Chapter 12:

How we earn our way in the world

The impact of emissions reductions on the country's economy will depend on the pace with which Aotearoa acts, the costs of reducing emissions and global action. Aotearoa needs strong, accelerated and predictable action so that businesses have predictability about where the country is headed, and to put us on a track where future generations inherit a thriving, climate-resilient and low emissions economy.

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12.1 Introduction

The transition to a thriving, climate-resilient and low emissions Aotearoa provides both opportunities and challenges for sectors, businesses and workers. The shift to lower emissions products, services and infrastructure would see low emissions sectors do well and job growth in these sectors.

The transition would be harder for the more emissions intensive sectors, particularly those that compete in international markets or have limited opportunities to reduce their emissions. There are concerns that climate policy in Aotearoa could increase costs and reduce the competitiveness of these industries, particularly if their overseas competitors do not face the same costs from their local climate policies.

Signalling early the changes that are required would allow businesses the time to adapt and innovate. However, there would be situations where businesses would close as they are not sustainable in a lower emissions economy. This would particularly impact the people who work in these businesses, and the local economy and community in which those businesses are located.

Overall, our analysis shows that the transition can be managed in a way that generates jobs but in the short term, it would come with some job losses. How policy is designed and tailored to local circumstances would be critical in ensuring that workers' livelihoods are respected and that workers in industries going through change are empowered in the transition.

This section looks more closely at the impact on the economy, the energy and food and fibre systems, businesses and workers, and the challenges and opportunities they may face as Aotearoa puts in place policy to reduce emissions. It then considers how these challenges can be managed and how workers can be supported throughout the transition.

The analysis in this section draws on modelling using our Energy and Emissions in New Zealand (ENZ), Climate Policy Analysis (C-PLAN), and Distributional Impacts Microsimulation for Employment (DIM-E) models. There are differences in the ENZ and C-PLAN models, and therefore differences in the scenario runs. However, all modelling results reported in this section are based on scenario runs that align with the country's domestic emissions reduction targets for biogenic methane and all other greenhouse gases.

More detail on the ENZ model can be found in *Chapter 8: What our future could look like*. More detail on the C-PLAN and DIM-E models can be found in Box 12.1 and Box 12.3, respectively, in this chapter.

Box 12.1: How the Climate Policy Analysis (C-PLAN) model works

C-PLAN is a type of economic model referred to by economists as a 'recursive-dynamic multi-region computable general equilibrium' (CGE) model. This means it models the whole world economy over time. We use it to simulate what happens to the economy every year out to 2050.[1]

C-PLAN assumes that if there is a change in one part of the economy, other parts of the economy would also change so that there is no excess supply or demand. Models like C-PLAN are good at showing how changes would flow through an economy, but usually cannot include a large amount of technological detail. For this reason, the Commission uses C-PLAN alongside the ENZ model, which provides a richer picture of technologies and practice changes for reducing emissions.

In C-PLAN, the world is divided into two regions – Aotearoa, and Rest of World. These regions have different climate policies to reduce emissions and may make things differently – for example, Aotearoa uses more land but less feed supplements to produce milk. However, both regions have the same sectors and can trade with each other where one region has a comparative advantage over the other.

Climate mitigation is modelled in C-PLAN primarily through abatement cost. The model splits out biogenic methane from livestock and waste from all other greenhouse gases and models a separate abatement cost for each of these two types of emissions. The caps on emissions for each emissions type are imposed in the model for each year, and the model works out the cheapest way to meet them. C-PLAN has several ways that emissions caps can be met. These include specific technologies (methane vaccines and inhibitors, electric vehicles (EVs), bioenergy for process heat, electrification of process heat), switching between energy sources, price-induced energy efficiency improvements, and reducing output. The Commission also assumes that energy efficiency and emissions-intensity gradually improve over time.

The forestry sector is included in C-PLAN but does not respond to abatement cost (due to the technical difficulties of modelling this). Instead, emissions caps are inserted into the model on a net basis. Land used for forestry and agricultural sectors in each year is fixed, so land use change does not respond to the abatement cost, but land use can vary across years and pathways. The effect of different levels of forestry is instead tested in the choices of target pathways.

C-PLAN is a new model, having been commissioned by the Commission in late 2019. As with all models, C-PLAN will continue to be developed and refined over time. It is based on Massachusetts Institute of Technology's Economics Projection and Policy Analysis (EPPA) model,[2] which was first developed over 20 years ago and continues to be refined, and the Vivid Economy-Wide (ViEW) model developed by Vivid Economics.

C-PLAN has some important differences from other CGE models that have been used in Aotearoa to inform climate mitigation policy. In particular, C-PLAN models emissions reducing in response to climate policy with little or no reduction in output, and so shows a smaller impact on gross domestic product (GDP) and abatement costs than other CGE models in Aotearoa.[3] This occurs because C-PLAN explicitly includes key emissions-reducing technologies that allow emissions to be reduced without reducing output (e.g. a methane vaccine), and also allows industries to switch the energy sources they are using. The scenarios and Current Policy Reference (CPR) case that the Commission uses are also different to previous modelling exercises, and so it is difficult to

[1] It uses base data from 2014.
[2] (Massachusetts Institute of Technology, 2017)
[3] (NZIER, 2018; Winchester, 2019)

compare the results. In particular, the New Zealand Institute of Economic Research (NZIER) modelling for the Zero Carbon Bill had more stringent targets for agriculture in some scenarios. The baseline scenario in C-PLAN also included a wider set of other policies that would reduce emissions, for example the new regulations for freshwater standards that the Government introduced in September 2020.

Four scenarios, in addition to the Current Policy Reference, have been run in C-PLAN. While these scenarios have been informed by data from the ENZ model, these scenarios are different to the scenarios run in ENZ because of differences in the two models. Each of these C-PLAN scenarios makes only a small number of changes compared to the Current Policy Reference. This makes it easier to understand the effects of each change. New technologies are enabled, and a split gas approach is used. The contribution of biogenic methane and long-lived gases, the level of removals by forestry, and the availability and methane emissions reduction potential of technology for ruminants are changed between the scenarios, as shown in Table 12.1.

In the text below, we present all four scenarios. However, in the Advice Report and text below we focus on Transition Pathways 3 and 4 (TP3 and TP4) as these scenarios are in line with our proposed emissions budgets and key assumptions.

The insights on the implications of reducing emissions from the C-PLAN model are in line with other international research, such as the modelling carried out by the European Commission and United Kingdom (UK) Committee on Climate Change.[4,5]

Table 12.1: The key assumptions used in each of the scenarios run in C-PLAN.

	Forestry	**Methane technology**	**Long-lived gases**	**Biogenic methane**
Current Policy Reference (CPR)	MPI's current projections	None	Business as usual	Business as usual (from 2026)
Transition Pathway 1 (TP1): More removals	CPR exotic forestry (with additional native forests)	Low effectiveness and uptake only	Straight line path for gross emissions to net-zero in 2050	24% reduction in 2050
Transition Pathway 2 (TP2): Methane technology	CPR exotic forestry (with additional native forests)	Higher effectiveness and uptake (vaccine)	Straight line path for gross emissions to net-zero in 2050	47% reduction in 2050
Transition Pathway 3: (TP3) Less removals	About 2/3 of CPR exotic forestry (with additional native forests as in TP1)	Low effectiveness and uptake only	Straight line path for gross emissions to net-zero in 2050, accounting for forestry removals	24% reduction in 2050

[4] (European Commission, 2020)
[5] (Committee on Climate Change, 2019)

Transition Pathway 4 (TP4): Faster reductions	About 2/3 of CPR exotic forestry (with additional native forests as in TP1)	Low effectiveness and uptake only	36% reduction in gross emissions in 2030, net-zero in 2050	24% reduction in 2050

12.2 Economic growth

How the economy grows as Aotearoa transitions to a thriving, climate-resilient and low emissions economy depends on the pace with which the country acts, the costs to businesses from reducing emissions, and the action the rest of the world takes. Global action to reduce emissions would reduce the increased severity of droughts, sea level rise and storms, and would reduce the cost to the economy of these impacts.

12.2.1 Impact on GDP

Table 12.2 presents the results of economic modelling, using the Commission's Climate Policy Analysis (C-PLAN) model. The modelling shows that Aotearoa can continue to grow its economy while taking actions to reduce emissions and achieve the country's domestic emissions reduction targets for biogenic methane and all other greenhouse gases.

Under current policy settings, GDP is projected to grow to $512 billion by 2050. This is likely to be an overestimate as this does not factor in the negative climate and trade impacts of not acting on climate change.

By contrast, Aotearoa taking action in line with our proposed emissions budgets – i.e. TP3 and TP4 – would result in GDP growing to about $508 billion by 2050. This is approximately equivalent to GDP being less than 1% lower in 2050 or reaching the same level about 6-7 months later in 2050.[6]

Looking out to 2035, our modelling suggests that reducing emissions to meet our proposed emissions budgets would cost Aotearoa no more than $190 million each year over emissions budget 1, $2.3 billion each year over emissions budget 2, and $4.3 billion each year over emissions budget 3. It is difficult to estimate the benefits of action with any accuracy as there is significant uncertainty in how the benefits will actually be realised.

This impact is small, compared to normal fluctuations in GDP caused by the business cycle. There would be recessions and booms in the next 30 years that are not due to climate change. By comparison, in the year ending March 2009, the global financial crisis caused a 1.6% drop in GDP from the previous year,[7] as compared to growth of 2-3% in previous and subsequent years. The recession caused by COVID-19 is likely to be larger again.

[6] This impact on GDP is likely to be an overestimate as the C-PLAN model does not include the full range of emissions reduction opportunities that the Commission is aware of and does not include endogenous technological change.
[7] Calculated from data series SNE004AA Series, GDP(E), Chain volume, Actual, Total (Annual-Mar) from Stats NZ Infoshare, last updated 17 September 2020

Table 12.2: GDP projections from the Commission's C-PLAN modelling ($ billion)

C-PLAN scenarios	2017	2025	2030	2035	2050
Current Policy Reference	270	329	362	396	512
Transition Pathway 1 (TP1): More removals	270	329	362	395	510
Transition Pathway 2 (TP2): Methane technology	270	329	362	395	510
Transition Pathway 3: (TP3) Less removals	270	329	362	395	508
Transition Pathway 4 (TP4): Faster reductions	270	329	358	392	508

These findings are in line with international estimates, such as those by the United Kingdom Committee on Climate Change and the European Commission.[8]

Internationally, the expected cost of deploying technology to meet emissions reduction targets is decreasing faster than expected. As a result, countries like the UK have re-assessed cost estimates of meeting emissions targets downwards over time. In 2019, the UK Committee on Climate Change assessed that achieving a 2050 net zero target for all greenhouse gases in the UK would cost approximately 1-2% of GDP. This is similar to the cost it assessed in 2008 of reducing emissions 80% relative to 1990, and in turn similar to the cost the UK Government assessed in 2003 of reducing emissions 60% relative to 1990.[9] See Box 12.2 for more detail on how our cost estimates compared to international studies.

Box 12.2: How do our overall cost estimates compare to international studies?

Our finding that meeting the 2050 emissions target could impact GDP on the order of 1% is consistent with recent international studies of pathways to achieve net zero emissions (Table 12.3). Overall, these other studies estimated GDP impacts in 2050 for the region in question ranging from 1.3% lower to 3% higher relative to the baseline. These estimates all exclude the co-benefits of the transition, the costs of adapting to climate change and avoided climate damages.

Table 12.3: Cost estimates of achieving net zero emissions

Scope	Author	Estimation method	Cost or GDP impact in 2050
Aotearoa	CCC / Motu	Macroeconomic model (general equilibrium)	GDP 0.3-1% lower relative to current policy baseline

[8] (Committee on Climate Change, 2019; European Commission, 2020)
[9] (Committee on Climate Change, 2019)

United Kingdom	Committee on Climate Change	Resource cost assessment	Net cost less than 1% of projected GDP
		Macroeconomic model (macro-econometric)	GDP 3% higher relative to current policy baseline
European Union	European Commission	Suite of three different macroeconomic models	GDP 1.3% lower to 2.2% higher relative to current policy baseline
Global, 'hard-to-abate' sectors	Energy Transitions Commission	Resource cost assessment	Net cost 0.2–0.5% of projected GDP

Sources:
(Committee on Climate Change, 2020). *The Sixth Carbon Budget: The UK's path to Net Zero*.
(European Commission, 2018). In-depth analysis in support of the Commission Communication COM 773, *A Clean Planet for all: A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy*.
(Energy Transitions Commission, 2020). *Making Mission Possible: Delivering a Net-Zero Economy*.

The studies cited used different methods to quantify potential costs.

> *Resource cost* measures the net additional cost each year to deliver the same services with lower or zero emissions. This additional cost will not necessarily reduce economic output by an equivalent amount. For example, substituting imported fossil fuels with domestically produced renewable energy could boost GDP while increasing the cost of the energy system.
>
> *Macroeconomic models* provide estimates of how decarbonisation could affect GDP, employment and other economic metrics. These models simulate the flow-on effects of decarbonisation on how capital, labour and other resources are deployed throughout the economy.

