Chapter 5

Ngā tūtohunga mō ngā tahua tukunga hauwaro
Recommended emissions budgets

Summary

Emissions budgets chart the course for stepping down greenhouse gas emissions over time to meet the emissions reduction targets are set out in the Climate Change Response Act (the Act). The Act requires us to provide advice to the Minister of Climate Change on the level of the first three emissions budgets, setting a path to achieving those targets.

The first emissions budget covers the 4-year period from 2022 – 2025, while the second and third budgets are five years, covering 2026 – 2030 and 2031 – 2035.

Our key decision in recommending the level of these budgets is how quickly Aotearoa should act to deliver emissions reductions. Acting too slowly pushes the burden of addressing climate change on to young people and future generations. Acting too quickly increases the transition cost, for example for infrastructure and asset replacement, and can have unintended consequences for people, society and the economy.

We have been guided by the requirements and considerations under the Act, which are grouped around achieving three key outcomes:

1. **Fair, inclusive and equitable** – emissions budgets that can be achieved in a way that is in line with Te Tiriti o Waitangi/The Treaty of Waitangi, that are affordable, manage negative impacts and support those most affected and least able to adjust, maximise broader opportunities to improve health and environmental outcomes, and ensure intergenerational equity.
2. **Ambitious** – emissions budgets that are ambitious and put Aotearoa on track to meet its emissions reduction targets, sustain those targets and contribute to the global effort of limiting warming to within 1.5°C of pre-industrial levels.
3. **Achievable** – emissions budgets that are technically achievable and economically affordable in light of uncertainty and real-world constraints. This recognises the time it takes people to build supply chains, install new infrastructure, develop markets, and develop skills.

Our recommended emissions budgets are fair, inclusive, equitable, ambitious and achievable. It is possible to meet them with solutions that are available to us today. If new technologies come on the market in the next few years, it may be possible and sensible to overachieve on these budgets.

Changes in our final advice

We relooked at the evidence around what pace is possible in terms of technological and behavioural change. In some cases, we reduced the ambition or pace of our assumptions, for example the number of used EV available in the early years or efficiency improvements on sheep and beef farms. In other cases, we increased the pace, for example the use of low emissions fuels in heavy freight and the increase in gas capture systems for landfills.

The recommended emissions budgets in our final advice have been updated to reflect the new evidence which we received through consultation, and our updated modelling. The budget numbers also reflect the latest National Greenhouse Gas Inventory published by the Ministry for the Environment (MfE). This update provided estimates of emissions in Aotearoa for 2019, as well as improving estimates for past years. This has lifted the baseline for emissions – meaning Aotearoa has a slightly harder job ahead to meet the targets set under the Act.

Introduction

1 Emissions budgets sit at the core of the transition to a thriving, climate-resilient and low-emissions Aotearoa. They chart the course for stepping down emissions to meet the emissions reduction targets.

2 The key judgement we had to make in recommending emissions budget levels is how quickly Aotearoa should act to reduce emissions. In making this judgement, we have been guided by the requirements in the Climate Change Response Act 2002 (the Act) that are outlined in more detail in *Chapter 3: The role of the Climate Change Commission.*

3 During consultation on our *2021 Draft Advice for Consultation* we asked for submitters' views on the levels of the first three emissions budgets and whether they were ambitious enough. Some people submitted that our proposed emissions budgets needed to be more transformational. Some submitted that our proposed emissions budgets were too ambitious and would be costly to meet. Others agreed with the balance we had struck, and in particular agreed with the focus on technology that is commercially available now and replacing assets on as natural a cycle as possible.

4 The path forward for Aotearoa must be different from our past approach. Until recently, the growth of forests planted in the 1990s contributed significantly to meeting targets, but the carbon removal benefits of these forests are now coming to an end. Re-planting after harvest maintains but does not add to the average carbon stock. This focus on net emissions meant that gross emissions in Aotearoa continued to increase. As a country, we are now in a position that is much more difficult than it might have been, if we had acted with more regard to the future.

5 A key challenge for the Climate Change Commission (the Commission) in preparing this advice has been to strike a balance between pushing hard to 'catch up' after years of delay, while also acknowledging that adjusting course after years of minimal action requires hard work.

6 This chapter sets out how we have balanced the different considerations set out in the Act to make a judgement on the pace of the transition and the level of the first three emissions budgets. It also lays out our emissions budget recommendations. These budgets will set Aotearoa up to achieve the targets and fulfil other requirements of the Act.

5.1 Emissions budgets that are equitable, ambitious and achievable

7 The Act outlines a series of requirements and considerations for the Commission when advising on emissions budgets. These requirements and considerations can be grouped around achieving three key outcomes:

- **Fair, inclusive and equitable** – emissions budgets that can be achieved in a way that is in line with Te Tiriti o Waitangi/The Treaty of Waitangi, affordable, manages negative impacts and supports those most affected and least able to adjust, maximises broader opportunities to improve health and environmental outcomes, and ensures intergenerational equity.
- **Ambitious** – emissions budgets that are ambitious and put Aotearoa on track to meet its emissions reduction targets, sustain those targets and contribute to the global effort of limiting warming to within 1.5°C of pre-industrial levels.
- **Achievable** – emissions budgets that are technically achievable and economically affordable in light of uncertainty.

8 Balancing the three outcomes is not simple. The world, including Aotearoa, needs to reduce emissions as quickly as possible to limit warming to 1.5°C and reduce the severity of climate change impacts such as sea level rise and drought. However, there are constraints as to how quickly low-emissions technologies will come into the country, solutions can be tailored to the Aotearoa context, and infrastructure put in place.

9 Acting too slowly pushes the burden of addressing climate change on to future generations. Acting too quickly increases the cost as it takes time to develop supply chains, markets and infrastructure. We must strike a balance that looks for equity across generations so that future generations inherit a thriving, climate-resilient and low-emissions Aotearoa.

10 There are actions that we can take to reduce emissions now, and there are many more actions that we can take now that will set us up for deeper emissions reductions in later emissions budget periods.

11 The following sections outline the judgements we have made to balance these three outcomes. Figure 5.1 illustrates how these judgements relate to the considerations in the Act.

