Tātaki Auckland Unlimited

AUCKLAND TĀMAKI MAKAURAU

Climate Connect Aotearoa

Mitigating climate change in New Zealand: impacts on Auckland's economy

Tātaki Auckland Unlimited Economic Insights Paper

Foreword

In early 2023, the impacts of climate change were felt in a very tangible way in Tāmaki Makaurau Auckland and across Aotearoa New Zealand.

As Aucklanders looked forward to the Auckland Anniversary holiday weekend in late January, an extreme weather event[1] occurred, causing widespread flooding that resulted in the loss of life and property on an unprecedented scale across the region. As a result of the Auckland Anniversary floods, the region's insurance losses are estimated at $1.66 billion, nearly six times the total for 2022.[2]

Climate change certainly played a role. According to NIWA Principal Climate Scientist Dr Sam Dean, the influence of climate change intensified the flooding in Auckland:

"The Earth has warmed by about 1.1 °C already because of human activity and this extra heat gives more power to extreme rainfall.

"All other things being equal, we would expect climate change to contribute between 10-20% more rain in the most intense part of this storm."[3]

The impact of climate change on economies around the world and, conversely, the impact economies are having on the climate, are of significant concern.

Governments have agreed to work together to mitigate the effects of climate change, signing the Paris Agreement in 2016 to, "hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels."[4]

A climate emergency was declared in New Zealand in December 2020, and in response, the government mapped out a path to net zero emissions by 2050. Auckland had already declared a climate emergency the previous year, as well as developing and adopting *Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan*, which was released in 2020.[5]

Te Tāruke-ā-Tāwhiri outlines the region's long-term approach to climate action. To achieve this, the plan sets out actions to reduce our greenhouse gas emissions by 50 per cent by 2030 and adapt to the impacts of climate change.

To support these goals, Tātaki Auckland Unlimited has created a climate innovation hub called Climate Connect Aotearoa[6], which brings together diverse organisations to develop, demonstrate and scale the solutions needed to reduce emissions in a way that is equitable and builds resilience[6] and is in line with global agreements.

While Climate Connect Aotearoa is an important step in the right direction, further work is needed to support sector transition in a way that equitably distributes the opportunities and challenges that climate change will bring.

As this paper outlines, national policies have an impact at a local level, but they don't necessarily consider regional economic factors. Understanding the potential costs, opportunities and changes for the Auckland region will help inform the development of local transition plans for our businesses in a range of sectors.

To reach net zero will require difficult decisions and trade-offs. As noted in *Te Tāruke-ā-Tāwhiri:* "We will need to rethink our economy to one that is less based on consumption and more focused on ensuring that we do not take more than we can replenish for future generations."[7]

If we can transition in a way that is just[8] and equitable, there is an opportunity to create a resilient, distributive economy that improves the wellbeing of people for generations to come, as well as the planet.

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[1] NIWA, "Auckland suffers wettest month in history."

[2] Insurance Council of New Zealand (6th March 2023) as seen in Deloitte, Tāmaki Makaurau Auckland's Turning Point.

[3] NIWA, "Auckland suffers wettest month in history."

[4] United Nations Climate Change, "The Paris Agreement."

[5] Auckland Council, "Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan."

[6] Climate Connect Aotearoa.

[7] Auckland Council, "Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan," p.6.

[8] A guide to just transitions for communities in Aotearoa New Zealand, highlights how "just transitions are a powerful invitation for communities to develop positive visions for change, transform unfair systems, draw on diverse strengths and world views, and come together to solve problems in ways that work better for everyone." (Just Transitions Aotearoa Group, 2023, P.1)

Climate change in Aotearoa New Zealand

The impact of climate change was felt through the extreme weather events of early 2023. However, the question remains: what are the future implications of climate change for Aotearoa New Zealand's economy?

According to the Ministry for the Environment (MfE) and The Treasury in the report *Ngā Kōrero Āhuarangi Me Te Ōhanga: Climate Economic and Fiscal Assessment 2023*, "the physical impact of climate change and the choices the country makes to transition to a low-emissions future will affect every aspect of the economy and society for generations."[9]

While a diverse range of climate-related impacts are anticipated, this paper specifically considers the impact of proposed changes outlined by the Climate Change Commission (CCC) to meet New Zealand's global obligations to reduce emissions. It quantifies and compares the economic impact these proposed changes will have in Tāmaki Makaurau Auckland and throughout the rest of the country.

The employment insights shared in this paper also utilise CCC modelling, to consider some of the employment transitions that may become available as New Zealand adopts emissions reduction technologies.