The studies all support the conclusion that the overall impact of decarbonisation on the economy will be small relative to projected growth. However, different macroeconomic models disagree on whether the impact on GDP will be negative or positive. This disagreement centres on distinct model assumptions around market imperfections and whether the economy operates at full capacity.

General equilibrium models, like the Commission's C-PLAN model, assume that the economy is at an equilibrium usually without any unused resources. This means that, for instance, the additional investment required to decarbonise will necessarily reduce investment somewhere else in the economy. The European Commission's general equilibrium modelling results are similar to ours, with the net zero emissions pathway reducing GDP by 0.6-1.3% relative to the baseline in 2050.

Other models, such as the E3ME macro-econometric model used in both the UK and EU studies, do not assume equilibrium. This means that the economy has unused capacity and the additional investment in decarbonisation can provide a stimulus that boosts total economic output. These models found that a net zero emissions pathway could increase GDP above the baseline.

That spare capacity in the economy could see climate action boost economic growth is an important insight from these international studies. In the current context of economic activity being suppressed due to the COVID-19 pandemic, spare capacity is very likely. This highlights the opportunity for investment in the transition in Aotearoa to stimulate the economy and support the post-COVID-19 recovery.

Our estimates of the cost of meeting the 2050 target are substantially lower than suggested by economic modelling undertaken to support the Zero Carbon Bill in 2019. The modelling undertaken by NZIER for the Ministry for the Environment tested a range of scenarios for different target forms and levels. In the scenarios relied on in the Zero Carbon Bill's Regulatory Impact Statement, modelled GDP was 5-8% lower in 2050 relative to a baseline representing current policies.[10] In contrast, our economic modelling indicates meeting the 2050 target could lead to less than a 1% reduction in GDP compared to the Current Policy Reference case. As climate policy and other factors have changed since the NZIER modelling was done in 2018, the NZIER baseline representing current policies has higher emissions than our current policy baseline, which is one factor making the costs appear larger. These differences are also discussed in Box 12.1.

The C-PLAN model is good at showing how a change in one sector flows through to other sectors in the economy and to overall demand. Our four scenarios show that for most sectors, there would be little change in output compared to the Current Policy Reference case. High-emissions sectors would be replaced by lower-emissions alternatives and some high-emitting sectors that do not have alternative technologies in the model would decline.

The C-PLAN model is purposefully designed to tell us about underlying trajectory of the economy to help us plan for long-term transformation. This is different from many other macro-economic models which are designed to focus on shorter term boom and bust cycles. This means C-PLAN is not an appropriate tool to assess the short-term impact of COVID-19.

However, the latest Treasury forecast suggests COVID-19 is likely to result in a lower level of GDP but a similar or slightly higher rate of growth once the pandemic is over (Figure 12.1). Figure 12.1 shows the Treasury projections from the Half Year Economic and Fiscal Update released in December 2019 as compared to the Pre-election Economic and Fiscal Update released in September 2020.[11]

[10] The NZIER report (NZIER, 2018, pp. 18, Table 7) uses the B-F-50 and B-F-75 scenarios, which are the same scenarios used in the Zero Carbon Bill's Regulatory Impact Statement (Ministry for the Environment, 2019b) (see the Addendum on p. 33, noting different terminology)

[11] (Te Tai Ōhanga The Treasury, 2019, 2020)

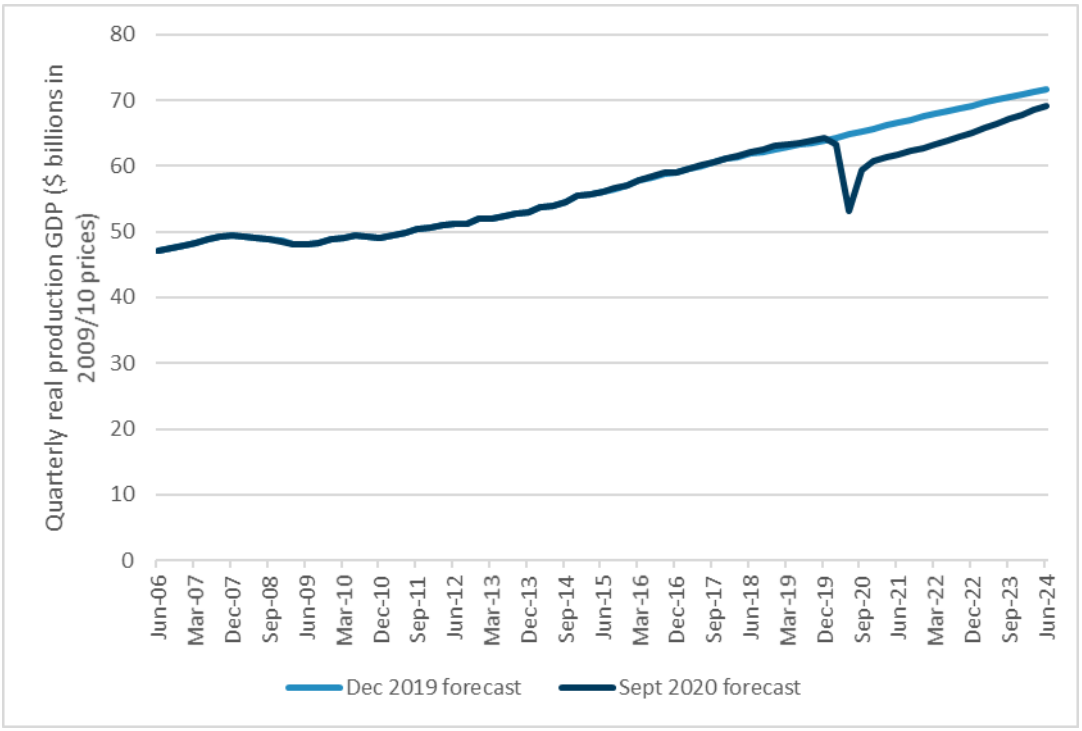


Figure 12.1: Treasury forecasts of quarterly real production GDP prior to COVID-19 (light) and during COVID-19 (dark).

Any analysis of the impact on GDP only provides a narrow picture of the impacts of reducing emissions. It does not reveal the indirect costs and benefits, nor who the costs and benefits fall on. The cost of not acting on climate change and the co-benefits of actions to reduce emissions, such as to health, the environment and productivity from increased innovation, are significant and provide even more reason for a country to act on climate change.[12]

12.2.2 A gradual vs abrupt transition

A key challenge is judging how fast the country's transition needs to be. There is a question as to how to balance the urgency of preventing dangerous climate change and its associated costs, with managing the impacts of disruptive economic transformation. There is also a question about our strategy as a nation – do we lead, which might come with higher costs but also first-mover advantages, or be a follower, delaying action until others show us the way and costs come down?

Experience, including the country's own experience of reforms in the 1980s, has shown that rapid transformative change is socially and economically painful. This counts against very fast early action. It also counts against waiting until solutions have been found and fully proven elsewhere before rapid uptake and transformation at home.

Pursuing an early, steep decline in emissions is likely to come with higher adjustment costs. Even where low emissions technology exists now, such as electric vehicles, there are short-run supply constraints. Time is needed to build capacity in these new markets, as well as to set standards and train the workforce to support them. There would also be greater risks that existing assets would

[12] (Karlsson et al., 2020)

have to be retired before the end of their expected lifespan, and of a political and social backlash that could stall progress.

Time is also needed to plan the transition and make sure affected businesses and workers are supported (see also *12.5 Small businesses, 12.6 Employment and workers* and *12.6.5 Ensuring an equitable transition for workers* sections below). An early and unplanned transition would make it harder to foresee other policy that could potentially compound the impacts on the same communities while also leaving less time to develop supportive policies for affected communities.

Delaying action would lead to a similar abrupt decline in emissions, but later. This also carries risks of increased costs, even though technology solutions may be cheaper. Continued investment in the wrong type of infrastructure, for example, could lock in emissions and cause stranded assets.[13] Delaying action would also increase the country's contribution to global emissions.

In contrast, early but consistent action would allow for a more gradual and steadier pace of change, with more scope for managing impacts. While there is uncertainty about the future pathway, the technologies for reaching emissions reduction targets in Aotearoa are mostly known. By adopting these technologies early rather than waiting for costs to come down, people can learn by 'doing', while steadily building up supporting infrastructure and services and helping overcome user barriers and reach critical mass.

Early signalling gives businesses time to adapt and innovate, find solutions that are both good for the climate and good for the bottom line, and replace assets and infrastructure with low emissions options on as natural a cycle as possible.

Modelling carried out for Westpac in 2018 showed that taking planned action on climate change was more cost effective and was could save Aotearoa $30 billion in GDP by 2050, compared to delaying action until 2030.[14] Taking an early and well-paced pathway was also found to have fewer impacts on individuals and businesses, have less economic impact on emissions-intensive sectors, and be better for the economy as a whole.[15]

Conversely, delayed and more abrupt action would come at greater cost, could be more disruptive and could lock in emissions-intensive infrastructure that could later become stranded.[16]

12.2.3 Impact on taxation and Government revenue

There are likely to be fiscal impacts the Government would need to plan for, as a result of actions to reduce emissions to meet emissions budgets and the country's domestic targets for biogenic methane and all other gases. The extent of these impacts would depend on how policies such as road transport levies or the New Zealand Emissions Trading Scheme (NZ ETS) are set.

At the moment, land transport revenue comes from petrol excise duty, road user charges for all other vehicles, and motor vehicle registration and licensing fees, as well as from other sources. In 2018/2019, net revenue from petrol excise duty was slightly less than $2.04 billion, from road user

[13] (OECD, 2019a)
[14] (Westpac, 2018)
[15] (OECD, 2019a; Westpac, 2018)
[16] (OECD, 2019a)

charges was $1.73 billion, from motor vehicle registration was $227 million.[17] This revenue is hypothecated, and along with a few other sources,[18] is used to fund the building, maintenance and operation of the land transport system.

Petrol and diesel consumption are likely to decrease over time as electric vehicles and other low emissions transport modes become more popular and vehicle efficiency improves. While electric vehicles are currently exempt from road user charges, this exemption is set to expire on 31 December 2021.[19] Revenue from petrol excise duty, road user charges and vehicles registrations would change over time, and the Government would need to plan how to fund land transport given these changes.

The climate transition could also impact the Government's spending on social assistance for workers and families, and health. The level of social assistance would depend on the transition strategy the Government puts in place and how well the transition is signalled and planned. The transition to a low emissions economy could result in better health outcomes for New Zealanders – for example, from warmer, drier homes and reduced air pollution – reducing the burden on the health system. However, this could be counterbalanced by the health impacts from a changing climate, such as heat stress from more heat waves, and increased exposure to new vector-borne diseases and microbial contamination.[20]

There are also opportunities to benefit both the economy and climate. The Government's COVID-19 stimulus package can be used to both create jobs and stimulate the economy and address climate change, and proceeds of the NZ ETS could also be leveraged in a similar way.

The NZ ETS can generate cash for the Government by selling emissions units. The amount of cash that would be generated over time would depend on both the volume of units sold (which itself depends on free allocation, decisions about forestry accounting,[21] international unit and emissions budget volumes) as well as the market price for units. The amount of cash that can be generated by the NZ ETS over time would also depend on the policy mix Aotearoa uses to meet emissions budgets (refer to *Chapter 17: The direction of policy for Aotearoa*). For these reasons, it is not possible to draw firm conclusions from the Commission's pathways analysis about how NZ ETS proceeds would be affected by meeting emissions budgets and domestic targets for biogenic methane and other gases.

The Government has estimated that based on current NZ ETS settings proceeds from auctioning units would provide at least $3.1 billion over the next five years.[22] The adoption of emissions budgets and flow-on changes to NZ ETS settings over 2021-2022 could significantly alter this forecast.

[17] The number of $2.04 billion for petrol excise duty also includes a small amount of excise duty on liquid petroleum gas and compressed natural gas. (Office of the Minister of Transport, 2020)
[18] The other sources equated to about an additional $700 million in 2018/2019. (Office of the Minister of Transport, 2020)
[19] Road User Charges (Exemption Period for Light Electric RUC Vehicles) Order 2012
[20] (Bolton, 2018; Royal Society Te Apārangi, 2017)
[21] A significant proportion of post-1989 forests registered in the Emissions Trading Scheme are accounted for using the stock change approach. Decisions about whether and how to transition these forests onto averaging accounting may affect the amount of NZUs that the Government can auction into the scheme.
[22] (Office of the Minister for Climate Change, 2020b)

Decisions have yet to be made on how the Government would use these proceeds. Options include using the funds to:[23]

- reduce the overall cost of policies to reduce emissions in Aotearoa, such as targeting investments
- adapt to the impacts of climate change
- enable an equitable and inclusive transition, for example through policies to reduce the distributional impacts of climate policy
- buying international units that may be needed for meeting the first NDC.[24]

12.2.4 Energy production

Energy is a vital part of New Zealanders' day-to-day lives – from the electricity that is used in homes, petrol and diesel to fuel vehicles, to the heat that industries use to produce goods used here in Aotearoa and sold around the world. Reducing emissions would require a transformation of the current energy system.

The Commission's economic modelling suggests that, under the Current Policy Reference case, coal and natural gas use would reduce, while wind, solar and biomass would expand. This assumes that the costs of renewable technology would continue to decrease.