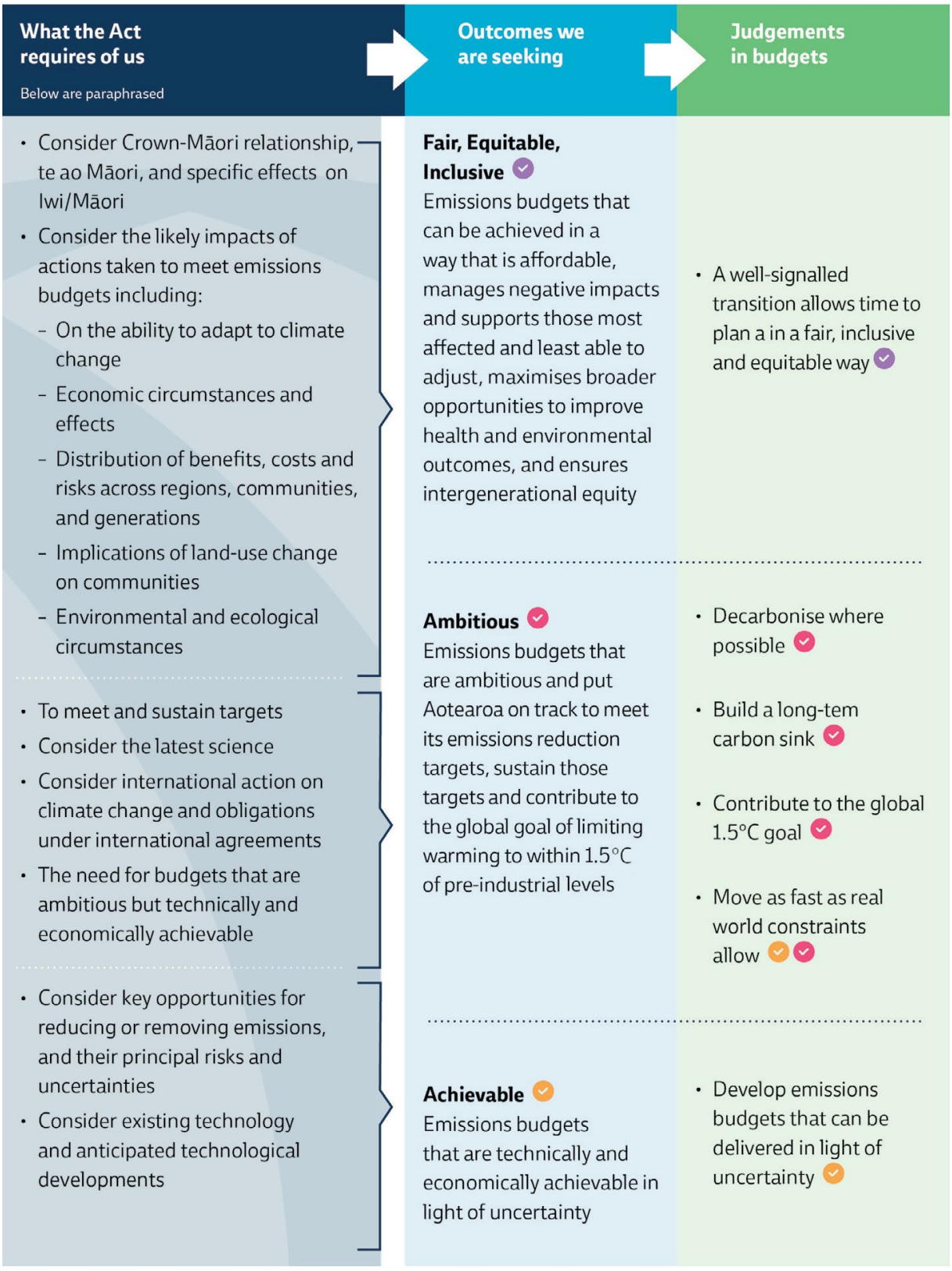

Figure 5.1: The outcomes we are seeking to achieve in recommending emissions budgets, the requirements in the Act that inform these outcomes, and the judgements we have made to achieve these outcomes.

5.1.1 A well-signalled transition allows time to plan in a fair, inclusive and equitable way

12 A well-signalled transition allows individuals, businesses and communities time to plan, and implement solutions for managing negative impacts and supporting those most affected and least able to adjust through the transition. Managed well, transitioning to a low-emissions Aotearoa offers broader opportunities to contribute to improving health, freshwater quality, biodiversity, reducing existing inequities, and addressing historic grievances.

13 A transition that is fair, inclusive and equitable for people is crucial so that it is acceptable to New Zealanders. Putting the values of manaakitanga, tikanga, whanaungatanga and kotahitanga at the forefront means having a deep ethic of care for people and the land. It means acknowledging people's role, being mindful of people's connections to each other and the land, working collaboratively and ensuring the right decision makers are involved. Having support and buy-in from New Zealanders is vital for meeting and sustaining emissions reduction targets.

14 Signalling a plan early provides people a level of predictability about the transition ahead. Having this time helps to avoid unnecessary costs. It means that families, businesses and public entities can replace assets – like coal boilers, fossil gas appliances and internal combustion engine (ICE) cars – with low-emissions alternatives when they reach the end of their useful life.

15 This planning is crucial as the decisions people make now have flow-on effects. This is not a reason for delay. Given lead times, the decisions people make now will set Aotearoa up for deep emissions reductions in future emissions budget periods.

16 A key part of an equitable transition is ensuring intergenerational equity and sustainable prosperity over the long term. In addition to passing on to future generations an Aotearoa that is low emissions, it is also important to pass on an Aotearoa with a productive economy where people are healthy and have jobs that are environmentally and socially sustainable. This will be vital for ensuring that future generations have the resilience and ability to make continual and lasting emissions reductions.

17 The risk of acting too quickly is that we make quick emissions reductions, but not in a way that follows a tikanga process. This could result in outcomes that are not socially, environmentally or economically sustainable, and may not get the buy-in for the deep decarbonisation Aotearoa needs in the long run.

18 The risk of moving too slowly is that Aotearoa misses the opportunity to put in place the changes needed now to deliver emissions reductions in the longer term, and the time Aotearoa has to act is further condensed.

5.1.2 Decarbonise where possible

19 The Act outlines emissions reduction targets for biogenic methane and long-lived greenhouse gases. These targets were set in 2019, after public consultation. The Act does not permit the Commission to recommend changes to these targets at this stage.

20 Aotearoa must not only meet these targets but must sustain them beyond 2050.

21 For long-lived greenhouse gases, there is the option of meeting the target by removing carbon from the atmosphere and storing it – primarily through forestry. Forestry is a lower-cost emissions removal option in the short term.

22 Relying heavily on forestry might help Aotearoa meet its 2050 emissions reduction targets (2050 targets) but it would make maintaining net zero long-lived emissions beyond that date more difficult. It would delay people taking actions that reduce gross emissions, lead to higher cumulative emissions and push the burden of addressing gross emissions on to future generations.

23 Climate change exacerbates forest fires, strong winds, storms, droughts, pests and pathogens – so there are also risks associated with the permanence of using forestry to remove emissions from the atmosphere, as these emissions are released if the forest degrades or is destroyed.

24 Many other countries are planning to rely on carbon capture, utilisation and storage (CCUS) in the long term. This is where carbon dioxide is captured from large emitters and transported to a site where it can either be used or stored in an underground reservoir. We have not relied on this in our analysis as CCUS is an expensive, emerging technology that has not progressed beyond the concept and research stage in Aotearoa.

25 We have designed emissions budgets to have a balance of gross emissions reductions and emissions removals to 'lock in net zero' beyond 2050. The different paths in *Chapter 6: Long term scenarios to 2050* show the kinds of actions that will be needed to reduce gross emissions in line with this balance.

26 Meeting targets in a way that locks in net zero requires rapid and sustained action to 2050. This means people need to decarbonise the sources of long-lived greenhouse gas emissions wherever possible, and only use carbon removals to offset emissions from hard-to-abate sectors.

27 We have set emissions budgets that would require near-complete decarbonisation in areas where it is technically and economically possible. There are already technologies that can be widely used to reduce emissions from low- and medium-temperature heat used in industry, electricity generation, energy use in buildings and land transport.

5.1.3 Build a long-term carbon sink

28 Achieving full decarbonisation will be very challenging in some sectors, so Aotearoa will need to build a long-term carbon sink (i.e. ongoing carbon removals) that is large enough to offset residual long-lived greenhouse gas emissions without the need for ongoing land use conversion.

29 A carbon sink removes carbon from the atmosphere and stores it.

30 **New exotic production forests** (particularly pine) absorb carbon quickly, but reach their average carbon stock (i.e. volume of standing carbon) after around 20 years. To keep adding to the amount of carbon stored in forestry, new land will need to be converted to forestry. We consider that the primary role of exotic production forests should be to support net emissions reductions prior to 2050. However, these should not be at the expense of progress to reduce gross emissions of long-lived greenhouse gases in those sectors where there are already clear routes for decarbonisation. Exotic forestry will also play an important role in providing construction materials and biomass feedstock for the bioeconomy, allowing biomass to be used as a replacement for fossil fuels. Some exotic forests have been established for carbon revenue, with no intention to harvest. If well managed, some of these could transition to native forests, but there are concerns that they may degrade and create environmental risks over the long term if not well managed.

31 **New permanent native forests** absorb carbon more slowly but will continue to do so for centuries until they reach maturity. Because of this, we consider that carbon removals from new permanent native forests have a role to offset the remaining long-lived greenhouse gas emissions in sectors with limited opportunities to reduce emissions from 2050. For instance, this could include offsetting residual nitrous oxide emissions from agriculture and residual industrial process emissions.

