in New Zealand
- the likely economic effects
- social, cultural, environmental, and ecological circumstances, including differences between sectors and regions
- the distribution of benefits, costs and risks between generations
- the Crown–Māori relationship, te ao Māori (as defined in section 5H(2)), and specific effects on iwi and Māori
- responses to climate change taken or planned by parties to the Paris Agreement or United Nations Framework Convention on Climate Change.

This 2025 report provides a view of progress towards reducing the country's greenhouse gas emissions at a particular point in time, showing progress to date and an assessment of how Aotearoa New Zealand is tracking towards its emissions budgets and the 2050 target. Details on timeframes and the report's focus can be found in the full report in *Chapter 1: Introduction*.

2.4. How we consider measured emissions and removals and projections

New Zealand's Greenhouse Gas Inventory

As required under section 5ZK of the Act, we evaluate the measured emissions and removals in the most recent year of the emissions budget period for which data is available from New Zealand's Greenhouse Gas Inventory (GHG Inventory).[2] To assess progress in emissions reduction to date within the first emissions budget period (2022-2025), we have used the historical data in the GHG Inventory.

The GHG Inventory published in April 2025 provides data up until the end of the 2023 calendar year: the second year of the first emissions budget. This includes the use of 100-year time horizon global warming potential (GWP_{100}) values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).

In 2025, net target accounting[ii] contributions from the LULUCF sector were published in the GHG Inventory, to facilitate reporting under the Nationally Determined Contribution (NDC). This was in addition to the reporting of emissions and removals using the GHG Inventory approach for the LULUCF sector. New Zealand's Emissions budgets and targets apply the net target accounting approach.

Government projections

The latest Government projections are those from the second emissions reduction plan. This differs to last year when the emissions reduction monitoring report used the latest government emissions projections at the time, and the Commission's 2022 demonstration path[iii] as pathways for assessing progress. The ERP2 New Measures

[ii] There are two accounting approaches used in Aotearoa New Zealand for assessing forest removals. Land use, land use change and forestry (LULUCF) inventory accounting, used in the national greenhouse gas inventory, reports emissions and removals from all land-use changes. Target accounting uses only a subset of emissions and removals in the LULUCF sector. Target accounting is the methodology used for tracking progress against national emissions budgets and targets.

[iii] The Commission's 2022 demonstration path represents the Commission's demonstration path used in the *Ināia tonu nei* advice, as updated in 2022.

path (ERP2 path) represents the basis of the Government's ambition. This allows us to assess progress and fulfil the requirements under section 5ZK of the Act to undertake the analysis with "the latest projections for current and future emissions and removals".

Government emissions projections were published in December 2024 and were developed using the 2024 GHG Inventory methodology. Projections are combined with our assessment of the adequacy and implementation of the current emissions reduction policies and plan.

There are eight policies within the second emissions reduction plan that were identified to have the greatest potential to lower emissions:

1. Carbon capture, utilisation and storage
2. Organic waste management and landfill gas capture
3. Electrify NZ
4. Afforestation on crown-owned land
5. Waste minimisation fund
6. Agricultural emissions pricing system
7. Product stewardship of refrigerants
8. EV charging network

The assumptions underpinning the impact of the eight policies, as well as any further changes, were in an accompanying ENZ model, and made available to the Commission. The ENZ model used in the development of the path in the Government's second emissions reduction plan (the 'ERP2 path') was helpful, although some emissions were not correctly characterised. For example, the carbon capture and storage initiatives for the gas industry were being modelled under Geothermal CCS in ERP2 path of the ENZ model, and therefore emissions for these were being assigned to the electricity generation outcome area. We reassigned this in our analysis.

Alongside the ERP2 path, the Government provided separate low and high pathways as a measure of uncertainty.

Stats NZ emissions data

We supplement GHG Inventory data with provisionally estimated emissions for the 2024 calendar year. The data was provided by the climate change interdepartmental executive board via a customised data request from Stats NZ. The estimates provided are quarterly GHG emissions and use the methodology aligned with the GHG Inventory published in 2024. We have made adjustments to the 2024 year provisional data to account for methodological changes in the GHG Inventory published in 2025. The Stats NZ emissions data uses the most recent data for energy-related emissions and combines these with Government projections for other sources and sectors.

The Stats NZ quarterly data allows us to assess the most recent progress on gross emissions reductions. Removals from forests are not in the scope of the Stats NZ emissions accounts and therefore net emissions are not reported for the 2024 year.

2.5. How we measure progress

Indicators

We have compiled a wide-ranging set of indicators to measure real-world progress. These indicators, or key measures, enable a deeper understanding of the drivers underpinning observed changes in emissions and show visually the direction of travel in underlying trends. The indicators facilitate the tracking of progress over time and our intent is that these sets of indicators remain largely consistent year-to-year. Some changes are necessary, however, as we refine the indicator sets either with new data or dropping indictors which may no longer be maintained or informative of progress.

A sub-set of the indicators are shown in the full report to highlight key areas of progress. Within the Technical Annex an extended set of indicators are presented, and which are comparable to last year's monitoring report.

Indicators are grouped by sector. The indicators show historic data from 2010, and where available projections from the ERP2 path or EB4 demonstration path. Some indicators may show other projected data if appropriate. Given that the ERP2 path was published in December 2024, the status of progress has typically defaulted to "Too early to say".

Policy

Under the Act, the Commission is required to assess "the adequacy of the emissions reduction plan and progress in its implementation" (section 5ZK). For this monitoring report, we have analysed current emissions reduction policies and plans in the 12 months up to 1 April 2025.

The Act requires, as part of monitoring and reporting of progress on emissions reduction, that the assessment considers a range of issues and impacts. Our assessment of these broader elements falls into two streams.

- We have looked at the overarching approach and framework to address challenges at system level (see these chapters in the full report: *Chapter 3: Enabling systems*, *Chapter 4: Emissions pricing*, *Chapter 5: Whakahekenga rehukino* and *Chapter 6: Impacts and benefits*.
- We have integrated consideration of how barriers and enablers have been addressed and whether they present any ongoing risk to delivery of emissions reduction outcomes, as part of the policy scorecard assessment.

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

How actions in emissions reduction plans can support adaptation is considered across our analysis and forms part of our assessment of the adequacy of current emissions reduction policies and plans. One output is a cross-cutting analysis of policies and plans, which provides a 'system-wide' view of progress towards the country's emissions budgets and 2050 target. The cross-cutting analysis covers global trends; and domestic policies, systems and tools, including the New Zealand Emissions Trading Scheme (NZ ETS).

We use data collated by the Climate Change Chief Executives Board for their quarterly reports, to assess implementation progress. These data sources provide information on whether actions in the first emissions reduction plan (including any new actions announced by the Government since the release of that plan) are being implemented as planned, or if they have been delayed or discontinued. The data informed our scorecard assessment on the strength of current government policies to achieve emissions reduction outcomes.

2.6. How we measure adequacy

Benchmark

The ERP2 path represents the Government's ambition for meeting the second emissions budget (2026-2030) and is the benchmark we have used for tracking progress. We have used the same path to assess how policies and plans intend to meet the third emissions budget (2031-2035), whilst acknowledging that there is currently a shortfall in the Government's plan for this period.

We quantify the emissions reductions expected to be achieved in the ERP2 path by comparing to a counterfactual baseline representing how emissions may have tracked had no policies been enacted since the emissions budgets were set. The baseline path is the Commission's 2022 current policy reference (CPR) scenario, which was based on Government emissions projections used in the first emissions reduction plan, with some adjustments. Adjustments were made to factor out some emissions reductions assumed to occur

from electricity generation and exotic afforestation in the Commission's 2022 current policy reference scenario. This is done to show the full extent of emissions reductions from these areas and enable us to map our scorecard results on to these quantities. This approach is consistent with that used in the Commission's first monitoring report in 2024.

The baseline path was updated with methodological changes from the 2024 Inventory. This was to ensure that the pathways could be compared on the same basis. Quantification of reductions were calculated in 16 Outcome Areas, covering all sectors of the economy.

The ENZ model was used to quantify the emissions reductions between the baseline path and the ERP2 path. To enable the assessment to be made required us to create a single version of the ENZ model from a combination of alternative iterations of the model. The single ENZ model combined:

- the Commission's 2022-Current Policy Reference (the '2022-CPR')
- the Commission's demonstration path from its advice on the fourth emissions budget (the 'EB4 demonstration path')
- the path in the Government's second emissions reduction plan (the 'ERP2 path').

The process of combining the ENZ model required that the Commission's 2022-CPR path was modified so that discrepancies in the underlying assumptions between different pathways could be made consistent.

The emissions reductions assessed are the cumulative impacts of the differences in assumptions used between the baseline and the ERP2 path. An example of the different assumptions between pathways is shown in **Table 1** for exotic afforestation.

Table 1: Assumptions used in different pathways for hectares of exotic afforestation until the end of the third emissions budget period

Exotic afforestation (Ha)

2022 CPR		EB4 demonstration path		ERP2 path	
Year	**Hectares**	**Year**	**Hectares**	**Year**	**Hectares**
2025	32,000	2025	17,688	2025	27,930
2026	31,500	2026	15,791	2026	27,433
2027	31,500	2027	19,386	2027	32,702
2028	31,500	2028	22,980	2028	33,596
2029	31,500	2029	22,980	2029	33,310
2030	31,500	2030	22,980	2030	38,223
2031	31,500	2031	22,144	2031	37,786
2032	31,500	2032	21,307	2032	37,635
2033	31,500	2033	20,471	2033	37,478
2034	31,500	2034	19,634	2034	37,316
2035	31,500	2035	18,798	2035	37,151

Source: Commission analysis, Commission's advice on the fourth emissions budget, New Zealand's second emissions reduction plan

The use of the 2022-CPR baseline was consistent with the approach used in the 2024 emissions reduction monitoring report. However, unlike last year, by making the comparison against the ERP2 path there were some contradictory results. Agriculture showed an increase in emissions in the second emissions budget period, when compared on this basis i.e. the emissions were higher in the ERP2 path than the 2022-CPR baseline. This difference was due to the underlying assumptions used in the different models. Most of the difference could be accounted for by different variables for i) land use, ii) livestock population and iii) nitrogen fertiliser use. The first two contributed to an estimate of stocking rate, a parameter which could also be manually over-ridden. Assumption values for total non-urea fertiliser were higher in the 2022-CPR and total

urea fertiliser was lower in the 2022-CPR. Overall, there was a higher nitrogen fertiliser use in the ERP2 path, leading to higher emissions estimates.

Scorecards

Our analysis of sectors uses 'policy scorecards' to summarise the strength of government policies and plans to achieve emissions reductions within each sector outcome area. This helps us answer the question: "How is the country tracking towards meeting the second emissions budget (2026–2030), the third emissions budget (2031–2035) and the 2050 target, under current policies and plans?"

The scorecard assessment provides a clear, methodical and transparent framework for assessing the strength of emissions reduction policies and plans to drive change in each sector. Specifically, the scorecards gauge the ability of current policies and plans to achieve the identified benchmark outcomes within sectors (based on the ERP2 path) that contribute to meeting emissions budgets.

Like the monitoring maps (set out in *Section 3: How we monitor emissions by sector*), scorecards help make the Commission's analysis visible. They 'show our workings', and they provide a useful way of signalling where there are risks to meeting the emissions budgets and the nature of those risks.

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

- **Main tools:** what are the key current policies that drive the mitigation actions and unlock the enablers to deliver the outcome in the monitoring maps?
- **Funding and finance:** are levels of funding sufficient and durable and are plans to mobilise private finance credible?
- **Barriers and opportunities:** are there specific barriers or opportunities that need to be addressed to deliver the outcome?
- **Timeline:** are timelines sufficient to achieve the key current policies and is there a roadmap for achieving emissions reductions outcomes in the second and third emissions budgets?

This includes examining barriers and enablers that relate specifically to iwi/Māori and/or have implications for equity, including how impacts of change are distributed across different communities and regions. It also includes consideration of the ability to adapt to climate change. **Table 2** shows the full scoring criteria for our policy scorecard, including descriptions for each score level.

Table 2: Scoring criteria used in the policy scorecards

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

* A roadmap may not be necessary for some outcome areas where the timelines for key policy tools are sufficient and short-term timelines may not be required if there is a clear roadmap for getting to a long-term change.

Note: the overall assessment of risk has a grey ( ) area on the bar chart for the third emissions budget. This represents a gap between the plan and what is required to meet the emissions budget.

The 'Fit for purpose networks' scorecard was assessed and shown in *Chapter 7: Energy, Industry & Buildings* of the full report. It continues the assessment in the 2024 emissions monitoring report, entitled 'Build flexible networks'. However, this scorecard does not form part of the calculations for the overall risk assessment because the emissions reductions it contributes to are covered within other outcome areas.

Enabling systems, emissions pricing and impacts and benefits

The Act requires the emissions reduction plan to include a 'a multi-sector strategy to meet emissions budgets and improve the ability of those sectors to adapt to the effects of climate change' (section 5ZG(3)(b))– this is what we assess in the full report in *Chapter 3: Enabling systems* and *Chapter 4: Emissions pricing*. The domains

covered in the report are listed below. The list of domains is informed by those included in government emissions reduction plans to date and in the Commission's previous advice:

- Funding and finance
- Urban design, planning and infrastructure
- Research, science, technology and innovation
- Nature, the circular economy and bioeconomy
- Adaptation
- Governance
- Emissions pricing.

There is a broad range of ways in which combinations of actions across these domains could be effective in supporting climate objectives. In recognition of the diverse approaches possible, we do not assess adequacy in terms of specific benchmarks in particular areas. Instead, where there is sufficient information to do so, our assessment is based on:

1) **Coverage:** The extent to which the Government's approach addresses the main barriers, opportunities and issues discussed in previous Commission advice
2) **Effectiveness:** Any risks to effectiveness of government policies in these areas.

Impacts and benefits

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

For *Chapter 6: Impacts and benefits* in the full report, in addition to the two elements above (coverage and effectiveness), our assessment is informed by any new evidence about impacts that may have emerged since our 2024 report.

2.7. How we measure new opportunities

Quantifying where the Government could reduce emissions further

For the third emissions budget period (2031-2035) the Government's ERP2 path shows a shortfall in emissions necessary to meet the budget. The policies and plans described in ERP2 are insufficient to achieve the third emissions budget. We therefore undertook an exercise to quantify where the Government could reduce emissions further.

The Commission's EB4 demonstration path was released in 2024 and represents a recent assessment of what is considered feasible. The EB4 demonstration path was developed to be a set of measures and actions within each sector that would deliver the recommended fourth emissions budget. As our EB4 advice stated, it is not the only option, it is not a forecast of what will happen, and it is not a strict plan that Government must follow. Other pathways, such as the high technological and high system change (HTHS) path, were developed in the advice, that could achieve more ambitious reductions over shorter timescales. However, for this exercise we used the Commission's EB4 demonstration path as an example pathway consistent with achieving the emissions budgets and the 2050 target.

The quantification of further emissions reductions was assessed by comparing the Commission's 2022-CPR and Commission's EB4 demonstration path. For each Outcome Area, if the emissions reduction was greater than that shown in our assessment of adequacy then we concluded that further reductions were feasible. For some Outcome Areas, the ERP2 path showed greater reductions in an emissions budget period, in which case we assumed that no further reductions were readily present.

3. How we monitor emissions by sector

Monitoring maps show the building blocks which set out a 'theory of change' or 'intervention logic' for the sector. They make visual the various elements of a change and the connections between outcomes, enablers, and policies for emissions reduction. The maps are also used to derive the wider set of indicators we use to show and assess real-world progress towards pathways outcomes and enablers for emissions reductions.

We have used them in our monitoring of emissions reductions to make our assumptions clear, it is a way of showing our workings.

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

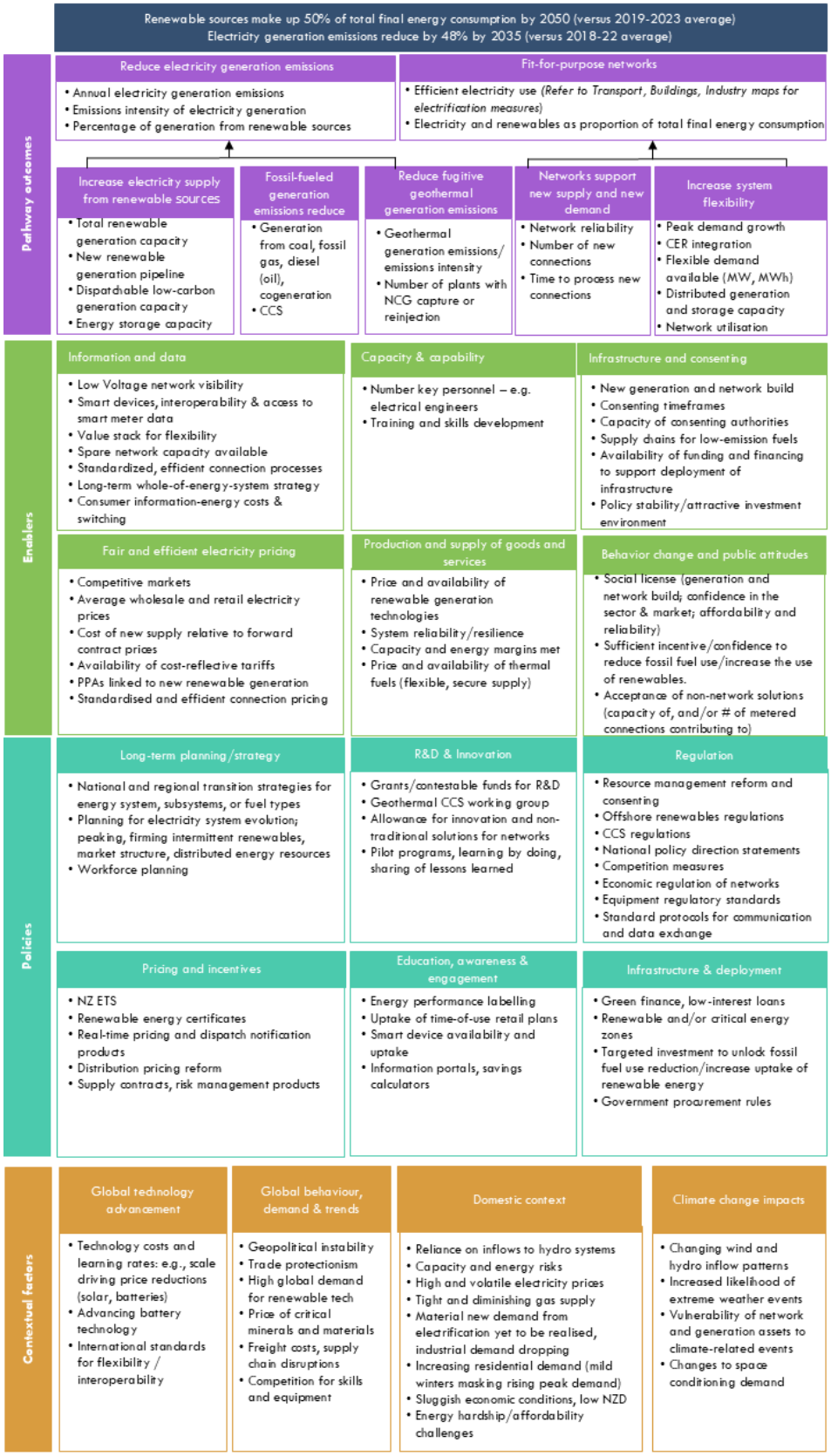
- **Emissions goal.** This is a working 'target' for the mapping exercise, which is used to measure emissions reduction progress (for example, "electricity generation emissions reduce 48% by 2035"). Where available, the goals are based on Government plans; otherwise the goal on the map draws on the ERP2 path (the benchmark used for this monitoring), set in the second emissions reduction plan. The content in any paler boxes relates to emissions occurring outside of Aotearoa New Zealand. These are out of scope of emissions budgets and targets, but they are included for completeness.
- **Pathway outcomes.** These are the specific changes within sectors that contribute to achieving the emissions reduction goal (for example, "reduce electricity generation emissions").
- **Enablers.** These are the critical factors that need to be in place for the pathway outcomes to be achieved (for example, "Information and data" and "Infrastructure and consenting").
- **Policies.** These are policies and strategies that implement or action the enablers. They may drive emissions reductions or address barriers (for example, "Pricing and incentives" or "R&D and innovation").
- **Contextual factors.** These are changes outside Government climate policy that could have major effect on the ability of the sector to achieve the pathway outcomes (for example, "Global technology advancement" and "Domestic context").

Pathway outcome benchmarks provided at the top of monitoring maps may not be entirely consistent with figures shown in indicator dashboards as they are based on projections from different greenhouse gas inventories.

3.1. Energy, industry and buildings

Electricity supply

Figure 2: Electricity supply monitoring map



Source: Commission analysis

Industry

Figure 3: Industry monitoring map[iv]

Source: Commission analysis

*The pathway outcome benchmark for domestic industry excludes fluorinated gases (f-gases), as there is a separate monitoring map and benchmark for this.

Note: emissions shown in the indicator for 'Industrial energy and process emissions' in Section 5.3 are higher because it includes f-gases.

[iv] The content in any paler boxes relates to emissions occurring outside of Aotearoa New Zealand. These are out of scope of emissions budgets and targets, but they are included for completeness.

Buildings

Figure 4: Buildings monitoring map

Source: Commission analysis

Note: the pathway outcome benchmark for building operational emissions uses a different calculation approach to the measured emissions in the indicator dashboard (*Section 5.3*) due to modelling limitations.