Our modelling also suggests that a shift in climate policy, to reduce emissions and meet the country's domestic targets, would speed up these trends. Increased renewable electricity generation would be needed to power more industry and electric vehicles (Figure 12.2).

[23] (Office of the Minister for Climate Change, 2020b)

[24] As discussed in *Chapter 10: Requests under s5K relating to the NDC and biogenic methane*, meeting the NDC will require use of offshore mitigation. In future, it may be possible to devolve the purchasing the offshore mitigation to the private sector through the ETS. At present, however, the NZ ETS is being run as a domestic-only scheme. If this continues, the Government may have to purchase international units directly to ensure that the NDC is met. This is why funding the purchase of offshore mitigation is an important option to consider for use of NZ ETS auction proceeds.

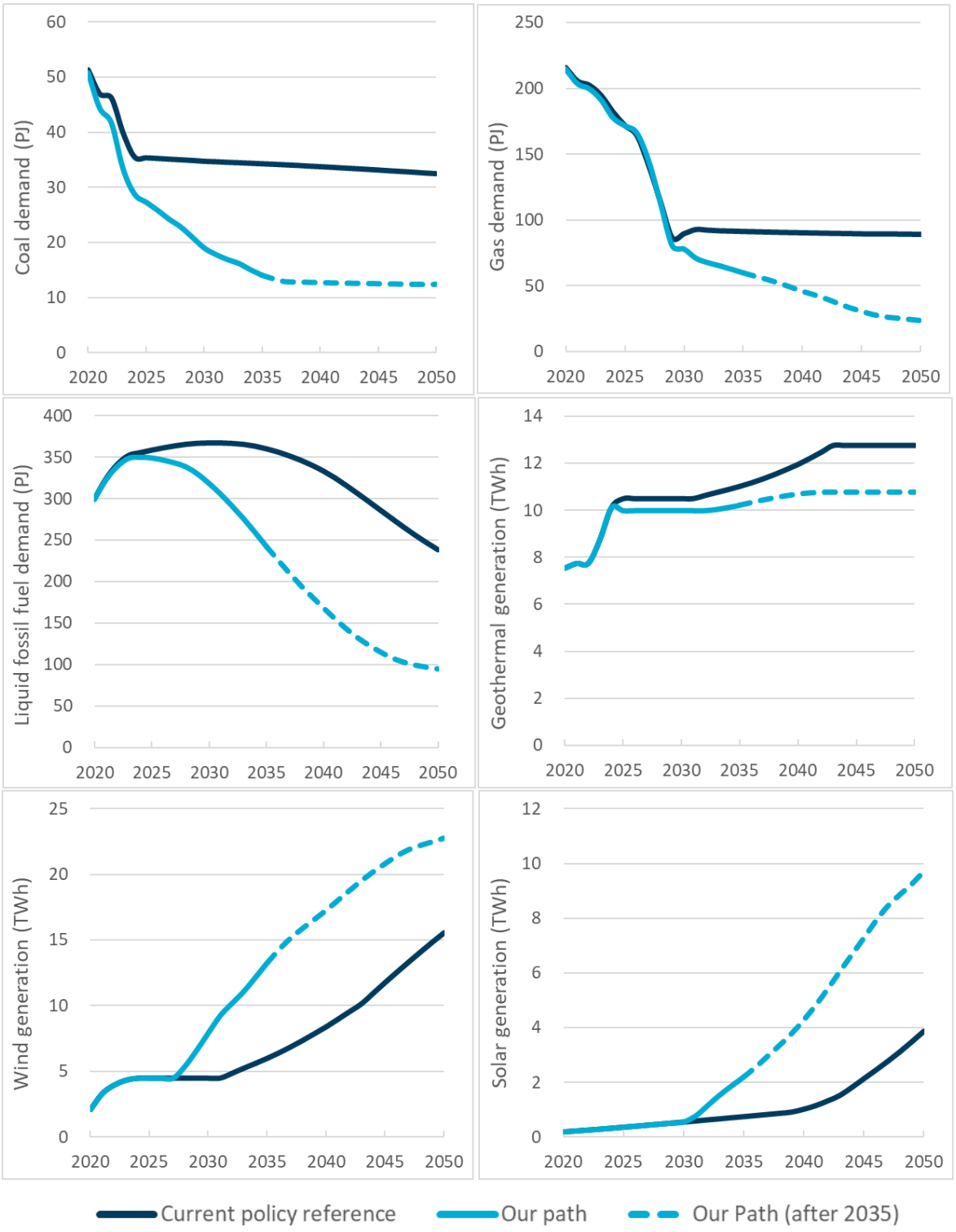


Figure 12.2: The changes in demand for coal, natural gas and liquid fossil fuels, and in geothermal, wind and solar generation that would occur in our path over the first three emissions budgets and out to 2050. Source: Commission's ENZ modelling

12.2.5 Energy security

People and businesses also need to know they can meet their energy needs throughout the transition – they need energy security.[25] Reliability and resilience of energy supply is crucial for medically dependent or vulnerable New Zealanders and for businesses where unplanned supply disruptions are costly.[26]

As Aotearoa shifts away from fossil fuels and increase its dependency on electricity generation, it needs to ensure the electricity system can reliably generate sufficient supply. At the moment, natural gas and coal provide this security of supply, particularly at peak times and in dry years when hydro lake levels are low. In addition, shifting energy reliance onto electricity to meet all transport, heating, cooking and industrial process needs carries risk in a nation exposed to natural hazards and other potential disruptions.

Aotearoa has a long, thin electricity grid that generally moves electricity from the South Island - where it is generated in large hydro schemes - to the major centres of demand in the North Island. However, there are ways to increase the resilience of the electricity grid and the system, such as building new generation in the North Island, reinforcing the transmission infrastructure, deploying new technologies such as batteries and diversifying into new fuels such as biofuels and hydrogen that boost energy security.

Aotearoa faces a specific challenge around the dry year risk. *Chapter 8: What our future could look like* of the Evidence Report provides more detail on this.

Decarbonising the transport sector would result in Aotearoa relying less on imported oil. In 2018, the latest year available, Aotearoa spent $11.2 billion on petroleum imports, the highest ever.[27] The dependence on imported oil exposes Aotearoa to oil price volatility and potentially insecure supply. Moving to domestic sources of energy for transport, such as renewable electricity or domestically produced biofuels, could reduce oil imports. This would improve the country's security of supply and provide opportunities for new businesses and jobs. The country's energy vulnerability could increase in the long term, however, as we would rely more heavily on fewer sources. Careful planning and management would be needed.

12.2.6 Emissions leakage and competitiveness in industrial sectors

Climate policies could potentially increase costs for many Aotearoa businesses, reducing their competitiveness. This is a particular concern for industries with high emissions and who compete in international markets for relatively undifferentiated commodities, where overseas competitors do not face similar costs from climate policies. In these cases, there is a risk of emissions leakage, where domestic climate policy inadvertently increases global emissions and so negates some of its intended effect. There are also possible impacts on employment when firms fail to stay internationally competitive.

[25] The World Energy Council defines energy security as *"a nation's capacity to meet current and future energy demand reliably, withstand and bounce back quickly from system shocks with minimal disruption to supplies."* (World Energy Council, 2019)
[26] For example, the 2018 unplanned outage at the Pohokura gas field event contributed to decreased production of methanol by approximately 0.3 million tonnes compared to the previous year. (Methanex Corporation, 2018)
[27] (Statistics NZ, n.d.)

This provides a particular challenge in Aotearoa, due to the small nature of its industries, where there are a number of industries that are made up of only one firm.

In our modelling, we assume that the Tiwai Point aluminium smelter closes in 2026 based on Rio Tinto's recent signalling, and that domestic methanol production ends in 2029 when Methanex's current gas contracts expire.[28] We have conservatively assumed that domestic steel making, cement and lime production continue to operate at current levels of production and do not achieve efficiency improvements.

Climate policy is one of many factors that can influence the competitiveness of businesses, and its impacts need to be considered in this broader context. For example, in the United Kingdom, the key drivers of competitiveness in the steel, aluminium and cement industry were reduced demand, low global prices, a strong pound sterling and high fossil fuel energy costs, with climate policy also contributing but to a relatively small extent.[29]

How and to what extent industrial or energy-intensive businesses would be impacted by climate policies would depend not just on the direct cost of those policies, but also on the businesses' ability to adapt and innovate as well as the other pressures they face, such as the price of key inputs.

Climate policy would incentivise businesses to innovate, which can both reduce emissions and improve productivity. International evidence suggests that pricing greenhouse gas emissions stimulates innovation in existing low emissions technologies, increasingly so at higher emissions prices. By pricing emissions, businesses are incentivised to find lower emissions ways to produce their product or service. This means businesses become more efficient, innovate, and invest in low emissions technologies that become more attractive due to the emissions price. In turn, increased deployment and diffusion of these technologies results in a larger and more competitive market, further lowering technology prices, accelerating learning and attracting investment.[30] While emissions pricing encourages the development, diffusion and deployment of new and existing practices and technologies, however, it does not provide a full incentive for low emissions innovation, taking into account positive spill over effects.

Some businesses may find it hard to invest in reducing emissions or climate-related innovation as they already are facing other pressures. For example, putting aside the emissions price or other costs related to climate policies, the cost of energy itself is a significant influence on many industrial businesses' operating margins. This may affect their ability to compete against global counterparts who may have lower energy costs or whose energy costs are a smaller proportion of their total production costs. A number of Aotearoa firms in energy-intensive sectors have recently carried out or announced strategic reviews, although none have cited costs from climate policy as a major driver of their current competitive situation.

If these industries were to close or lose market share due to climate policies imposed in Aotearoa, there are risks that production could shift offshore to countries with less stringent controls on emissions, causing global emissions to increase – known as emissions leakage. How likely emissions

[28] Rio Tinto have signalled their intention to close the smelter in 2021. Our modelling assumes a further 3-5 years operation beyond signalled closure date. The Government has signalled that this is the extension they are trying to negotiate.
[29] (Cambridge Econometrics, 2017)
[30] (Eden et al., 2018)

leakage is to occur depends on where production is likely to shift to and how emissions intensive that production is.[31]

While climate policy has not been cited as a major factor in Rio Tinto's announcement that it intends to close the Tiwai Point Aluminium Smelter, the smelter's planned exit illustrates that understanding the risk of emissions leakage is not straightforward. Commentators have held various views on the implications of the smelter's closure on global emissions. Some suggested that aluminium production could move to smelters in China that are powered by coal, while others suggested that it could move to low emissions plants in Canada.

Analysis by Sense Partners in 2018 suggested that there was no perceptible evidence of reduced competitiveness in Aotearoa from climate policy in place at that time. However, they noted that this could change in the future if climate policies continued to be unevenly applied globally.[32]

There are options for mitigating the risks of reduced competitiveness and emissions leakage. So far competitiveness and emissions leakage concerns are managed in Aotearoa by providing potentially exposed businesses with output-based free allocation under the NZ ETS.[33] This is similar to approaches taken in other jurisdictions with emissions pricing. Firms undertaking emissions-intensive and trade-exposed activities receive free emissions units under the Government's Industrial Allocation policy. Activities that are highly emissions intensive receive 90% free allocation while moderately emissions intensive activities receive 60% free allocation.[34] This reduces the cost of the NZ ETS on these firms.

In 2019, there were 85 companies that received free allocations from the Government. In total, over 8 million units were allocated which, assuming an emissions price of $35 per unit, represents a value of almost $290 million. This is a cost to the Government because if it did not provide these units for free, it would be able to sell them by auction.

Over half of the unit allocations were received by three companies, comprising of about five million units. Most unit allocations were relatively small – more than 75% of unit allocations were less than 20,000 units. Most of the recipient companies of these smaller levels of allocation are small horticultural producers, such as fresh cucumber, capsicum and tomato growers who do not participate in the NZ ETS, but receive free allocations because of the pass-through costs from their electricity or fuel use.[35]

Free allocation can effectively mitigate emissions leakage risk but it comes with downsides. Output-based free allocation reduces downstream incentives for demand-side emissions reductions, such as resource efficiency and driving substitution of emissions-intensive goods, which can distort low emissions investment. This means that some cost-effective emission reductions would not be taken

[31] (Sense Partners, 2018)
[32] (Sense Partners, 2018)
[33] (Ministry for the Environment, 2018)
[34] The purpose of Industrial Allocation is to reduce the risk of emissions leakage from production moving offshore to places with lower emissions pricing. There are currently 26 activities that are eligible to receive Industrial Allocation. Three firms receive 60% of total industrial allocation volume: New Zealand Steel near Auckland, New Zealand Aluminium Smelter in Southland, and Methanex in Taranaki collectively employing approximately 5,400 people. It is important to note that EITE firms will still face some incentive to reduce emissions as long as their allocation corresponds to less than 100% of their ETS costs, i.e. an ETS cost exists on a proportion of their emissions. By reducing their emissions, they can also benefit from selling the units that were allocated to them.
[35] (EPA, 2019)

up and, as a result, the emissions price in the NZ ETS would be higher than it would be if there were no free allocation. Providing free allocation to some firms can therefore put the burden of reducing emissions on others.

