



Tāmaki Makaurau  
Auckland's Turning Point  
The Cost of Climate Inaction vs Decisive Action

25 July 2023



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# 1. Executive summary



# Executive summary

Taking decisive action can pay off substantially. The Auckland region can reach its turning point in 2037 – the time when the costs are outweighed by the benefits.

The Auckland region is New Zealand's economic, cultural and population hub. It is the heart of New Zealand's largest metropolitan area, both by population and landmass. It is home to a diverse population, and is the Polynesian capital of the world.

The Auckland region acts as an innovation hub and is the economic centre of New Zealand, generating 38% of the nation's GDP.<sup>1</sup> The economic makeup of the region differs from the rest of the country, with the services sector a key contributor to its economic activity, along with wholesale and retail trade.<sup>2</sup>

The Auckland region has a unique emissions profile and has taken steps to accelerate emission reductions. Its metropolitan nature and differing economic makeup means the region's emissions profile is distinct to the rest of New Zealand. The Auckland region has a more 'city-like' emissions profile and accounts for 12.4% of all of New Zealand's emissions,<sup>3</sup> with transportation and manufacturing significant contributors. This is in contrast to the rest of New Zealand, where the emissions from the primary sector play a larger role.

As a region, Auckland has taken steps to accelerate emissions reductions, such as formulating and adopting Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan and the Transport Emissions Reduction Pathway.

The region is already experiencing the impact of climate change. Extreme rainfall is projected to increase, as is drought, due to changing rainfall patterns and temperature increases. As one of the top 10 cities in the world to live in, the Auckland region has a reputation to protect and enhance and ensure it is resilient to a changing climate.

Against this backdrop, Tātaki Auckland Unlimited (TAU) is interested in exploring the costs and benefits of inadequate and decisive action on climate change.

This report focuses on the GDP and workforce impacts of two scenarios; inadequate and decisive action on climate change. GDP and workforce impacts are some measures of the wide range of potential impacts of climate change can have. Inadequate or decisive action on climate change will have a variety of impacts across different dimensions of wellbeing, ranging from effects on New Zealand's natural environment to New Zealanders' individual subjective wellbeing and safety. These impacts are beyond the scope of this report and are not captured by the GDP and employment impacts presented.

This report finds inadequate action on climate change could cost the Auckland region. If there is inadequate action and the planet warms by 3°C by the end of the century, the Auckland region's economy could lose \$0.8 billion of GDP by 2050, compared to projections that do not take into account the effects of climate change. These losses get exponentially worse as time passes, but should still be considered conservative, as they do not take into account the full range of potential impacts from rising temperatures.

Auckland and New Zealand can't do it alone. The rest of the world also needs to take action to limit warming. If this happens, and temperature increases are limited to 1.5°C by the end of the century, \$22 billion could be delivered to the region's economy (equivalent to 16% of Auckland's GDP in 2022),<sup>4</sup> along with over 19,000 additional jobs, compared to a scenario of inadequate action. Decisive action on climate change could be an investment towards future benefits and prosperity.

There are considerations to take into account when making decisions regarding climate change. A systems focus is needed for the Auckland region to build on and accelerate the pace of change. A multi-faceted and systemic approach to decisions is needed; one that respects and acknowledges likely transition impacts on Māori and Pacific People, sees infrastructure investment as enabling behaviour change and focuses on people. The right regulations, incentives and policy certainty are also crucial to enable the pace of change and to unlock benefits.

Decisive climate action could deliver **\$22 billion** to the Auckland region's economy by 2050

Climate inaction could cost the Auckland region's economy **\$0.8 billion** by 2050

Auckland's turning point occurs in **2037**

## 2. Introduction and scope



# Introduction

The impacts of climate change are increasingly being felt across the globe. Decisions taken now are likely to significantly determine the wellbeing and prosperity of future generations. Within this context, this report provides an economic assessment of inadequate and decisive action on climate change for the Auckland region.