However, as this macroeconomic model only looks at economic indicators, it does not model the wider, interconnected impacts of climate change on social, cultural and environmental wellbeing. Currently measures are predominantly focussed on gross domestic product (GDP) by necessity, as the primary global measure of economic 'success'.

By this measure alone, our economy will change, but the impacts on wider social, cultural and environmental wellbeing are missed. How we manage the transition and a shift to a more balanced, equitable and regenerative economy, will require us to consider all aspects of wellbeing, beyond GDP.

CLIMATE CHANGE RESPONSE (ZERO CARBON) AMENDMENT ACT

One of Aotearoa New Zealand's most tangible responses in addressing the challenges of climate change to date has been the enactment of the Climate Change Response (Zero Carbon) Amendment 2019 ('the Act').

The Act outlines how our country will deliver on its commitment to the Paris Agreement. It established clear emissions reduction targets for greenhouse gases (GHG), which are a major driver of climate change, including:

- the reduction of emissions from biogenic methane to 24-47 per cent below 2017 levels by 2050
- the reduction of net emissions from all other GHGs to zero by 2050.

The Act also led to the establishment of the CCC, an independent government organisation created to provide expert advice and monitoring to help keep our country on track to meet these targets.

[9] Ministry for the Environment & The Treasury, Ngā Kōrero Āhuarangi Me Te Ōhanga: Climate Economic and Fiscal Assessment 2023, p.7.

The CCC's first advice to Government on climate action, *Ināia tonu nei: a low emissions future for Aotearoa*, was presented in 2021.[10] This report mapped out the transition required to lower New Zealand's emissions, modelling different scenarios and the impact these may have on the national economy.[11]

To better understand the economic implications of the proposed pathways outlined in *Ināia tonu nei*, the CCC used the Climate PoLicy ANalysis (C-PLAN) model - a model that places the New Zealand economy in a global context.[12]

According to the CCC, the proposed scenarios could see New Zealand's level of GDP be around 0.5 per cent lower in 2035 and 1.2 per cent lower in 2050 than it would be otherwise.[13]

This approach looked at New Zealand as a whole, however it did not take the distinctive characteristics of Tāmaki Makaurau Auckland into account, including it being the country's largest region in terms of population and economic output.

This paper brings forward local and regional economic considerations and demonstrates the importance in considering these in national policy.

Beyond GDP

While gross domestic product (GDP) is particularly useful to compare economic implications at global, national and regional levels as we transition to a low-carbon economy, It is important to think beyond GDP if we are to truly measure and plan for wellbeing in the transition. This is because wellbeing is driven by holistic, interconnected factors.

The New Zealand Government recognised this in Treasury's Living Standards Framework, where individual and collective wellbeing spans 12 factors, with 'income, consumption and wealth', just one consideration. Furthermore, the wealth of Aotearoa is measured by natural environment, social cohesion, human capability, and financial and physical capital.[14]

[10] Climate Change Commission,Ināia tonu nei: a low emissions future for Aotearoa, p.14.
[11] The Climate Change Commission's draft advice for the second emissions reduction plan is currently out for consultation, to inform the second emissions budget for 2026 – 2030.
[12] Winchester and White, The Climate PoLicy ANalysis (C-PLAN) Model.
[13] Climate Change Commission,Ināia tonu nei: a low emissions future for Aotearoa 2021, p.14.
[14] The Treasury, The Living Standards Framework (LSF).

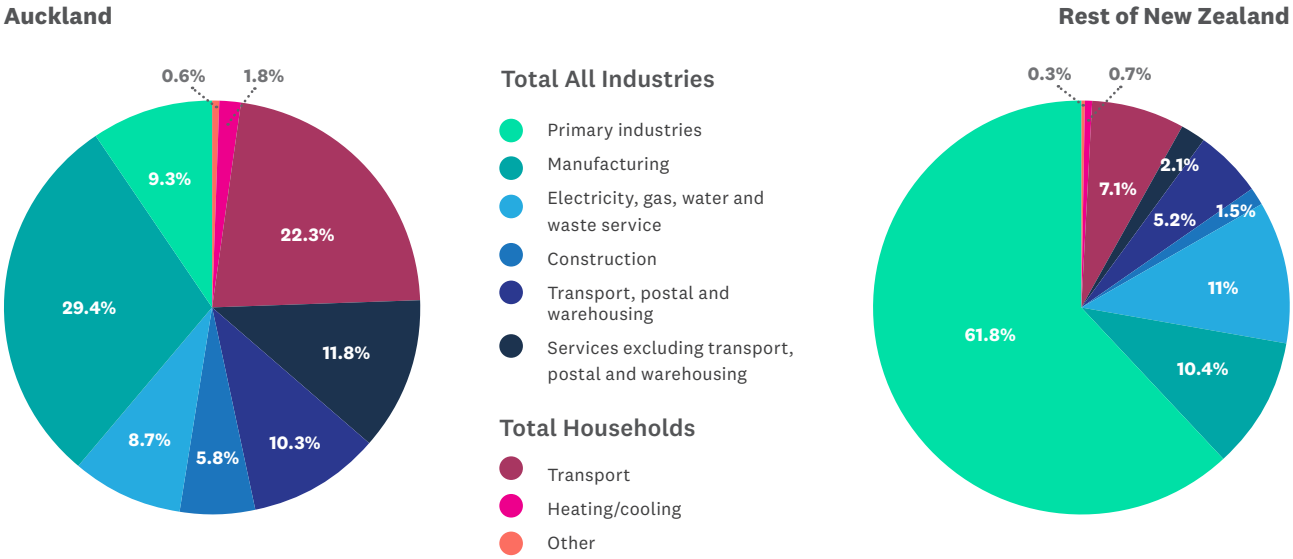
Comparing Tāmaki Makaurau Auckland to the rest of Aotearoa New Zealand