For these reasons, it is important to make sure that the allocation regime is not overly generous. There is concern that currently the Government may be over-compensating firms in some industrial activities, by providing more units than are necessary to address emissions leakage risk.[36] The Government is looking to undertake a first principles review of industrial allocation policy to address this concern.

Over time, other options for providing leakage protection should also be explored – such as product standards, consumption charges or border carbon adjustments. These alternatives all come with their own, not insignificant implementation challenges, particularly in relation to trade policy and political economy concerns, so are likely to be options for the longer-term.

The impact of increased emissions prices on emissions-intensive and trade-exposed businesses depends on the industrial allocation policy in the short to medium term, as well as the climate policies put in place internationally. Nonetheless, it would be important to monitor global markets and actions by competitors to ensure that domestic climate policy contributes to global environmental benefits. This would be an important task for the Commission, with a new function of advising on the industrial allocation phase out rates, which includes assessing emissions leakage risk.

Emissions budgets should also be set with a mind to such risks and uncertainties. We need to assure ourselves the emissions budgets can be met in multiple ways, to make sure they are resilient. The work we are doing to narrow down on emissions budget numbers is looking to ensure that the emissions budgets can be met in multiple ways.

12.2.7 Food and fibre production

A number of New Zealanders work in the food and fibre sector – from farmers, farm workers and foresters to those transporting food and fibre around the country, working in processing plants, and exporting food and fibre products. This income also supports broader rural communities and is an important export earner for the nation.

Our ENZ modelling suggests that in the Current Policy Reference scenario, under current policy, production of milk solids would remain relatively stable over the first three emissions budget periods, and increase slightly by 2050. In our emissions budgets path, milk solids output would reduce slightly.

In comparison, meat production would stay relatively stable over the first two emissions budget periods, and then increase slightly looking out to 2050 under the Current Policy Reference scenario. Our emissions budgets path would follow a similar trend.

For forestry, the total harvestable volume would fall in the second emissions budget, but then increase in the third emissions budget and out to 2050. Our path would result the same total harvestable volume by 2050 as our reference case (Figure 12.3). This reflects the long-term nature of forestry. Due to the long harvest cycles for pine forests, new planting will not make a difference to

[36] (Office of the Minister for Climate Change, 2020a)

harvest volumes until around 2050. The variations up until 2050 are due to the age profile of trees already in the ground. Over time, we are assuming increasing harvest yield from new vintages due to improvements in genetics and silvicultural practices.

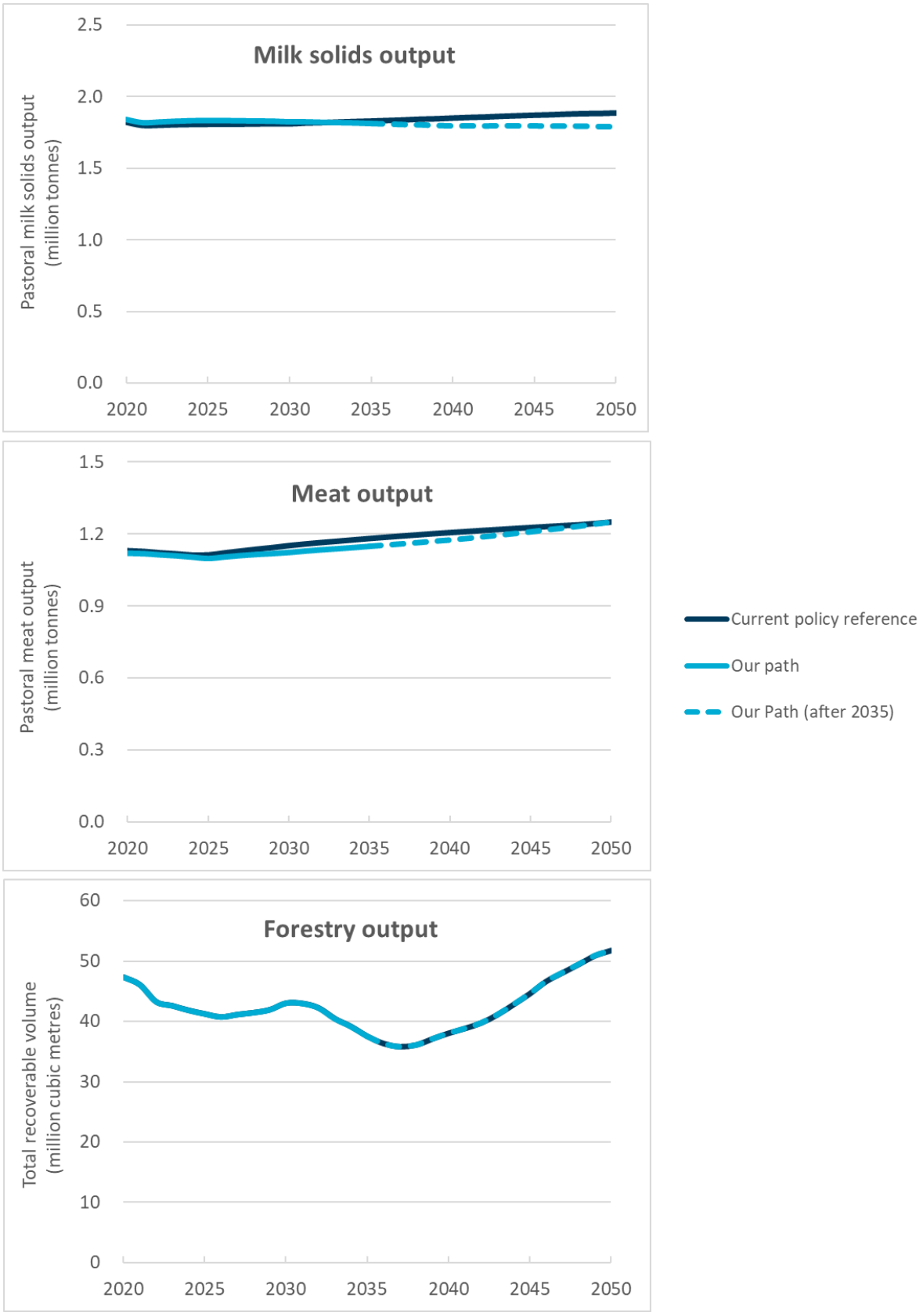


Figure 12.3: The changes in output of milk solids, meat and forestry that would occur in our path over the first three emissions budgets and out to 2050. Source: Commission's ENZ modelling

12.2.8 Food security

As a food producing and exporting nation that is estimated to contribute to feeding over 40 million people,[37] Aotearoa must consider the potential effects that climate policies could have on the country's agricultural production, and domestic and global food security. Food security not only depends on food production and availability, but also on nutritional content, and the ability to acquire affordable food, in which well-functioning markets play an important role.

Global food security

The Paris Agreement highlights the importance of food production and food security, recognising *"the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change".* Article 2 outlines that *"This Agreement...aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: ... (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production."*

The Paris Agreement is focused on efforts to adapt to the effects of climate change, in a way that helps to end hunger and poverty. Climate change is likely to exacerbate food insecurity globally, as rising temperatures increase crop failures, lower livestock production and heighten the risk of disease, pests, and extreme weather events in these regions.[38] The Intergovernmental Panel on Climate Change has found that low income consumers are particularly at risk from the impacts of future climate change.[39]

Hunger and poverty are issues experienced more in developing countries. Therefore, safeguarding food security is to a large extent about ensuring access to basic food requirements, particularly for the 750 million people largely located in sub-Saharan Africa and South Asia classified as 'severely food insecure'.[40]

The role of Aotearoa in helping to address global food security challenges is likely to be limited. This is because the country's food production is focused on the premium value chain,[41] and feeding the world's growing middle-class and high-end consumers.[42] In 2018, only 3.4% of food exports from Aotearoa went to the low-income food-deficit countries as classified by the Food and Agriculture Organization of the United Nations.[43] Consumers of exports in these countries are also unlikely to be the rural poor and food insecure due to the relatively premium nature of Aotearoa products. In low-income, food-deficit countries, 62% of dietary energy comes from cereals, roots, and tubers.[44] This highlights that food security concerns primarily centres around the supply and cost of grains rather than the more premium products exported by Aotearoa.

[37] KPMG (2017)
[38] FAO (2018)
[39] IPCC (2019, p. 439)
[40] FAO (2020c). The exact number is difficult to pinpoint because of variation in diets and the way Aotearoa export products are consumed.
[41] Primary Sector Council (2020); B+LNZ (2020)
[42] Productivity Commission (2018a, p. 317)
[43] FAO (2020a); (Stats NZ, 2020)
[44] (FAO, 2020b)

Aotearoa does, however, make important contributions to global food security through trade policy, research, and development assistance. Aotearoa has long been a champion for a fair, open and rules-based trading regime and has played an important role in negotiating agreements which reduce distortions in global food trade. As the Organisation for Economic Cooperation and Development (OECD) has pointed out, food and nutritional security is dependent on production and trade, necessitating open and well-functioning supply chains to ensure food reaches markets where it is needed. Existing agricultural trade distortions tend to undermine food producers in food insecure countries.[45]

Aotearoa research and technical assistance on animal productivity and farm efficiency could also enhance global food security and the resilience of agricultural systems. This could be achieved through improving the contribution of livestock in food insecure countries to food supply and raising incomes. The Government's role in founding and funding the Global Research Alliance on Agricultural Greenhouse Gases is a key example. Its ability to credibly lead such initiatives is enabled and underpinned by the country's innovative ecosystem of farmers, researchers, and agriculture experts. Support for food production is also a key priority in the Government's spend on foreign aid.

Finally, one of the most important contributions Aotearoa could make would be to reduce emissions. Playing a role in mitigation and building momentum for an effective global effort to limit temperature increases would help to reduce the worst impacts of climate change on food security.

Domestic food security

Despite Aotearoa producing much more food than we consume, some disadvantaged communities find it challenging to access nutritious food. The Child Poverty Action Group notes that 160,000 Aotearoa children live in households without sufficient access to healthy food. While the overall cost of food rose by 4% in the last five years, the cost of fruit and vegetables rose by 9%.[46]

These domestic food security problems are driven primarily by low incomes rather than a lack of food supply. Given the export orientation of most of food production in Aotearoa, it is likely that international markets would affect domestic food prices to a greater extent than changes in production due to climate change policies. The possible exception to this is if production of items grown primarily for domestic consumption (such as some fresh vegetables) contracts, as this could drive prices up and exacerbate existing food and nutrition access for some vulnerable groups. However, in both the Current Policy Reference case and scenarios modelled in *Chapter 7: Where are we currently headed?* and *Chapter 8: What our future could look like,* horticultural area, and therefore production, increases in the years to 2050.

In 2015/16, it was estimated that 39% of children in food insecure households were Māori.[47] If food price increases do occur, they are likely to have a disproportionate effect on Māori. Strategies relevant to food security or correlated policy issues, should prioritise equitable outcomes for Māori households, particularly Māori children, who may be impacted by increases to food prices.

However, given the high levels of food production in Aotearoa, and that horticulture production is unlikely to contract, reducing emissions to meet targets for biogenic methane and all other greenhouse gases is unlikely to exacerbate food insecurity domestically. Solutions to domestic food

[45] OECD (2020)
[46] Child Poverty Action Group (2019a)
[47] Child Poverty Action Group (2019b)

security problems likely lie in addressing poverty and other barriers to nutritional access rather than in climate policy.

12.2.9 Emissions leakage and competitiveness in the food and fibre sector

As with emissions-intensive and trade-exposed industrial businesses, there are risks that climate policy could reduce the competitiveness of the food and fibre sector and result in emissions leakage.

The Interim Climate Change Committee noted that it was difficult to assess any potential reduction in competitiveness of the food and fibre sector from climate policy as compared to other factors that affect the overall competitiveness of Aotearoa in international markets. It noted that producer costs in all markets would continue to evolve through changes in labour markets, production systems, food safety requirements and health and safety regulations.[48]

The risk of emissions leakage is difficult to quantify precisely for the food and fibre sector. However, looking at some of the factors which contribute to emissions leakage, the Committee found that the risk of emissions leakage from reducing agricultural emissions in Aotearoa was unlikely to be high in the short-term. Any decrease in dairy production would likely be made up by an increase in production in Western Europe or North America. Those locations have dairy emissions footprints similar to Aotearoa, have economy-wide emissions caps, and their farm businesses also face environmental regulations on nitrate, ammonia and phosphorous pollution which would constrain production.[49]

The risk of emissions leakage from reduced meat and wool production is likely to be greater than for dairy. This is because not all competitor countries are advanced economies with economy-wide emissions reduction targets. However, Aotearoa producers' increasing efforts to differentiate their products on quality, environmental credentials and provenance may moderate this risk.[50]

Under current legislation, agricultural emissions are set to be priced from 2025.[51] At the same time, farm businesses would receive free allocation, which can be provided in a way to reduce emissions leakage risk.[52]

As with emissions-intensive and trade-exposed industrial businesses, it would be important to monitor global markets and actions by competitors to ensure that domestic climate policy contributes to global environmental benefits. This would be an important part of our future advice on what allocation should be given to participants in the alternative pricing system for farm-level agriculture emissions.[53]

[48] (Interim Climate Change Committee, 2019b)
[49] (Interim Climate Change Committee, 2019b)
[50] (Interim Climate Change Committee, 2019b)
[51] (Climate Change Response Act 2002 (as at 01 December 2020), 2020, sec. 219)
[52] (Interim Climate Change Committee, 2019a)
[53] Before preparing a report on the system to price agricultural activities as an alternative to the ETS in 2022, the Ministers of Climate Change and Agriculture must request and consider advice from the Commission on "what assistance, if any, should be given to participants" (see section 215(4) of the Climate Change Response Act).