## Overview

- TAU is Tāmaki Makaurau Auckland’s economic and cultural agency committed to making the Auckland region a desirable place to live, work, visit, invest and do business. TAU is a thought leader for the region and provides advice on the challenges of climate change.
- Climate change impacts are being felt by New Zealanders in their daily lives. Recent events, such as the Auckland Anniversary floods and Cyclone Gabrielle, are bringing into sharp focus the potential damaging impacts of a changing climate. The time to act on climate change and limit its worst impacts is widely acknowledged to be rapidly closing. Decisions taken now will have a significant influence on the wellbeing and prosperity of future generations.
- This report seeks to add to the discourse by looking at potential impacts and costs of climate change, and the benefits of addressing those impacts. This report explicitly incorporates the physical risks of climate change and provides a pragmatic view on the magnitude of potential impacts of different decisions. It demonstrates that while there is initially an upfront cost of addressing climate change, there is a ‘turning point’ beyond which the benefits of action outweigh the costs of inaction.
- This report focuses on the Auckland region, addressing the implications of different decisions regarding climate change for the region. In particular, this report explicitly models the Auckland region, in addition to the rest of New Zealand, and takes a look at Auckland unique role, its distinct sectoral makeup, and the choices in front of it to continue to be a vibrant and sustainable place to live in into the future.

## Purpose of this report

- TAU has engaged Deloitte to assess the economic impact of climate action and inaction in the Auckland region. In particular, TAU seeks:
  - An economic impact analysis of two scenarios, as changes in GDP and employment with respect to Auckland and the rest of New Zealand.
  - A report summarising the methodology and results.

## Structure of this report

- This report is structured in the following way:

### Part one – Overview

- Auckland’s unique position
- Economics for a new climate

### Part two – Economic impact

- Inadequate action scenario
- Decisive action scenario

### Part three – Insights for Auckland

- What this means for Auckland

### Attachments to this report

- Appendix A contains the references used in this report.
- Appendix B sets out restrictions in relation to the use of this report.

- This report is also accompanied by a detailed technical appendix setting out the modelling methodology in greater detail.

### 3. Auckland's unique position



# Auckland's unique position

Auckland's climate is changing, and these changes will continue, leading to a range of negative outcomes. Recent severe weather events have brought to life the potential impacts of a changing climate for the region.

## Climate change will negatively impact the Auckland region

Average temperatures in the Auckland region have already risen from 15.2°C in 1972 to 15.8°C in 2023. Under a mid-range scenario of greenhouse gas emissions (RCP 4.5), modelling from NIWA projects average temperatures to hit 16.2°C in Auckland by 2050.<sup>5</sup>

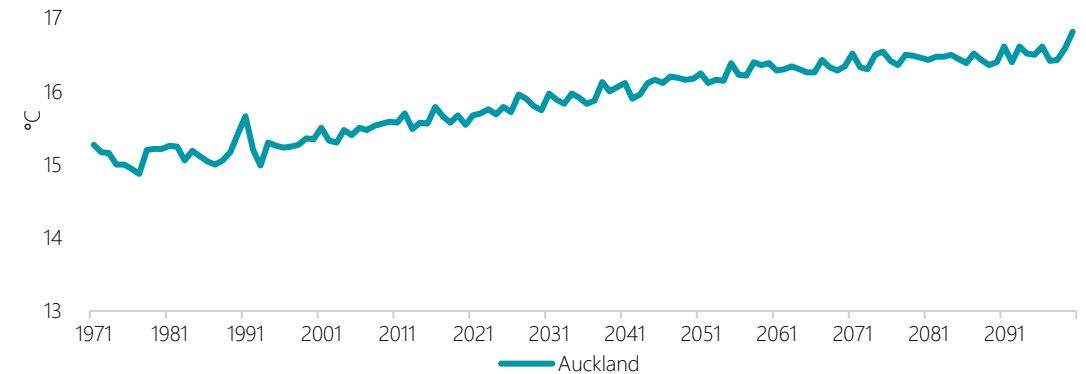
The impacts of an RCP 4.5 scenario are projected to be significant and affect the entire Auckland region. Extreme rainfall is projected to increase, as a warmer atmosphere is able to hold more moisture. Drought is also expected to become more common and severe due to changing rainfall patterns and temperature increases. Changes in rainfall and temperatures are likely to result in drier soils and changes to river flows, impacting different sectors in the region as well as leading to an increase in the occurrence of landslips. Changes in air quality in response to climate change are also likely to impact the health of Aucklanders.<sup>6</sup>