Cities around the world are responsible for the largest percentage of carbon dioxide emissions, due to the sheer number of people who live in them and the industries that operate within them. Tāmaki Makaurau Auckland is no exception, with an emissions profile that differs to that of the rest of Aotearoa New Zealand.

Auckland is the country's business centre and most populated region. It generates 38 per cent of New Zealand's GDP, which is derived from sectors ranging from technology and health to construction and manufacturing.

Auckland's 2021 emissions (outlined in Figure 1) primarily came from manufacturing (29.4 per cent), household consumption (24.7 per cent), services (11.8 per cent), and transport, postal and warehousing (10.3 per cent), while for the rest of New Zealand, 61.8 per cent came from primary industries.[15]

Figure 1: Proportion of greenhouse gas emissions by industry and households (2021)



While primary industries are the main emitter across the rest of New Zealand, Auckland's emissions are generated by a wider range of industries. This presents a different set of challenges, as does the higher proportion of household emissions.

For example, transport emissions represent a total of 32.6 per cent of Auckland's 2021 emissions when factoring in households. To make significant reductions to transport emissions, transformational systems change is required to provide a low-emissions, affordable transport system that supports behavioural change at scale. As an increasingly urbanised, sprawling economic hub with a growing population, navigating this change is complex.

[15] Stats NZ, Greenhouse gas emissions by region (industry and household): Year ended 2021.

Assessing the impact on Tāmaki Makaurau Auckland

Tāmaki Makaurau Auckland's unique economic profile means our region will feel the impact of meeting our climate targets in different ways to the rest of the country.

Tātaki Auckland Unlimited, the region's economic and cultural agency, engaged independent consultancy and research provider Market Economics (ME), to assess the economic consequences for Tāmaki Makaurau under the proposed pathways considered in *Ināia tonu nei*. To do so, this research[16] adapted the C-PLAN model used in *Ināia tonu nei*.

To highlight the implications for Auckland compared to the rest of New Zealand, the model maps the transitions under the two scenarios outlined by the CCC, then reports the region's net impacts of change for key economic indicators annually over a 30-year period. These indicators included industry output, GDP and employment.

###Ināia tonu nei – two scenarios

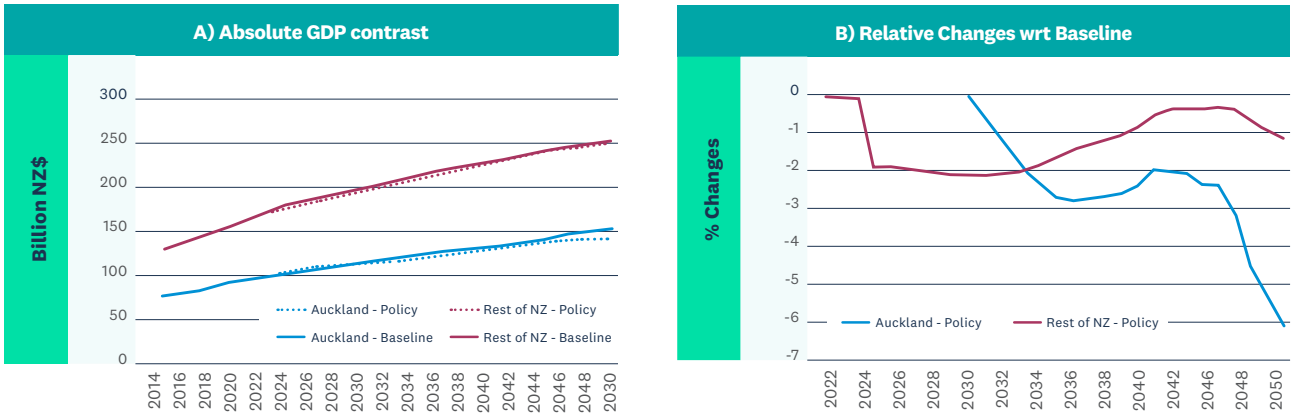
1. Baseline scenario: considers current climate policies such as the New Zealand Emissions Trading Scheme (NZ ETS), uptake of electric vehicles, and projected industry growth trends.
2. Policy scenario: builds on the baseline scenario, and considers emerging advanced technologies (e.g., methane inhibitors, renewable energy generation) and decreasing NZ ETS GHG caps that align with the targets set out for 2050 in the Zero Carbon Act 2019.