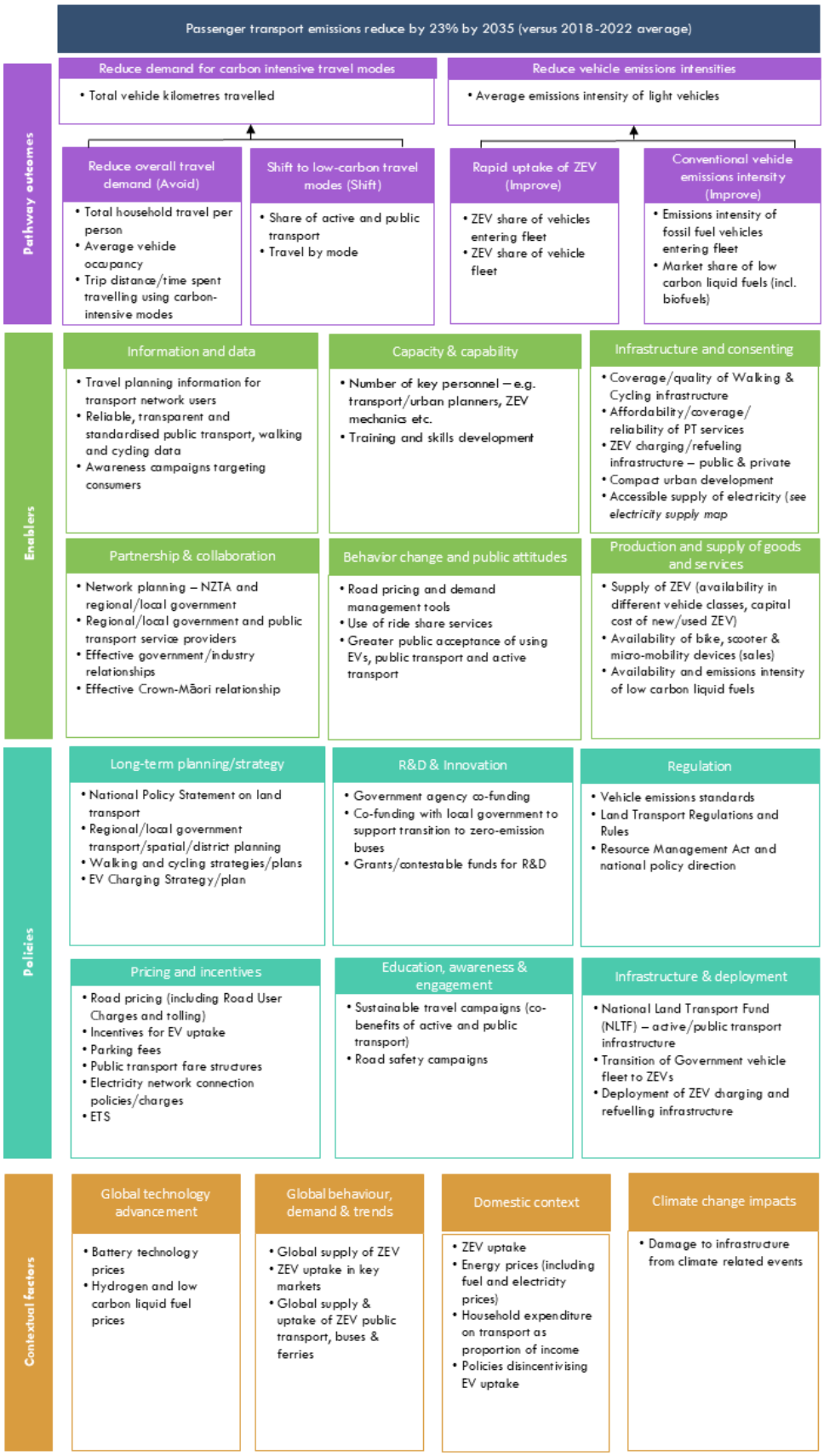
Gas supply and domestic oil and gas production

Figure 5: Gas supply and domestic oil and gas production monitoring map

Source: Commission analysis

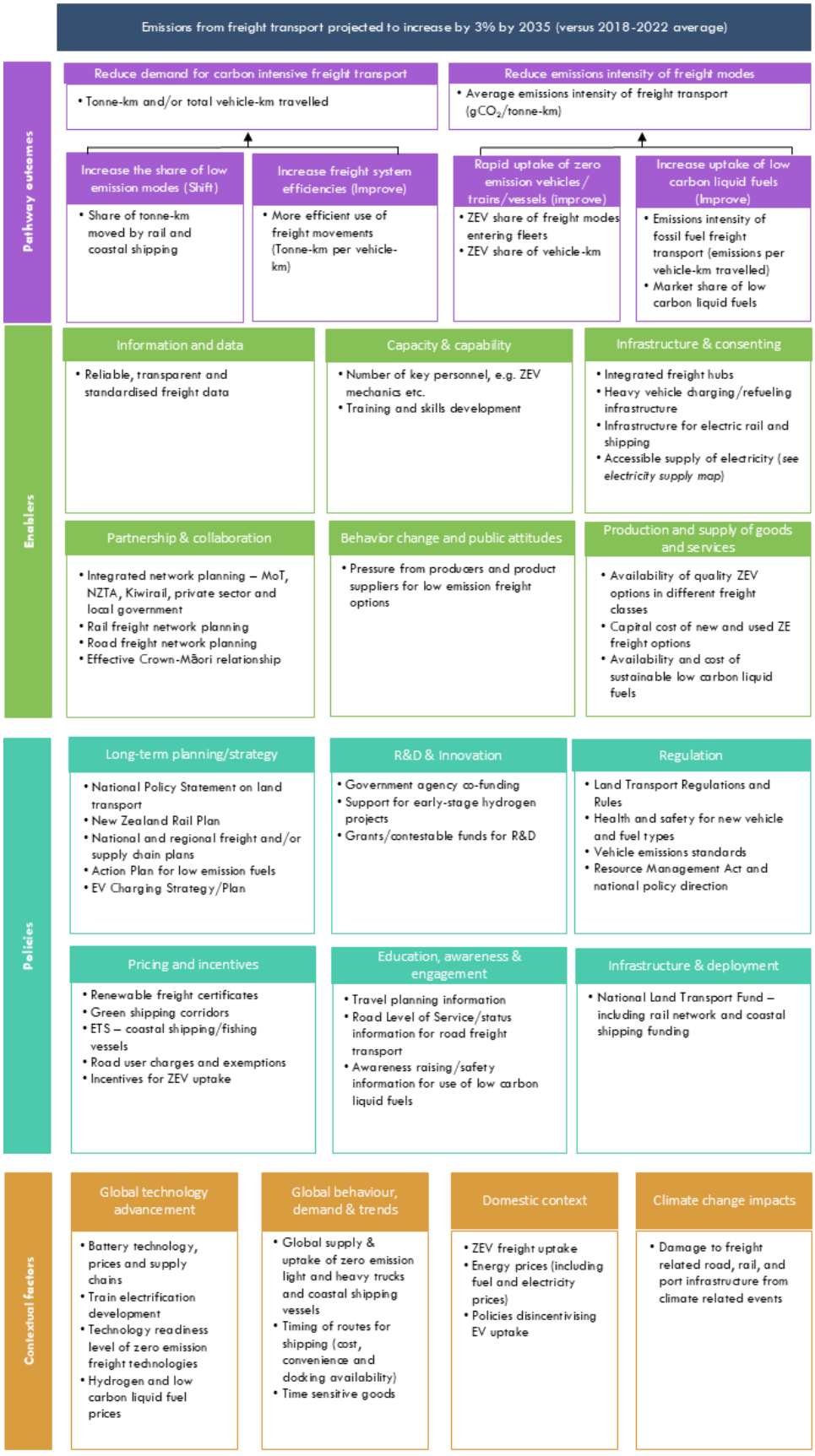
3.2. Transport

Figure 6: Passenger transport monitoring map



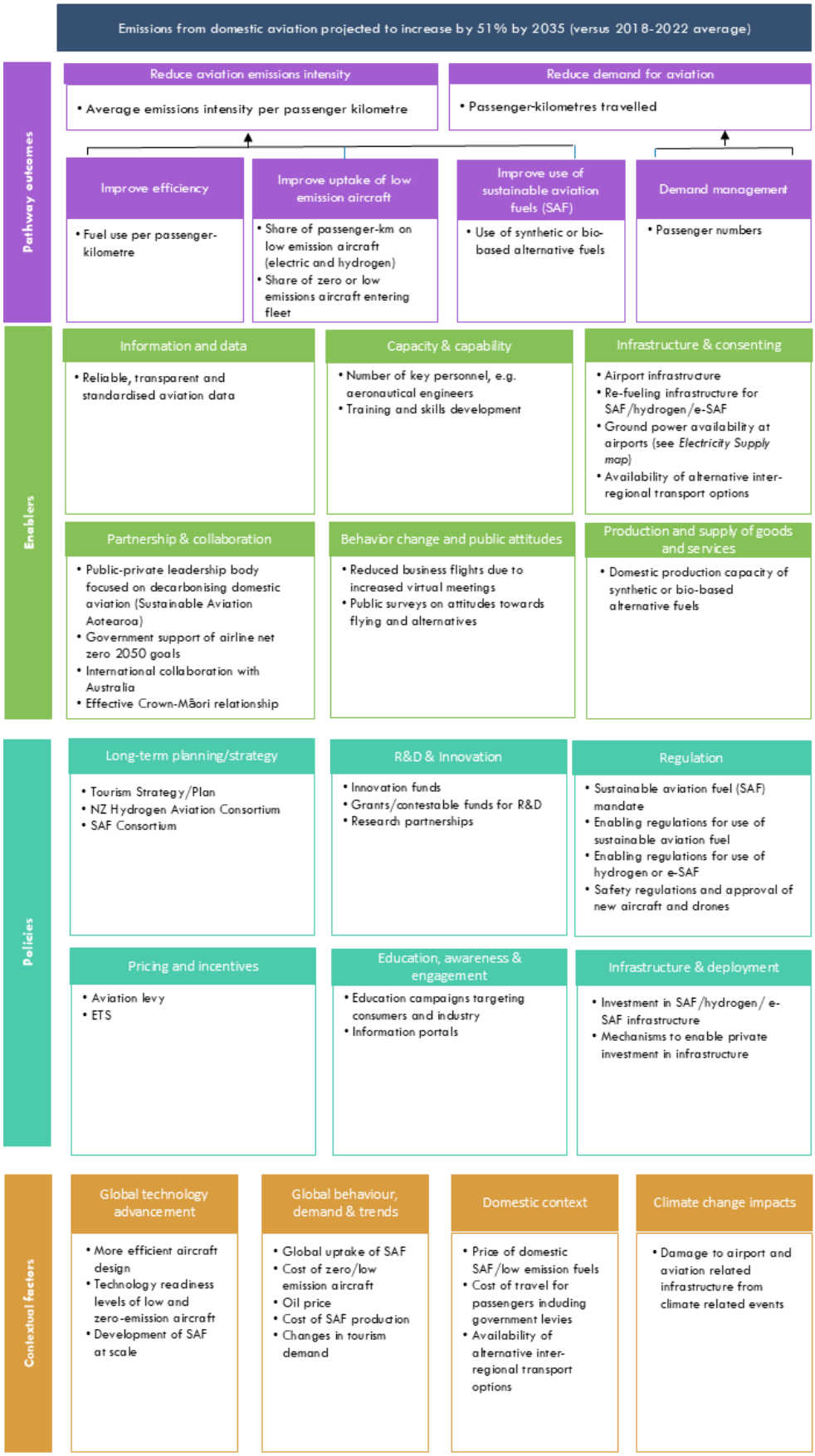
Source: Commission analysis

Figure 7: Freight transport monitoring map



Source: Commission analysis

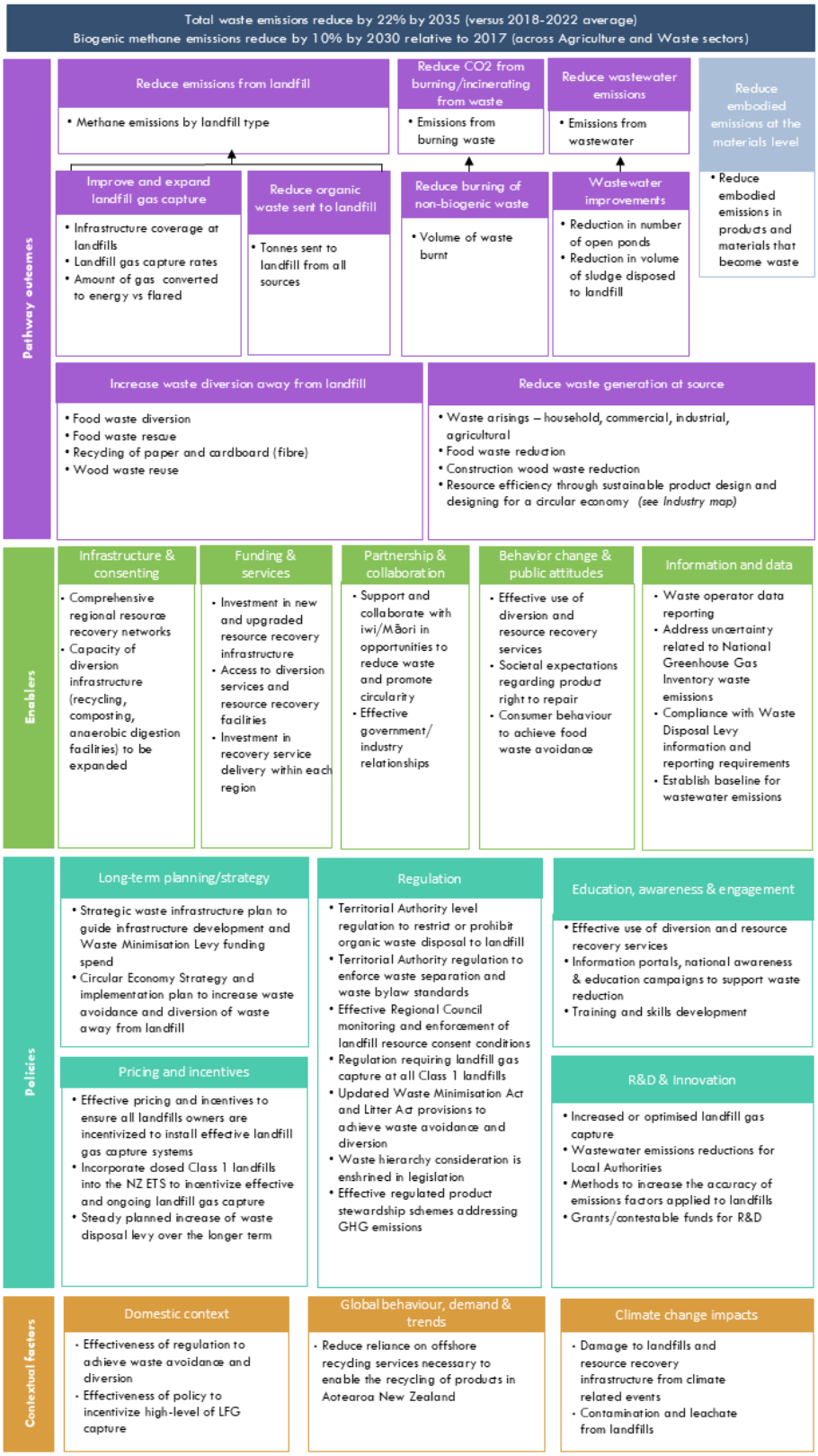
Figure 8: Aviation monitoring map



Source: Commission analysis

3.3. Waste and fluorinated-gases (f-gases)

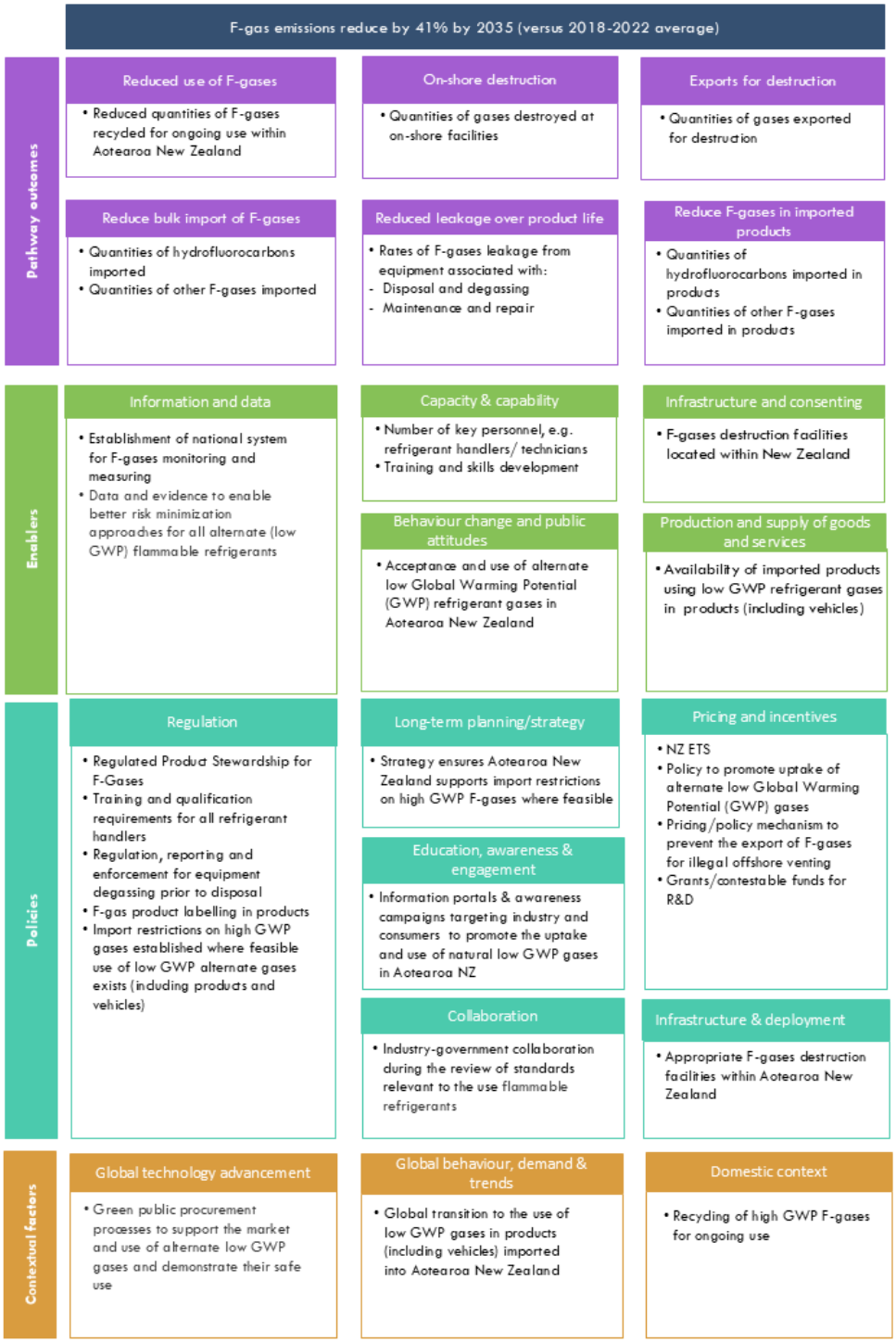
Figure 9: Waste monitoring map[v]



Source: Commission analysis

[v] The content in any paler boxes relates to emissions occurring outside of Aotearoa New Zealand. These are out of scope of emissions budgets and targets, but they are included for completeness.

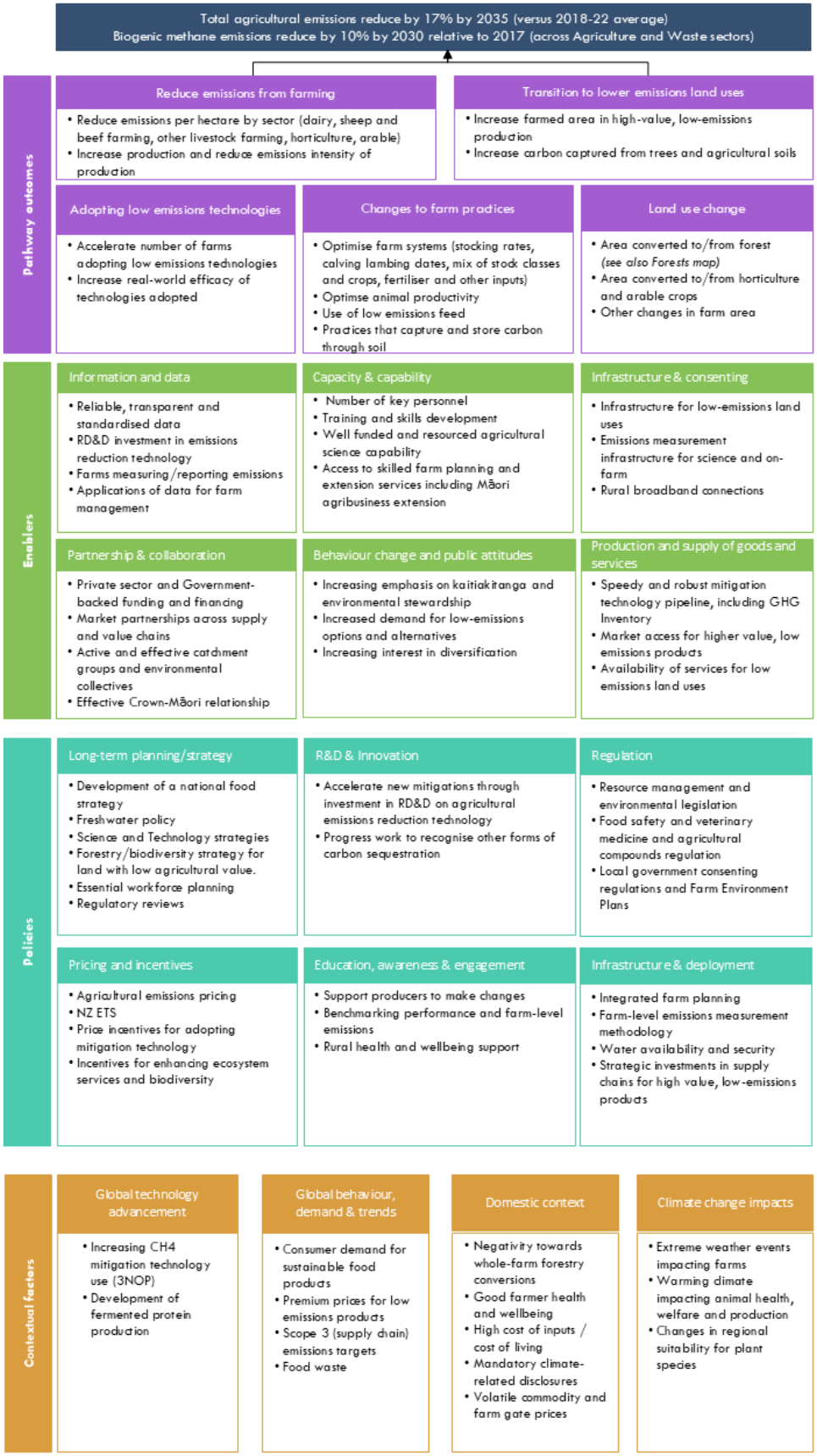
Figure 10: F-gases monitoring map



Source: Commission analysis

3.4. Agriculture

Figure 11: Agriculture monitoring map



Source: Commission analysis

3.5. Removals

Figure 12: Removals monitoring map

Source: Commission analysis

4. Detail about progress in reducing emissions

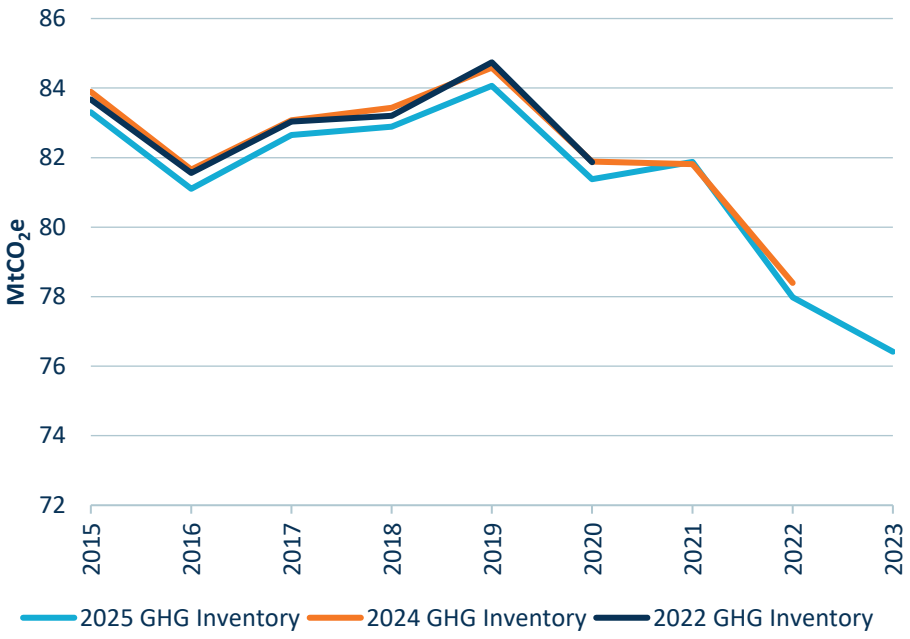
4.1. Impacts of methodological improvements in the 2025 GHG Inventory

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

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

The latest gross emissions estimates align very closely with the GHG Inventory data published in 2024 (**Figure 13)**. They also closely align with the GHG Inventory published in 2022. Prior to 2023 the GHG Inventory used GWP_{100} values from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4), whereas now the Fifth Assessment Report (AR5) values are used. The GHG Inventory published in 2022 therefore had to be converted to be consistent with AR5.