## Recent severe weather events have highlighted the potential magnitude of the impact of climate change

Insured losses from weather events cost private insurers \$300m in 2022, setting a new record. The Auckland Anniversary floods insurance losses provisionally exceed \$1b, over three times the total for 2022. While there is debate as to the extent that climate change contributed to this event, it has served to emphasise the potential magnitude of losses the Auckland region may face should the climate continue to change as it has.

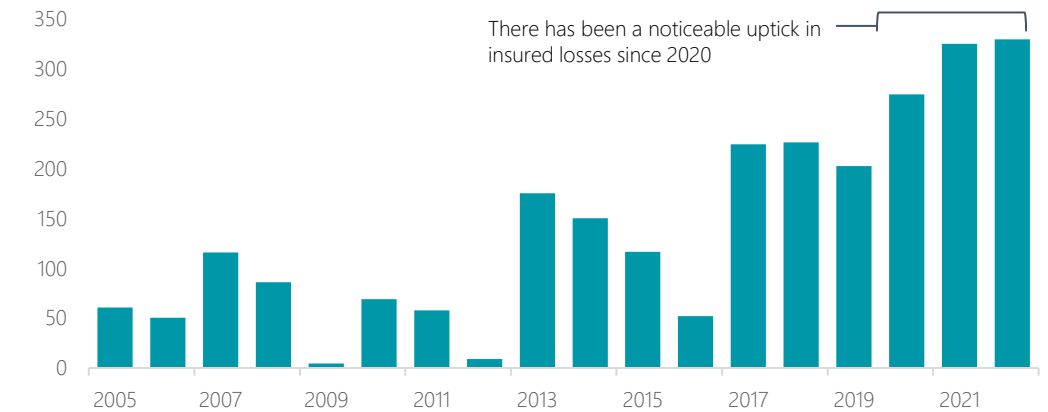
## Auckland's projected rising temperatures