Assumptions in the policy scenario were modified to provide an Auckland-specific lens that considers the decarbonisation pathway informing Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan.

[16] Monge, McDonald and Cardwell, The economic implications of national climate change mitigation strategies on the Auckland region.

As shown in Figure 2, GDP trends under the 'policy' scenario through to 2050 for Auckland and the rest of New Zealand are lower than they would be under the 'baseline' scenario. The effects are initially felt more strongly in the rest of New Zealand, with a lag for Auckland.

Figure 2: Absolute and relative contrast of regional GDP for the Auckland region and the rest of New Zealand under the baseline and policy scenarios from *Ināia tonu nei*.



Under the policy scenario, GDP drops over time and in 2050, Auckland could see an approximate six per cent reduction in GDP, compared with what would be generated under the baseline scenario. The rest of New Zealand is modelled as reaching just over a one per cent reduction in 2050.

Auckland's lag in impact can be explained by the region's different sectoral make-up, as compared to the rest of New Zealand.

Auckland has a larger services base and concentration of valued-added manufacturers. For example, the region is home to most of the services (including head offices) that support primary and manufacturing services located elsewhere in New Zealand.

The region's manufacturing sector also processes primary sector goods from other regions before export. Therefore, some of the lag can be explained through the economic interdependencies that exist between Auckland and the rest of New Zealand.

Read *The economic implications of national climate change mitigation strategies on the Auckland region*