32 Aotearoa will need to start now to grow new native forests so that carbon removals can be used to offset the remaining long-lived greenhouse gas emissions from 2050 onwards. Establishing new native forests on less productive land offers a way for Aotearoa to build up an enduring carbon sink that supports intergenerational equity while minimising any loss to agricultural production and delivering wider benefits for erosion, soil health, water quality and biodiversity.

5.1.4 Contribute to the global 1.5°C effort

33 Aotearoa has a strong focus on getting to net zero – the support for the Climate Change Response (Zero Carbon) Amendment Act in 2019 shows that this is a collective goal. At the same time, the Commission also has to consider how Aotearoa is contributing to the global effort of keeping warming to 1.5°C.

34 There is no one prescriptive path of emissions reductions for Aotearoa or any other nation that will guarantee the world limits warming to within 1.5°C. This also means there is no single prescribed way to determine whether our recommended emissions budgets are compatible with contributing to the global 1.5°C effort.

35 The targets in the Act were set at a level that the Government viewed to be in line with the effort of limiting warming to 1.5°C above pre-industrial levels. In setting these targets, the Government drew on the Intergovernmental Panel on Climate Change (IPCC) *Special Report on Global Warming of 1.5°C* released in 2018. At a high level, this means that any emissions budgets set to meet our domestic targets are also consistent with what Aotearoa needs to do to meet international obligations.

36 We have also considered how emissions of the different gases would change under these budgets compared to the IPCC's assessment of global 1.5°C pathways. These global pathways provide useful insights for considering how our recommended emissions budgets contribute to limiting warming to 1.5°C. However, the pathways represent global averages and do not set out prescriptive pathways for individual nations. There is no 'right way' to reduce emissions.

37 As a result, we looked at the relative reductions and global trajectories for the different gases, drew out the key lessons and features, and then applied these in the Aotearoa context.

38 Our recommended budgets would put Aotearoa on track to meet the targets in the Act. The demonstration path would deliver net carbon dioxide emissions from Aotearoa at zero by 2038. It would also deliver combined emissions of nitrous oxide and carbon dioxide at net zero by 2050.

39 The reductions in biogenic methane in our recommended emissions budgets would put Aotearoa on track to meeting the biogenic methane target of reductions of at least 24%-47% by 2050. If some of the more uncertain methane reducing technologies come to fruition, biogenic methane emissions could reduce further.

40 The total contribution Aotearoa makes to the global 1.5°C effort is not limited to what can be done domestically. We have recommended emissions budgets that are ambitious and can be achieved solely through domestic actions. The Government can choose to increase the country's total contribution by reducing emissions offshore. This is discussed in more detail in *Chapter 21: The global 1.5°C effort and Nationally Determined Contribution for Aotearoa.*

5.1.5 Move as fast as real-world constraints allow

41 During consultation, some submitters requested we recommend more ambitious emissions budgets, and in particular a more ambitious first emissions budget.

42 Even with swift and decisive action, there are real-world constraints that mean it takes time to build momentum to make significant emissions reductions. For example, the time it takes people to build supply chains for new technologies, get electric vehicles (EVs) into the country, build up infrastructure such as electricity lines and EV charging infrastructure, develop supply chains and markets for horticultural products, and upskill farm advisors to support practice changes on farm.

43 We're recommending emissions budgets that we judge will enable Aotearoa to move as fast as these real-world constraints allow. This helps us to recommend budgets that are ambitious. At the same time, emissions budgets need to be achievable and sustainable so we are not recommending moving faster than these real-word constraints allow.

44 Some of these real-world constraints mean that we do not see deep reductions within the first emissions budget period. However, the actions we take within that time will be critical for setting Aotearoa up to deliver deep reductions in subsequent emissions budget periods.

45 Going beyond these real-world constraints would limit the options for reducing emissions. This could force businesses to reduce production or even close – having detrimental flow on effects to society – when there may have been solutions for reducing emissions if a different course was taken. A thriving economy and society is vital for ensuring that both current and future generations can make continual and enduring emissions reductions over time.

46 There could also be unintended consequences, where moving too quickly could increase global emissions or make future emissions reductions within Aotearoa more challenging. For example, this might happen if production moves offshore to other countries in a way that increases global emissions, or if electricity prices increase as fossil gas use is reduced too quickly and therefore slow emissions reductions from electrifying transport and heat.

47 Boxes 5.1, 5.2 and 5.3 outline the real-world situation for three key opportunities for reducing emissions – the shift to EVs, reduction in the use of fossil gas, and changing farm management practices.

Box 5.1: The shift to electric vehicles

EVs will be a key technology for decarbonising transport. To meet our recommended emissions budgets, Aotearoa would need to stop importing ICE vehicles between 2030 and 2035. This is in line with decisions by other developed countries and with the latest modelling by the International Energy Agency.

In considering what is technically achievable, we must consider the constraints around the supply of EVs. About 50% of vehicles imported into Aotearoa are used and about 90% of these used vehicles come from Japan. The speed with which Japan rolls out EVs will affect how quickly we can roll out EVs here in Aotearoa in the short term. Historically EV uptake in Japan has been low. However, Japan is aiming for all vehicles entering their fleet from the mid-2030s to be low-emissions vehicles. We have reflected these constraints in our recommended emissions budgets.

We heard from some submitters during consultation that our assumptions for EV uptake were too ambitious given these supply constraints. In our final advice, we have amended our assumptions and have highlighted different paths that could achieve our recommended emissions budgets (see *Chapter 7: Demonstrating emissions budgets are achievable* for more detail).

If EV supply was to be lower, we could still achieve emissions budgets by rolling out more conventional hybrids, by importing more new EVs as opposed to used EVs, and through more behaviour change in how, and how much, we travel.

It is also possible that EV supply could be higher than we have assumed, particularly in the second and third emissions budget periods, given how rapidly the EV market is developing. EV uptake in Europe has rapidly increased in response to policy, and despite the COVID-19 pandemic new EV markets are emerging in other countries. Several vehicle manufacturers announced plans in early 2021 to produce only EVs (see *Chapter 6: Reducing emissions from transport, buildings and urban form* in the *2021 Supporting Evidence*).

Policy will play an important role in speeding up EV uptake. The Act requires us to recommend emissions budgets that are achievable. At this point in time, we cannot be confident that EV uptake will be faster than we assume. However, we would welcome faster uptake if it was possible, and could revise future emissions budgets if circumstances change and new information comes to hand.

More detail on how policy can help speed up the shift to EVs is discussed in *Chapter 14: Policy direction for transport.*

Box 5.2: Reducing the use of fossil gas

The transition away from fossil gas and other fossil fuels is important for achieving the 2050 targets. Much of the fossil gas is used for producing chemicals, generating electricity, process heat, and heating and cooking in buildings.

One factor in the transition away from fossil gas is the company Methanex. Methanex produces methanol from fossil gas and consumes around 40% of the total domestic fossil gas supply. As a large user of fossil gas, Methanex's demand incentivises fossil gas producers to continue production to supply all users. Methanex can also provide flexibility by reducing its demand and methanol production when there is an interruption in supply or in dry years when the hydro lakes are low.

The supply of fossil gas could reduce over time. Current fossil gas fields are likely to reach the end of their economic life. This would reduce the amount of fossil gas available for all users. In the long term, it may become uneconomic for Methanex to continue operating in Aotearoa in its current form.

The speed with which Aotearoa reduces fossil gas use for generating electricity needs to be carefully managed to ensure electricity remains reliable and affordable. Fossil gas currently plays an important role in maintaining this reliability and affordability by backing up renewable generation, particularly at peak times in winter and in dry years.