12.3 Māori economy

The Māori economy makes a significant contribution to the overall economy of the country. The Māori economy represents $50 billion or more in assets,[54] which is approximately 6% of the country's total asset base. These are the assets owned by Māori, including collectively owned trusts and incorporations, and Māori-owned businesses, service providers, and housing.[55]

Collectively, Māori own about $13 billion in primary sector assets – 50% of the fishing quota, 40% of forestry, 30% in lamb production, 30% in sheep and beef production, 10% in dairy production and 10% in kiwifruit production. The majority of the Māori economy sits outside the primary sector, and includes property, private equity, financial assets, tourism, geothermal energy and technology and innovation.

Driven by cultural values, some Māori-collectives are already identifying, and/or moving into, innovative low emissions industries, such as hemp, medicinal cannabis, and koura, or investing in technology to drive innovations in nutraceuticals, fashion, and tourism.

The Māori economy is like a developing economy within a developed economy. It is growing at a rate that exceeds that of the Aotearoa economy. In 2016, the Māori economy grew 5% compared to 2.7% for the Aotearoa economy, and Māori-collectives and businesses are expected to invest $1.5 billion a year for the next 10 years.[56]

Although Māori freehold land is estimated to comprise about 1.4 million hectares in Aotearoa, nearly 80% of all Māori land is of a less versatile land class (class 6, 7 and 8) and many parcels of Māori land are small and fragmented.[57] Different structures and priorities have led to significant areas of iwi/Māori owned land being under-utilised for agricultural activities. The Ministry for Business, Innovation and Employment estimates that one-third of Māori land has potential for development or increased utility.[58] Māori enterprises have different structures and priorities. Collective ownership structures result in lengthier decision-making processes to obtain agreement from all shareholders. Collective ownership, and concepts such as taonga tuku iho, also make it difficult to use land as security when seeking finance for development.

Māori economic development also tends to have a long-term outlook and is typically progressed alongside Māori cultural, social, and environmental development strategies as a holistic approach to intergenerational wellbeing. Iwi/Māori put significant cultural value on the land, such as access to traditional medicines, hunting, providing social well-being, and maintaining connection to the land. Māori-collectives typically have a conservative risk appetite to ensure the protection of their cultural assets, and values-based decision-making is considerably more complex for iwi/Māori.[59]

It is important to note that different iwi, hapū, marae and whānau have diverse views and their own specific challenges. These differences affect the ability of many iwi/Māori landowners to respond to policy in a timely way, to minimise risk and maximise strategic opportunities.

[54] (Chapman Tripp, 2017, 2018)
[55] (NZIER, 2003)
[56] (Ministry for Business, Innovation and Employment, 2017a)
[57] (Nana, 2019); (Harmsworth et al., 2012)
[58] (Ministry for Business, Innovation and Employment, 2017a)
[59] (Whetu Consultancy Group, 2019); (BERL & FOMA, 2019); (Funk, 2009)

In addition to Māori-collectives and businesses, Māori workers also face particular challenges. This is considered in the employment and workers section (*12.6 Employment and workers*).

12.4 Trade

International trade is critical for the Aotearoa economy, jobs and society. Currently, about 60% of economic activity in Aotearoa is from trade.[60] The food and fibre sector is a major employer and exporter with about 85% of its meat,[61] and 95% of its milk exported each year.[62] Tourism and commercial services are also significant export earners for Aotearoa, with tourism having been particularly impacted by the COVID-19 pandemic. Trade is also beneficial for the Māori economy and offers opportunities for Māori exporters to gain access to new markets.[63]

Trading activity of Aotearoa affects its foreign exchange and balance of trade. Exporting products and services allows Aotearoa to pay for imported goods and services. Imports reduce costs and make more goods and services available to New Zealanders. Aotearoa imports a large range of goods, including crude oil and diesel, motor vehicles, clothing, and computers, mobile phones and other electrical goods.[64] While the move to electric vehicles may see Aotearoa import less petrol in the future, New Zealanders would continue to rely on imports from other countries for a range of products and technologies.

Figure 12.4 and Figure 12.5 show modelling results for exports and imports under the Current Policy Reference and target-aligned scenarios from our Climate Policy Analysis (C-PLAN) model. Our economic modelling suggests that under the Current Policy Reference case, both exports and imports would increase by 2050. In particular, services and manufacturing exports would increase, while more manufacturing products would also be imported. The target-aligned scenarios show very little difference to the Current Policy Reference case.

These modelling results suggest that taking actions to meet emissions budgets and the country's domestic targets for biogenic methane and all other greenhouse gases would not result in significant changes to exports and imports. However, this would depend on how Aotearoa transitions compared to its trade partners and competitors.

Depending on the transition pathway Aotearoa takes, New Zealanders could see significant land-use change from pastoral agriculture to forestry. We have commissioned Infometrics to analyse the implications of land use change on the balance of payments. The provisional analysis of this study suggests that under some circumstances the income from the resulting timber exports would likely be greater than the lost earnings from pastoral agriculture.[65]

Aside from climate policy, other factors may play a role in the country's trade flows. International markets would change over time as consumers' preferences change, trade rules evolve, demographics change and other economic factors such as labour costs, education and innovation alter countries' comparative advantages. The physical impacts of climate change would also affect trade.

[60] (New Zealand Ministry of Foreign Affairs and Trade, 2018)
[61] (Meat Industry Association, 2020)
[62] (DCANZ, 2020)
[63] (Ministry for Business, Innovation and Employment, 2017a)
[64] (Stats NZ, 2019)
[65] (Infometrics, forthcoming)

For Aotearoa, there are also economic opportunities in international markets for differentiating products for being low emissions, and risks to losing access to markets or to capital from not acting to reduce emissions.[66] Globally, consumers are increasingly demanding products that meet specific environmental standards,[67] and financial institutions are increasingly factoring climate risk into their decisions.[68] Companies manufacturing or selling high value goods are turning to their supply chains and selecting inputs based on their environmental credentials.[69] For example, the food company Danone has committed to becoming carbon neutral across their full supply chain by 2050 and require that their suppliers support this.[70] Benefitting from these opportunities would require Aotearoa businesses to move ahead of other businesses.

The physical impacts of climate change are also likely to affect production, and trade routes and infrastructure. Agricultural production may be affected by more frequent droughts. Higher sea levels and more frequent storms could result in more frequent port closures. How these changes affect trade flows in Aotearoa would depend largely on the relative impacts on its trading partners and competitors.[71]

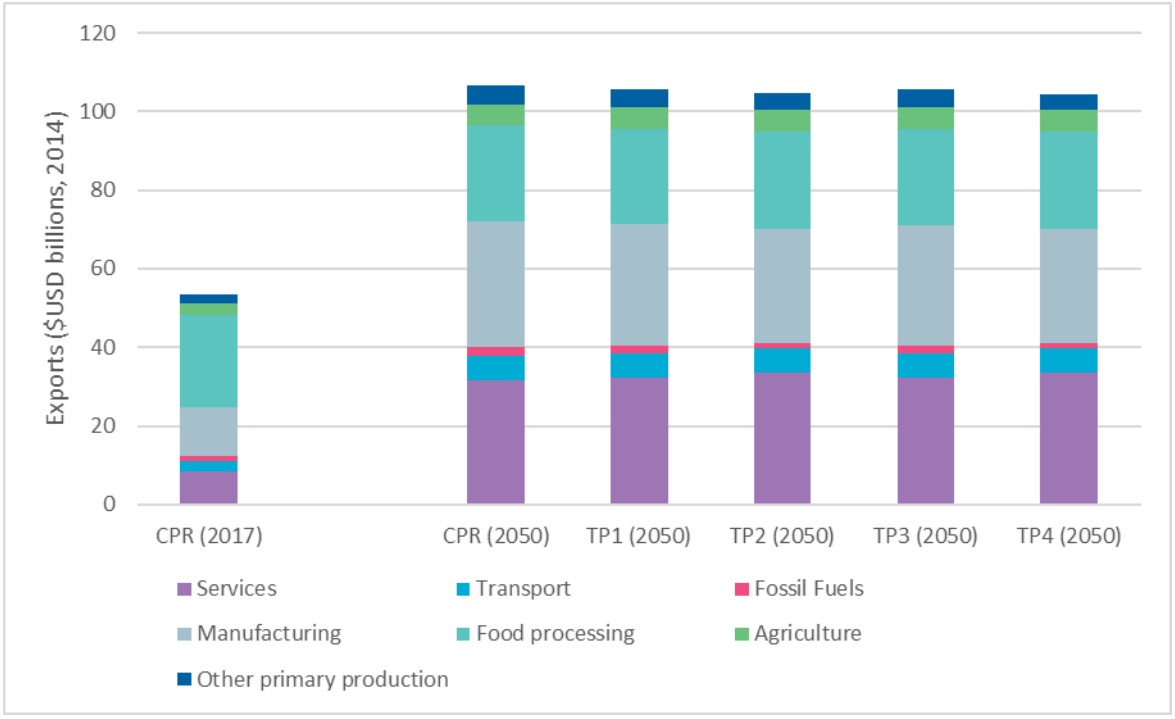


Figure 12.4: Economic modelling of how the country's exports would be impacted by 2050 under the Current Policy Reference (CPR) and the different Transition Pathways (TP1, TP1, TP3 and TP4). Source: Commission's CPLAN modelling

[66] (Interim Climate Change Committee, 2019a)
[67] (Unilever, 2017)
[68] (Investor Group on Climate Change, 2020); (Eceiza et al., 2020)
[69] For example, 115 global companies with US$3.3 trillion in procurement spend have signed up for CDP's global environmental disclosure system. Of these companies, 43% are selecting or deselecting suppliers based on their environmental credentials. A further 30% are looking to follow this lead in the near future. (CDP, 2019)
[70] (Danone, 2019)
[71] (Dellink et al., 2017)

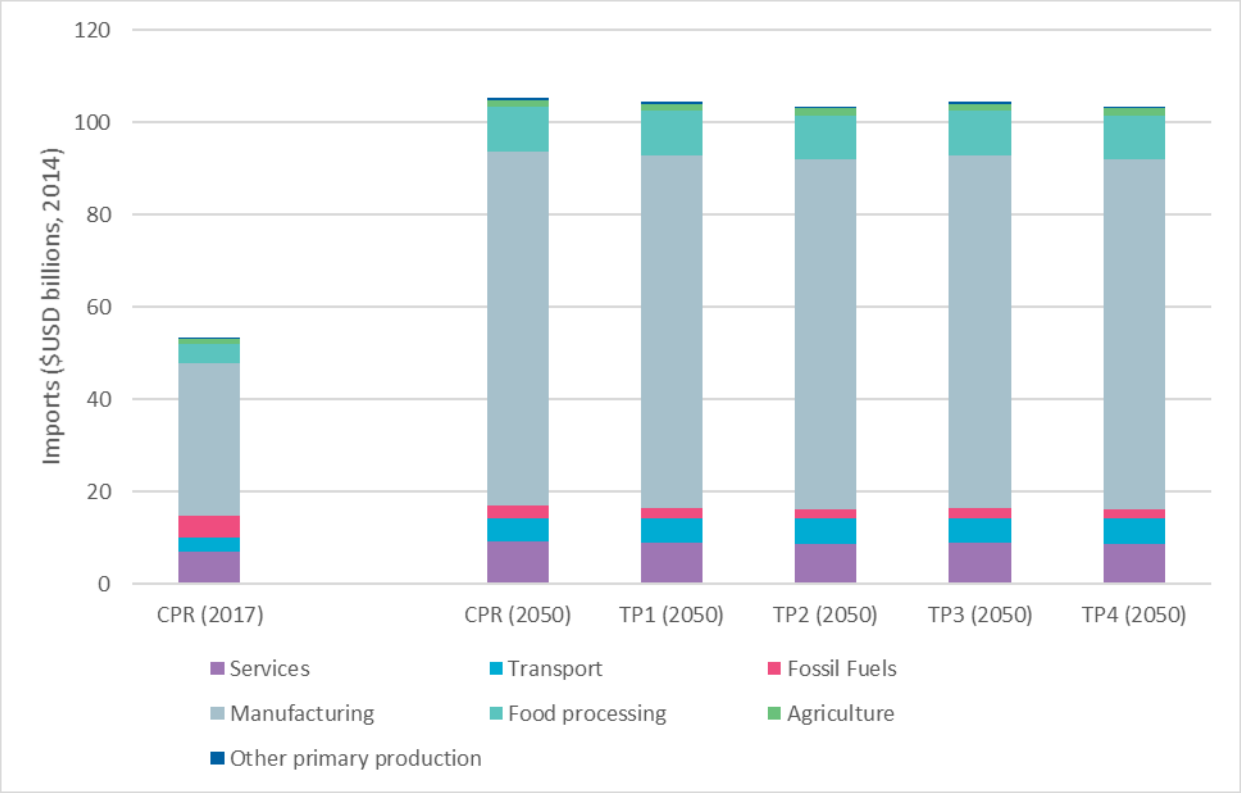


Figure 12.5: Economic modelling of how Aotearoa imports would be impacted by 2050 under the Current Policy Reference (CPR) and the different Transition Pathways (TP1, TP1, TP3 and TP4). Source: Commission's CPLAN modelling

12.5 Small businesses

Aotearoa small businesses – those with fewer than 20 employees – make up about 97% of Aotearoa businesses and contribute about 30% of employment and over 25% of GDP.[72] They include farm businesses, tradespeople and construction businesses, retail, hospitality and tourism.[73] They play a crucial role in the economy, especially in supply chains and larger exporting businesses. Many of these businesses have been particularly affected by lockdowns due to the COVID-19 pandemic.