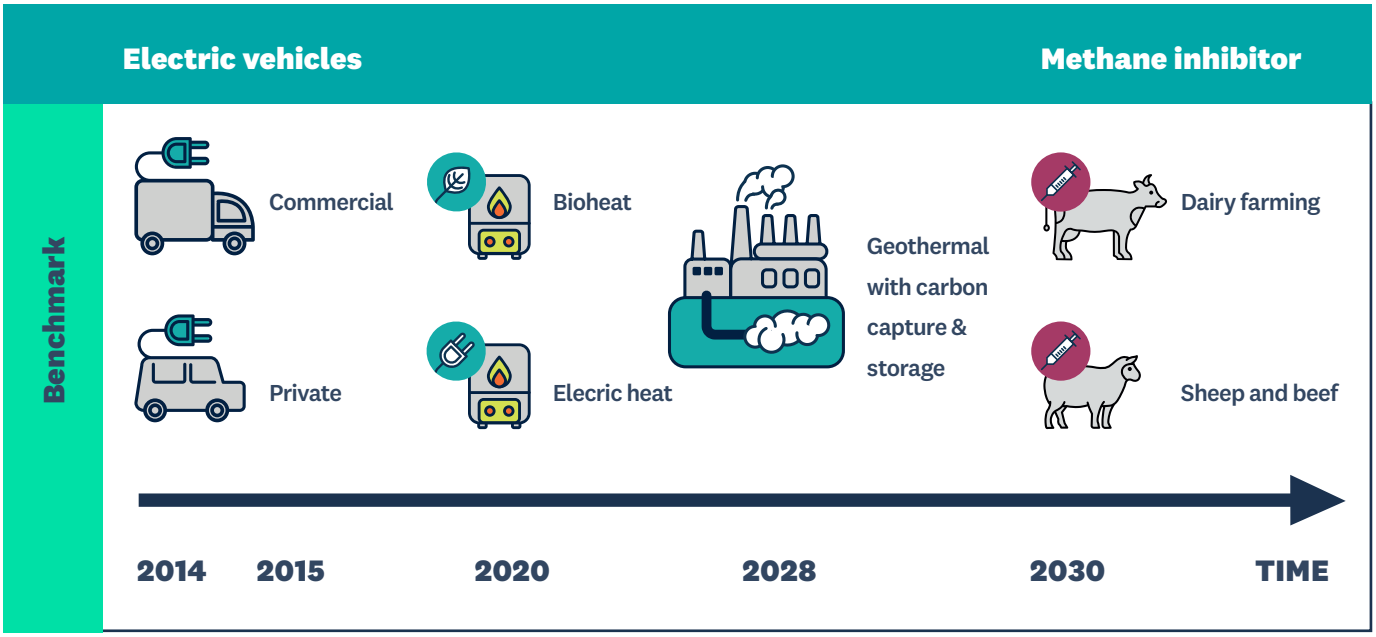
Changes in employment – new green jobs

In the second phase of research[17], Market Economics extended its analysis of CCC modelling to look at how the introduction of emissions reduction technology alternatives to high emitting processes could change employment in Auckland. The technology inputs are considered conservative and likely to occur before 2035.

The technology in the policy scenario[18] includes:

- replacing internal combustion engine (ICE) vehicles with electric vehicles (EVs)
- the adoption of methane inhibiting technology in the primary industries for dairy, sheep and beef farming
- the uptake of renewable and cleaner energy alternatives such as wind, solar, hydro and geothermal with carbon capture storage (CCS) to replace coal, gas and conventional geothermal and fossil-fuel electricity.

Figure 3: Low-emission technologies included in the modelled emission reduction pathways for Auckland region from when they are available to implement.

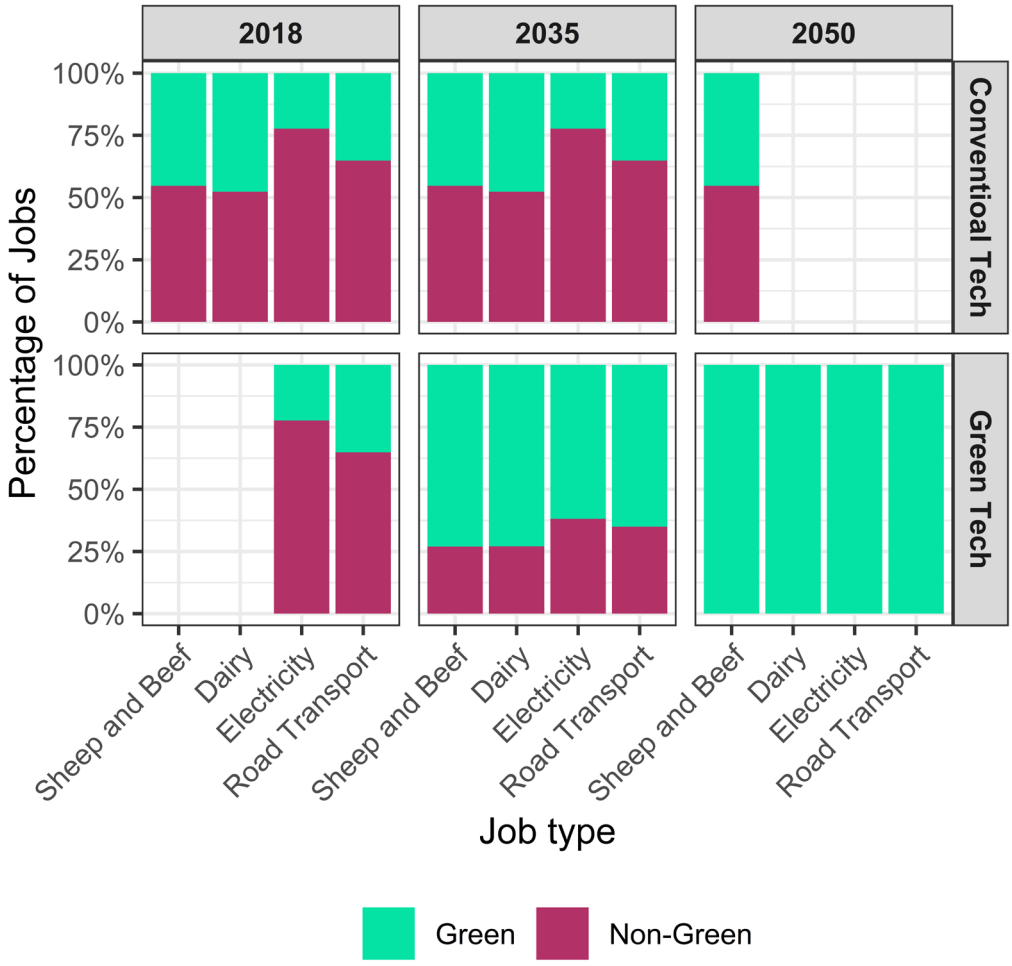


The modelling looks at how sectors may change as a result of these technologies, and what this could mean for employment numbers in new 'green jobs'.