Six-model-average, RCP4.5



Source: NIWA

## Annual insured losses from weather events (\$m), 2005 to 2022



Source: Insurance Council of New Zealand

## Auckland Anniversary flooding provisional insured losses

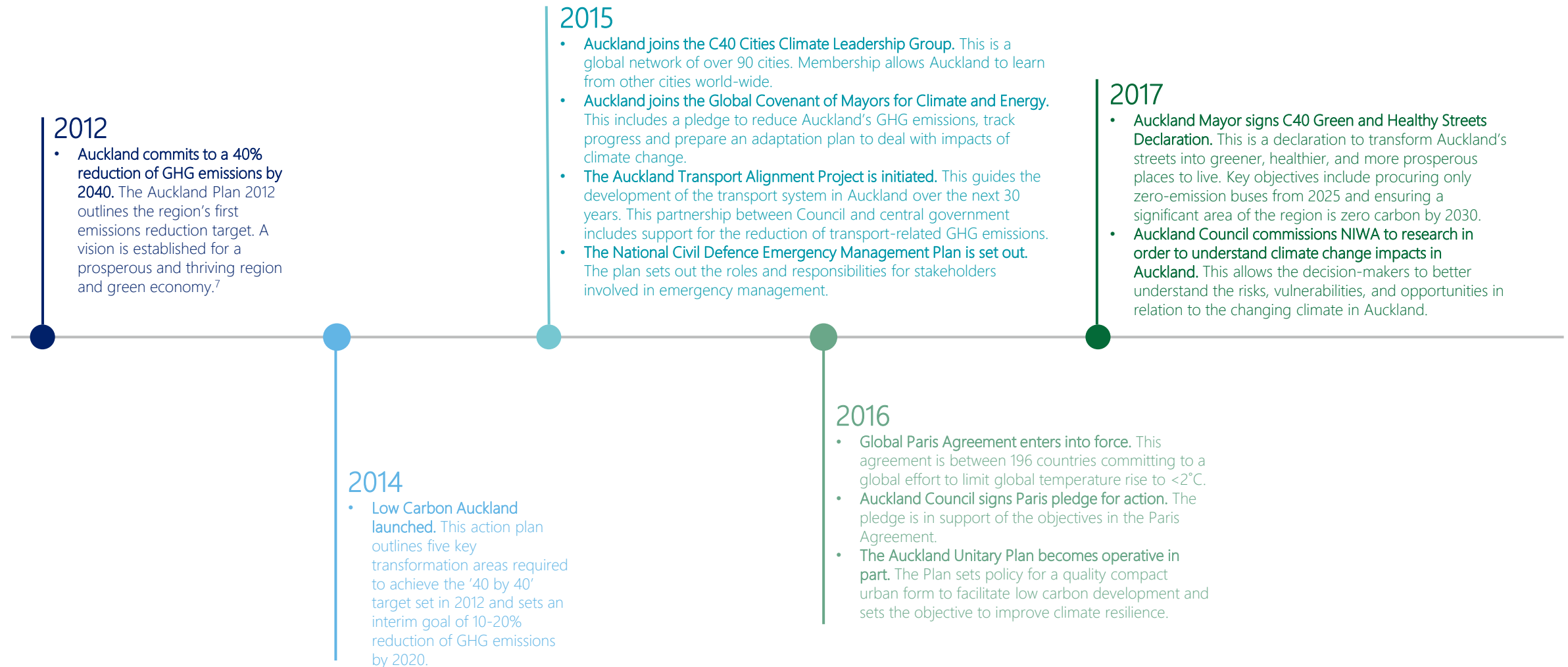
Insurance category	# of claims	Value of claims (\$m)
Home & Contents	36,200	\$565
Commercial	2,900	\$321
Motor	7,500	\$109
Other	300	\$7
Total	46,900	\$1,003

Source: Insurance Council of New Zealand as at 6<sup>th</sup> March 2023 (latest claims update available)