Small businesses are diverse and would be impacted in different ways by the transition to reduce emissions, meet emissions budgets and eventually the country's domestic targets.

All small businesses would be exposed to the climate transition and emissions budgets in some way. Most would be exposed through their electricity and transport usage. However, this exposure is likely to be minor over the course of the first three emissions budgets as electricity prices are modelled to remain stable or decrease, and vehicles become more fuel efficient. Small businesses could reduce costs further by improving their energy efficiency or switching to EVs for transport. Small supermarkets and local dairies would also be exposed through the use of hydrofluorocarbons as refrigerants.

[72] (Ministry for Business, Innovation and Employment, 2020)
[73] (Ministry for Business, Innovation and Employment, 2017b)

There could also be opportunities for small businesses that have a heavy reliance on vehicles. Taxi drivers, couriers, builders and tradespeople that move to electric cars or vans would not only reduce their transport emissions, but also reduce ongoing running and maintenance costs. EVs are currently more expensive than conventional petrol and diesel vehicles, but our modelling expects that they would reach price parity in the late 2020s. There are also examples of larger companies helping their independent contractors purchase EVs. For example, recognising the upfront cost is preventing uptake, NZ Post is contributing a minimum of 50% of the price difference between an EV and its petrol/diesel equivalent to help its CourierPost, Pace, Rural Post and Provincial Delivery contractors purchase an EV.[74]

Some small businesses work with more emissions-intensive products and technologies in their businesses than others - for example, builders who use cement or steel in construction or mechanics who maintain vehicles with internal combustion engines. These businesses may need to start working with newer low emissions products and technologies and upskill to be able to do so. There would also be opportunities for new small businesses in developing and supplying these low emissions products and technologies.

Some small businesses would face greater challenges and be more impacted by the move to a lower emissions society than others. Some businesses would be more directly impacted because their core business is no longer viable and would need to adapt. Some small businesses which depend on local industries, either directly (e.g. through supply chains) or indirectly (e.g. supporting coffee shops or mechanics) would also be exposed if those industries were to close down. This could be especially the case for small businesses that provide support services for emissions-intensive industries or are located in communities where an emissions-intensive industry is a large employer.

Approximately 20,000 to 30,000 farm businesses in Aotearoa would be impacted by climate policy. These businesses would need to make practice changes and take up new technology as it becomes available to reduce biogenic methane and nitrous oxide. It may be more challenging for them to pass on any costs they incur from these changes as they supply milk, meat and wool into international markets. In addition, the need to reduce emissions on farms sits within a broader context for farm businesses, which are also responding to water quality, biodiversity and biosecurity regulation.

For vegetable growers who heat their greenhouses, it would be costly to replace a coal boiler with a lower emissions option earlier than would otherwise be needed. Boilers are 20 to 30 year investments, and retiring them early comes at significant cost.[75]

Small businesses generally have less resource to dedicate to measuring their businesses' emissions footprint, understanding where their emissions come from and assessing the options for reducing them. A 2019 survey of 707 farmers found that 50% of farmers had little or no understanding of the actions they could take to reduce their on-farm emissions, while only 14% had quantified their emissions in the last two years.[76]

The ability for small businesses to respond, adapt and innovate would depend on information, skills and capability, access to capital, and how early the necessary changes are signalled. In addition to ensuring that the workforce has the skillsets to respond, the Government would also need to play an

[74] (NZ Post, 2020)
[75] (Horticulture New Zealand, 2020)
[76] (The Nielsen Company, 2019)

important role in working with small businesses, for example through extension programmes, to ensure they have the information and support to respond to climate policy.

12.6 Employment and workers

There will be inevitable changes to employment and jobs as Aotearoa moves towards a low emissions society.

Some regions and communities of Aotearoa will be more affected by the climate transition than others. Some communities may see the closure of large businesses that provide significant employment for the community. This would have a big impact as major job losses at a local level can lead to entire communities being left vulnerable and dislocated. Some affected workers may have the mobility and means to acquire new jobs in other industries and regions. Others may not. Affected communities can end up 'stranded', where workers with particular skills and expertise are no longer in demand.

Aotearoa has already seen Rio Tinto announce the Tiwai Point aluminium smelter will close. Other emissions-intensive industries and large employers have also announced strategic reviews. There are many reasons for such industry closures besides climate change policy, with Rio Tinto citing energy costs and a challenging aluminium outlook. Closure of these industries has an impact on those who work there.

To help understand the impact on employment, we commissioned a new model called the Distributional Impacts Microsimulation for Employment (DIM-E). We ran four scenarios through this model. We present results from all four scenarios in figures and tables in this section. However, we have focused on two of these scenarios in the text of this section – Transition Pathway 3 (TP3) and Transition Pathway 4 (TP4). TP3 and TP4 are in line with our proposed emissions budgets and key assumptions. Box 12.3 provides a description of the DIM-E model.[77]

Box 12.3: The Distributional Impacts Microsimulation for Employment Model

The Distributional Impacts Microsimulation for Employment (DIM-E) model takes the results of the C-PLAN model and combines them with granular data from Stats NZ (particularly the

[77] The results in this chapter are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand. The opinions, findings, recommendations, and conclusions expressed in this chapter are those of the authors, not Statistics NZ. Access to the anonymised data used in this study was provided by Statistics NZ under the security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this chapter have been confidentialised to protect these groups from identification and to keep their data safe. Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.
The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes. Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Integrated Data Infrastructure IDI and the Longitudinal Business Databases LBD). Using information on job characteristics by industry and demographic information for workers like age, ethnicity, education level, and location, the DIM-E can take the percentage changes in industry employment provided by C-PLAN and show which groups of people are most likely to be affected by the changes to the economy, as well as the size of those effects. For example, a 1% change in a large industry could mean more jobs being affected than a 5% change in a small industry. Moreover, instead of reducing their work force, employers may adjust employment by reducing the hours or earnings of the employees they have. Similarly, businesses may respond to increases in production by increasing the number of hours worked by their existing employees. For this reason, we should think of jobs being affected in terms of 'job-equivalents'.

Hence, DIM-E allows us to estimate the number of job-equivalents expected to be gained and lost across the economy based on the expected expansion and contraction of different industries. By comparing the characteristics of jobs potentially being lost to those being gained, we can then get a sense of whether the people who are expected to lose jobs due to changes in the economy would be able to find similar jobs in industries that are growing.

This model cannot tell us about the aggregate effect on jobs in Aotearoa but provides insights on the flow of work across Aotearoa.

12.6.1 Distribution of impact on jobs and employment

Our modelling cannot tell us about the aggregate impact on jobs and employment. However, it does provide insights on where job changes could occur.

There will be both job gains and losses in the next 30 years whether or not new policy is put in place to transition Aotearoa to meet emissions budgets and emissions targets for biogenic methane and other greenhouse gases. This is in line with what Aotearoa has seen in the past as industries rise and fall over time depending on economic cycles.

As a result, the analysis below focuses on the job gains and job losses that would occur under scenarios that would allow Aotearoa to meet our proposed emissions budgets and targets relative to the Current Policy Reference scenario. It is important to note that the Transition Pathways can provide more employment by resulting in more job gains in industries that are expanding, but also by resulting in fewer job losses in industries that are contracting relative to the Current Policy Reference scenario. Conversely the transition pathways can provide less employment by resulting in either fewer job gains in industries that are expanding or more job losses in industries that are contracting relative to the Current Policy Reference scenario.

Although our analysis cannot tell us about net overall employment changes, international studies have estimated that the climate transition will have a net positive effect on jobs. This is because countries are expected to put greater attention on the impacts on jobs and employment as they decarbonise their economy. The International Labour Organisation (ILO) estimates that by 2030, about 25 million jobs will be created and about 7 million jobs lost globally.[78] The UK Government estimated that its efforts to address climate change could create and support up to 250,000 green

[78] (International Labour Organisation, 2019)

jobs.[79] However, job creation is not guaranteed. Government must invest in supporting policies to educate or retrain workers and provide support for those that need it to maximise the opportunities to create new jobs.

In addition to creating jobs, existing jobs could be transformed and refined. The ILO estimates that about 5 million jobs will be reallocated into other industries. For example, electricians or engineers in emissions intensive sectors could be redeployed into other sectors in need of their skillsets.

12.6.2 Impacts on jobs by sector

The actions taken to meet the country's emissions targets will increase the demand for low emissions goods, services and skills. International trends show the growth and value of the clean energy transition, as jobs in the sector have grown to approximately 11.5 million, compared to 11 million in 2018.[80] In the United States, wind turbine technicians and solar panel installers are the fastest-growing jobs.[81] These jobs are also found to have a better gender balance than jobs in fossil fuel industries, as women hold an estimated 32% of the renewable energy jobs.[82]

Some sectors that are emissions-intensive will face challenges and may face greater employment changes than others. The literature suggests that those who work in legacy energy industries will be negatively impacted. Industries such as the automobile and servicing industry could face changes in employment from shifting towards low emissions transport.

The coal mining and oil and gas sectors, and the services that support them, will be impacted by the transition away from fossil fuels. This would particularly affect Taranaki and the West Coast where the majority of these jobs are located.

Under current policy settings, our modelling indicates that Aotearoa would see about 600 net job losses from these fossil fuel sectors between 2022 and 2035. However, taking action to meet our proposed emissions budgets would result in 600-1100 more net job losses in both these sectors by 2035 (Figure 12.6). If Aotearoa reduced emissions at a faster rate in the first two emissions budget periods, job losses in these sectors would occur earlier.

The jobs that are lost from the oil and gas sector are likely to be highly skilled and therefore high paying jobs. The individuals affected are likely to have skillsets that could be valuable in other sectors, including sectors emerging as part of the transition to a low emissions economy.

[79] (UK Government, 2020)
[80] (IRENA, 2020)
[81] (US Bureau of Labor Statistics, 2020)
[82] (IRENA, 2020)

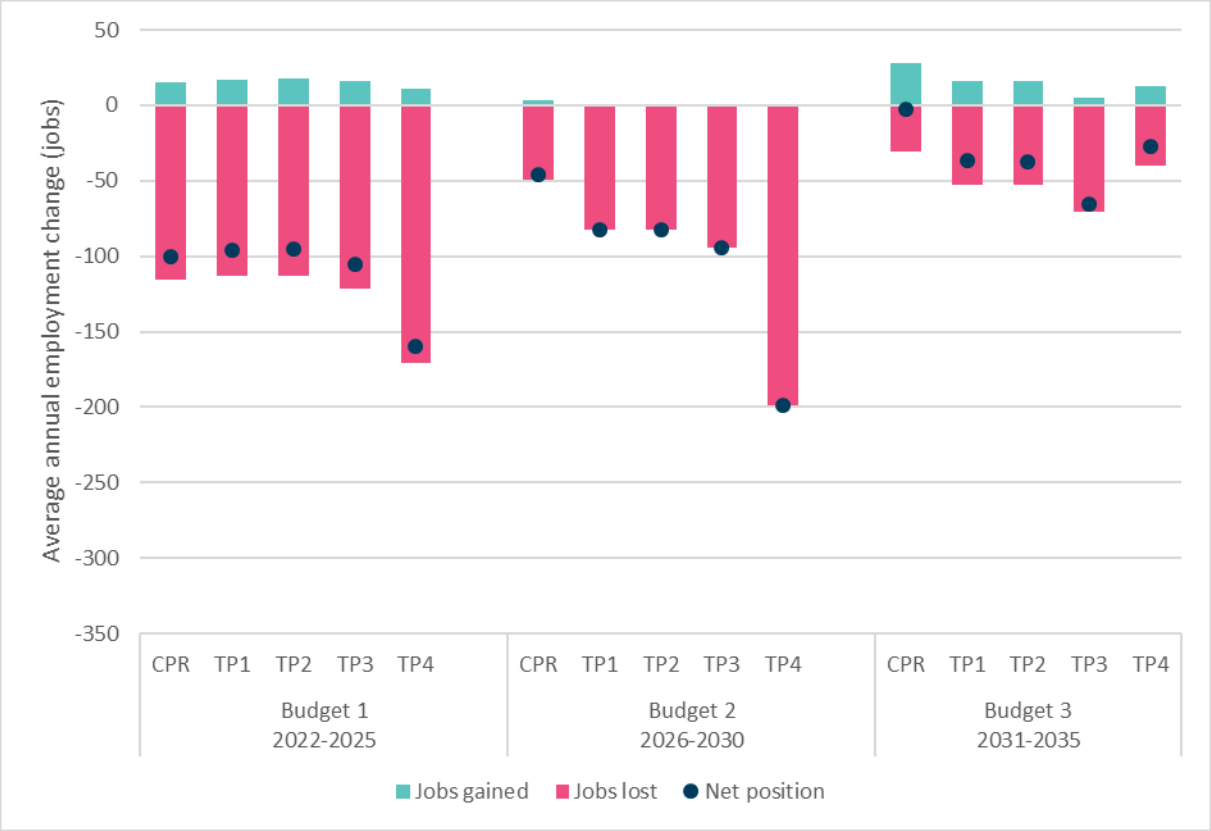


Figure 12.6: Simulation results of the average annual change in employment in the fossil fuel sectors (ANZSIC codes B060, B070, B109, C170, D270) in each emissions budget period under the Current Policy Reference case (CPR) and Transition Pathways 1-4 (TP1 - TP4) that are in line with our proposed emissions budgets.