Green jobs in this research are those that cannot be performed without extensive knowledge of green skills, with green skills as those that enable the environmental sustainability of economic activities.[19] These jobs are considered as being impacted by 'greening' which could involve the increased demand of certain occupations by green sectors, changes in worker requirements, and the creation of new occupations.[20] Non-green jobs are those likely to stay non-green if employed in a sector without green technology up to 2050.

[17] Monge et al., Tāmaki Makaurau Auckland's Green Employment.
[18] Winchester and White, The Climate PoLicy ANalysis (C-PLAN) Model.
[19] Tāmaki Makaurau: Building the Workforce for Better Jobs, 2023, Ministry of Business, Innovation & Employment.
[20] Bowen et al. as described in Monge et al., Tāmaki Makaurau Auckland's Green Employment.

Figure 4: Relative transition to green employment (in percentages) for different conventional and green technologies used by different sectors in Auckland region.



As shown in Figure 4, the adoption of emissions reduction technologies suggests a full transition to green jobs by 2050 in sheep and beef, dairy, electricity, and road transport. While other sectors in Auckland will likely be affected by the transition to a low carbon, thriving and resilient economy, these broader transitions are not captured in the original model developed by the CCC.

Figure 5 shows this information in absolute terms based on employment estimates to 2050 and the CCC policy scenario. The 'green tech' graphs show how Auckland's transition will be largely felt in the road transport sector, due to the sheer number of jobs and the introduction and uptake of electric vehicles. This equates to more than 26,200 green jobs in road transport in 2050.

As Auckland is a predominantly urban region with lower levels of farming and electricity production, the number of anticipated green jobs in these sectors is lower. For dairy farming, the model estimates just over 1000 green jobs, sheep and beef at 1500, and electricity at 2800.

Figure 5: Absolute transition to green employment (in 10,000 jobs) for different conventional and green technologies used by different sectors in Auckland region.