Removing fossil gas too quickly from the system could increase electricity prices and reduce reliability. This could have significant consequences for the electrification of transport and low- to medium-temperature process heat – two big opportunities for reducing emissions in Aotearoa. Access to reliable and affordable electricity will also support homeowners and businesses as they gradually transition away from fossil gas for heating and cooking.

There are options for reducing the use of fossil gas for electricity generation. However, these options are currently expensive and therefore also need to be carefully assessed against the size of the potential emissions reductions while balancing electricity system reliability and affordability.

There are currently fewer options for moving away from fossil gas for industries that need high-temperature process heat and rely on fossil gas as a feedstock for products like urea. Alternative technologies are in the early stages of development and are expensive.

There are solutions for moving away from using fossil gas in heating and cooking, such as heat pumps and induction stove tops. Biogas and hydrogen may also offer opportunities. There is an upfront cost to replacing fossil gas appliances, boilers and infrastructure. This cost can be minimised by replacing appliances with low-emissions alternatives when they reach the end of their useful life.

As the use of fossil fuels is phased down, the diminishing role of fossil gas across the energy system will need to be carefully managed and sequenced as there may be consequences for network infrastructure and the workforce.

More detail on how policy can help manage the phase out of fossil gas is discussed in *Chapter 15: Policy direction for energy, industry and buildings.*

Box 5.3: Changing farm management practices

Widespread changes to farm management practices will play a key role in reducing emissions from the food and fibre sector.

Farming and growing in Aotearoa has been at the global leading edge in terms of efficiency in recent decades. Changing farm management practices will keep Aotearoa in that position and maintain credibility with consumers as their attention increasingly turns to climate change and other environmental issues.

Making these practice changes is both ambitious and achievable, in line with what is required under the Act. This widespread change requires many of the people who own or manage the 20,000 – 30,000 farms in Aotearoa to calculate their emissions, assess what changes are needed to reduce emissions, and put these changes into practice.

Farms are complex biological systems. The mix of animals, plants, soils and feed means that each farm has its own unique emissions profile. Changing one element of the farm system will have impacts on other parts of the system, and on emissions. For example, changing what an animal is fed will affect how much meat or milk it produces, how much methane it emits, as well as how much nitrogen is deposited.

What an optimal system looks like will vary considerably between farms. Reducing emissions on-farm requires each farmer to be able to tailor solutions to their specific farm context, including the farm's climate, soil and geography. Each farmer will need to carefully balance stocking rates, pasture and fertiliser management, and supplementary feed to optimise for production, profit, emissions reductions and other environmental outcomes.

Farmers will need advice from expert farm advisers to estimate what their farm emissions are and to identify how they can optimise their farm system to reduce emissions and address other environmental and business objectives. Developing these plans across the tens of thousands of farms in Aotearoa will take time. It will also take time to upskill farm advisers so they can provide advice on the comprehensive range of issues farmers will need to consider.

He Waka Eke Noa, the Primary Sector Climate Action Partnership, has milestones for 100% of farmers and growers to know their total annual on-farm emissions by the end of 2022, and for 100% to have a written plan for measuring and managing their emissions by the end of 2024.

More detail on how policy can help deliver widespread farm management practice changes is discussed in *Chapter 17: Policy direction for agriculture.*

5.1.6 Develop emissions budgets that can be delivered in light of uncertainty

48 We developed a range of scenarios to look at possible futures to 2050 and beyond to understand the changes that are possible and required. Our scenarios were designed to look at how Aotearoa could meet the 2050 targets if future conditions around technology and behaviour change were more, or less, favourable.

49 The Headwinds scenario is our least optimistic scenario that examines what could happen if there are more barriers to adopting new technology and less behaviour changes in the future. The Tailwinds scenario is our most optimistic scenario and shows what could be possible if there were fewer barriers to technology and more behaviour changes. See *Chapter 6: Long term scenarios to 2050* for more detail.

50 We cannot be certain in how technologies develop or behaviours change. So, while policy should aim for a Tailwinds performance, we cannot be confident that Aotearoa could achieve emissions reductions in line with Tailwinds and so are not recommending emissions budgets quite as ambitious as this.

51 The Act requires us to recommend emissions budgets that are both ambitious and achievable. For this reason, we have tested that there are different paths that could deliver our recommended emissions budgets.

5.2 Principles to guide the Aotearoa transition

52 Underpinning the judgements in the previous sections are a set of key principles that can help guide people's decisions on the transition to low emissions.

53 During consultation, feedback we heard from submitters indicated that we needed to clarify the purpose of the principles. We put together these principles as a practical distillation of the considerations of the Act. These principles can be used by everyone involved in the transition – individuals, Iwi/Māori, the private sector and public sector – to shape their strategy and make decisions. Individuals, Iwi/Māori, the private and public sectors will all play unique but important roles in the transition.

54 These principles build on our framework described in *Chapter 3: The role of the Climate Change Commission*. At the foundation, we must approach the transition through the lens of people, the environment, te ao Māori and give effect to Te Tiriti o Waitangi/The Treaty of Waitangi principles of partnership, protection, participation, and equity. Accordingly, our approach must recognise the guarantee of rangatiratanga and kaitiakitanga for Iwi/Māori under Te Tiriti o Waitangi/The Treaty of Waitangi.

55 The key principles for a low-emissions transition strategy are as follows:

1. **Transition in an equitable and inclusive way.** Aotearoa should take an approach to the transition that is in line with tikanga values. It must give effect to partnership with Iwi/Māori. Working inclusively also means working in collaboration with businesses, workers and unions, and different community groups. How Aotearoa responds to climate change should consider who will be most impacted and how any negative impacts can be mitigated. Aotearoa should take immediate action to set up well-paced and sustained emissions reductions, reducing the risk of abrupt shocks. By doing this, Aotearoa will be best placed to enhance living standards, health and wellbeing of both current and future generations. The path Aotearoa takes should aim to reduce or even reverse inequities on different groups of society, not compound historic grievances with Iwi/Māori, and not penalise early movers.
2. **Take a long-term view to 2050 and beyond**. Aotearoa will need to adopt actions that not only set it on a path to meet emissions reduction targets, but which sustain those targets beyond 2050, set up for net negative emissions later and contribute to the global effort to limit warming to 1.5°C. Meeting these goals requires a long-term view of investments and infrastructure developments. Actions that are taken in the next five years will need to set Aotearoa up to deliver the deeper reductions required in subsequent emissions budgets to meet and sustain the 2050 targets.

3. **Prioritise gross emissions reductions.** Emissions must be reduced at source to prevent further warming of the atmosphere and meet emissions reduction targets. Aotearoa should prioritise actions that reduce gross greenhouse emissions rather than reducing production. Removing and storing carbon through forestry will still play an important role but should not displace making gross emissions reductions. Relying heavily on forestry before 2050 is likely to make maintaining net zero long-lived greenhouse gas emissions after 2050 challenging. It would delay action, lead to higher cumulative emissions and put the burden of reducing gross emissions on to future generations. It would also require significantly more land to be converted to forestry in the future.
4. **Create options and manage uncertainty**. There is much uncertainty in embarking on this decades-long transition. Uncertainty is not a reason for delay. There is value in creating options for meeting the targets and having the ability to adjust course as the transition proceeds. Aotearoa should deploy low-emissions technologies that are commercially available now. People should also make decisions that open up a wide range of future options and keep options open for as long as possible. This will spread risk and make the transition more resilient.
5. **Take a systems view.** Addressing climate change requires people to transform the way they live and how they go about business. All sectors have a role to play in the low-emissions transformation, and each should take actions in line with the available opportunities. Making a change in one sector can have flow-on consequences in other sectors. The actions people take now also have flow-on consequences to the emissions reductions people can achieve later. People should consider the dynamics and interconnections, what opportunities they could bring, and the potential for unintended consequences.
6. **Avoid unnecessary cost.** The actions Aotearoa takes to meet emissions budgets and targets should avoid unnecessary costs. This means using measures with lower costs and planning ahead so that technologies, assets and infrastructure can be replaced with low-emissions choices on as natural a cycle as possible. This will help to avoid scrapping assets before the end of their useful lives or being left with stranded assets.
7. **Increase resilience and manage risks.** The actions Aotearoa takes to reduce emissions should help manage increasingly extreme weather events, increasing risk of drought and flooding, increasing fire danger, and increasing incidence of pests and diseases. Where possible, actions should increase the country's resilience to the impacts of climate change that are already being experienced and that will increase in the future.
8. **Leverage co-benefits**. The actions Aotearoa takes to meet emissions budgets and targets should consider the wider benefits, including benefits to health, broader wellbeing and the environment. Co-benefits can provide further reason to take particular actions where the initial emissions reductions may be modest or appear relatively costly.