Source: DIM-E simulation results

In some other sectors, our modelling indicates that there could be fewer job losses as a result of taking actions to meet our proposed emissions budgets. For example, our modelling suggests that, under current policy settings, there could be about 4,000 job losses in sheep, beef and grain farming by 2035. However, our modelling suggests that taking actions to meet our proposed emissions budgets would result in 400-700 fewer job losses. This is largely because our proposed emissions budgets would result in less land use change from sheep and beef farming to forestry.

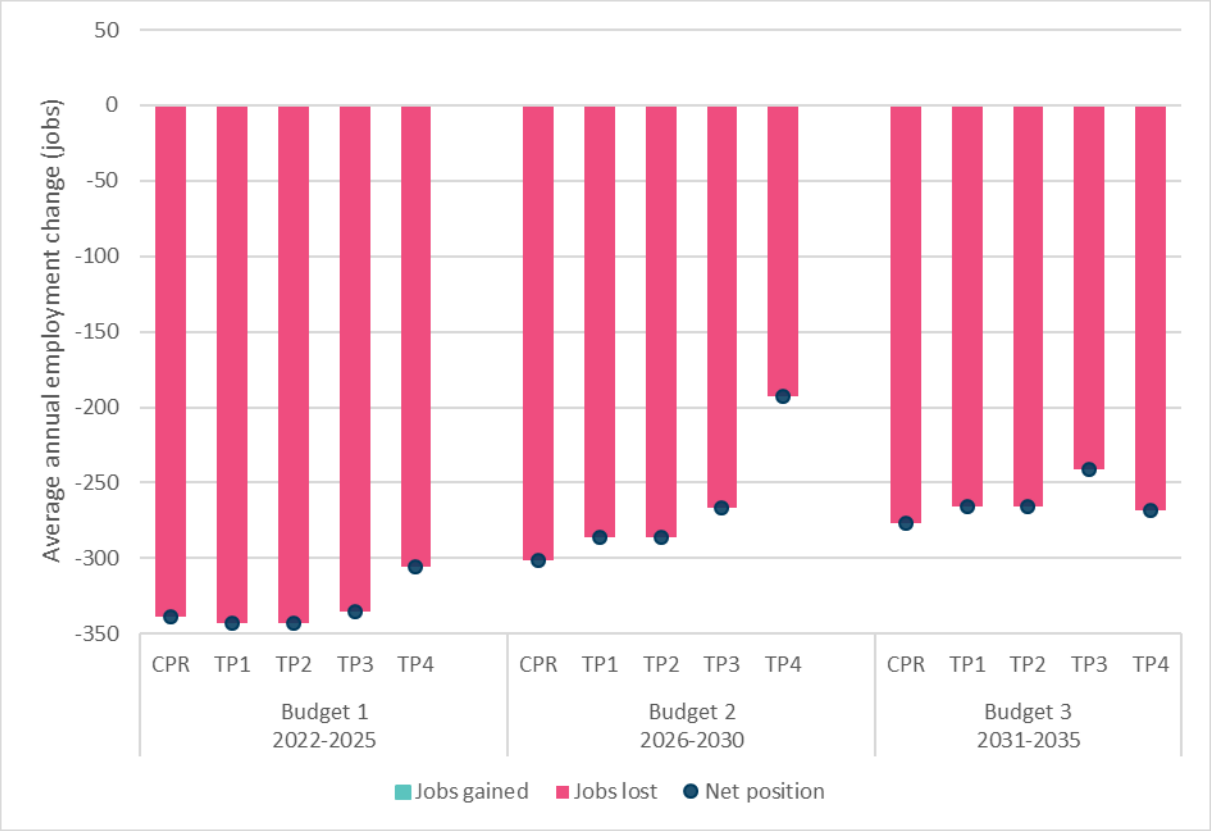


Figure 12.7: Simulation results of the average annual change in employment in the ANZSIC sector A014: Grain, Sheep and Beef Cattle Farming in each emissions budget period under the Current Policy Reference case (CPR) and Transition Pathways 1-4 (TP1 - TP4) that are in line with our proposed emissions budgets.

Source: DIM-E simulation results

While our modelling is able to look at existing industries, there will also be new industries that arise as a result of the low emissions transition and from regional development that our modelling is not able to foresee. For example, there are opportunities to create new jobs associated with the circular economy, such as using wood waste for biofuels,[83] and new industries, such as hydrogen. New jobs could also be generated in energy efficiency and home energy audits, and advisory services for managing emissions on farm, for example. Generating jobs and taking advantage of these new opportunities will require investment and planning.

To take advantage of these opportunities and support workers affected by the climate transition, Aotearoa will need the transition to be well-signalled to allow time to plan and localised transitions planning that is tailored by the community for the community. Many of the workers affected will have important skillsets that will be in demand in new low emissions industries. Workers will need to be supported to redeploy into these new areas of work, and provided opportunities to retrain and build new skillsets.

[83] (Eunomia et al., 2017; Ministry for the Environment, 2019a)

12.6.3 Impacts on jobs by region

Job changes could be concentrated in certain regions, such as when a town depends on a single industry for employment or could be more structural changes that occur over a longer period of time, such as the innovation opportunities from increased demand for low emissions goods.

Without transition planning, regions that are dependent on emissions-intensive activities, such as mining, could face lob losses or fewer job opportunities. These impacts can have adverse effects on the wider community, such as loss of community culture and economic decline of regions.

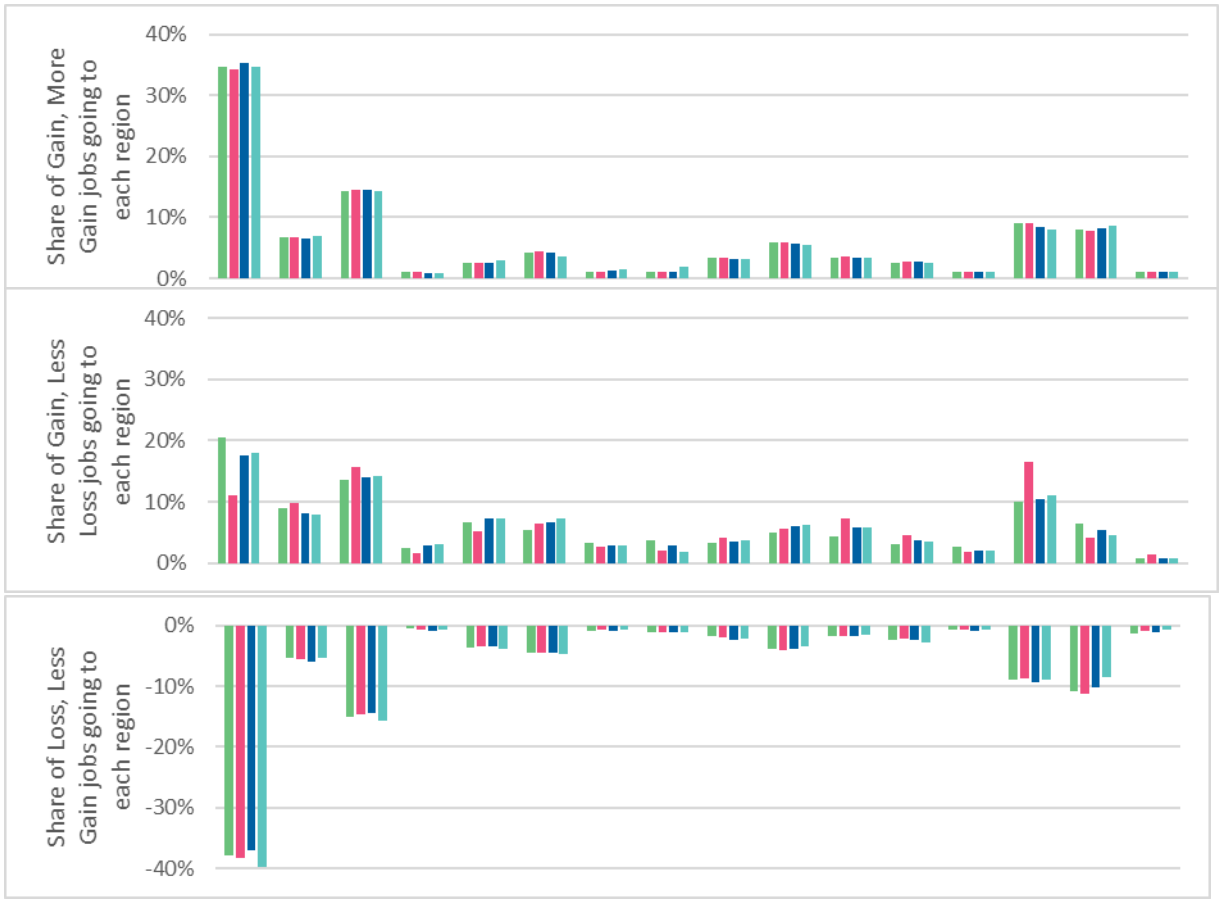
The modelling suggests that Taranaki and the West Coast would be negatively impacted under our proposed emissions budgets, relative to the Current Policy Reference case, between 2022 and 2050. The job losses would largely occur in the oil and gas, mining, transport and manufacturing industries. Most of these job losses would occur over the course of the first and second emissions budget periods. Moreover, the jobs in these industries tend to pay more than the average job.

By 2050, the other regions would largely gain more jobs than are lost under TP3 and TP4 that are in line with our proposed emissions budgets, relative to the Current Policy Reference case. Still, some regions of Aotearoa would experience disproportionately more job losses relative to the Current Policy Reference case though these would not be significant. The regions that could be disproportionately impacted by job losses include: Northland, Waikato, Taranaki and Wellington.

To understand where job changes are occurring, it is helpful to group industries based on whether they are gaining or losing jobs, and whether they are growing or declining. This gives us four categories:

- Gain, more gain: More jobs in the industry in the Transition Pathway than in the Current Policy Reference case, and a growing industry
- Gain, less loss: More jobs in the industry in the Transition Pathway than in the Current Policy Reference case, in a declining industry (so less job loss in the scenario than in the CPR)
- Loss, less gain: Less jobs in the industry in the Transition Pathway than in the Current Policy Reference case, but a growing industry (so still more jobs than now, but not as many new jobs as we would have had without our mitigation actions)
- Loss, more loss: Less jobs in the industry in the Transition Pathway than in the Current Policy Reference case, and a declining industry (so more job loss with our mitigation actions than we would have otherwise had)

In each of these groups, our modelling then allows us to determine what proportion of jobs lost or gained nationally occurs in each region. For example, 34-35% of the jobs gained nationally in growing industries (gain, more gain category) are in Auckland, while 13-18% of jobs lost nationally in declining industries (loss, more loss category) are also in Auckland. In net terms, across the four categories, Auckland could gain around 80 jobs (in the TP3 scenario) or around 600 jobs (in the TP4 scenario).