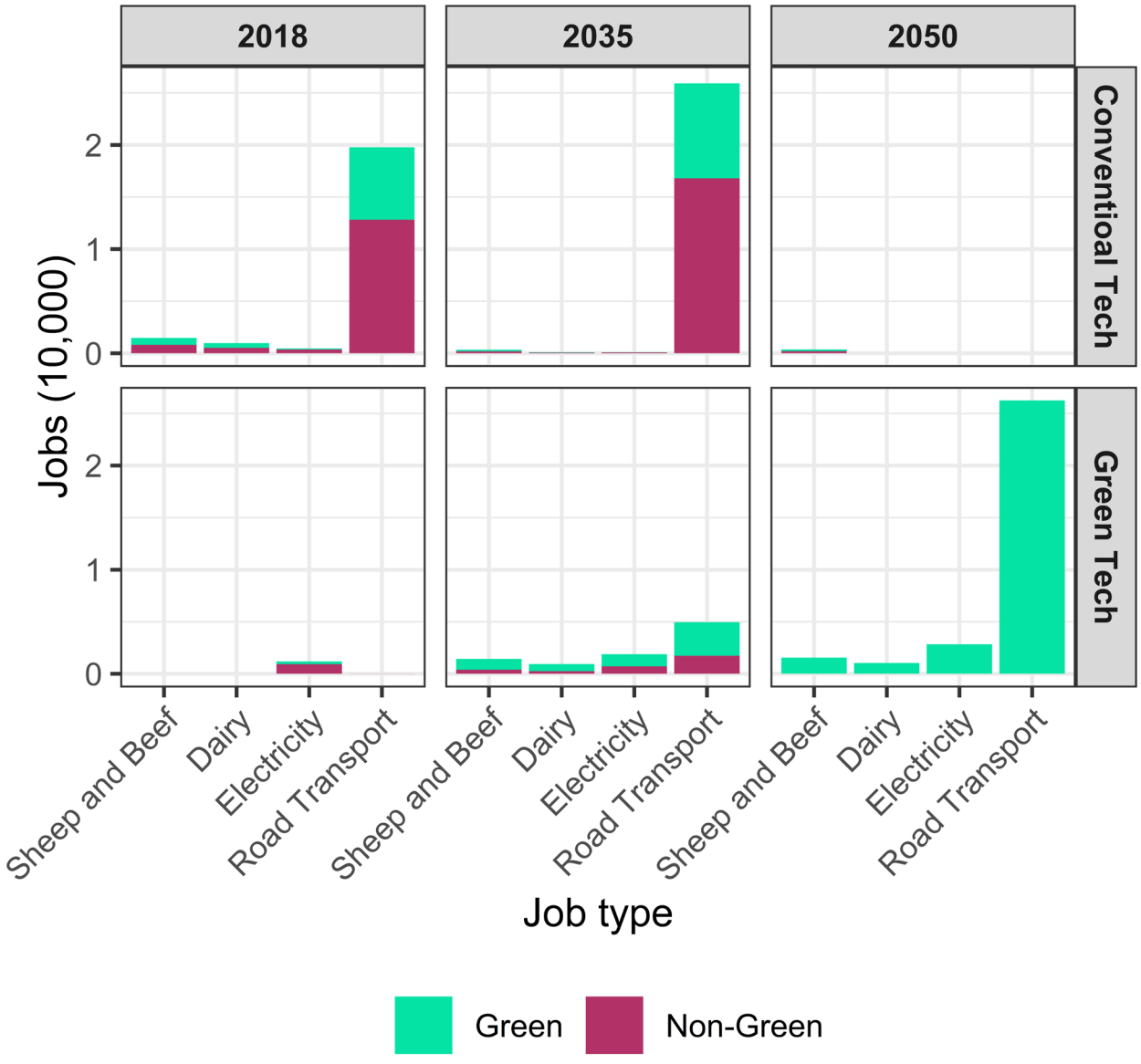


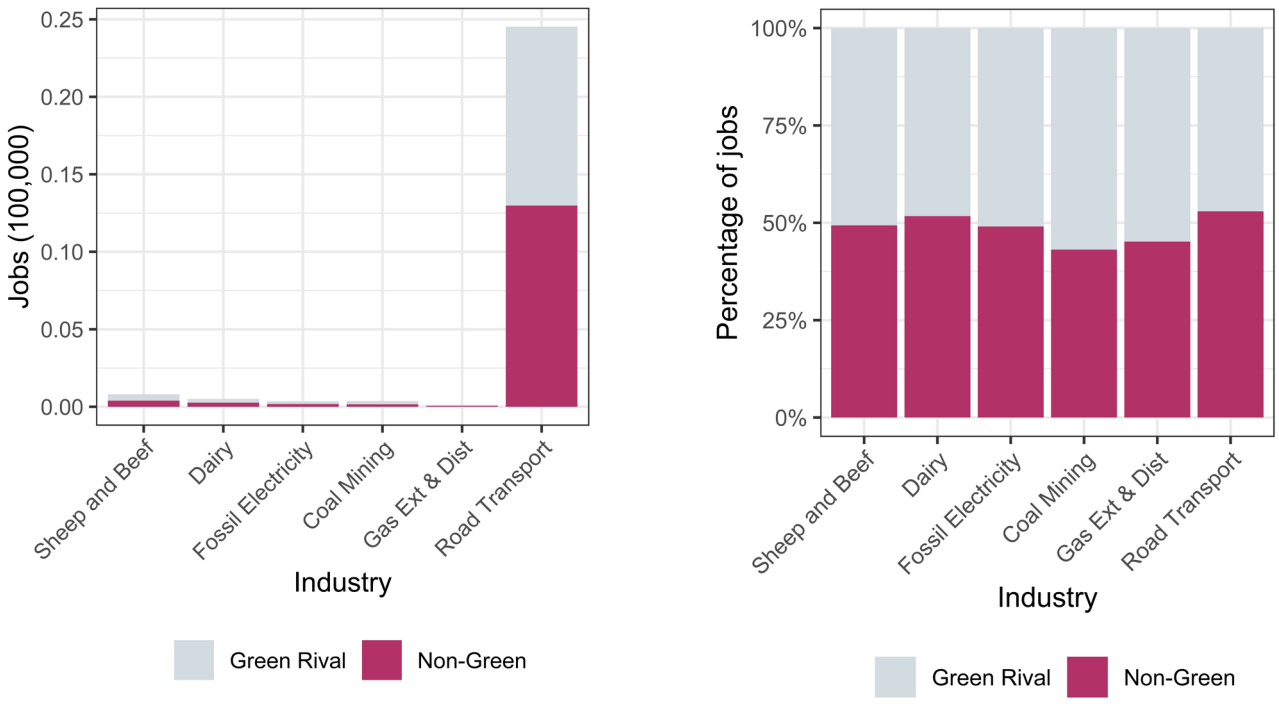
Figure 5 also shows a reduction of employment numbers over time in sectors that keep using conventional technologies. However, the introduction of green technologies shows how a gradual transition will likely take place as more green jobs supersede those in emissions-intensive sectors, such as 'sunset sectors'.

Sunset sectors are those that will either be phased out or will need to make significant changes to transition to low carbon. These sectors are split in the model into non-green, i.e., those that cannot currently be transitioned, and 'green rival', which are non-green jobs that are close in tasks and skills to some green jobs and could make a shift into a closely related green job by 2035.