5.3 Our recommendation on the level of the first three emissions budgets

56 Under the Act, we must provide the Minister of Climate Change with advice on the level of the first three emissions budgets. The first emissions budget covers the 4-year period from 2022 to 2025, while the second and third budgets are both 5 years, covering 2026 to 2030 and 2031 to 2035.

57 We have provided our recommendation on the level of the first three emissions budgets in Recommendation 1. In making this recommendation, we have drawn on the judgements outlined in the preceding sections, and on the analysis provided in Chapters 6-9 of this report. We consider that our recommended emissions budgets are both ambitious and achievable. Box 5.4 outlines the potential consequences of setting emissions budgets more or less ambitious than we have recommended.

58 If new technologies were to come on the market in the next few years, it may be possible and sensible to overachieve on these budgets. The time it takes to roll out new technologies and change behaviour means that significant emissions reductions may not be observed until the next emissions budget period. However, in this case we would have reason to revise future emissions budgets in light of these developments.

59 We are required under the Act to provide emissions budgets that include all greenhouse gases expressed as a net quantity of carbon dioxide equivalent. In the next section, we also provide the breakdown by gas and for biogenic methane and long-lived greenhouse gases. Providing the breakdown of biogenic methane and long-lived gases allows us to distinguish between different greenhouse gases and align with the country's domestic emissions reduction targets.

60 The Act requires us to use the GWP_{100} metric to calculate emissions budget levels. GWP_{100} values are regularly reassessed by the IPCC. Our recommended 'all gases' emissions budgets outlined in Recommendation 1 are expressed in units of $MtCO_2e$, based on the GWP_{100} metric from the IPCC's *Fifth Assessment Report (AR5)*. The Government should set emissions budgets using the *AR5* GWP_{100} values, to be consistent with international obligations relating to Inventory reporting. Net emissions and removals by forestry are calculated using a modified activity-based approach (see *Chapter 10: Rules for measuring progress towards emissions budgets and 2050 targets*).

61 Our analysis throughout this report is based on the GWP_{100} values from the IPCC's *Fourth Assessment Report (AR4)*. Table 5.1 outlines the GWP_{100} values from *AR4* and *AR5* for carbon dioxide, methane, nitrous oxide and the common refrigerant gas HFC-134a. This table does not include a full list of all greenhouse gases, in particular the large number of F-gases.

62 Table 5.2 outlines the draft emissions budgets that we consulted on (in *AR4* GWP_{100} values) and our recommended emissions budgets (both in *AR4* and *AR5* GWP_{100} values).

63 Our recommended emissions are higher than in our draft advice primarily due to increases in historic emissions estimated in *New Zealand's Greenhouse Gas Inventory* and increases in projected emissions under the Current Policy Reference case.

Table 5.1: GWP_{100} values from the IPCC's AR4 and AR5 for some greenhouse gases

	GWP_{100} values	
	***AR4*, no climate-carbon feedbacks**	***AR5*, no climate-carbon feedbacks**
Carbon dioxide	1	1
Methane	25	28
Nitrous oxide	298	265
HFC-134a	1,430	1,300

Table 5.2: The levels of the first three emissions budgets in our draft advice and our final recommendations

	2019	Emissions budget 1 (2022 – 2025)	Emissions budget 2 (2026 – 2030)	Emissions budget 3 (2031 – 2035)
Draft emissions budgets (*AR4*) Annual average	72.1 Mt CO_2e/yr	271 MtCO_2e 67.7 Mt CO_2e/yr	286 MtCO_2e 57.3 Mt CO_2e/yr	223 MtCO_2e 44.6 Mt CO_2e/yr
Final emissions budgets (*AR4*) Annual average	74.9 Mt CO_2e/yr	278 MtCO_2e 69.5 Mt CO_2e/yr	298 MtCO_2e 59.7 Mt CO_2e/yr	240 MtCO_2e 47.9 Mt CO_2e/yr
Final emissions budgets (*AR5*) Annual average	78.0 Mt CO_2e/yr	290 MtCO_2e 72.4 Mt CO_2e/yr	312 MtCO_2e 62.4 Mt CO_2e/yr	253 MtCO_2e 50.6 Mt CO_2e/yr

Recommendation 1

Emissions budget levels

We recommend the Government set and meet the emissions budgets as outlined in the table below. These emissions budgets are expressed using GWP_{100} values from the IPCC's *Fifth Assessment Report (AR5)* for consistency with international obligations relating to Inventory reporting.

	2019	Emissions budget 1 (2022 – 2025)	Emissions budget 2 (2026 – 2030)	Emissions budget 3 (2031 – 2035)
All gases, net (AR5)		290 MtCO_2e	312 MtCO_2e	253 MtCO_2e
Annual average	78.0 MtCO_2e	72.4 MtCO_2e/yr	62.4 MtCO_2e/yr	50.6 MtCO_2e/yr

Box 5.4: The consequences of setting emissions budgets more or less ambitious than recommended

In recommending emissions budgets, we have balanced the need for budgets to be ambitious, achievable, and fair, inclusive and equitable.

Some submitters to our *2021 Draft Advice for Consultation* have requested faster transitions, and in particular for deeper reductions starting immediately. More ambitious emissions budgets would mean transitioning faster than real-world constraints for deploying technology, developing supply chains, infrastructure and markets allow. This has a number of consequences:

- Communities may not have time to work together to plan for the changes they'll see in their community, or to determine solutions for supporting those most adversely impacted and least able to adjust.
- Households and businesses could need to prematurely scrap some assets like vehicles and boilers before the end of their useful life, increasing costs.
- Acting too quickly could have unintended consequences for reducing emissions. For example, reducing fossil gas too quickly could increase electricity prices and reduce electricity reliability. However, reliable and affordable electricity is vital for enabling greater emissions reductions by electrifying transport and process heat.
- Some of our industries – like cement and steel – are bespoke and hard to abate. Solutions for decarbonising these industries are further off. Acting too quickly could see some of these industries close before strategic decisions can be made. Once closed, it would be difficult to get these industries back again.
- Some businesses that do have solutions for reducing emissions may not have the time to plan, upskill staff and deploy these solutions. A quicker transition may therefore force these businesses to reduce production.
- Reducing production and closing industries would have significant flow-on effects to jobs, broader society and the economy. This could undermine public support for the transition. It would also reduce our resilience and ability to put in place solutions to make continual and lasting emissions reductions. Environmentally and socially sustainable jobs, a productive economy and the wellbeing of the people who live here are vital for future generations and sustainable prosperity over the long term.

Other submitters requested a slower transition, stating that our draft emissions budgets would be costly to meet. A less ambitious transition would mean transitioning slower than real-world constraints allow and comes with a number of consequences:

- Delaying action on reducing emissions would increase cumulative emissions and our contribution to warming. It would push the burden of reducing emissions to young people and future generations. It would risk other countries following suit. Slower global action would reduce the ability for society and natural systems to adapt to the physical impacts of climate change and expose a greater number of people to climate-related risks, including risks to health, water supply, and food security.
- Businesses would risk missing opportunities for developing new low-emissions products and services, and could lose market share or access to some markets or to investment from delayed action. Businesses could also be left with stranded assets from a delayed but more disruptive transition later. Climate change is a material financial risk, and investors are increasingly taking account of this. Businesses are responding to consumer demand for low-emissions products, and are increasingly looking at emissions across their supply chains and requiring their suppliers to reduce emissions.