Share of Gain, More Gain jobs going to each region
40%
30%
20%
10%
0%
Share of Gain, Less Loss jobs going to each region
40%
30%
20%
10%
0%
Share of Loss, Less Gain jobs going to each region
0%
-10%
-20%
-30%
-40%

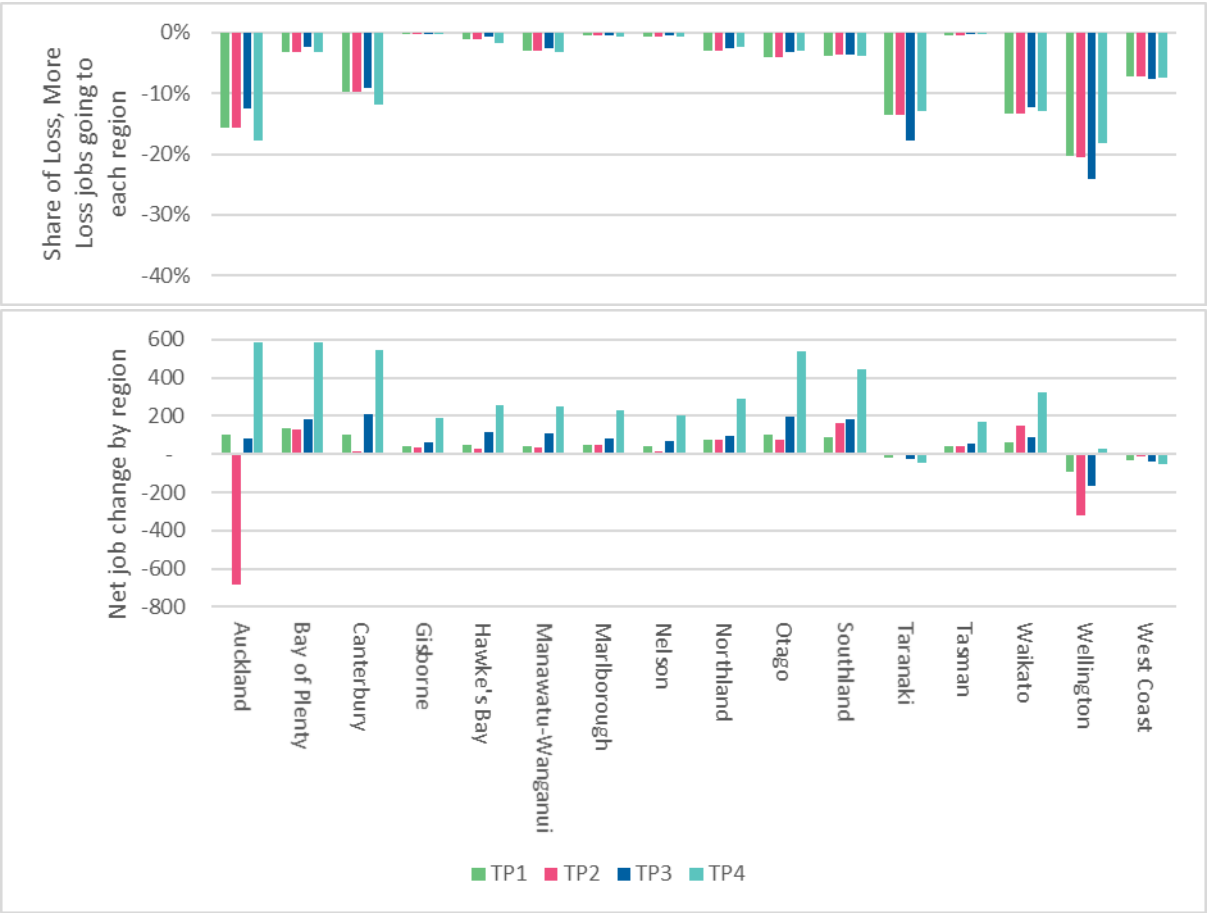


Figure 12.8: Job changes by region in the first three budget periods. Industries are grouped by whether they gain or lose jobs in the transition pathways compared to the CPR (top two and next two graphs respectively), and whether they are in growing or shrinking industries (first and third, and second and fourth graphs respectively). The fifth graph shows the net effect on jobs in each region.

Source: DIM-E simulation results

12.6.4 Impact on jobs held by Māori, Pacific Peoples and other ethnic groups

Some Māori individuals in the workforce could experience greater changes. Our analysis suggests that 18-25% of those who gain jobs from the transition would be Māori, while 13-21% of those who lose jobs from the transition would be Māori. Māori in the workforce would see more job gains than job losses across all three emission budget periods.

Proportionately, Pacific Peoples could also experience greater changes. Our analysis suggests that 7-9% of those who gain jobs from the transition would be Pacific Peoples, while 3-9% of those who lose jobs from the transition would be Pacific Peoples. As with Māori, Pacific Peoples in the workforce would see more job gains than job losses across all three emission budget periods.

BERL has estimated that the current income gap for Māori is $2.6 billion per year, equating to $140 less income per person per week for the working age Māori population. Over half of the working Māori population are in lower skilled jobs, and almost half are in jobs that have a high risk of being

replaced by automation.[84] Research indicates that current education and training providers are not serving Māori well and have low levels of engagement from Māori.[85] Māori who need to retrain or update their skillsets as employment changes may be particularly impacted. Education and training developed by Māori for Māori would be important for reducing existing inequities and in ensuring an equitable transition.

While our analysis does not allow us to distinguish the specific effects on Māori incomes, across the whole population the jobs gained are on average similar or lower paid than those jobs that are lost. The Crown–Māori Economic Development Strategy, He kai kei aku ringa, also has a goal of growing the future Māori workforce into higher-wage, higher-skilled jobs.[86]

These barriers would need to be addressed to enable Māori to fully participate in climate action, and ensure that Māori-collectives, businesses and workers are not disadvantaged. Any additional costs arising from climate policy could result in additional barriers for the continued development of iwi/Māori landholdings and businesses.

Impacts on jobs for different generations

Our modelling suggests that over the first emissions budget period, workers aged 45 years and over would experience a disproportionate number of job losses under the target-aligned scenarios compared to the Current Policy Reference case. Looking out to 2050, there could be more new jobs in all age groups compared to the Current Policy Reference case. However, younger age groups would benefit more from the target-aligned scenarios than older age groups, and older workers are disproportionately impacted by job losses.

Impacts on jobs by highest qualification

The modelling suggests that over the first emissions budget period, there would be fewer job gains under the scenarios that would put Aotearoa on track for its targets, which particularly impact those who have a Bachelors or postgraduate degree, than the Current Policy Reference case. This is due to the impact on the oil and gas and mining sectors, where a higher proportion of workers hold Bachelors or postgraduate degrees.

Looking out to 2050, the modelling suggests that workers with qualifications would be better off under the target-aligned scenarios compared to the Current Policy Reference case. Workers with no university qualification would experience disproportionately more job losses.

12.6.5 Ensuring an equitable transition for workers

The previous sections outline that, while overall the impact of the climate transition on businesses and jobs is likely to be manageable, some workers, industries and communities could be more severely impacted.

This section considers how workers can be supported through the transition, particularly by investing in education and retraining to help prepare displaced workers for the new job opportunities that would emerge from the transition to a low emissions and climate-resilient economy and society.

[84] (BERL, 2017)
[85] (Whetu Consultancy Group, 2019)
[86] (Māori Economic Development Panel, 2012)

Productivity, skills and innovation is important for ensuring an equitable transition where workers have the skills to move into new jobs, and businesses have the skills and capability to innovate, adopt new technologies and commercialise new ideas.

Localised transitions planning would also be needed, particularly in communities that rely heavily on one or two industries for employment.

Productivity, skills and innovation

Productivity refers to how well businesses, people or organisations convert inputs – like capital and labour – into the output of goods and services. By improving productivity, a certain amount of output can be created using fewer resources, or more or better outputs can be created from the same amount of resource.[87] Productivity growth is a major driver of income growth and living standards.[88] Policy that addresses both productivity growth and the low emissions transition can help to ensure more innovation, more inclusive economic growth, the creation of higher paying jobs, and therefore higher living standards.

However, despite having high labour market performance relative to other OECD countries, Aotearoa has relatively weak labour productivity and earnings quality – a measure of how the level of wages contribute to living standards and wellbeing, and the distribution of wages across the workforce.[89] Research by the Productivity Commission suggests that the country's low productivity growth is due to weak technology diffusion from leading edge global businesses to the country's leading businesses, low technology and knowledge spill over from domestic leading businesses to less productive businesses, and resources being concentrated in small unproductive businesses and not reallocating to more productive businesses.[90]

The decisions business owners make affect how well the productivity-enhancing processes of innovation, technology diffusion and resource allocation happen. Those decisions are in turn affected by government policy.

Leading edge businesses develop and make smart use of new technologies and processes to improve their operations. They adopt innovative management practices, and flexible approaches to delivering their goods or services. These technologies and processes then diffuse to other firms in the economy, which can adapt them to improve their own productivity. In this way, these leading firms help to lift the productivity of the whole economy. Government policies that support these productivity enhancing processes would be an important part of an equitable transition to low emissions.[91]

The education, and science and innovation systems are critical for ensuring low emissions economic growth.[92] The Productivity Commission suggests productivity growth in Aotearoa can be improved by strengthening international connections and integrating with high-value global value chains,

[87] (New Zealand Productivity Commission, 2020)
[88] (Gurría, 2015). In Aotearoa, wages increase at a faster rate when there is strong growth in labour productivity. (Conway et al., 2015)
[89] (OECD, 2018)
[90] (New Zealand Productivity Commission, 2016)
[91] The Productivity Commission is currently undertaking an inquiry into "frontier firms", and how the Government can support the processes of innovation, diffusion and reallocation to improve productivity. The draft report was released in December 2020. Their issues paper is (New Zealand Productivity Commission, 2020).
[92] (OECD, 2017a)

improving the science and innovation system, and ensuring that New Zealanders have the skills that are needed for where the labour market is heading.[93]

A good skills and education system benefits workers, businesses and societies.[94] For a worker, skills are important for allowing an individual to pursue their interests, for improving employability and wages, for empowering individuals and allowing autonomy in the workplace, and improving overall wellbeing.[95]

For businesses, skills and capability allow them to innovate, adopt new technologies or commercialise new ideas. Ensuring skills match what is needed in the labour market is important for enabling businesses can do this.[96] Increased rates of innovation would also help to soften competitiveness impacts from strong climate action. Being an early mover in researching new technologies and adopting existing technologies could benefit Aotearoa, particularly in sectors where Aotearoa is particularly innovative such as agriculture. This could lead to new sectors, new business opportunities and new jobs.[97]

For societies, skills and innovation help to create new opportunities for transforming the economy, creating new jobs, and more inclusive sustainable growth.[98]

The education and training system would need to focus not just on learning at the start of an individual's career, but lifelong learning, as well as ensuring individuals are provided with the skills that would be needed in the future labour market. Long-term skills development would need to include pre-employment and life skills training, secondary and tertiary education, vocational training and apprenticeships, ongoing training in the workplace, and training and retraining for those seeking work or new careers.[99]

Policy intervention would also need to focus on the skill requirements of those who work in industries where more change would be needed as part of the climate transition, and on those who would have the most difficulty gaining new employment. The education system would need to be more flexible, and address barriers that restrict all New Zealanders from participating in education and training, with particular focus on the challenges Māori face in accessing education and training.[100]

Chapter 17: The direction of policy for Aotearoa further explores the direction of policy needed to ensure that New Zealanders are equipped with the skills needed to thrive in the transition to low emissions economy.

Localised transition planning

Some regions and communities of Aotearoa would be more affected by the climate transition than others. In particular, some communities may see the closure of large businesses that provide

[93] (New Zealand Productivity Commission, 2016)
[94] (The Global Deal for Decent Work and Inclusive Growth et al., 2020)
[95] (The Global Deal for Decent Work and Inclusive Growth et al., 2020)
[96] (New Zealand Productivity Commission, 2016, 2019)
[97] (Ministry for the Environment, 2018)
[98] (The Global Deal for Decent Work and Inclusive Growth et al., 2020)
[99] (The Global Deal for Decent Work and Inclusive Growth et al., 2020)
[100] (New Zealand Productivity Commission, 2019; Whetu Consultancy Group, 2019)

significant employment for the community. Such a closure can have a big impact, not just on employees, but also on businesses and workers in the wider community.

Significant job losses at a local level can potentially lead to entire communities being left vulnerable and dislocated. Some affected workers may have the mobility and means to acquire new jobs in other industries and regions, while others may not. Affected communities may therefore end up 'stranded', with some workers with skills and expertise that are no longer in demand.[101]

Already disadvantaged groups, such as those on lower incomes, youth, elderly, Māori and Pacific Peoples, are also more likely to be more vulnerable to climate hazards.[102] For example, some coastal communities that may need to relocate due to sea level rise and flooding, dislocating both the communities that remain and those resettling elsewhere.[103]

In such situations, localised transitions planning would be needed where central government works together with local businesses, workers, iwi/Māori, community and local interest groups, and local government to develop a long-term vision and strategies for affected regions.

The OECD emphasises that localised transition planning would help to ensure climate change policies are tailored to regional and local circumstances, and address the needs and aspirations of different groups within the community.[104]

Localised planning is also important for achieving successful and enduring transition outcomes, and aligning government and business investment priorities.[105] In some situations, businesses would only invest if they know that complementary investments, such as to infrastructure, are being made.[106]

Transparent and inclusive processes, and active social dialogue regarding the transition, would be key to achieving a transition that is accepted and enduring.[107]

There are several international examples of different approaches to inclusive transition planning. Research suggests that important elements of existing initiatives aimed at supporting an equitable transition include ensuring affected workers, businesses and communities are active and empowered participants in transition planning. The provision of targeted financial and capacity building support is also important.

In Spain, for example, 'just transition agreements' have been required since 2018 between the government, unions, and businesses in all regions that are affected by climate transitions. Local civil society groups and the general public can also participate in the development of the agreements, which are designed to support strategies to reduce the negative impacts of the transition, and to finance green projects. The first such agreement was reached in October 2018 for regions impacted by coal mine closures.[108]

[101] (OECD, 2017b)
[102] (Ministry for the Environment, 2020); (Islam & Winkel, 2017)
[103] (Ministry for the Environment, 2020)
[104] (OECD, 2017b)
[105] (New Zealand Productivity Commission, 2018b)
[106] (New Zealand Productivity Commission, 2018b)
[107] (OECD, 2019b)
[108] (Bouyé et al., 2019; Gobierno de España, 2020)

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