Figure 13: Gross emissions since 2015, as reported in the GHG Inventories published in 2022, 2024 & 2025



Source: Commission analysis of GHG Inventories published in 2022[4], 2024[5] and 2025

The most notable change from methodological improvements between GHG Inventories published in 2024 and 2025 was in the Waste sector. This resulted from a significant update to the data sources used for emissions estimates. Methodological improvements led to a decrease in emissions of 0.56 $MtCO_2e$ (15.9%) for the 2022 year.

In the Commission's final advice on the fourth emissions budget, we recommended that existing emissions budgets be revised to reflect methodological improvements.

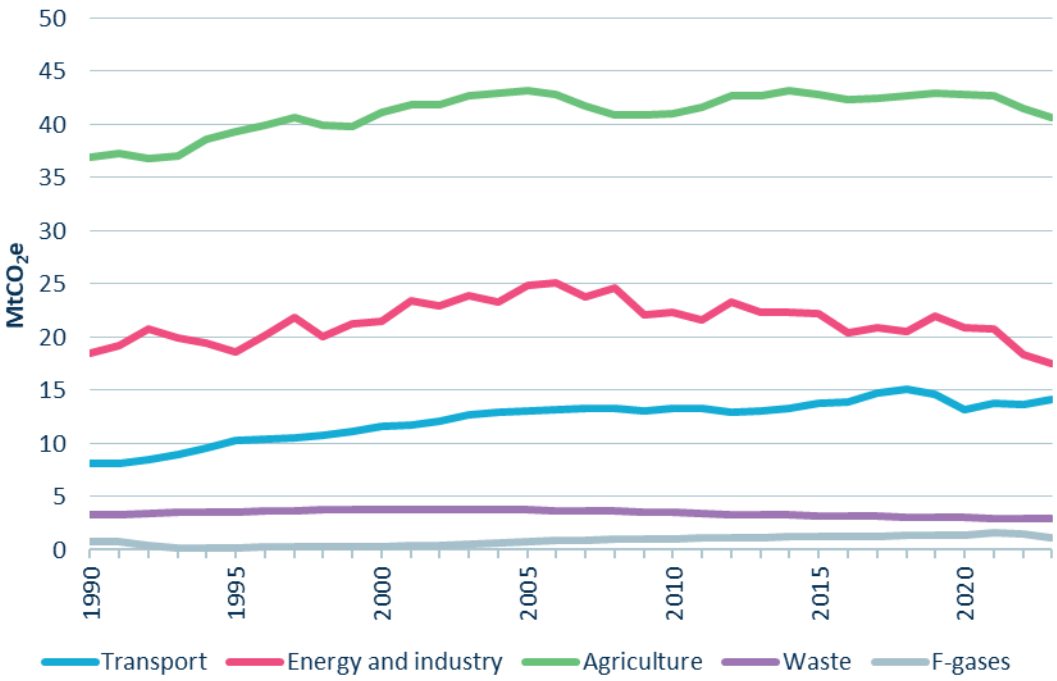
Our modelling applied methodological improvements to previous pathways so that the basis was consistent and comparable. For example, the Commission's 2022 CPR path, which we use as the baseline in this monitoring report, was originally developed based on the GHG Inventory data published in 2022. Both the projections in the Government's second emissions reduction plan and the Commission's EB4 demonstration path were developed based on the GHG Inventory published in 2024. In this analysis we have adjusted the Commission's 2022 CPR path to include the methodological improvements from the GHG Inventory published in 2024. These three pathways were the basis for our assessment of progress, adequacy and opportunities of the second emissions reduction plan.

4.2. Overall progress

Where emissions reductions have come from

Our assessment of measured emissions and removals are based on the GHG Inventory published in April 2025 (1990-2023). Gross emissions by sector are shown in **Figure 14**. This shows the long-term trends occurring in each sector.

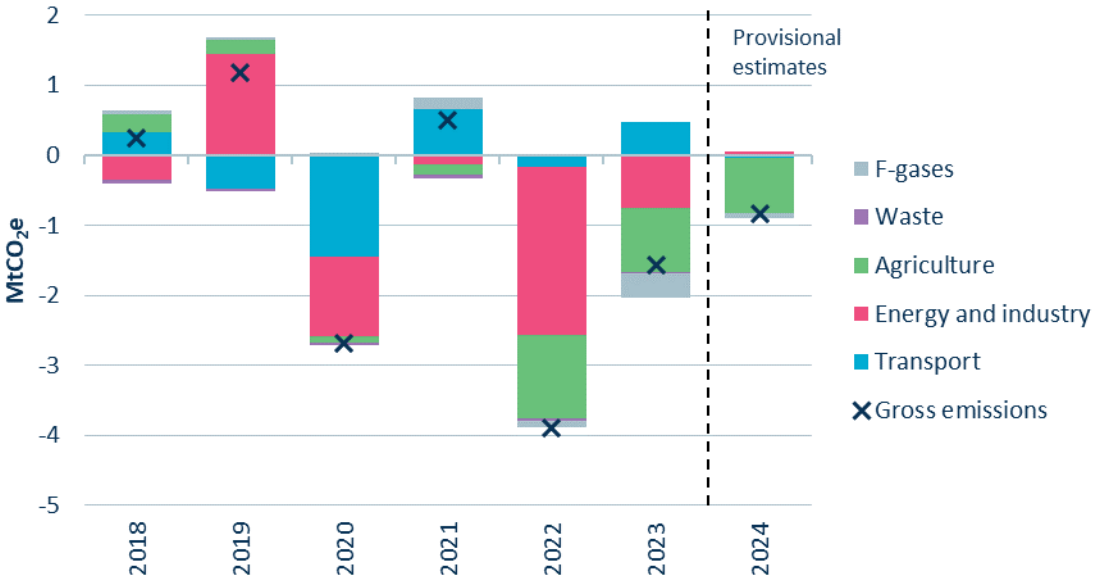
Figure 14: Emissions by sector



Source: Commission analysis of GHG Inventory 1990–2023

Figure 15 shows the annual change in gross emissions for each sector. In 2023 gross emissions fell in every sector apart from transport. The largest sectoral emissions drop in this period occurred in agriculture, and provisional estimates from Stats NZ are that agricultural emissions will drop further in 2024.

Figure 15: Annual changes in gross emissions by sector since 2018



Source: Commission analysis of GHG Inventory 1990–2023, Stats NZ

Methane emissions fell 2% (0.02 $MtCH_4$[vi]) from 1.22 $MtCH_4$ in 2022 to 1.19 $MtCH_4$ in 2023.

4.3. Energy, industry and buildings

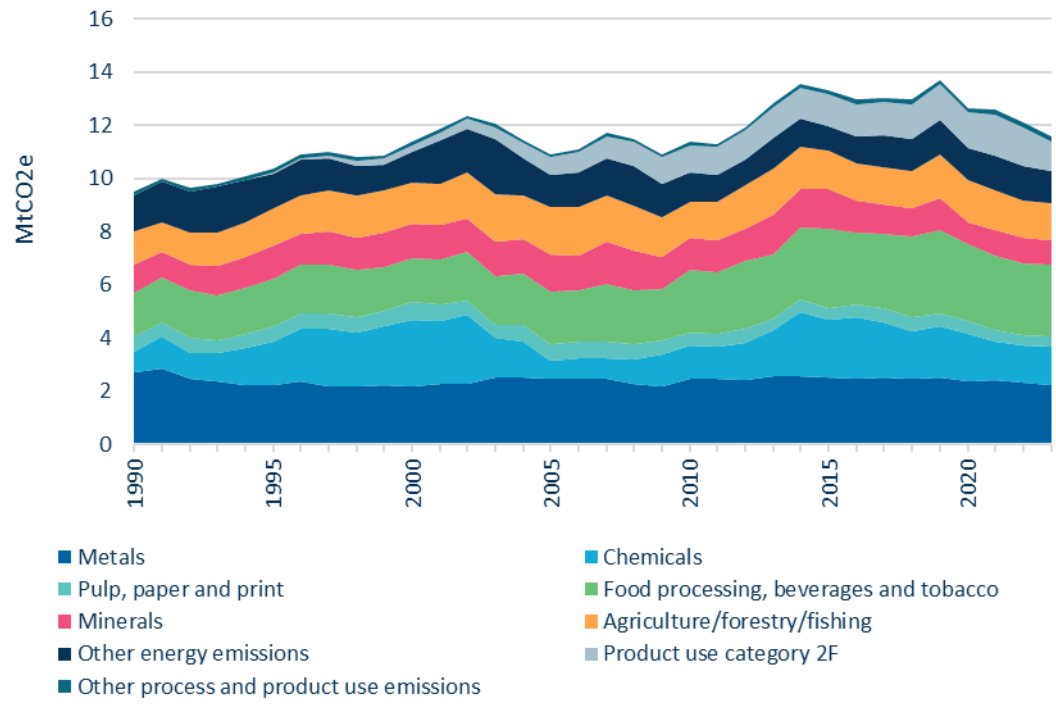
This section summarises the progress to reduce greenhouse gas emissions in the energy and industry sector, which includes industry, buildings, electricity supply, and domestic fossil fuel supply.

Industry accounted for 11.6 $MtCO_2e$ of emissions in 2023 (**Figure 16).** Between 2022 and 2023, emissions from industry reduced by 4.2% (0.5 $MtCO_2e$) from 12.1 $MtCO_2e$ to 11.6 $MtCO_2e$. This change was driven by a 2.9% (0.05 $MtCO_2e$) reduction in emissions from iron and steel making, and 6.8% (0.03 $MtCO_2e$) reduction in emissions from cement and lime production. Other energy emissions saw a 5.6% (0.07 $MtCO_2e$) reduction, attributable principally to energy use in the mining sector and textiles and leather.

These reductions offset emissions increases occurring from solid fuel use (+0.02 $MtCO_2e$) and in methanol production (+0.01 $MtCO_2e$), aluminium production (+0.01 $MtCO_2e$) and N_2O from medical applications (+0.02 $MtCO_2e$).

[vi] Totals may not sum precisely due to rounding.

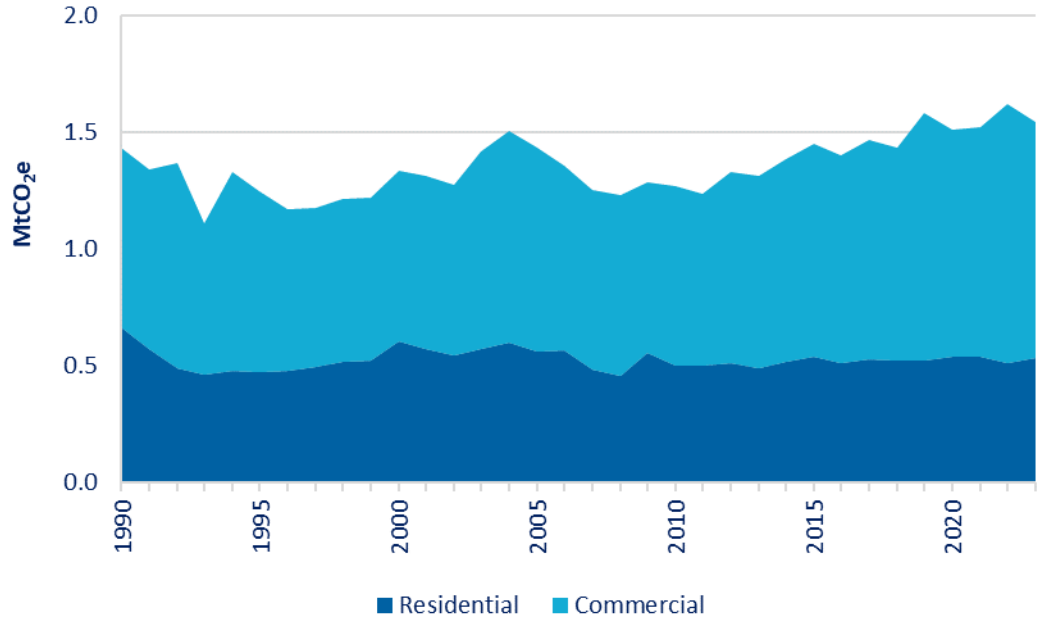
Figure 16: Emissions by industrial sector



Source: Commission analysis of GHG Inventory 1990–2023

Between 2022 and 2023, emissions from direct fossil fuel use in buildings decreased by 4.7% (0.08 $MtCO_2e$) (**Figure 17**). This was driven by a decrease of 0.09 $MtCO_2e$ in the commercial sector which was offset by an increase of 0.02 $MtCO_2e$ in the residential sector. Emissions from commercial buildings have been trending up since 2010, whilst those from residential buildings have remained stable.

Figure 17: Residential and commercial buildings emissions



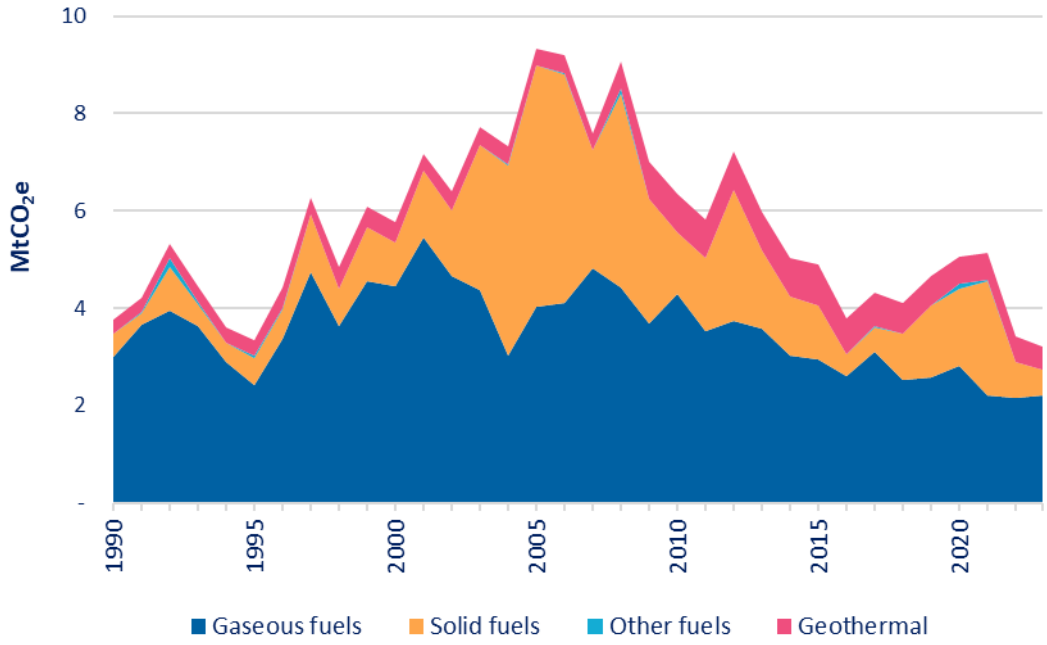
Source: Commission analysis of GHG Inventory 1990–2023

Electricity supply emissions reduced in 2023, reaching the lowest level in the entire data series beginning in 1990 (**Figure 18**). Emissions from electricity generation have largely been trending downwards since peaking in 2005 at 9.3 $MtCO_2e$. This is largely attributed to a reduction in fossil fuel generation and increase in renewable generation build, mainly wind and geothermal.

Between 2022 and 2023, emissions from electricity generation reduced by 6% (0.2 $MtCO_2e$), from 3.4 $MtCO_2e$ to 3.2 $MtCO_2e$. Emissions from coal fell by 26% (0.2 $MtCO_2e$) but rose from fossil gas generation by 1.8% (0.04 $MtCO_2e$).

Emissions from geothermal generation reduced by 12% (0.1 $MtCO_2e$).

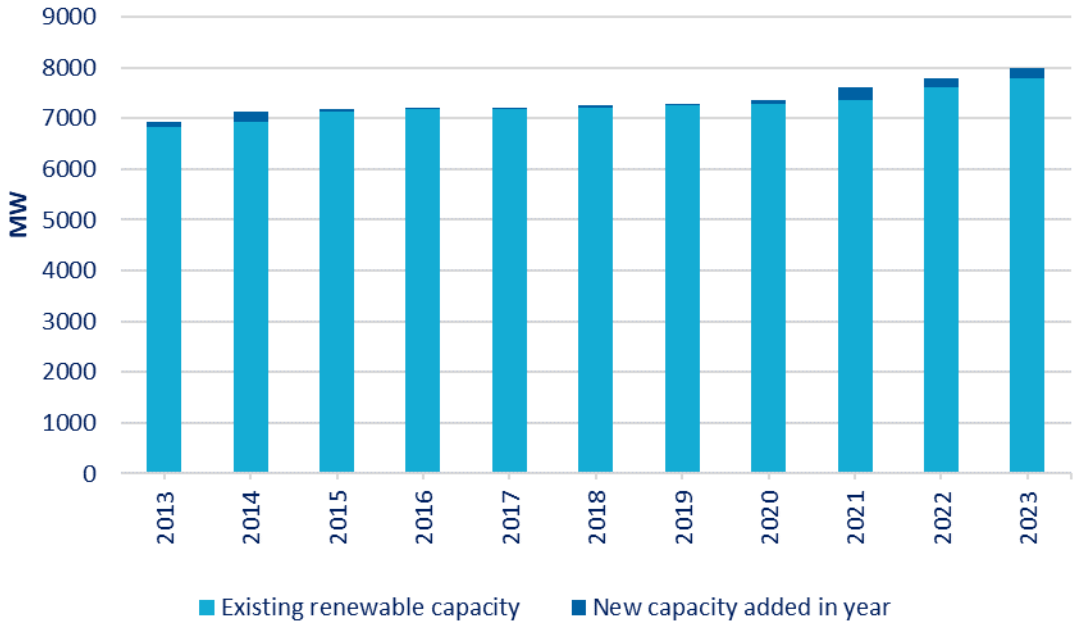
Figure 18: Electricity supply emissions by fuel type



Source: Commission analysis of GHG Inventory 1990–2023

The MBIE electricity statistics[6] showed a record amount of electricity was generated from wind in 2023 (3.2 TWh or 7% of total generation). There was an additional 208 MW of renewable generation capacity built in 2023 (**Figure 19**).

Figure 19: Total renewable generation capacity



Source: Commission analysis, MBIE electricity statistics

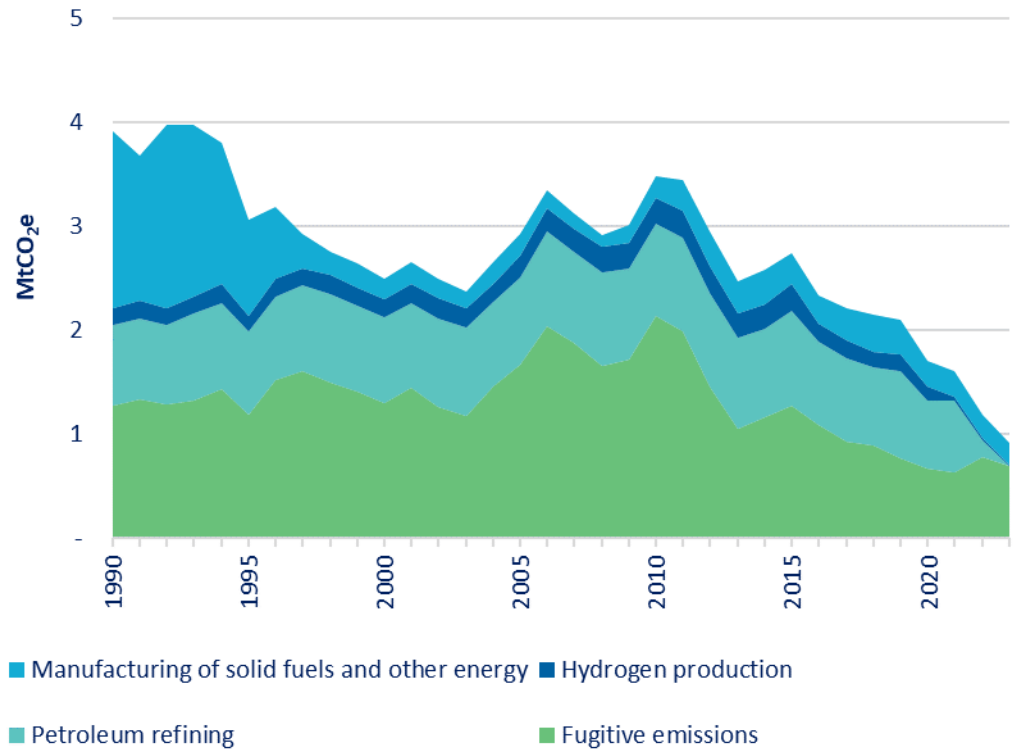
Overall emissions from fossil fuel supply decreased by 23% (0.3 $MtCO_2e$) in 2023 to 0.9 $MtCO_2e$ (**Figure 20**).

In 2023, emissions from oil refining reduced to zero, reflecting the closure of Marsden Point oil refinery.

Between 2022 and 2023 there was a 10% (0.08 $MtCO_2e$) decrease in fugitive emissions, mainly relating to venting and flaring. While fugitive emissions from fossil fuel supply were higher in 2022-2023 than in the years 2020-2021, they have been on a downward trend since 2010.

Between 2022 and 2023, MBIE gas statistics[7] show net production of fossil gas increased by 3.4% (4.8 PJ) from 143.2 PJ to 148.1 PJ, with consumption also increasing, by 5.5% (3.6 PJ). Although the 2023 fossil gas consumption increased relative to 2022, it remains below levels for all other years back to 2013.