- Delaying action could risk a faster, and more disruptive transition later that could have significant impacts on jobs, society and the economy. It risks missing opportunities for economic growth. It risks missing opportunities for driving down costs from deploying solutions and learning by doing. It may not allow time to plan and signal the transition, and ensure that costs do not disproportionately fall on those who are least able to bear those costs. It could also miss opportunities for improving health and health equity.
- It risks Aotearoa not being able to deliver on the 2050 targets as it fails to take account of the time it takes to deploy technologies, scale up supply chains and build infrastructure. In some areas, immediate and concerted action is needed now to build the momentum needed to deliver the emissions reductions needed by 2050.
- A slower domestic transition would require Aotearoa to pay for more offshore mitigation to meet our Nationally Determined Contribution (NDC) under the Paris Agreement. While offshore mitigation could be used to increase our contribution, it should be used in addition to domestic action rather than replace it (see *Chapter 22: Factors relevant to setting the level of the Nationally Determined Contribution*).
- A slower transition could put the country's international reputation on climate change and environmental issues at risk.
- A slower transition would fail to meet the criteria outlined in the Act to balance intergenerational equity and contribute to global action, and has social and economic risks as described in the preceding bullet points.

5.4 Contribution of different gases, and domestic emissions reductions and domestic removals

64 We have assessed how different greenhouse gases contribute to warming, and the different amounts of domestic emissions reductions and domestic removals needed to meet the emissions budgets and targets. At the core of this assessment is the need to set Aotearoa up to meet the 2050 targets and sustain them beyond 2050.

65 The split-gas nature of the 2050 targets means that forestry removals cannot be used to offset biogenic methane emissions from agriculture and waste to meet this target. Gross biogenic methane emissions need to be reduced by at least 10% below 2017 levels by 2030 and 24-47% below 2017 levels by 2050.

66 Aotearoa would reduce biogenic methane emissions from agriculture and waste by 12.5% by 2030 relative to 2017 under the demonstration path, 11.4% under alternative path A, and 13.3% under alternative path B (see *Chapter 7: Demonstrating emissions budgets are achievable).* Aiming for slightly more than a 10% reduction in biogenic methane by 2030 gives some flexibility to deal with unexpected events, and sets Aotearoa on course to achieve the 2050 targets.

67 Gross emissions of long-lived greenhouse gases need to be reduced to the maximum extent possible to set Aotearoa up to meet and sustain the target of net zero by 2050. Our analysis in *Chapter 6: Long-term scenarios to 2050* shows that, in many sectors, there are clear solutions for reducing gross emissions of long-lived greenhouse gases. This means we could confidently set Aotearoa on a trajectory that would achieve near complete decarbonisation of low- and medium-temperature heat used in industry, electricity generation, energy use in buildings and land transport. Taking actions to meet our recommended emissions budgets would put Aotearoa on track to achieve net zero long-lived gas emissions in the early 2040s.

68 Relying too heavily on forestry removals to offset emissions carries risks. It would require ongoing land-use change to continue offsetting emissions and put the burden of reducing gross emissions on young people and future generations.

69 Table 5.3 outlines what the emissions budgets would equate to in terms of percentage reductions for each gas by 2025, 2030 and 2035, relative to 2019. The biogenic methane target for Aotearoa is at least a 10% reduction by 2030 compared to 2017 levels. Aotearoa would reduce biogenic methane emissions from agriculture and waste by 12% by 2030 relative to 2017 under the demonstration path – an 11% reduction by 2030 relative to 2017 for biogenic methane from agriculture, and 29% from waste.

Table 5.3: The percentage reduction of the different greenhouse gases by 2025, 2030 and 2035. The percentage reductions in this table cannot be directly compared to those in the IPCC pathways, as the IPCC used 2010 as the base year.

	2025	2030	2035
Net long-lived greenhouse gases	15% below 2019	38% below 2019	63% below 2019
Net carbon dioxide	18% below 2019	47% below 2019	78% below 2019
Nitrous oxide	7% below 2019	11% below 2019	16% below 2019
F-gases	6% below 2019	25% below 2019	34% below 2019
Non-biogenic methane	18% below 2019	27% below 2019	32% below 2019
Biogenic methane	8% below 2019	13% below 2019 (12% below 2017)	17% below 2019

Recommendation 2

Break down of emissions budgets

We recommend that the Government implement policies that will meet emissions budgets based on the balance of emissions and removals as outlined in the table below.

	Emissions budget 1 (2022 – 2025)	**Emissions budget 2 (2026 – 2030)**	**Emissions budget 3 (2031 – 2035)**
Total net emissions budget *Annual average*	278 $MtCO_2e$ 69.5 $MtCO_2e$/yr	298 $MtCO_2e$ 59.7 $MtCO_2e$/yr	240 $MtCO_2e$ 47.9 $MtCO_2e$/yr
REMOVALS Forestry carbon removals *Annual average*	26 $MtCO_2e$ 6.6 $MtCO_2e$/yr	50 $MtCO_2e$ 10.0 $MtCO_2e$/yr	69 $MtCO_2e$ 13.8 $MtCO_2e$/yr
EMISSIONS – LONG-LIVED GASES Gross long-lived gases	178 $MtCO_2e$	199 $MtCO_2e$	166 $MtCO_2e$
Carbon dioxide	136 $MtCO_2e$	149 $MtCO_2e$	121 $MtCO_2e$
Nitrous oxide	32 $MtCO_2e$	38 $MtCO_2e$	36 $MtCO_2e$
F-gases	7 $MtCO_2e$	8 $MtCO_2e$	6 $MtCO_2e$
Non-biogenic methane	3 $MtCO_2e$	4 $MtCO_2e$	3 $MtCO_2e$
EMISSIONS – BIOGENIC METHANE Gross biogenic methane*	5.04 $MtCH_4$	5.99 $MtCH_4$	5.70 $MtCH_4$

* Note that biogenic methane amounts are provided in megatonnes of methane ($MtCH_4$). Megatonnes of methane do not equate one-for-one to megatonnes of carbon dioxide equivalent ($MtCO_2e$). As a result, the amounts in this table cannot be summed to give the total net emissions budget. However, the methane volume can be converted into a CO_2e amount by multiplying by 25, the IPCC *AR4* GWP100 value for methane.

Recommendation 3

Reductions by greenhouse gas to meet the emissions budgets

We recommend that the Government implement policies that deliver emissions reductions of each greenhouse gas as outlined in the table below.