Figure 6 shows an approximate 50 per cent split between green-rival and non-green jobs in sunset sectors. This means two different approaches are required to support workers to transition. For green-rival jobs, the workforce would need to know what components of their current roles are already transferable to green jobs in non-sunset sectors. For non-green jobs, the workforce would require training pathways to support a shift into green jobs that require new tasks and skills, over the medium-to-long term – by 2050.

Although these estimates are only one part of a larger picture, this information could be used to inform local just transition plans that ensure employment pathways into green jobs from sectors affected by the transition to low carbon.

Figure 6: Absolute and relative split of Auckland's non-green categories by sunset sector (following the CGE sectors) based on O*NET's green occupations and the 2018 New Zealand Census of Population and Dwellings.



Read *Tāmaki Makaurau Auckland's green employment.*

Tāmaki Makaurau Auckland's Turning Point.

The research by Market Economics clearly demonstrates the need for regional action in addressing the transition to low carbon. This is important when considering the implications of climate change on Tāmaki Makaurau Auckland's economic future.

In addition to Market Economics research, Tātaki Auckland Unlimited and Climate Connect Aotearoa commissioned professional services firm Deloitte to develop *Tāmaki Makaurau Auckland's turning point: the cost of climate inaction vs decisive action*,[21] taking a regional lens to its previous work modelling *Aotearoa New Zealand's Turning Point*.[22] This research adds to the broader base of knowledge about the impacts of climate change on our region, including the implications of global action and physical risks, such as flooding, sea level rise and heat.

The economic modelling in *Tāmaki Makaurau Auckland's turning point* shows how decisive climate action could deliver $22 billion of additional economic gain to the economy by 2050 if warming is limited to 1.5ºC (more than a third of the nationally identified potential gain at $64 billion). Furthermore, 19,000 jobs could be generated in the region by 2050 through decisive climate action in addition to the significant value of existing jobs that transition to green. As a result, Tāmaki Makaurau Auckland's turning point – where the economic benefits outweigh the upfront costs to take climate action – would occur in 2037.

In common with Market Economics research, these findings demonstrate the need for a regional lens on national climate policies and plans that have regional impacts. Both reports demonstrate that an appropriately sized and skilled workforce will be essential to meet emissions reduction targets, requiring fair and equitable employment pathways for those most impacted.

Furthermore, climate change mitigation and adaptation are primarily seen as a cost within the context of GDP. If dealt with decisively, mitigation and adaptation can instead deliver environmental, social and economic benefits, making it a positive driver of wellbeing beyond GDP alone.

Read *Tāmaki Makaurau Auckland's Turning Point.*

[21] Deloitte, Tāmaki Makaurau Auckland's Turning Point.
[22] Deloitte, Aotearoa New Zealand's Turning Point.

Where to from here?

The findings highlighted in this paper are an important starting point for identifying how national climate change policy and emissions reduction targets may impact Tāmaki Makaurau Auckland's economy and employment. This type of analysis should be ongoing as the New Zealand Climate Change Commission monitors progress and updates its advice to central government.

While national policies and green technology are important levers of change in this economic modelling, Auckland should not wait on national policy implementation before it acts. The region must start preparing its workforce for change through skills development in the sectors required to drive transition.

IMPLEMENTING TE TĀRUKE-Ā-TĀWHIRI: AUCKLAND'S CLIMATE PLAN

Collaborative implementation of *Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan* will be central for Auckland to reduce emissions and adapt to climate change in a way that is place-based and equitable.

Tātaki Auckland Unlimited will continue its leadership on the plan's economy priority actions –

Action E4: *Ensure Aucklanders are prepared for the transition to a zero-carbon economy and* ***Action E1:*** *Accelerate Auckland's transformation to a resilient, regenerative, and distributive economy.*

This includes:

- Working with central government agencies such as the Ministry of Business, Innovation and Employment (MBIE) to support Tāmaki Makaurau Auckland's workforce to transition to low carbon. This includes collaborating with the Regional Skills Leadership Group to utilise Tātaki Auckland Unlimited's evidence base.
- Seeking further opportunities to advocate for central government to support an equitable place-based just transition to low carbon.
- Collaborating with business, community, academia and Māori to develop transition plans to ensure the move to low carbon provides equitable opportunities. This includes incorporating opportunities for employment in green, circular and regenerative jobs.

Action E2: *Accelerate the uptake of innovation that supports the delivery of a resilient, climate proof and regenerative economy.*

This includes:

- Continuing the development of Climate Connect Aotearoa to map the growing climate innovation ecosystem, deliver on challenge areas, develop a Māori-led programme, and building the capacity and capability of businesses and organisations to take climate action.

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