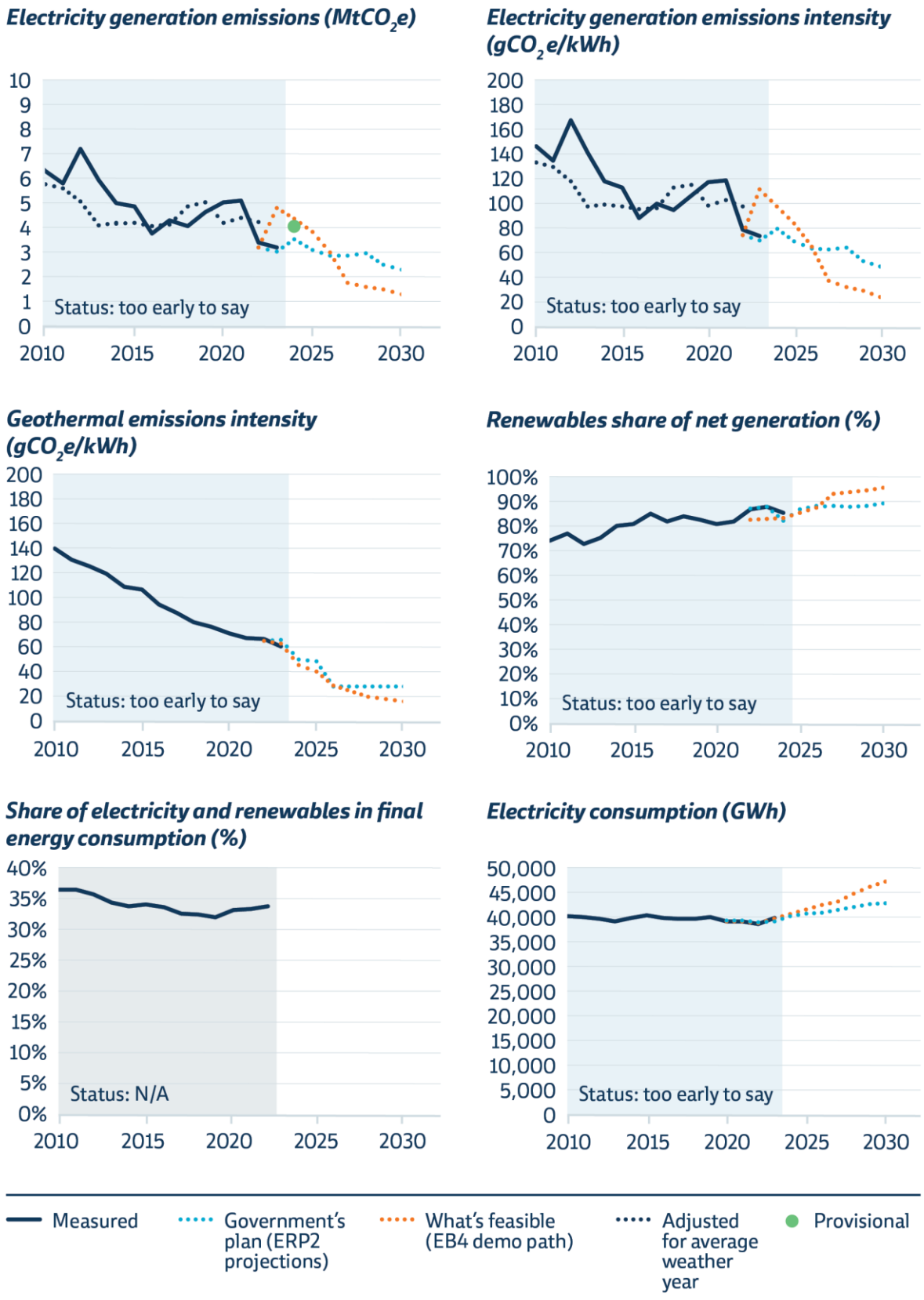
Figure 20: Fossil fuel emissions in industry



Source: Commission analysis of GHG Inventory 1990–2023

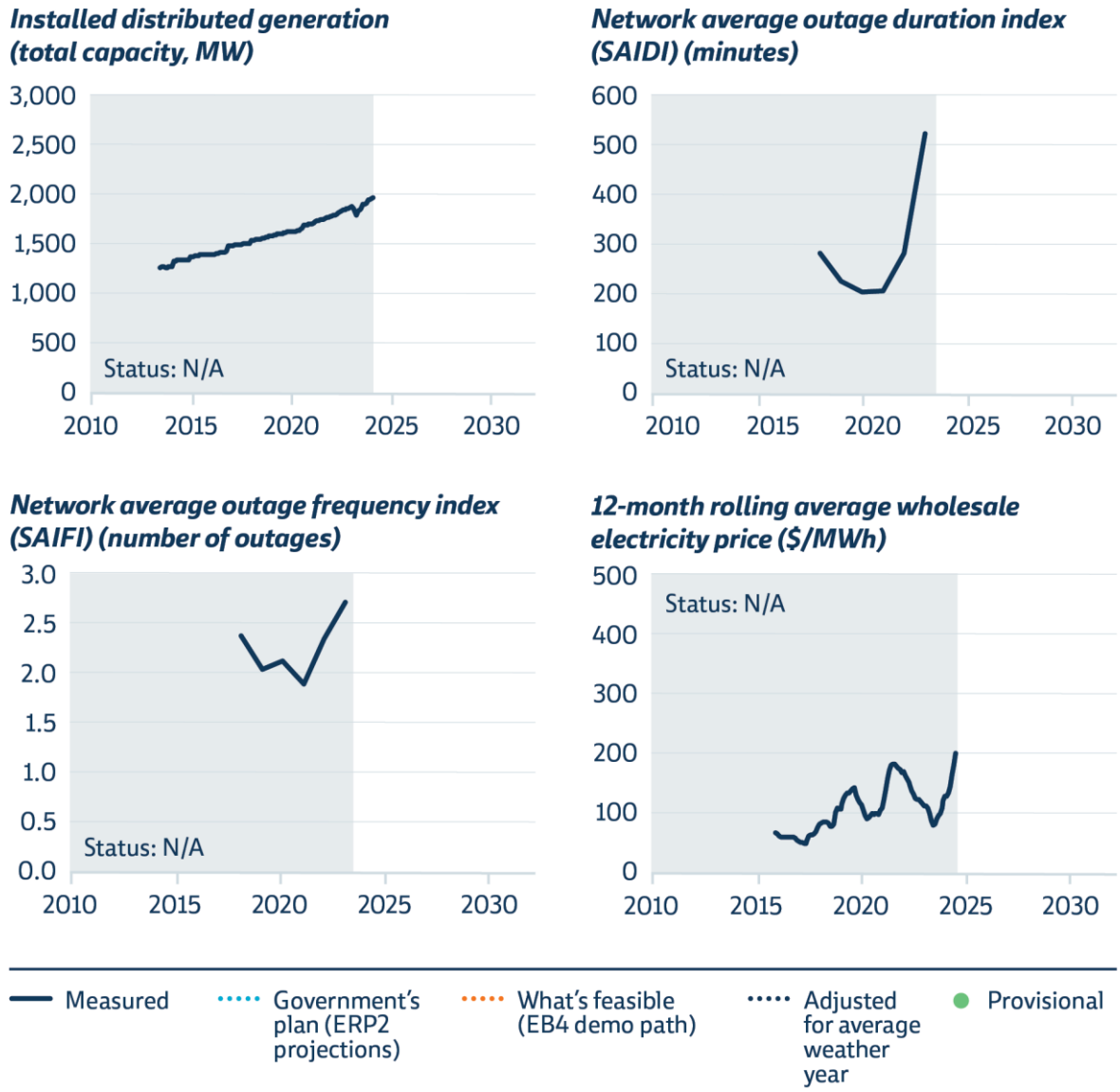
The electricity supply progress indicators (**Figure 21**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 21: Progress indicators dashboard for electricity supply



Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Figure 21: Progress indicators dashboard for electricity supply *continued*

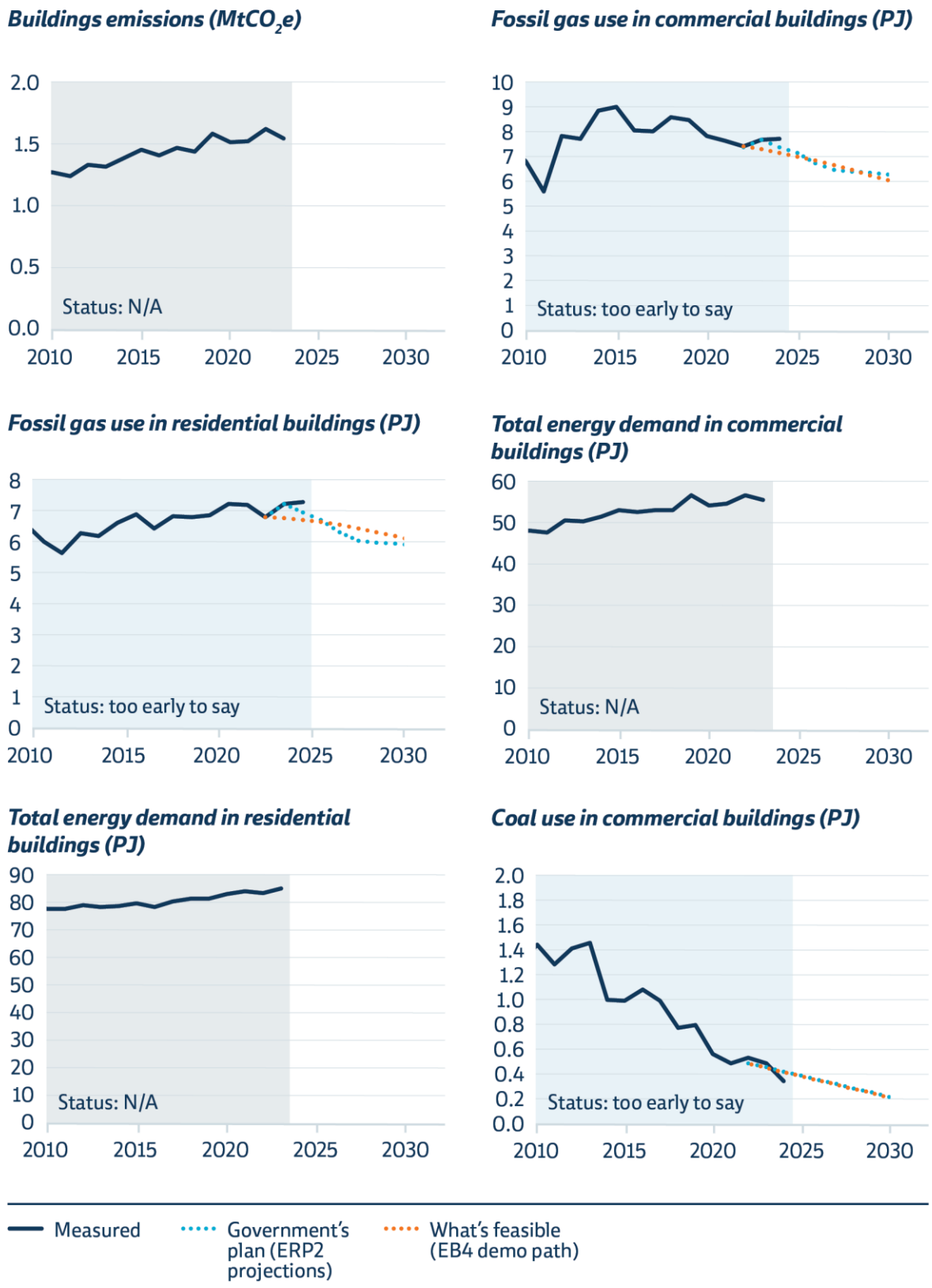


Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, MfE ERP2, Stats NZ, GHG Inventory, MBIE energy statistics, Electricity Authority[8]

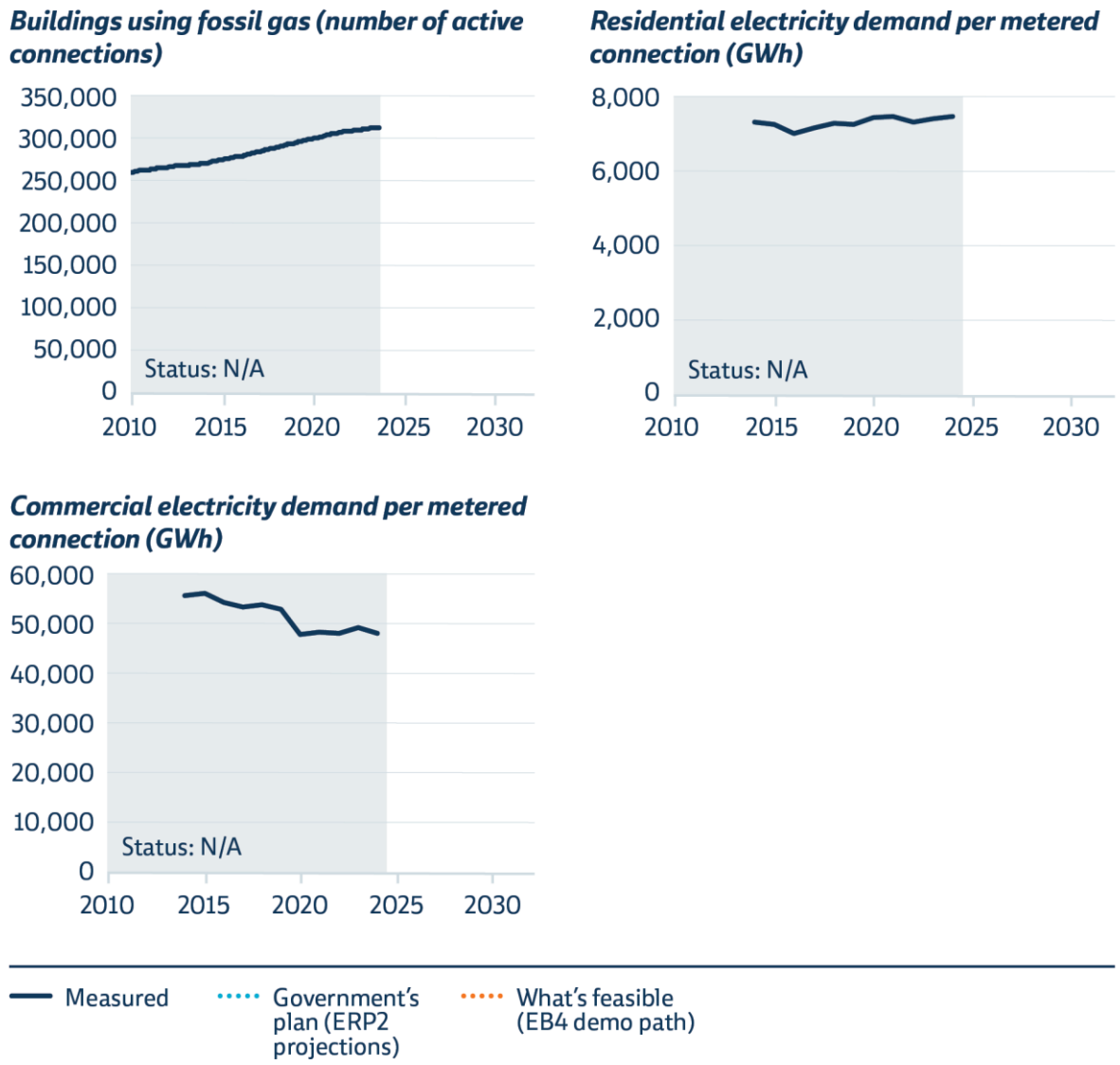
The Buildings progress indicators (**Figure 22**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 22: Progress indicators dashboard for buildings



Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Figure 22: Progress indicators dashboard for buildings *continued*

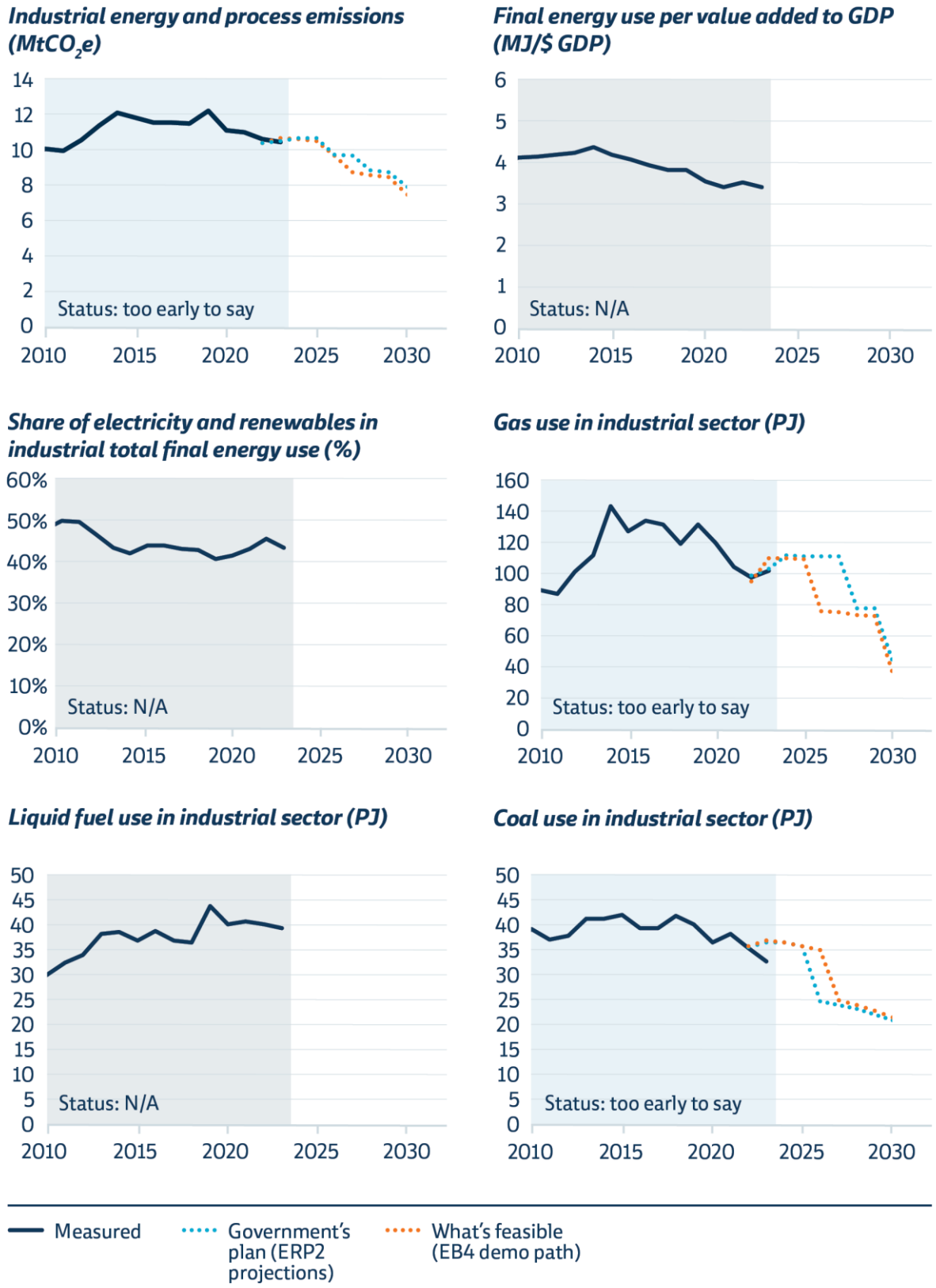


Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, MfE ERP2, GHG Inventory, MBIE energy statistics

The Industry progress indicators (**Figure 23**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 23: Progress indicators dashboard for industry



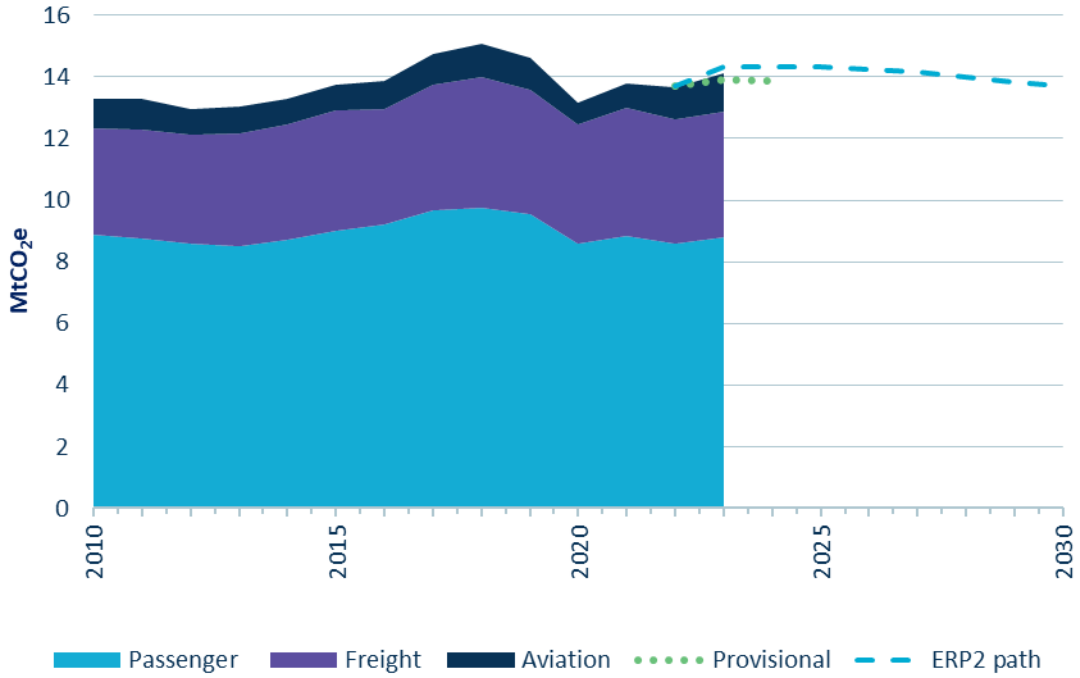
Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, MfE ERP2, GHG Inventory, MBIE energy statistics[6]

4.4. Transport

This section summarises the progress to reduce greenhouse gas emissions in the transport sector. Transport emissions in 2023 were 14.2 $MtCO_2e$ (**Figure 24**), which is 18% of gross emissions and 35% of long-lived greenhouse gases (other than biogenic methane). These emissions are created by the burning of fossil fuels for road and rail transport, domestic aviation, and domestic shipping.

Figure 24: Transport emissions by subcategory

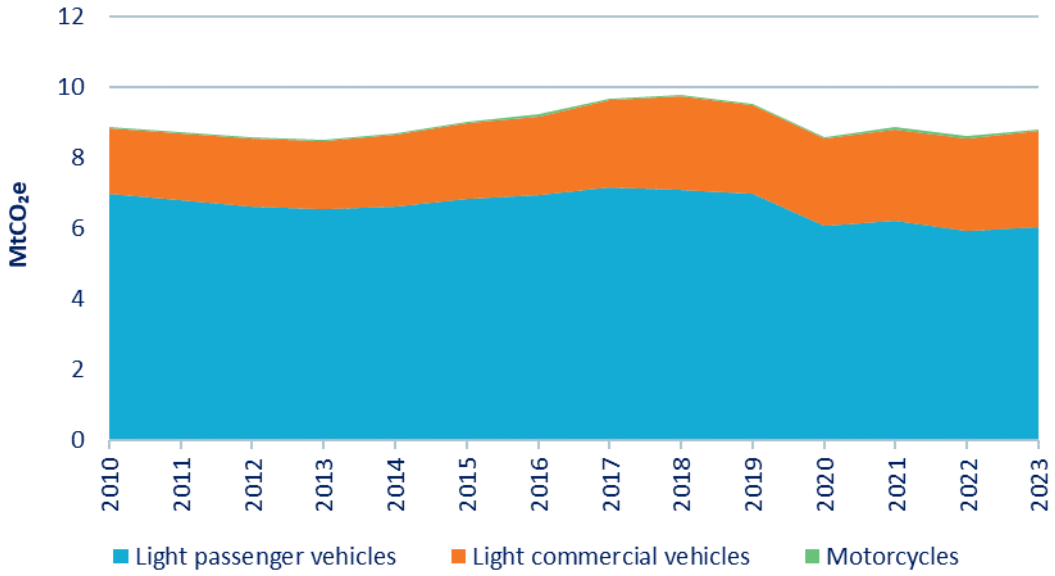


Source: Commission analysis of GHG Inventory 1990–2023, Stats NZ provisional data for 2024, Government's second emissions reduction plan

Passenger transport gross emissions grew by 2% (0.2 $MtCO_2e$) from 8.6 $MtCO_2e$ in 2022 to 8.8 $MtCO_2e$ in 2023. Passenger emissions in 2023 are composed of light passenger vehicles (LPVs) (69% or 6.0 $MtCO_2e$), light commercial vehicles (LCVs) (31% or 2.7 $MtCO_2e$) and motorcycles (0.5% or 0.04 $MtCO_2e$) **(Figure 25**).