	2019	Emissions budget 1 (2022 – 2025)	Emissions budget 2 (2026 – 2030)	Emissions budget 3 (2031 – 2035)
Total net emissions ($MtCO_2e/yr$) Annual average Reduction from 2019	74.9	69.5 5.4	59.7 15.3	47.9 27.0
Total gross emissions ($MtCO_2e/yr$) Annual average Reduction from 2019	82.3	76.1 6.2	69.7 12.6	61.7 20.6
Broken down by:				
Carbon dioxide (gross) ($MtCO_2e/yr$) Annual average Reduction from 2019	37.5	34.0 3.5	29.8 7.7	24.1 13.4
Nitrous oxide ($MtCO_2e/yr$) Annual average Reduction from 2019	8.4	7.9 0.4	7.6 0.8	7.2 1.2
F-gases ($MtCO_2e/yr$) Annual average Reduction from 2019	1.8	1.8 0.0	1.6 0.2	1.3 0.6
Non-biogenic methane ($MtCO_2e/yr$) Annual average Reduction from 2019	0.9	0.8 0.1	0.7 0.2	0.7 0.3
Biogenic methane ($MtCH_4/yr$) Annual average Reduction from 2019*	1.35	1.26 0.09	1.20 0.15	1.14 0.21

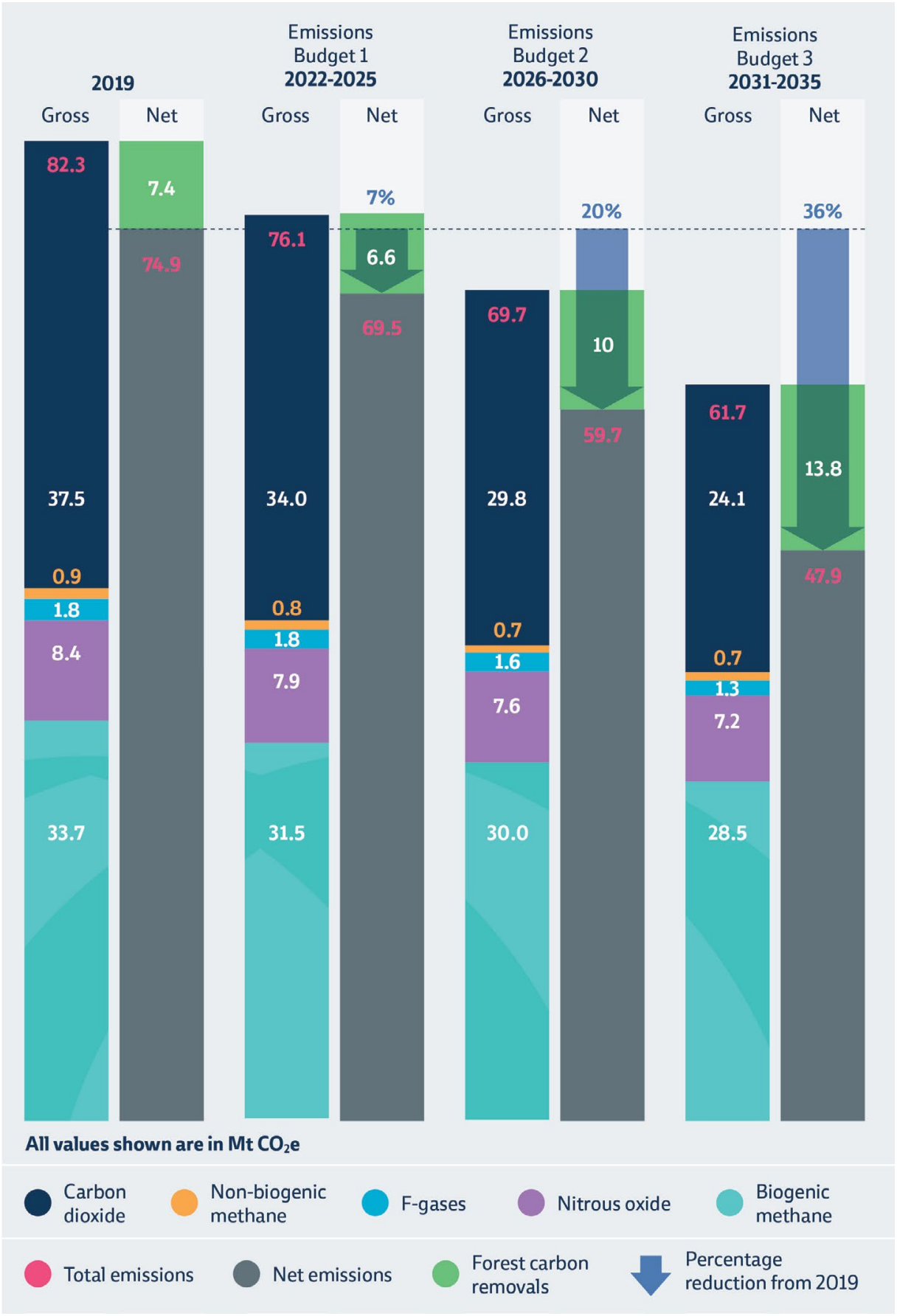

Figure 5.2: Average annual emissions and removals (AR4) by Emissions Budget

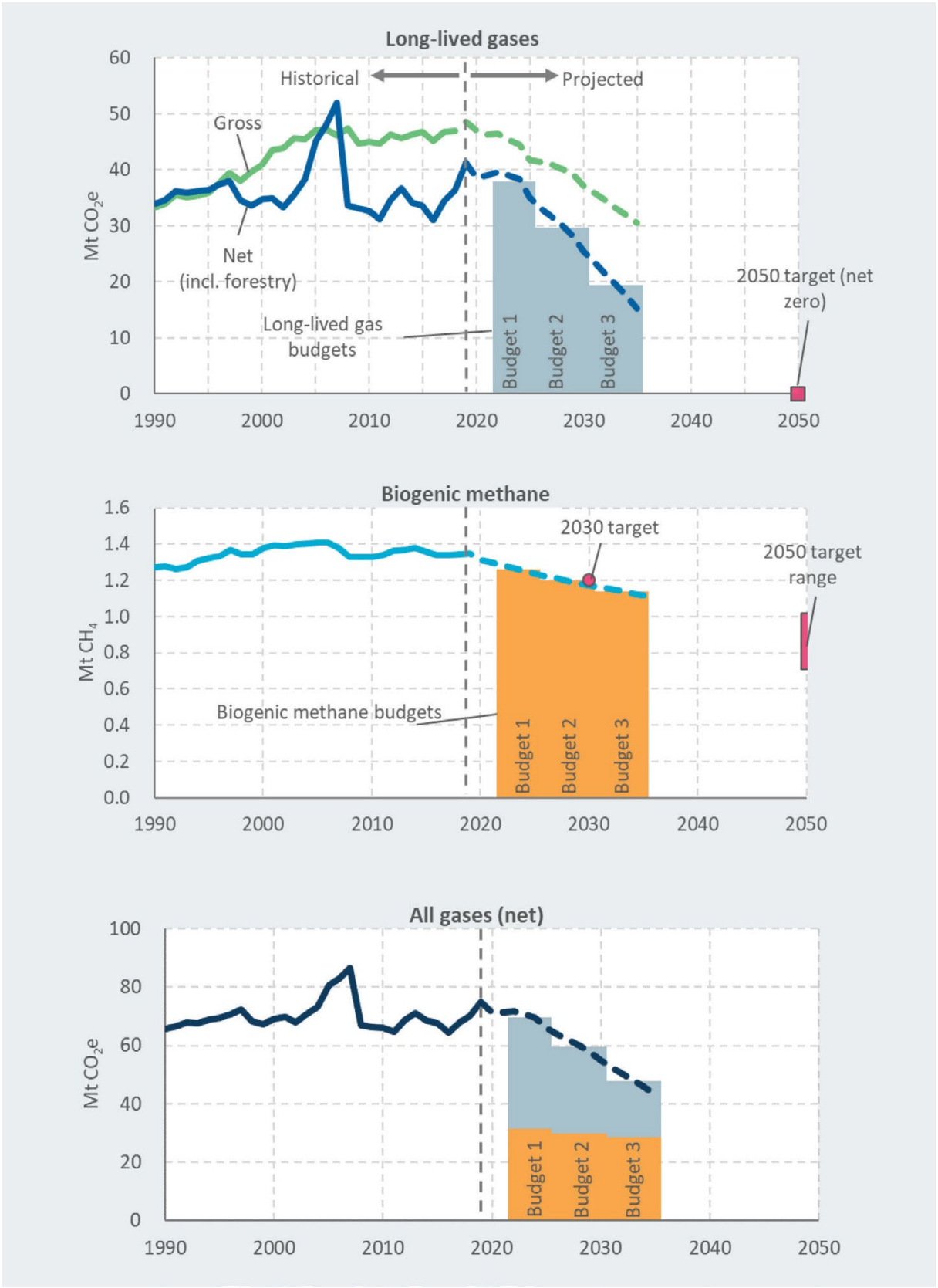

Figure 5.3: These three figures show how our proposed emissions budgets would step Aotearoa towards its emissions reduction targets. The top figure shows long-lived greenhouse gases, the middle figure shows biogenic methane, and the bottom figure shows all gases combined as CO_2-equivalent.

Source: Commission analysis.

Figure 5.4: Emissions of long-lived gases (top) and biogenic methane (bottom) by sector at the end of each budget period in the demonstration path, compared to 2019

Source: Commission analysis.

5.5 Flexibilities for meeting emissions budgets, including offshore mitigation

70 The Act requires the Minister to set emissions budgets for Aotearoa that can be met domestically. In line with this we have recommended emissions budgets that are achievable through deploying technologies and changing behaviour within Aotearoa.

71 This differs from Nationally Determined Contributions (NDCs) adopted under the Paris Agreement. The current NDC for Aotearoa was set on the basis that it would include a contribution from offshore mitigation, in addition to domestic action to reduce emissions (Figure 5.5). More discussion on this can be found in *Chapter 21: The global 1.5°C effort and Nationally Determined Contribution for Aotearoa.*

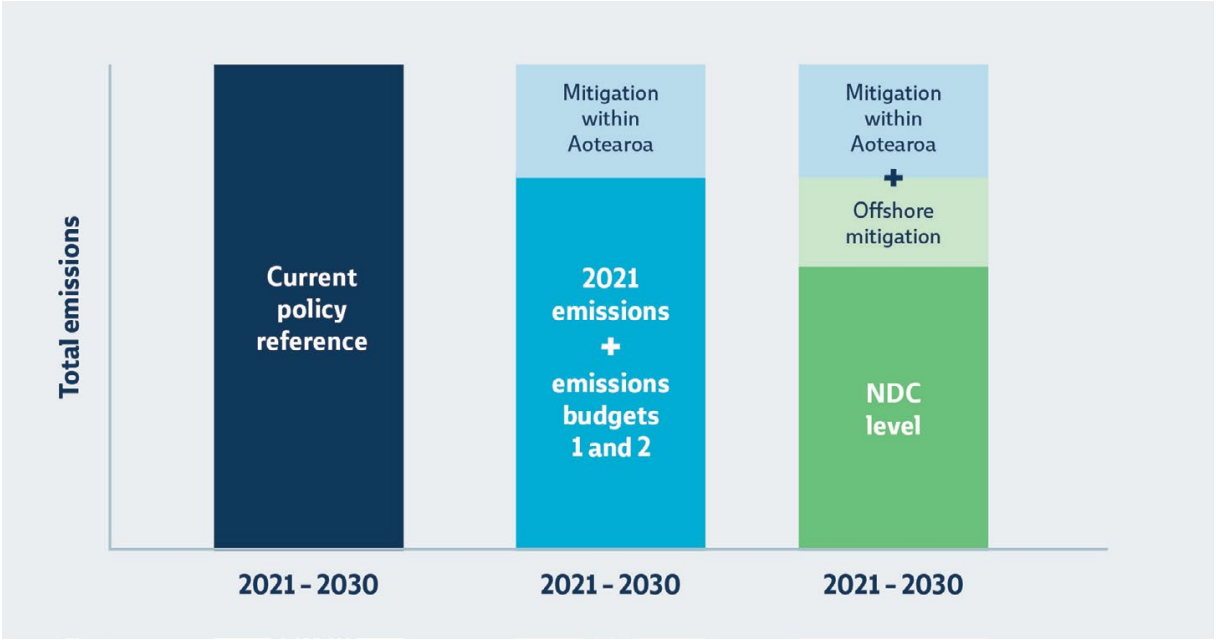

Figure 5.5: Illustration of the role of international mitigation in the NDC compared to emissions budgets

72 While emissions budgets must be set in a way that allows for them to be met domestically, there is always uncertainty when projecting forward in time. In recommending the emissions budgets, we have aimed for them to be resilient to uncertainty and tested that they can be delivered by different paths. The Act also provides some flexibility measures to help manage uncertainty about the future. This section looks more closely at these flexibility measures, how they might be useful and provides advice on the use of one of them, offshore mitigation.

5.5.1 Revising emissions budgets

73 Emissions budgets that have already been set can be revised when a further emissions budget is put in place. For example, in 2024 the Commission will provide advice and in 2025 the Government will set the fourth emissions budget. At this time, the second and third emissions budgets can also be revised if there has been a significant change in circumstances since those emissions budgets were set. The exception is an emissions budget for which the period has already started, in which case revisions are only possible in exceptional circumstances.

74 This flexibility is likely to be useful when relatively long-term technology or behaviour change trends play out differently than anticipated. For example, if a methane inhibitor or vaccine was to become commercially available there may be reason to revise emissions budgets.

5.5.2 Borrowing from the next emissions budget

75 At the end of an emissions budget, up to 1% of the volume from the next emissions budget can be borrowed to help meet the current emissions budget. Borrowing brings emissions forward in time and increases risks that subsequent budgets will be more difficult to meet.

76 The risks to future budgets mean that borrowing should be approached with caution. Our view is that in light of uncertainty, the Government's emissions reduction plans should be set to not only meet but overachieve the budgets. We consider it is prudent to only use borrowing to a very limited extent, for example when the Government finds itself in a position where there is insufficient time in the budget period to adjust policies to ensure emissions are below the budget level.

5.5.3 Offshore mitigation

77 The use of offshore mitigation – buying emissions units or emissions reductions and removals from overseas – should only be used as a last resort for meeting emissions budgets.

78 There was strong support for this advice from submitters, who were overwhelmingly in favour of Aotearoa aiming to meet emissions budgets domestically. A small group of submissions, including some businesses and business-affiliated interest groups, thought offshore mitigation should be allowed, to reduce costs. However, meeting emissions budgets this way shifts the burden of reducing gross emissions onto future generations.

79 We expect that most of the uncertainties in meeting emissions budgets can be managed in the way they are set and revised, and in the way the Government implements its emissions reduction plan. The latter should involve planning to overachieve budgets and refining policies over time in response to how emissions reductions are tracking.

80 Exceptional circumstances may, however, arise – such as force majeure events – which are unpredictable, unpreventable, outside the control of the Government and which cause a large one-off increase in emissions. Examples include disasters such as an earthquake, a volcanic eruption, or a major disruption.

81 If such events occur, the timing and scale of the emissions increase may be so large that it cannot be made up for domestically. We consider that for the first three emissions budgets, only these types of exceptional circumstances justify using offshore mitigation. Even if this happens, Aotearoa should exhaust its domestic options first, with offshore mitigation being the last resort.

82 As emissions reduce, however, it may become harder and more expensive to reduce emissions further. If there were consistent barriers in the known areas of uncertainty or if technologies were to repeatedly deliver fewer emissions reductions than expected, it could become more difficult to stay on track to meet the 2050 target. This is why the Commission may revisit the possibility of offshore mitigation for later emissions budgets as Aotearoa approaches 2050.

83 By their nature, the exceptional or force majeure circumstances that would justify using offshore mitigation are difficult to foresee or quantify. It is not possible to predict the scale of offshore mitigation that might be needed if they occur. Therefore, we advise a limit on offshore mitigation of zero for the first three emissions budgets except in exceptional circumstances, for example force majeure events.

Recommendation 4

Limit on offshore mitigation for emissions budgets and circumstances justifying its use

We recommend that, given that emissions budgets must be met as far as possible through domestic action, for the purposes of meeting emissions budgets:

a. The limit on offshore mitigation should be zero for the first three emissions budgets.
b. The only circumstances that at this stage would justify the use of offshore mitigation is as a last resort in exceptional circumstances beyond the Government's control, such as force majeure events, where domestic measures cannot compensate for emissions impacts.