Growth in overall vehicle travel is a key driver of emissions growth in 2023. Total travel by light vehicles increased in 2023 to 45.8 billion (**Figure 27**), which is a 5% increase from 2022 and 3% higher than the previous peak in 2018. However, despite the increase in travel in 2023, passenger transport emissions have declined 10% since their peak in 2018 (9.8 $MtCO_2e$) this highlights ongoing improvements in the emissions intensity of the fleet. This improvement is driven by uptake of electric vehicles and improvements to conventional vehicles (including hybridisation).

Figure 25: Passenger transport emissions by vehicle type

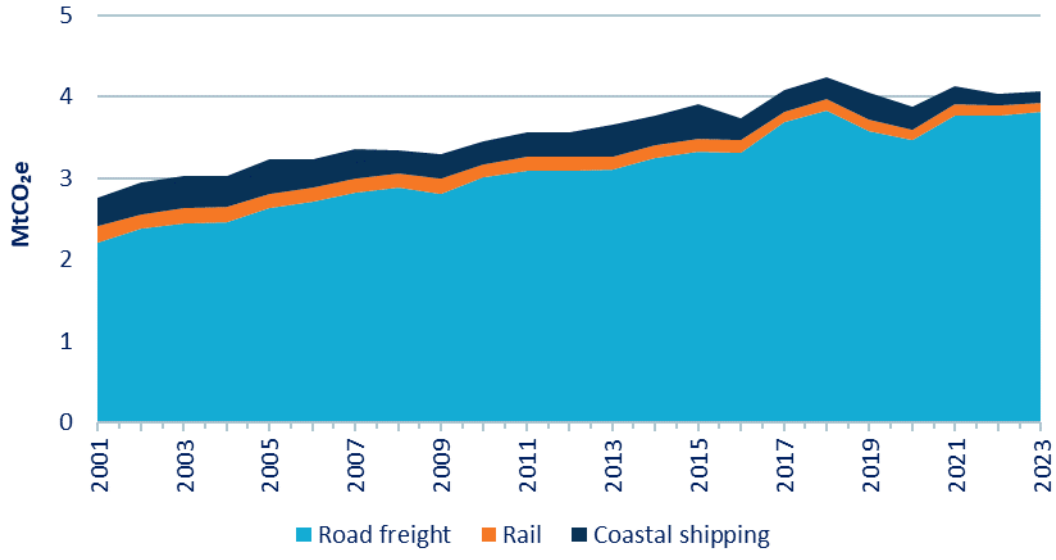


Source: Commission analysis of GHG Inventory 1990–2023

Gross freight emissions have increased by 0.8% (0.03 $MtCO_2e$) from 4.03 $MtCO_2e$ in 2022 to 4.06 $MtCO_2e$ in 2023. Freight emissions in 2023 are composed of heavy vehicles (medium and heavy trucks and buses make up 94%), rail (3%) and coastal shipping (3%) (**Figure 26**).

Coastal shipping emissions remain at historically low levels, whilst road freight increased by 1.1% (0.04 $MtCO_2e$) between 2022 and 2023.

Figure 26: Freight transport emissions



Source: Commission analysis of GHG Inventory 1990–2023

Aviation

Gross emissions from domestic aviation in 2023 were 1.3 $MtCO_2e$. This was 1.7% of gross emissions and 3.1% of gross long-lived greenhouse gas emissions (other than biogenic methane). Emissions from domestic aviation in 2023 grew by 24% (0.2 $MtCO_2e$[vii]) from 2022 (1.0 $MtCO_2e$).

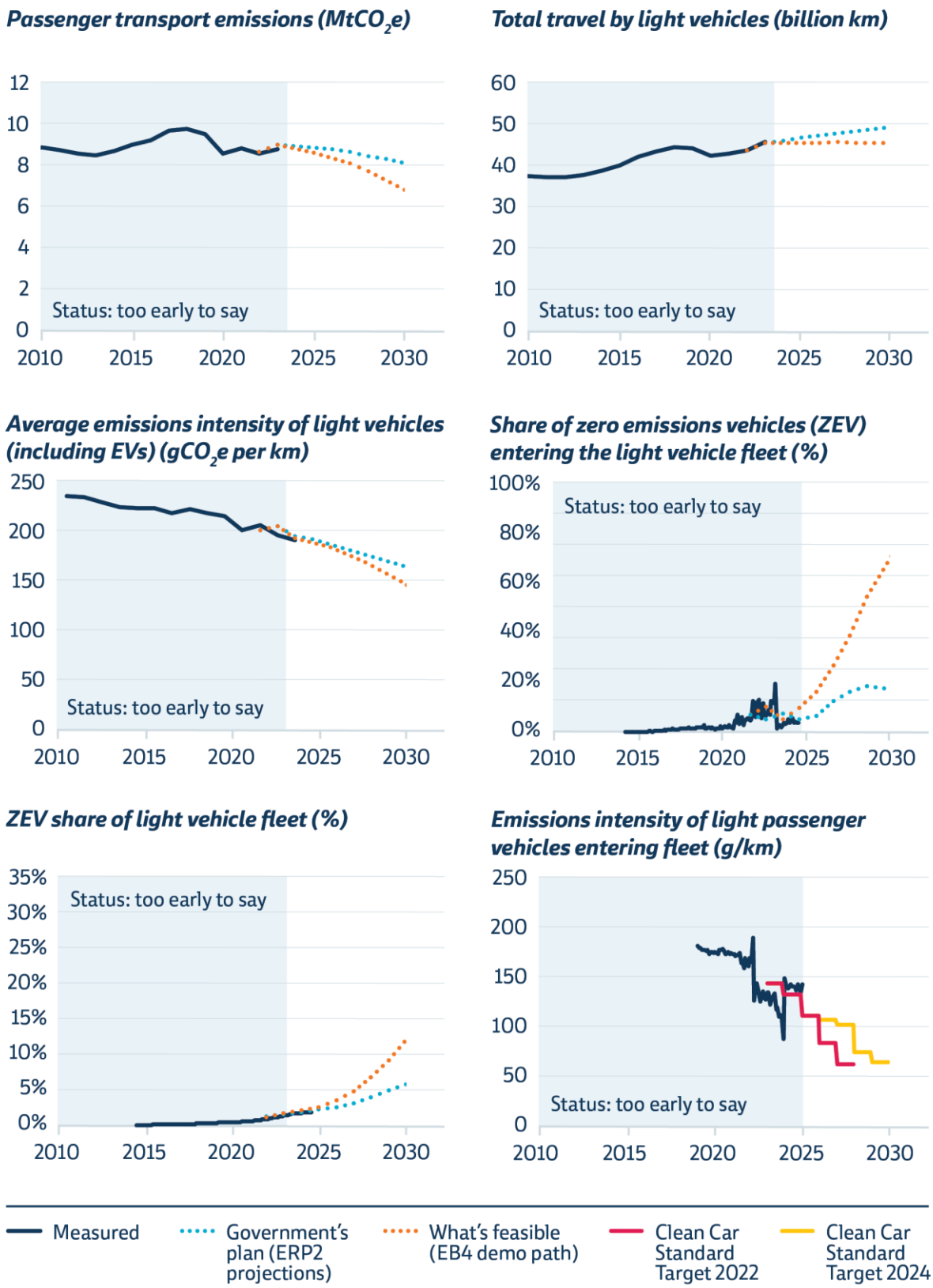
Recent trends in aviation emissions have been dominated by a recovery in demand after the effects of COVID-19. Emissions in 2023 exceed the levels prior to COVID-19 and were the highest on record. The emissions growth in 2023 appears to be driven by both growth in flight hours and increasing emissions per flight hour. However, without publicly available data on passenger or fright tonne kilometre moved by aircraft we cannot assess emissions intensity or drivers of emissions growth definitively.

Progress indicators

The passenger transport progress indicators (**Figure 27**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

[vii] Totals may not sum precisely due to rounding.

Figure 27: Progress indicators dashboard for passenger transport



EVs include battery electric vehicles, plug in hybrids and fuel cell electric vehicles.
ZEVs include battery electric vehicles and fuel cell electric vehicles.
Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Figure 27: Progress indicators dashboard for passenger transport *continued*

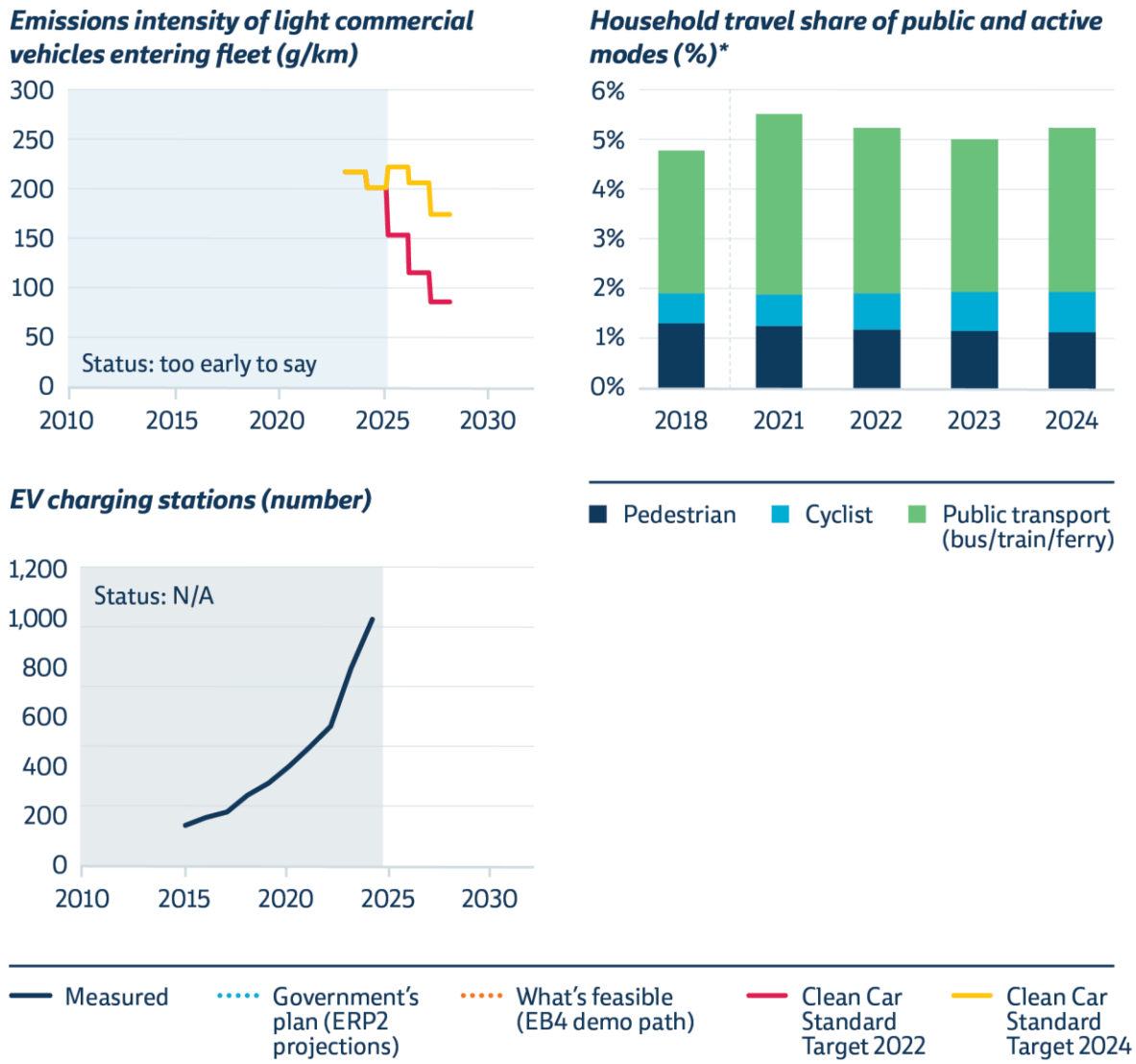
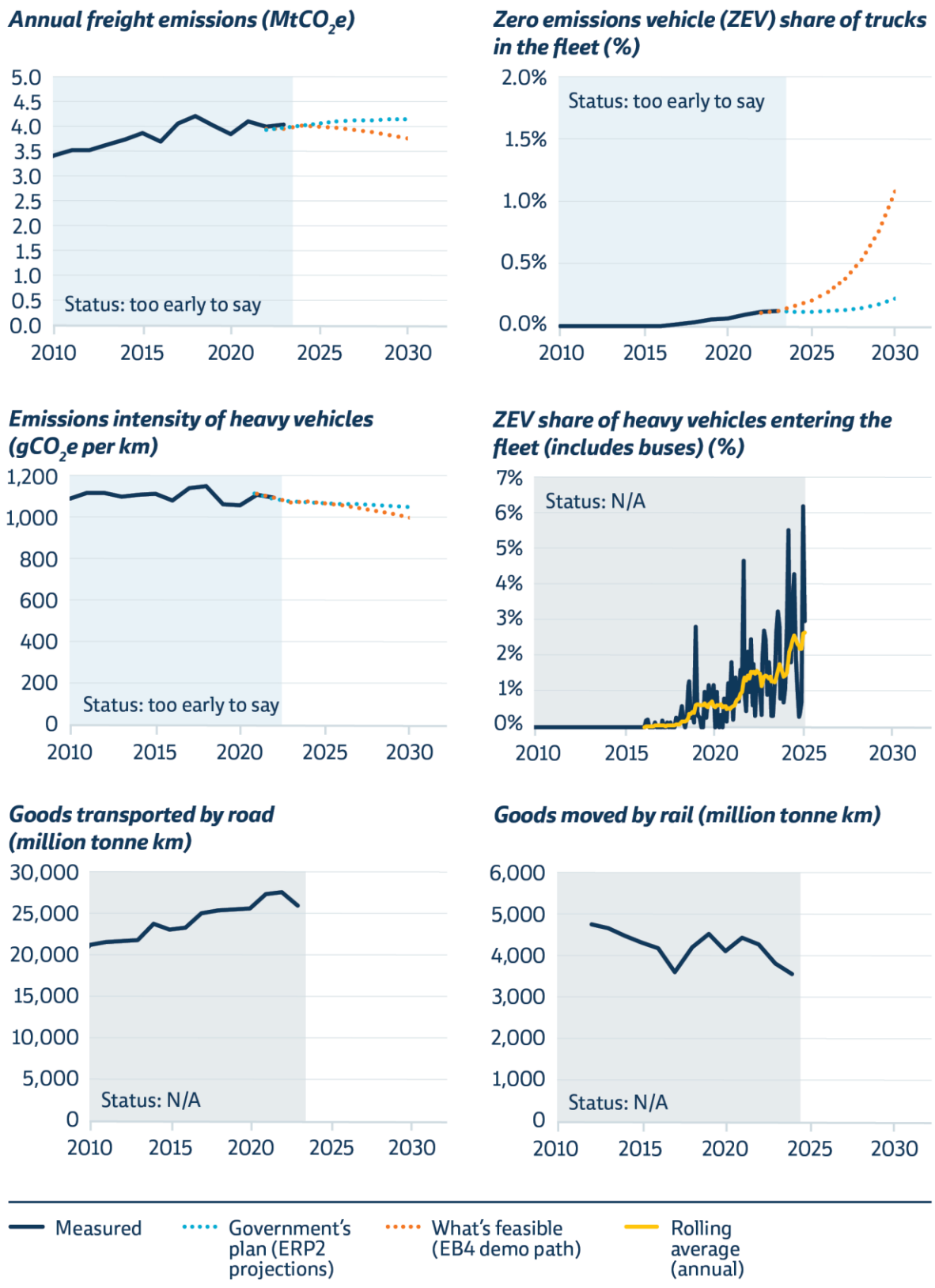


*Chart shows final year of survey, data corresponds to surveys conducted between 2015-2018, 2018-2021, 2019 - 2022, 2021- 2023, 2023-2024.
EVs include battery electric vehicles, plug in hybrids and fuel cell electric vehicles.
ZEVs include battery electric vehicles and fuel cell electric vehicles.
Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, GHG Inventory, MfE ERP2, Ministry of Transport Annual Motor Vehicle Fleet Statistics[9], Ministry of Transport Fleet Statistics (monthly)[10], New Zealand Household Travel Survey [11], Energy Efficiency & Conservation Authority (EECA) Public EV Charger Dashboard[12]

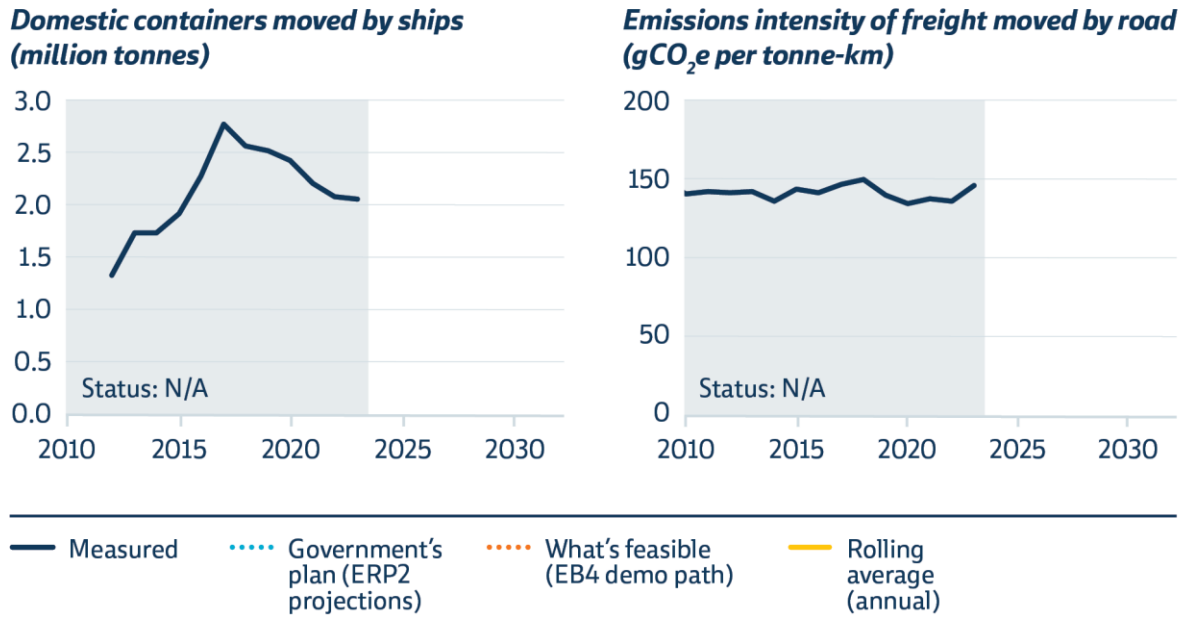
The freight transport progress indicators (**Figure 28**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 28: Progress indicators dashboard for freight transport



Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Figure 28: Progress indicators dashboard for freight transport *continued*

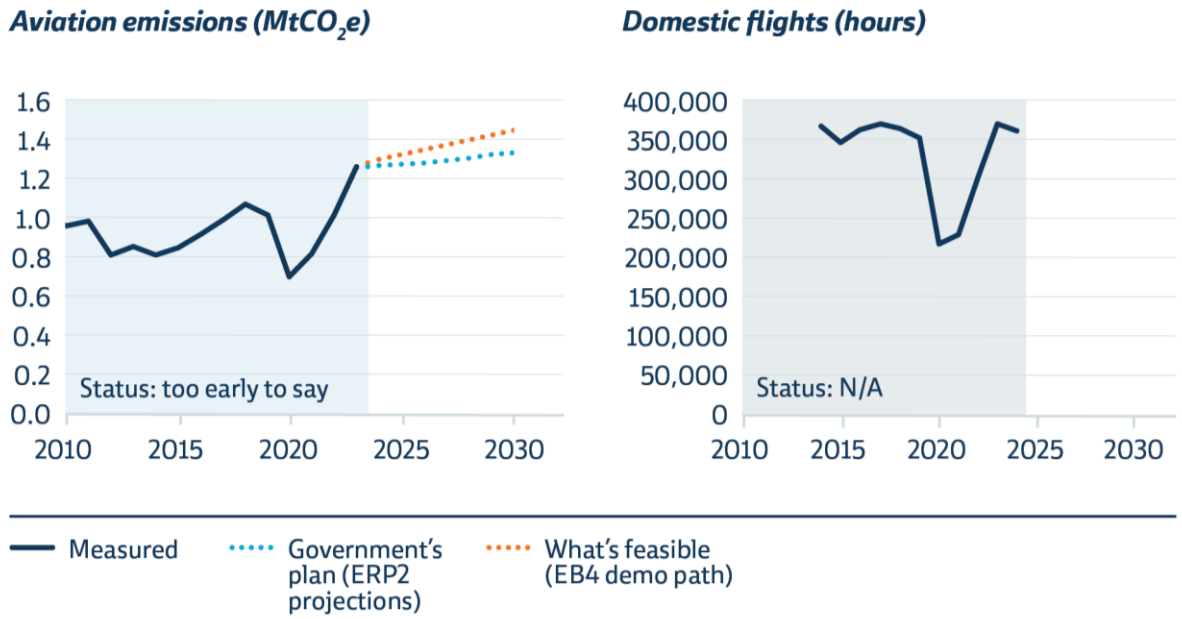


Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, GHG Inventory, MfE ERP2, Ministry of Transport Annual Motor Vehicle Fleet Statistics, Ministry of Transport Fleet Statistics (monthly), Ministry of Transport Freight Information Gathering System[13]

The aviation transport progress indicators (**Figure 29**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 29: Progress indicators dashboard for aviation



Note: Commission and Government projections include slightly different assumptions about aviation efficiency improvements, leading to a higher path for future aviation emissions in the Commission's EB4 demo path than the Government's ERP2 projection.
Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, GHG Inventory, MfE ERP2, Civil Aviation Authority[14]

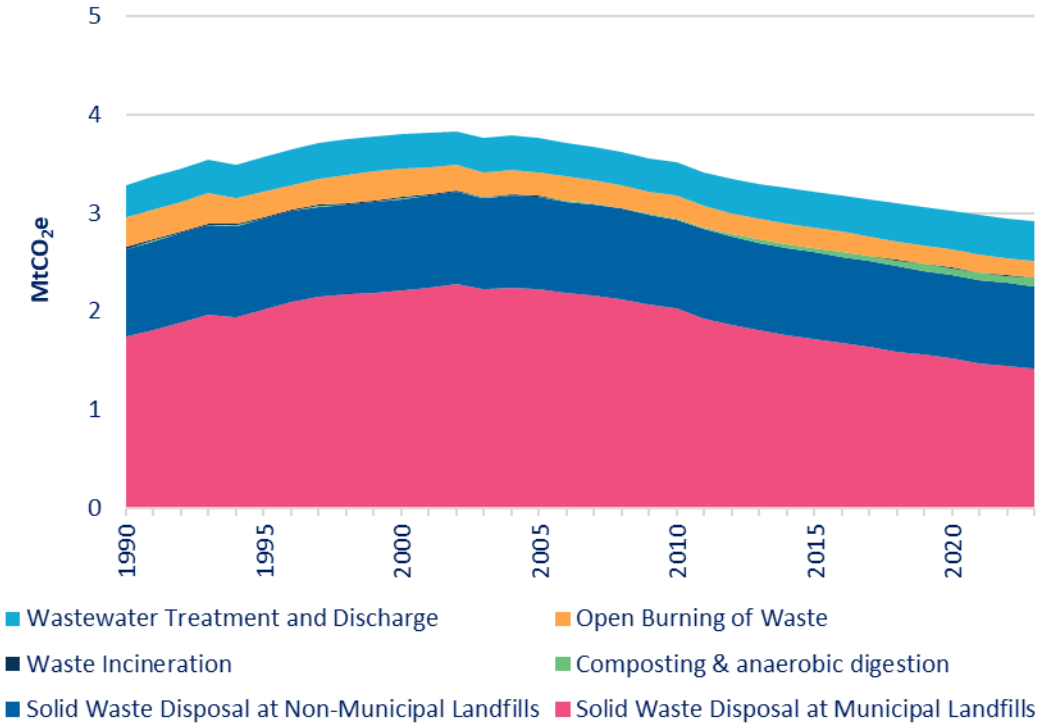
4.5. Waste and f-gases

In 2023, gross emissions from the waste sector were 2.9 $MtCO_2e$, making up 3.8% of Aotearoa New Zealand's gross emissions. Waste emissions are primarily methane (91.9% of the total waste CO_2e emissions, with the remainder from the long-lived greenhouse gases carbon dioxide and nitrous oxide. Methane emissions from waste were 0.10 $MtCH_4$ in 2023, making up 7.4% of biogenic methane emissions.

Aotearoa New Zealand's waste emissions come mostly from disposal of organic waste to landfills (77.4% of total waste emissions). Smaller quantities of emissions come from wastewater treatment (13.8%), the incineration and burning of solid waste (6.1%), and biological treatment such as composting (2.8%).

Waste emissions reduced by 0.7% between 2022 and 2023, from 2.94 $MtCO_2e$ to 2.92 $MtCO_2e$ (**Figure 30**).

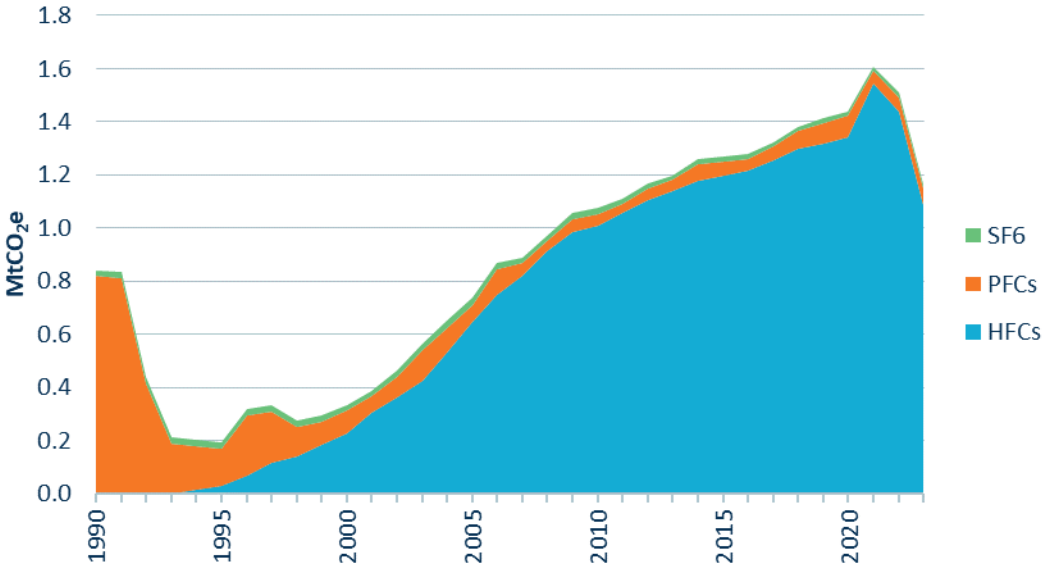
Figure 30: Emissions from waste



Source: Commission analysis of GHG Inventory 1990–2023

New Zealand's GHG Inventory reporting shows emissions from f-gases, such as hydrofluorocarbon (HFC, perfluorocarbon (PFC) and sulphur hexafluoride (SF_6), reached a peak in 2021, and dropped 23% (0.35 $MtCO_2e$) between 2022 and 2023 (**Figure 31**).

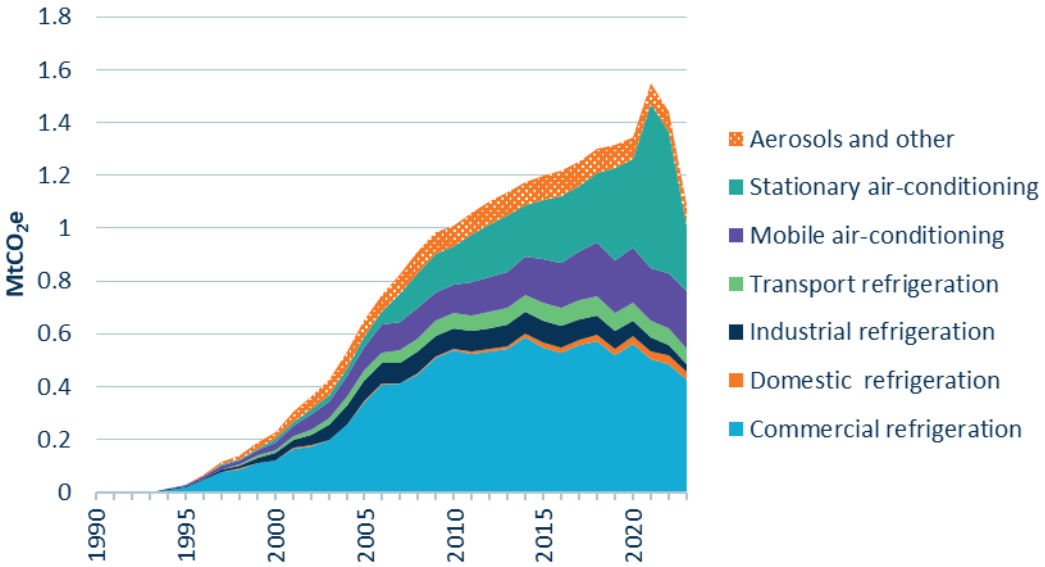
Figure 31: F-gas emissions



Source: Commission analysis of GHG Inventory 1990–2023

Refrigeration and air conditioning contributed to 93% of HFC emissions in 2023 (**Figure 32**).

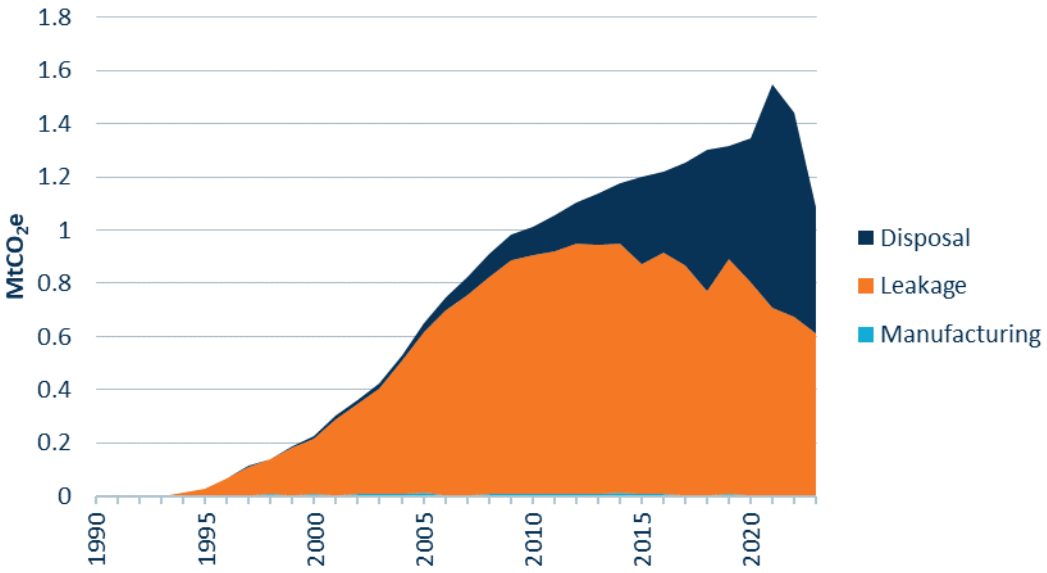
Figure 32: Breakdown of HFC emissions by activity



Source: Commission analysis of GHG Inventory 1990–2023

Figure 33 shows the release of HFCs from product manufacturing, leakage and disposal. Emissions from leakage were responsible for 56% of the release in 2023, whilst disposal contributed 43% and manufacturing only 0.3%.

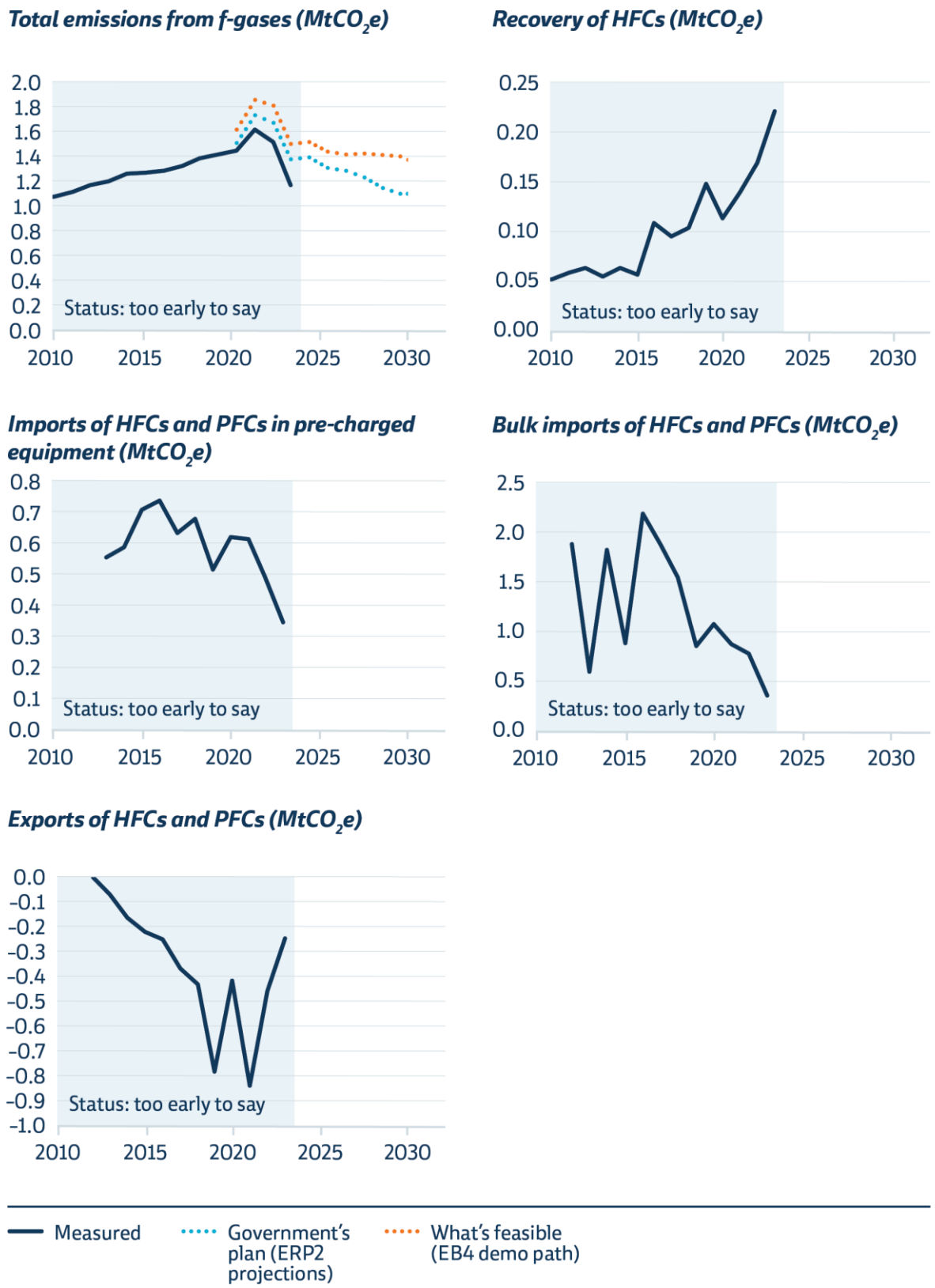
Figure 33: Release of HFCs from product manufacturing, leakage and disposal



Source: Commission analysis of GHG Inventory 1990–2023

The f-gas progress indicators (**Figure 34**) and waste progress indicators (**Figure 35**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

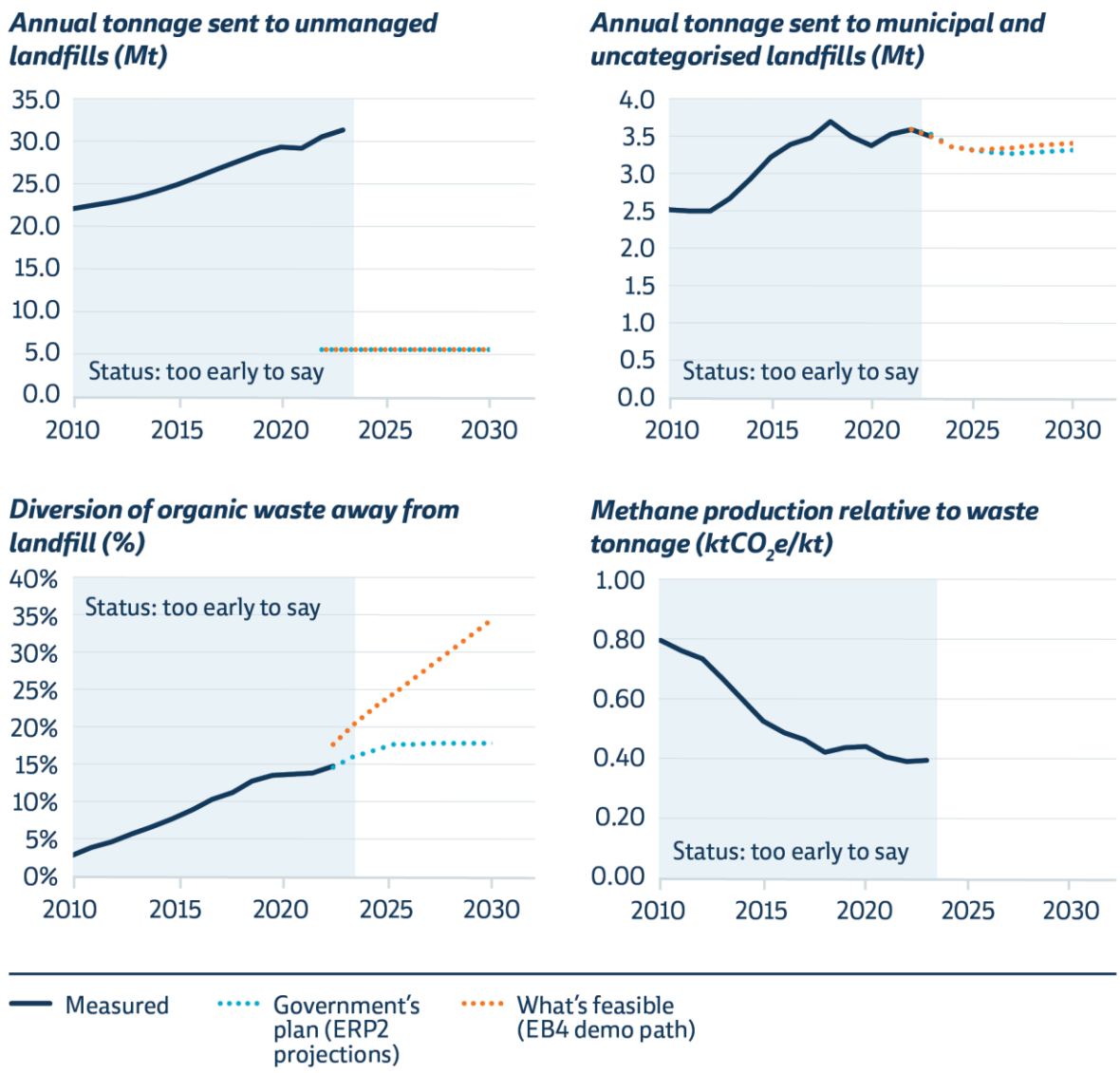
Figure 34: Progress indicators dashboard for f-gases



Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, GHG Inventory, MfE ERP2, Environmental Protection Authority (EPA)[15]

Figure 35: Progress indicators dashboard for waste



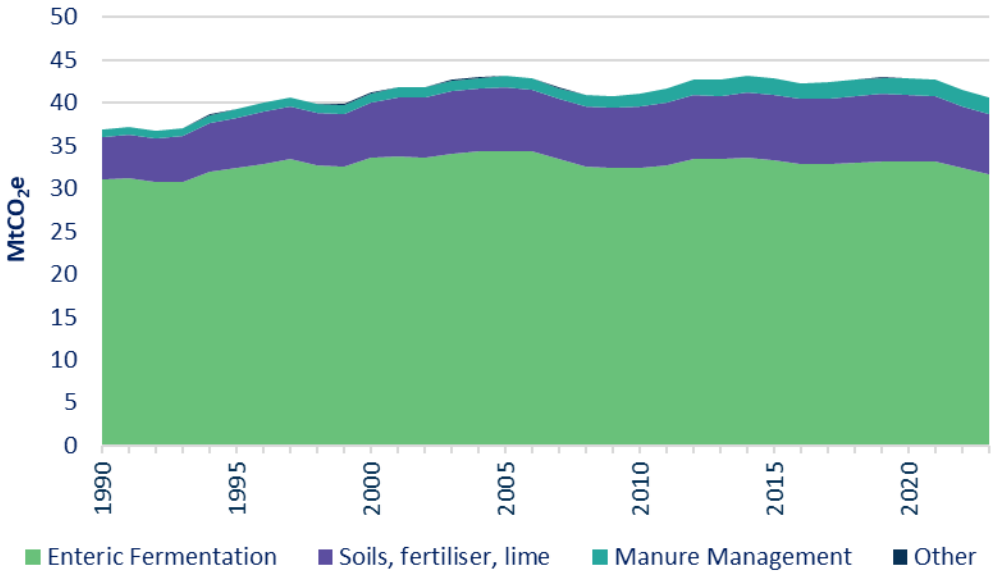
Note: Projections are included only where modelled data of sufficient quality are available for the indicator.

Source: Commission analysis, GHG Inventory, MfE ERP2

4.6. Agriculture

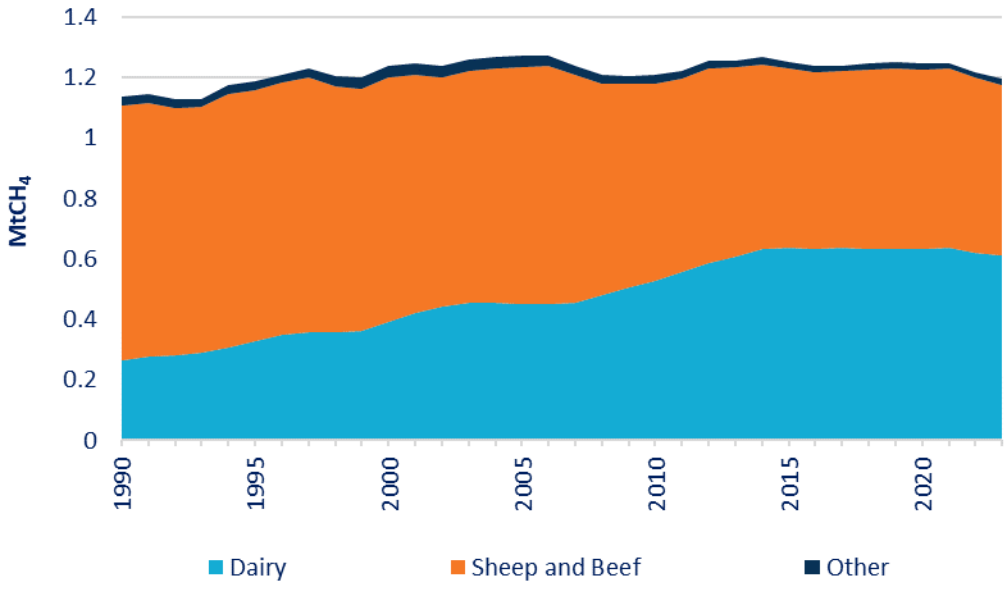
Emissions data for 2023 shows there has been 2.2% (0.9 $MtCO_2e$) decrease in total agricultural emissions from 2022 to 2023, falling from 41.5 $MtCO_2e$ to 40.6 $MtCO_2e$ (**Figure 36**). Biogenic methane emissions from agriculture have maintained a recent downward trend (**Figure 37**).

Figure 36: Agricultural emissions, all gases



Source: Commission analysis of GHG Inventory 1990–2023

Figure 37: Agricultural biogenic methane emissions



Source: Commission analysis of GHG Inventory 1990–2023

The Agriculture progress indicators (**Figure 38)** help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 38: Progress indicators dashboard for agriculture

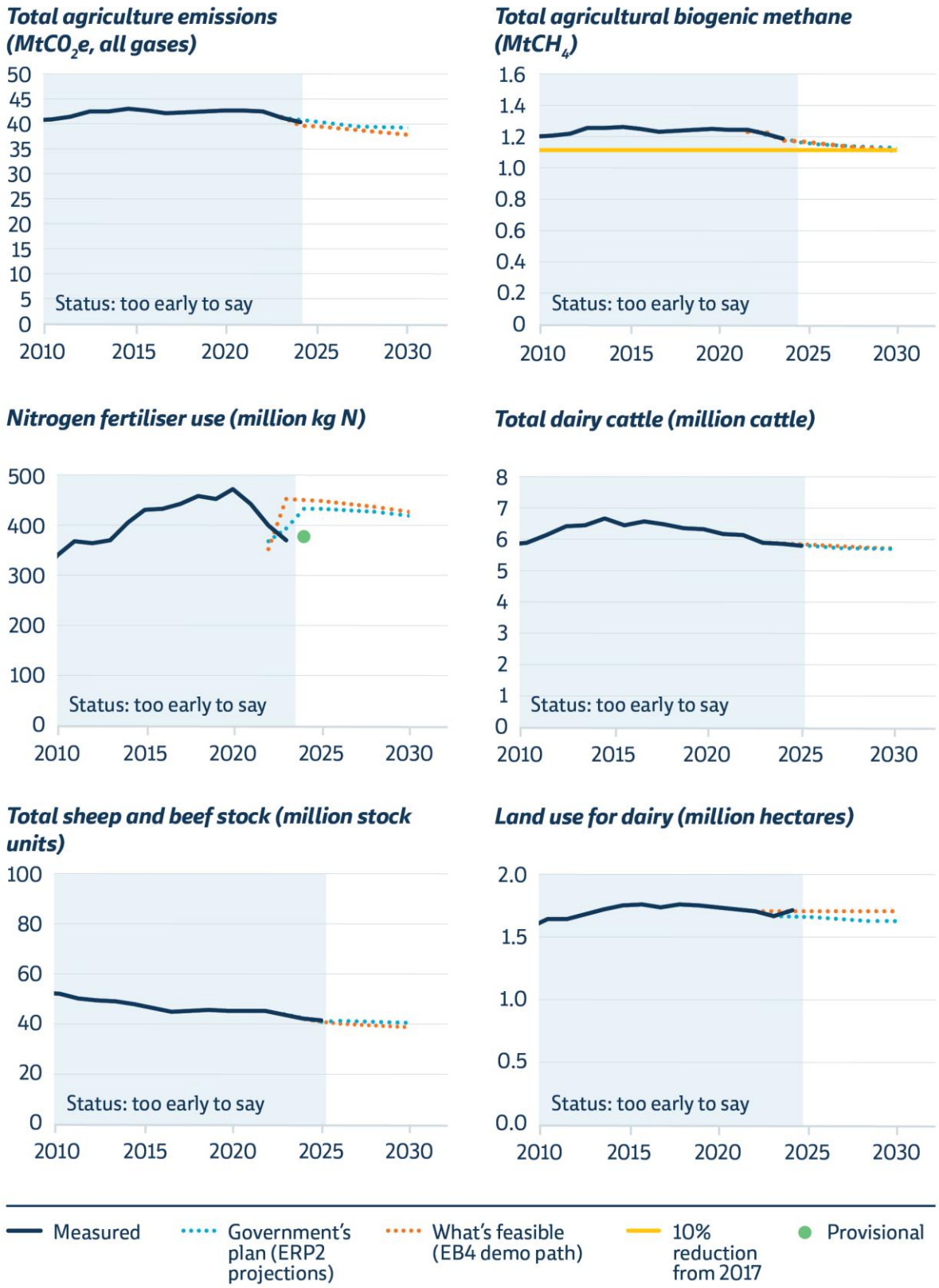
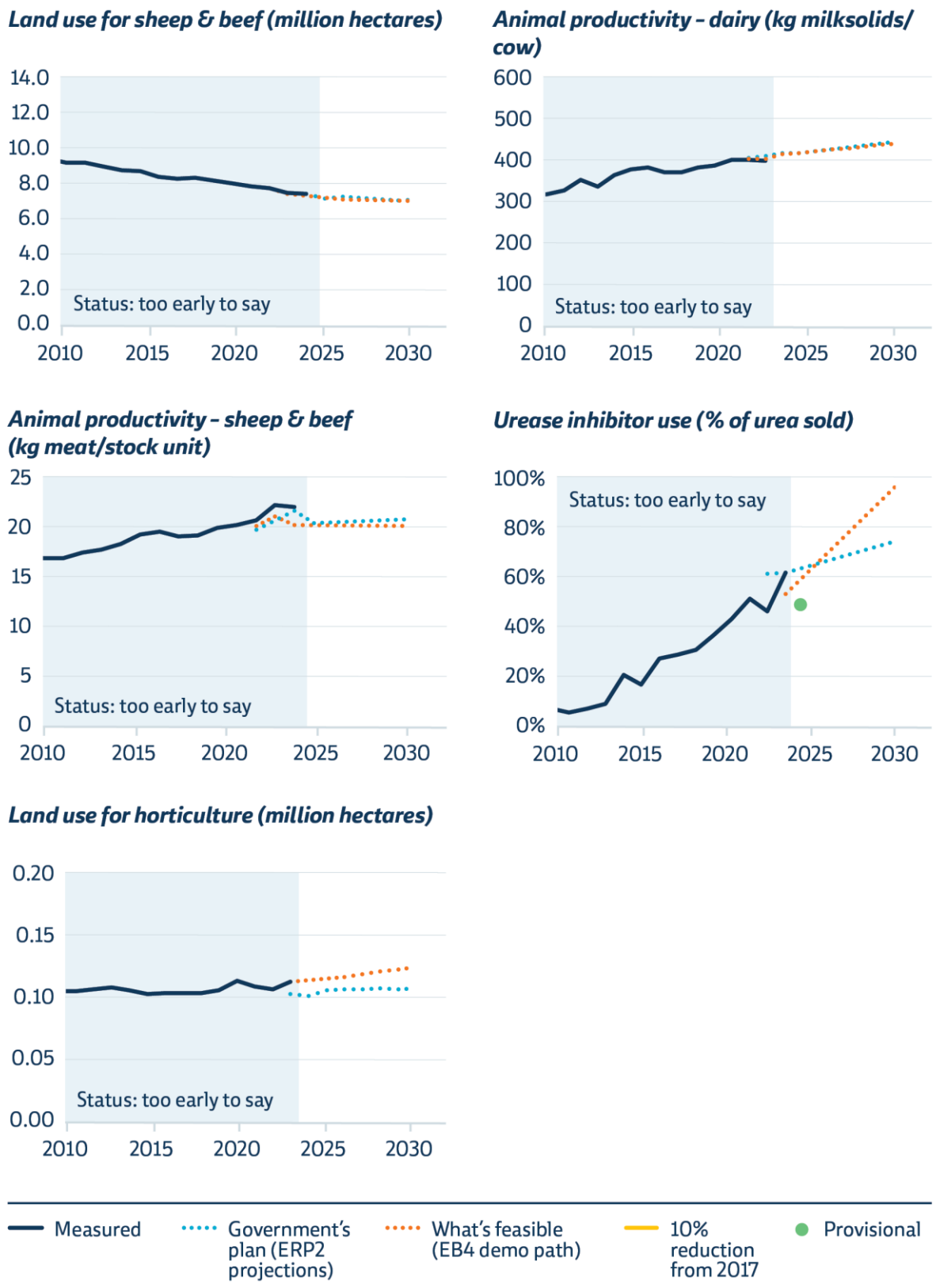


Figure 38: Progress indicators dashboard for agriculture *continued*



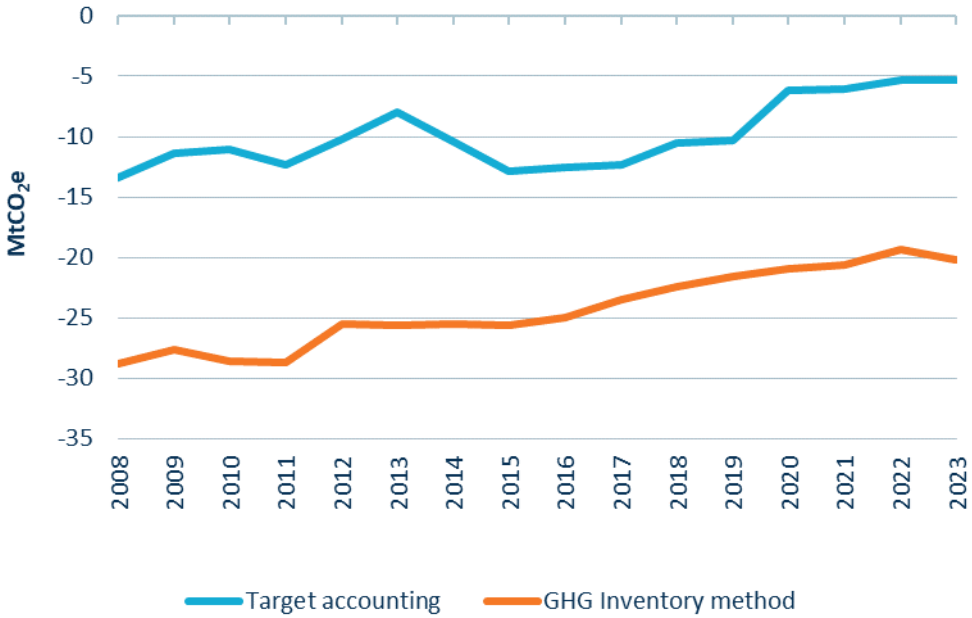
Source: Commission analysis, GHG Inventory, MfE ERP2, Dairy Industry Statistics[16], Fertiliser Association[1718], Ministry for Primary Industries (MPI), Stats NZ

4.7. Removals

Figure 39 shows the level of net emissions from forests and other land uses under both the target accounting and GHG Inventory approach.

In the GHG Inventory this year, net removals by forests under target accounting in 2023 were -5.3 $MtCO_2e$. This is equal to 6.9% of Aotearoa New Zealand's gross emissions in 2023, and 13.1% of emissions of long-lived gases (gases other than biogenic methane).

Figure 39: Forest removals by accounting method



Source: Commission analysis of GHG Inventory 1990–2023, Ministry for Primary Industries[19]

The forest removals progress indicators (**Figure 40**) help us track progress to the goals and pathway outcomes as outlined in the monitoring maps. See *Section 2: Our approach to monitoring* for an explanation of the indicators and *Section 3: How we monitor emissions by sector* for a description of the monitoring maps.

Figure 40: Progress indicators dashboard for forest removals

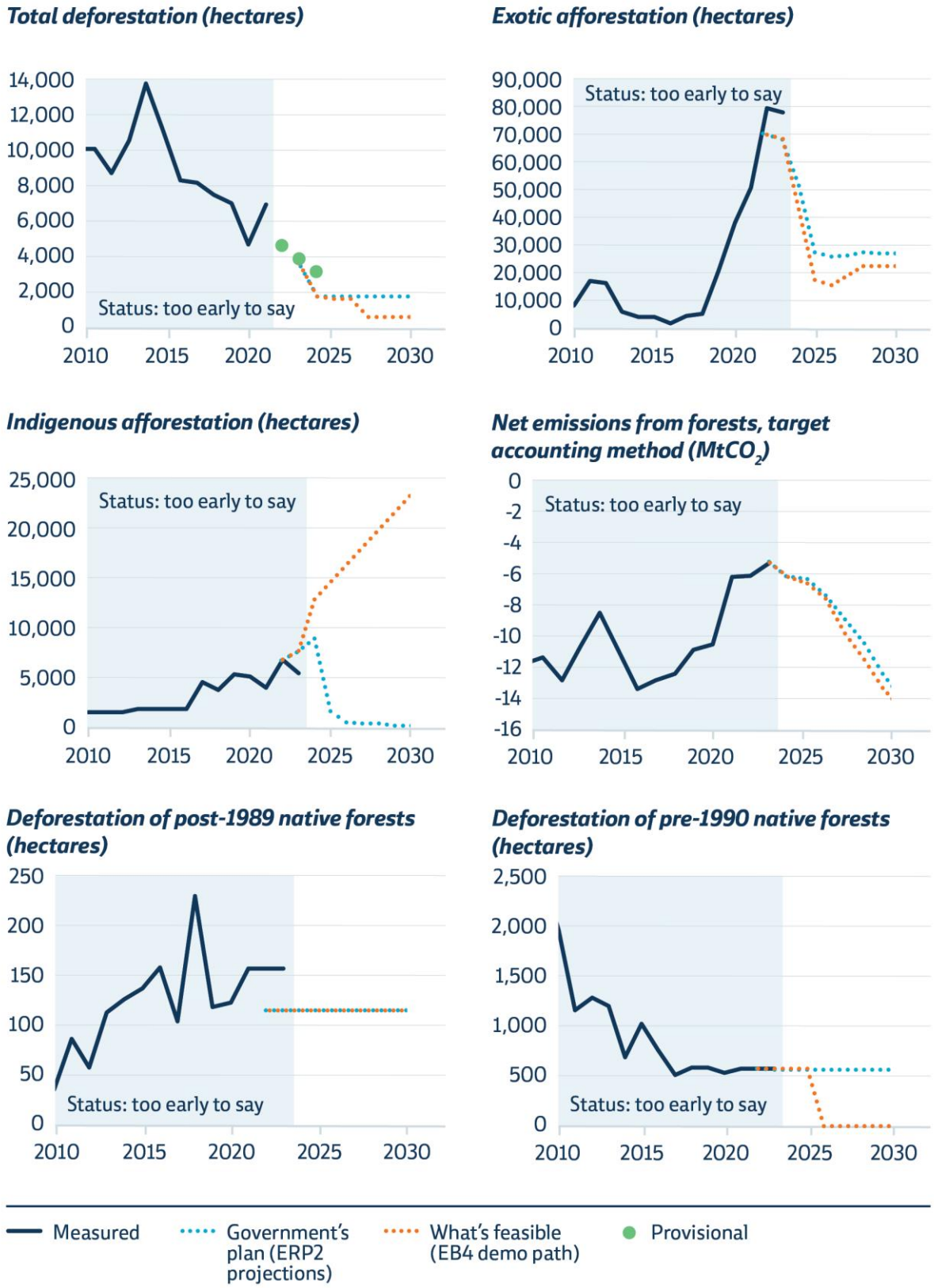
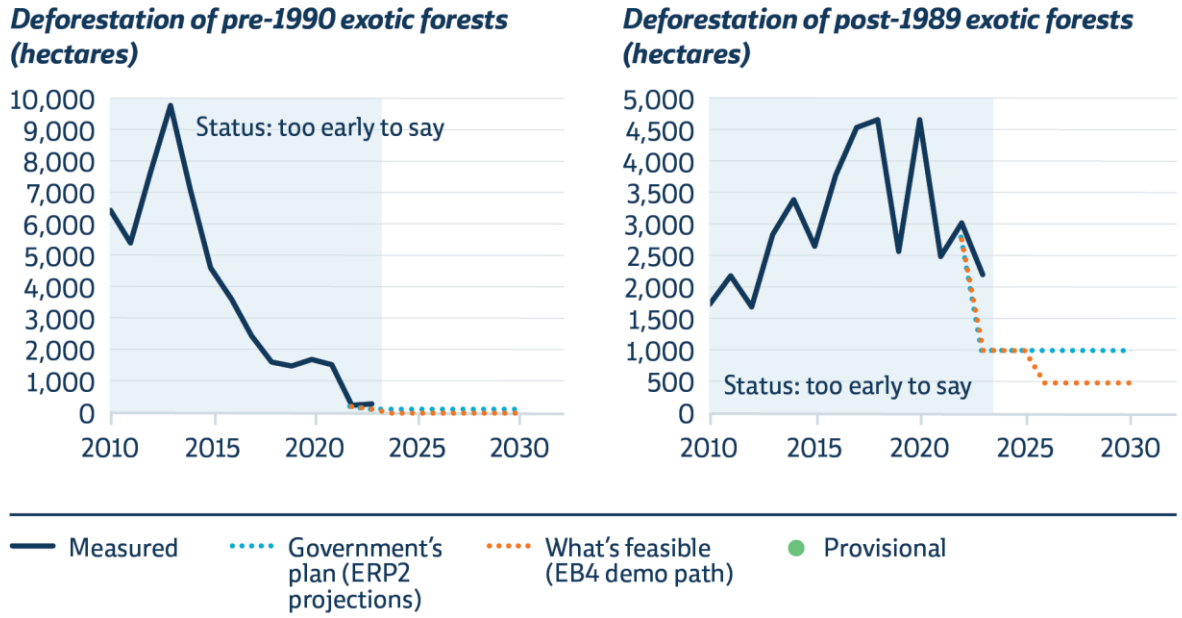


Figure 40: Progress indicators dashboard for forest removals *continued*



Source: GHG Inventory, MfE ERP2, Afforestation and Deforestation Intentions Survey[20]

5. Detail about progress in cross-cutting areas

This section provides additional detail about progress in cross-cutting areas, as referenced in the full report.

5.1. Impacts and benefits

Analysis of impacts

Table 3 summarises impacts identified by the Government in its second emissions reduction plan and by the Commission in this report and prior advice. Note many of the quantified impacts are not directly comparable as they relate to different emissions scenarios or periods. It is more valid to compare the types, direction, and distribution of impacts found than the quantified value.

Table 3: Summary of impacts identified by the Government and by the Commission

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
Aggregate macroeconomic impacts	• GDP will continue growing • Real GDP 0.3% (2030) to 0.4% (2050) with measures than without measures • Employment 0.2% lower than counterfactual in 2030 then returns to long-term trend • Real wages 1.3-1.4% lower than otherwise over medium-long term.	• GDP will continue growing • There would not be a noticeable impact on GDP from taking additional emission reduction actions. Model results indicated GDP would be around 1% lower in 2050 following the demonstration path for fourth emissions budget than following the reference scenario. • The demonstration path scenario would likely result in a different pattern of economic activity than the reference scenario – with the output of some sectors increasing and others decreasing. The distribution of these changes would depend on the policies chosen to achieve the budget.[21]
Electrification	• Not explicitly identified.	• Operational cost-savings from electrified transport estimated at $4.2b over third emissions budget period under draft LTLS pathway.[22]
Impacts on households	• Annual household NZ ETS expenditure in 2030 with ERP2 policies $705 (vs $585 without ERP2 policies) • NZ ETS adds 15c to petrol price (2024) • Average household spends 0.27% gross income on NZ ETS transport fuel costs • Disproportionate impacts for lower income households, Māori, Pasifika, older people • Noted potential for poorer health outcomes and flow-on impacts for economic and educational opportunities and for health system.	• See detailed discussion in ERM 2025 full report on distribution, energy hardship and health impacts. The Commission's EB4 demonstration path indicates: • Petrol prices could increase up to 40 cents per litre in 2040 • Petrol price impact on specific households depends on efficiency of private vehicle, availability of low-emissions alternatives and extent of behaviour change • Electricity prices rise slightly faster in scenarios with faster build of renewables. • Households switching from fossil gas to electricity for space and water heating save $670 pa from 2035 (including capital outlay) • Households staying on fossil gas risk high prices due to distribution network maintenance as gas supply declines.[23]
Sectoral impacts	• Notable effects on sectoral GDP by 2050:	The Commission's EB4 demonstration path indicates:

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
	– Agriculture: GDP higher than today but 7% lower than without mitigation action. Sheep and beef farming most affected. Impacts depend on future technology and policy. Climate change effects aren't included. – Forestry: +12% in 2050 – Mining (mainly gas changes): Higher than today, but 7% lower than without mitigation action – Food manufacture: 5% lower vs without mitigation; 13% lower for meat and dairy vs without mitigation; some increases in other sub-sectors relative to no mitigation.	• fewer jobs in fossil fuels, motor mechanics, and sheep/beef farming, with gains in renewables, energy efficiency, waste recovery, horticulture, forestry, the bioeconomy and agricultural advisory and R&D roles. • Carbon-intensive industries face job uncertainty, with new roles possible in emerging green sectors.[24]
Regional impacts	• Driven by mix of industries in the region. • Higer negative impacts in regions with heavier reliance on dairy, sheep and beef farming, including Southland, West Cost, Manawatū-Whanganui, Waikato. Taranaki also affected by lower gas mining and manufacturing.	• Most regions will experience more jobs, except for Taranaki and West Coast due to exposure to oil, fossil gas and mining.[25]
Employment	• Employment impacts are driven by sectoral impacts • Change from agriculture to forestry land-use may increase or decrease employment overall depending on regional context and forestry type. • Forestry employment more likely to be in main centres. Little employment provided by Carbon and/or permanent exotic forests.	• Changes in employment are mostly expected to be gradual. • *Ināia tonu nei* suggested there could be negative impacts on: – Māori due to workforce exposure – Older people as they are more likely affected by job loss – Men, due to workforce exposure – Disabled people.[26] • In contrast Pacific people who currently earn less and are unemployed more may experience job gains while young people are likely to see net job gains.[27] • Land-use change may affect employment: horticulture requires more seasonal workers, permanent and native afforestation may generate fewer jobs.[28]
Regional Communities	• Submitters highlighted risk of migration away from regions where land-use change decreases work opportunities	• Stakeholders have highlighted risk of decrease in vitality of rural communities with changing land-use and associated employment changes.[29]

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
Iwi/Māori	Impacts on Māori are discussed in pages 57-59 of the Government's second emissions reduction plan, including: • Māori households are expected to be more affected than non-Māori households by NZ ETS pricing, but the difference is very small. • Māori are more vulnerable to economic transitions due to socio-economic disadvantage and higher exposure to emissions pricing. • [Based on 2018 data:] The Māori economy is over-represented in New Zealand's emissions profile and so more exposed to impacts from emissions reduction efforts. • The relative risk of negative employment impacts for Māori is expected to be higher than for non-Māori, based on the Māori share of the workforce across sectors. • The agricultural sector is significant for the Māori economy. Policies that continue to enable Māori landowners to develop unused or underused lands will reduce the potential impact on Māori. • Māori have significant existing forestry interests. 71,000 hectares of Māori freehold land comprise remote and less versatile land, suited to forestry. While forestry and NZ ETS revenue offer opportunities, it may also limit future land use options for iwi/Māori.	Specific barriers and impacts for iwi/Māori in the low-emissions transition in the main ERM 2025 report and previous advice, include: Transport • Over-representation of Māori in the transport workforce and businesses, combined with higher costs of capital for Māori SMEs, may create barriers to transport decarbonisation[30] • There is a risk of transport disadvantage for Māori and greater harm from transport activities *(*see the full report, *Chapter 6: Impacts and benefits)*. Households • Lower average incomes and wealth for Māori may reduce affordability of low-emissions technology which often has high upfront cost.[31] • Māori households experience higher levels of energy hardship and associated health and wellbeing impacts (see the full report, *Chapter 6: Impacts and benefits)*. Economic factors • Māori SMEs face barriers accessing capital (see the full report, *Chapter 3: Enabling systems*– 'Funding and finance' section) • Māori collective owners of land may be 'asset rich' but 'cash poor'.[32] • Significant interests in the agriculture sector (combined with characteristics of whenua Māori described below) increase exposure to negative impacts from climate policy.[33] • There is a lack of data on emissions from the Māori economy combined with appropriate data sovereignty in this area.[34]

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
		### Whenua Māori • Characteristics of whenua Māori include more marginal and land-locked land, high fragmentation, legal constraints and ownership complexities. These characteristics may limit the use of land as collateral for finance, limit options for development and complicate management.[35] • Mainstream advisory solutions may not provide the bespoke support for agricultural emissions reductions appropriate for Māori collective owners of land.[36] • Iwi/Māori have cultural and spiritual connections to te taiao and hold an important role in the forestry sector. It is important to consider the specific effects of climate policy on iwi/Māori in relation to forests.[37] ### Workforce • Patterns of employment for Māori may present barriers to participating and benefiting from climate action, including: – Under-representation in high-skilled engineering jobs relevant to renewable energy and adaptation[38] – Over-representation in lower-skilled jobs with lower job security and greater likelihood of automation.[39] ### Historical context Historical injustices have resulted in contemporary poorer outcomes for Māori in health, education, employment, household wealth and land use, thereby contributing to the issues above.[40] Understanding this historical context and the resulting contemporary circumstances is needed to avoid current policies compounding these factors.[41]
Future generations	• Future generations face higher impacts from climate change, possible higher costs to reduce gross emissions due to current	• The low-emissions transition could improve the lives and choices of young people and future generations although excessively fast cuts to emissions would

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
	reliance on forestry, and may benefit from lower technology costs.	have a legacy impact on the quality of life for younger generations if families are left without employment or essential services.[42] • Relying on forestry creates an ongoing burden in future to reduce those gross emissions and limits future generations' choices about land use.[43] • Young people are experiencing climate anxiety risk.[44] • Transformation of the energy system requires a considered approach as part of a broader strategy that supports intergenerational wellbeing.[45]
Energy	• Faster consenting could improve the 'green image' for exporters and reduce energy costs long term	• Consenting issues highlighted as existing barrier (see the full report, *Chapter 7: Energy, industry and buildings*) • The full report *Chapter 6: Impacts and benefits* notes benefits for economy and attracting foreign direct investment of reliable, affordable, low-emissions electricity.
Carbon capture, use and storage (CCUS)	• CCUS may bring range of benefits and distributional impacts including employment opportunities; improved gas production viability; benefits for some regions; benefits for iwi/Māori from use of fossil gas reservoirs in rohe.	• Not assessed.
Agricultural pricing	• Agricultural pricing will increase costs for sector, but new emissions reduction technology may have economic and social benefits.	• Changes in farm management practices on most farms can reduce emissions while improving animal productivity.[46] • Actual impacts depend on technology availability and price, choices made by farmers and design of emissions pricing.[47] • By 2035 dairy revenue is estimated to be 1% lower than the reference scenario in the draft LTLS scenario. We estimate 2035 sheep and beef revenue to be 1.5% higher the reference scenario in the draft LTLS scenario. Land conversion from ruminant pastureland to low emissions uses, such as horticulture and forestry, is expected to result in more revenue for these uses.[48]

ERP2 policy impact area or group	Summary findings in the Government's second emissions reduction plan (ERP2)	Commission findings
Transport	• Noted very large potential for air quality benefits from electrifying transport.	• See environmental impacts below
Waste	• Noted economic impacts as manageable.	• Policy-dependent and not analysed in detail by Commission.
Environmental impacts	• Noted potential risks and benefits of forestry for erosion control, water quality, biodiversity, wildfires, wilding conifers and slash mobilisation • Opportunity for energy recovery and reduced environmental impacts from landfills	*Ināia tonu nei:* • Potential co-benefits of improved on-farm practices for water quality and emissions, depending on the farm context. • Risk of increased nutrient run-off and demand for irrigation water from more horticulture. • Opportunity for energy recovery from landfills and reduced environmental impacts with increased waste diversion. • Discussed 'embodied' emissions and other environmental impacts of electric vehicle manufacture, noting lifecycle environmental costs are better than for fossil-fuelled vehicles and will continue improving as manufacturing countries shift to renewable electricity. • Noted higher mineral and metal inputs for low-emissions technologies (solar panels, batteries and wind turbines), associated environmental harms during extraction and disposal, and the opportunity to mitigate these through a more circular economy. • Noted substantial landscape and ecological impact of pumped hydro schemes. • Noted biodiversity, water quality, soil and erosion benefits of appropriate afforestation.[49]
Taxation revenue	• Changes to waste levy noted	• Noted likely tax revenue changes are manageable, but the Government could plan for these across fuel excise and road user charges, the Waste levy, oil and fossil gas royalties, and NZ ETS income.[50]

Source: Commission analysis, MfE ERP2

5.2. Discontinued and changed policies related to impacts

The following policies and actions that could mitigate impacts have been discontinued or changed as reported in the amended first emissions reduction plan (ERP1) or elsewhere.[51]

This list excludes new policies introduced with the purpose of mitigating impacts, which are described in the full report.

Discontinued policies and actions

Equitable transition planning

3.2.1[viii] Develop an equitable transition strategy *(in 2024 we reported this as postponed)*.

3.2.2b Support regions and industries to manage the transition *(in 2024 we reported this as related to areas where work had stopped)*.

3.2.3 Implement the Just Transition Partnerships Programme *(in 2024 we reported this as on-hold)*.

Supporting access to low-emissions transport for low-income households

10.2.2 Support social leasing schemes to make access to cleaner vehicles affordable for low-income households.

10.2.2 Implement an equity-oriented vehicle scrap-and-replace scheme to make cleaner vehicles and low-emissions alternatives affordable for low-income households.

10.2.2 Investigate whether further targeted support is required to make low-emissions vehicles more accessible and affordable for other disadvantaged groups and communities.

Reporting of energy poverty indicators

MBIE stopped reporting on energy hardship measures in 2024.[52]

Changed policies

Public transport farebox rules

The 2024 Government Policy Statement on Land Transport indicates the Government expects Public Transport Authorities (PTAs) to recover a greater share of public transport costs from users (farebox recovery), and the NZTA is working with PTAs to implement this.[53, 54]

Warmer Kiwi Homes

Budget 2023 expanded the Warmer Kiwi Homes programme to include additional measures including hot water heat pumps, LED lighting and minor repairs, and this expansion was reversed in Budget 2024. Core programme funding for insulation and heating remains in place (EECA, personal communication, 12 May 2025).

[viii] ERP1 number for this action

5.3. Whakahekenga rehukino: Government reporting on the Māori Climate Platform

Reporting provided by the interagency Climate Change Chief Executives Board (IEB) indicated that as at 1 April 2025 action 2.1 Establish a platform for Māori climate action was experiencing process delays and action 2.3 Support development of a Māori climate strategy was on hold due to internal funding/resource constraints.

A later response from the Ministry for the Environment confirmed "Mid way through 2024 responsibility for delivery of the MCP returned from Oho Mauri Charitable Trust to MfE. The Minister agreed that the project would be delivered in two stages to allow for design and implementation. We are currently in stage one with a focus on pilot projects and fund design. We expect to make progress on Action 2.3 in stage two when the fund is fully implemented (FY25/26)."[55]

5.4. Enabling systems: Funding and finance

Public sector actions and funding

The Government is taking a market-led approach in ERP2, which aims to encourage private investment in the low-emissions transition with credible, efficient and resilient markets.

ERP2 actions in this area are to develop a sustainable finance strategy and taxonomy, establish a sustainable finance reference group to advise the Government, work with Australia on aligning sustainable finance policy and regulation, and share knowledge with international partners and to investigate a biodiversity credits market.

We understand the Centre for Sustainable Finance will publish a first iteration of the sustainable finance taxonomy covering agriculture and forestry in late 2025 and is working with the Government to develop a sustainable finance strategy.

Other relevant developments in this area are:

- The wind down of New Zealand Green Investment Finance[56] and the conclusion of the EECA-administered State Sector Decarbonisation Fund.[57]
- Consultation by MBIE on proposals to reduce compliance costs of the Climate-Related Disclosures (CRD) regime by raising thresholds to cover a smaller set of large entities and reducing the liability exposure of entity Directors.[58]
- Amendments to climate reporting standards by the External Reporting Board (XRB) to allow entities an additional year before starting some aspects of Climate Related Disclosures.[59]
- Increased public scrutiny and reform proposals related to bank lending practices, including:
    - The Finance and Expenditure Committee's Inquiry into banking competition[ix,60]
    - Select Committee consideration of the Member's bill on Financial Markets (Conduct of Institutions) Amendment (Duty to provide Financial Services)[61]
    - The reported Commerce Commission investigation into adoption of net-zero strategies and targets by banks.[62]

International action

International developments in carbon markets, country and corporate targets and sustainable finance can affect New Zealand.

[ix] The Inquiry's terms of reference include 'the effect of any bank lending policies relating to borrowers' emissions that result in additional lending costs and/or lending restrictions'.

Globally, carbon pricing mechanisms have continued to expand. Approximately 24% of global greenhouse gas emissions are now subject to carbon pricing, encompassing both emissions trading schemes and carbon taxes.[63]

In January 2025, the United States announced its withdrawal from the Paris Agreement. State-level initiatives are progressing climate action with multiple states having implemented carbon markets.[x,64]

Other jurisdictions have continued with climate policies. The European Union's (EU) Emissions Trading System (EU ETS) remains a cornerstone of its climate policy and EU Carbon Border Adjustment Mechanism (CBAM) will, from 2026, tax imported goods from countries with weaker climate regulations, incentivising trading partners to adopt stricter emissions policies.

China has the world's largest carbon market by emissions coverage, including more than 4.5 billion tonnes of carbon dioxide emissions from the electricity sector.[65] Aluminium, steel and cement sectors will now be brought into the market following consultation in 2024.[66] China's economy is increasingly electrified, accounting for more than 40% of global installed capacity for wind and solar PV, and more than half of the electric cars in the world today.[67]

In 2023 Australia strengthened its carbon pricing scheme, the Safeguard Mechanism, with a further policy review planned for 2026–27.[68]

Global sustainable finance

Following the United States (US) election and announced withdrawal from the Paris Agreement, the US Federal Reserve and US Treasury have withdrawn from the Network for Greening the Financial System, and several US and Canadian banks have withdrawn from the Net Zero Banking Alliance.[69]

There have been recent outflows from environmental, social, governance (ESG) funds at the global level which might be an early indicator of relatively lower availability of capital for low-emissions investment (including in New Zealand) going forward.[70]

Engagement feedback and financial sector commentary indicates that it is too early to know the full domestic implications of these recent international developments, and that Aotearoa New Zealand firms in international supply chains remain focussed on meeting overseas emissions disclosure requirements.[xi,71]

Domestic private sector targets and disclosures

The international Science Based Target Initiative (SBTI) provides a framework for companies to make net-zero consistent commitments for direct and indirect emissions. In December 2024 there were 12 Aotearoa New Zealand companies with SBTI-verified targets and a further two awaiting approval.[72] Air New Zealand withdrew its 2030 SBTI target in July 2024.[73]

In February 2025 Fonterra announced additional incentives for farmers to reduce emissions through a higher milk price and access to emissions efficiency tools.[74] This includes funding from its customers Mars and Nestlé as part of reducing their supply chain emissions to meet corporate net zero targets.

New Zealand's Climate Related Disclosures regime requires some large companies to regularly disclose information about climate risks including physical and transition risks.[75] The first round of disclosures by banks, insurers,

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[x] Washington State, Oregon and Colorado have existing state-level carbon pricing initiatives, with New York State set to launch a new ETS in 2025. Eleven northeast states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) also work together in the Regional Greenhouse Gas Initiative to cap and reduce CO_2 emissions from the electricity sector. See International Carbon Action Partnership (2025) for more information.

[xi] This includes voluntary target setting by multinationals as well as the ongoing rollout of mandatory climate disclosures in many jurisdictions including China, Europe, UK, Brazil, Singapore and California, as well as the European Carbon Border Adjustment Mechanism.

investment firms and listed companies under the Climate-Related Disclosures regime was largely complete by the end of 2024. Following issues with data availability and compliance costs the XRB has extended the phase-in period year for some elements of reporting and has also indicated it is considering differentiated disclosure requirements which could reduce compliance costs on smaller entities (separate to the Government's consultation on adjusting the CRD regime).

Domestic sustainable finance activity

Sustainable finance includes lending provided for exclusive use in sustainable activities (such as 'Green bonds'), which may allow borrowers to access a lower interest rate, and sustainability-linked lending – where the interest rate is contingent on the borrower meeting a quantified environmental target. Such arrangements may include low emissions investment but also other environmental and social goals and governance factors such as employment standards or reduced pollution.

The Commission does not have quantitative indicators of levels of sustainable finance uptake or low-emissions investment by Aotearoa New Zealand businesses, although we would like to develop these.

We heard from stakeholders:

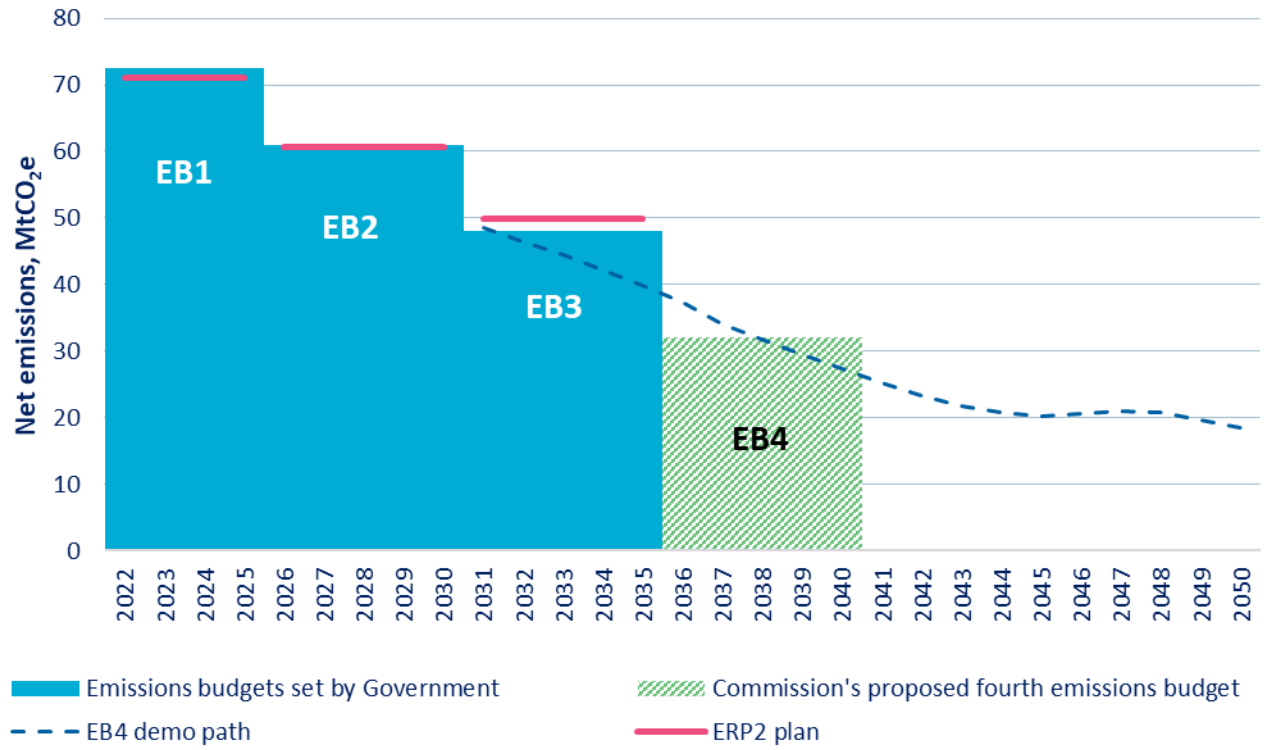
- The high cost of assembling evidence to validate claims for sustainability-linked loans is a barrier to smaller firms and councils, which may not be justified by the available reduction in interest rate.
- Aotearoa New Zealand businesses are considering decarbonisation as both an opportunity to access cheaper finance and to mitigate risks to energy supply and cost.

6. New opportunities

An assessment of opportunities to go further in the third emissions budget period was made by comparing the Government's plan (ERP2 path) to the Commission's EB4 demonstration path. The EB4 demonstration path was developed by the Commission to provide advice on the level of the fourth emissions budget and to be consistent with the 2050 target. The EB4 demonstration path has similar levels of emissions reductions as set in the first three emissions budget periods. It is therefore a suitable pathway to assess where additional opportunities could come from.

Figure 41 shows the Government's plan (ERP2 path) against our advice on the fourth emissions budget level and how the EB4 demonstration path projects out to 2050. **Figure 41** shows that a shortfall in the third emissions budget period will mean a steeper reduction in emissions would be required later to return to a trajectory aligned with the EB4 demonstration path. Some opportunities may need to be enacted with sufficient time for them to achieve the reductions necessary by the time the third and fourth emissions budget arrives.

Figure 41: ERP2 plan compared to EB4 demonstration path, projected to 2050



Source: Commission's advice on the fourth emissions budget, New Zealand's second emissions reduction plan

7. Information gaps

Our sectoral assessment of emissions reductions shows some areas lack regular or sufficiently detailed data. Data gaps can limit how well real-world progress is tracked and understood. Analysis of data gaps can also provide opportunities for linking action for adaptation to climate change impacts.

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

7.1. Overall information gaps

There is no coordinated collection or reporting of data on the impacts of climate policy or the effectiveness of policies to mitigate those impacts.

7.2. Cross-cutting areas

There is not currently adequate data to track investment aligned with the transition to a low-emissions economy (see discussion in the full report, *Chapter 3: Enabling systems* – 'Funding and finance' section).

There is not currently adequate data to track energy hardship as experienced by households and its underlying drivers including housing quality (see discussion in the full report, *Chapter 6: Impacts and benefits)*.

7.3. Whakahekenga rehukino

The Commission's previous emissions reduction monitoring report highlighted data gaps limiting our ability to track and understand the progress of emissions reductions actions regarding iwi/Māori. This has not been resolved, and a lack of updated Māori emissions data has limited this assessment. It is also difficult to assess the adequacy of government action in supporting Māori-led action and integrating mātauranga Māori into the climate response, due to delivery uncertainties surrounding the Māori climate platform, a lack of transparency, and uncertainty of the post-2025 future of the Vision Mātauranga policy and capability fund. Future emissions reduction monitoring reports will be strengthened by the inclusion of mātauranga-informed indicators.

7.4. Energy and industry

Aggregate capacity (MW) of demand flexibility contracts. Some information is publicly available on the total capacity of demand that can be shifted or temporarily turned off but is not consistently tracked and reported. The Electricity Authority's demand-side flexibility survey may provide data in the future if it continues. New metrics could be developed to show what proportion of demand can be shifted or turned off when needed.

Low-carbon fuels project pipeline. Some information is publicly available but is not consistently tracked and reported. Competitive and secure supply of low emissions fuels is a key enabler in switching away from fossil fuels for energy or feedstock. Low-carbon fuels projects many include, for example, development of green hydrogen and bioenergy production facilities.

Carbon intensity of materials. Environmental Product Declarations (EPDs) are available and used to populate different tools and databases. However, tools and databases are not in a standardised format to enable comparison and monitoring of changes in the carbon intensity of materials over time. A more standardised and centralised approach that collates EPD data could help.

Secondary material collection and use. Data on secondary material collection and use could improve monitoring and reporting at the sector and/or product level (for example, volume of scrap metal collection, and construction and demolition waste). Over time, this could include data on recycling and reuse of critical minerals and metals.

Increase energy efficiency of products. EECA tracks improvements in the energy efficiency of products through sales and product performance information as part of the Equipment Energy Efficiency (E3) Programme. Data on improvement in the energy efficiency of products and the range of products offered are not reported in a format that is suitable for tracking progress.

Rate of buildings switching away from fossil gas. Data are not reported in a format that is suitable for tracking progress. Existing data may be accounting for all existing connection points and meters even if a consumer has disconnected from gas through their service provider. Data on switching could be aggregated and reported by a central entity, such as the Commerce Commission or the Gas Industry Company.

Building stock retrofit rates. Data are not collected on building retrofits – where the owner undertakes renovations to improve energy efficiency, increase use of renewable energy, improve insulation or similar. Some building projects require a building or resource consent, but others do not. Data from consents are not collected and reported consistently across building consent authorities. A hub for building consent authorities, such as Simpli, could be a centralised way to collect and report such information.[76]

Building efficiency and thermal performance improvements. The NABERSNZ programme collects data from commercial building participants and publishes case studies, but the data are not collated and reported in a format that is suitable for tracking progress. An annual report and database similar to NABERSAUS[77] published by, for example, the New Zealand Green Building Council, could support the development of indicators to monitor progress. There is no centralised collection of data from new or existing residential buildings, but BRANZ has work underway to develop a national housing indicator framework for new builds.

Planned renewable capacity and build rate. The data that are currently collected are not comprehensive. The Electricity Authority's Generation Investment Survey and Transpower's Connection Enquiry Dashboard provide short-term data, but a more robust data set is not currently available nor is it in a format that can be readily analysed. The Electricity Authority has also signalled intent to develop a dashboard to provide ongoing and increased visibility of generation investment.

Capacity (MW) of demand flexibility. The Commerce Commission indicated that its information disclosure requirements could require electricity distribution businesses to report on demand flexibility in the future. However, this may not be in a format that can be readily analysed. The Electricity Authority's demand-side flexibility survey may provide data in the future if it continues. New metrics could be developed to show what proportion of demand can be shifted or turned off when needed.

Dispatchable low-carbon generation capacity and build rate. Some information about capacity and building of dispatchable generation (that can be turned on as needed) is available for grid-connected resources, but information is not required to be divulged or collected. Data are currently too sparse and inconsistently collected to provide meaningful insights for monitoring purposes.

Grid storage capacity and build rate. There is some information about capacity and building of grid-connected energy storage collected by Transpower and the Electricity Authority, but this information is not required to be divulged or collected. Sparse and inconsistently collected data cannot provide meaningful insights for monitoring purposes.

7.5. Transport

Public and active transport. A variety of data are published for public transport passenger and active mode movements across Aotearoa New Zealand. However, data sets are incomplete for public transport usage per passenger kilometre and there is no national level aggregated public transport rideshare data. There is also no data on aggregate active mode or micromobility use in cities. These data would be helpful to track changes in passenger kilometre movements by public transport mode and walking, cycling and micromobility use.

Public transport passenger movements. Measuring emissions from passenger movements by bus, rail and ferry services would improve emissions reporting through a better division of emissions between freight and passenger transport. In particular, splitting buses off from other heavy vehicles would allow bus emissions to be captured under passenger transport. This is already done in some of the Ministry of Transport projections, but not published annually.

Coastal shipping. Coastal shipping tonne-km per vessel data would enable reporting of freight by mode share. Shifting freight to less emissions intensive modes is a key pathway outcome.

Vehicle fuel types. Improved data on vehicle fuel types would enable a more accurate division of heavy vehicle emissions.

Overall aviation travel demand. For the aviation sector, the following data for measuring the reduction of overall travel demand are collected but not freely available at the national level - commercial and passenger kilometres travelled, and freight tonne-kilometres transported at a national level. These data would enable an improved calculation of the efficiency and intensity of domestic aviation in association with national energy and emissions statistics.

7.6. Waste and f-gases

Our previous concern about LFG data uncertainty continues to exist. In 2024 we identified that there was uncertainty about the rate of landfill gas capture occurring at landfills. As part of this initial monitoring work, we referred to the United Nations Framework Convention on Climate Change (UNFCCC) review of New Zealand's GHG Inventory submission, which found that Aotearoa New Zealand's methodology underlying the two assumed recovery rates (68% and 52%) was not in accordance with the 2006 IPCC Guidelines. We understand that the that the Ministry for the Environment has attempted to address this issue through a reliance on voluntary data sharing with landfill operators. However, the ongoing lack of open transparency related to landfill emissions data, creates ambiguity for achievement of the second and third emissions budgets.

Further review of Class 2–4 landfill waste reduction assumptions. The Government's assumed reductions of waste to unmanaged landfills as part of the ERP2 path may not be feasible and would benefit from further review.

Quality of f-gas emissions data. Ambiguity continues to exist around f-gas emissions data in Aotearoa New Zealand, with data quality being an issue to be addressed. Increasing the robustness of f-gas data would be beneficial for policy development, emissions budgets and emissions reduction plan monitoring.

7.7. Agriculture

Low emissions practice, feeds and technology activity. There is currently limited quantitative evidence on the uptake of different actions farmers are taking to reduce emissions on farm. In general, this is because technology is not yet commercially available that activity data can be collected for. MPI actively works to account for new approved technologies in the inventory, but our monitoring could be improved with early activity data of feeds and technology that may be included in the inventory

Farm GHG numbers. We can calculate national averages of emissions per hectare and per kilogram of product, but collating of individual farm emissions numbers would allow a more detailed understanding of progress towards emissions reductions.

7.8. Removals

Long-term monitoring of existing forests to monitor carbon stock maintenance and changes. This is needed to understand long-term forest carbon removals and how to account and report for forest management.

Disaggregating 'natural regeneration and native planting' mapping and carbon removal estimates into subcategories (for example, indigenous regeneration, wilding pines, and indigenous tall forest planting). This will improve understanding and reporting of the role of native afforestation and regeneration in carbon removals.

Afforestation/restoration success. Long-term monitoring is needed to understand the success rate of afforestation and regeneration efforts and their resulting carbon removals.

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