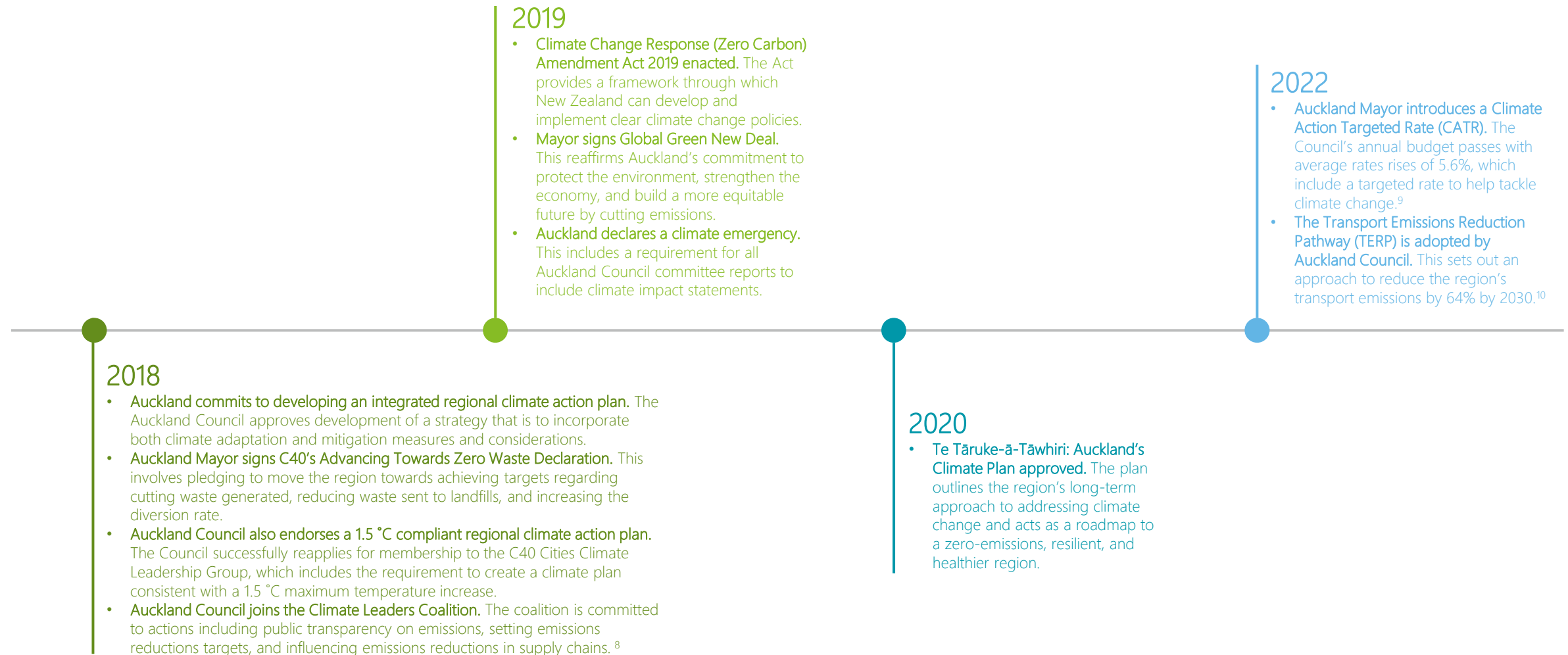
## Auckland's unique position

For the past decade, the region has been on a journey to reduce emissions and help Aucklanders think about the changes needed to minimise the impacts of climate change.




## Auckland's unique position

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# Auckland's unique position

Auckland is New Zealand's economic, cultural and population hub. Unlike other parts of the country, the primary sector plays a relatively smaller role in the region.




### New Zealand's biggest metropolitan area

Auckland is the largest metropolitan area in the country, both by population and landmass. With a population of around 1.7 million people, the region has over four times the population of the next largest, Wellington, and is expected to rise to around 2 million by around 2040. Overall, about a third of the total population of New Zealand lives in the region, with the proportion projected to increase to 35% by 2048 (under the medium projection).<sup>11</sup>



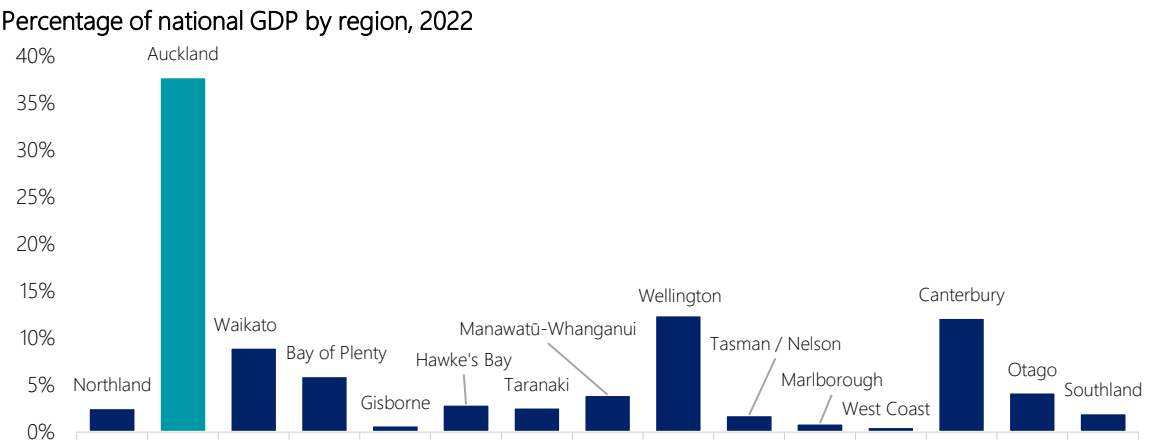
### Cultural diversity

Auckland is home to people from a variety of different ethnic backgrounds, and is New Zealand's most diverse region, with 41.6% of the population being born overseas. A majority of residents are of European descent, but there are also large communities of residents who identify as belonging to Asian, Pacific, or Māori ethnic groups.<sup>12</sup> The region expects the cultural and ethnic diversity to continue to increase as the population grows.<sup>13</sup>

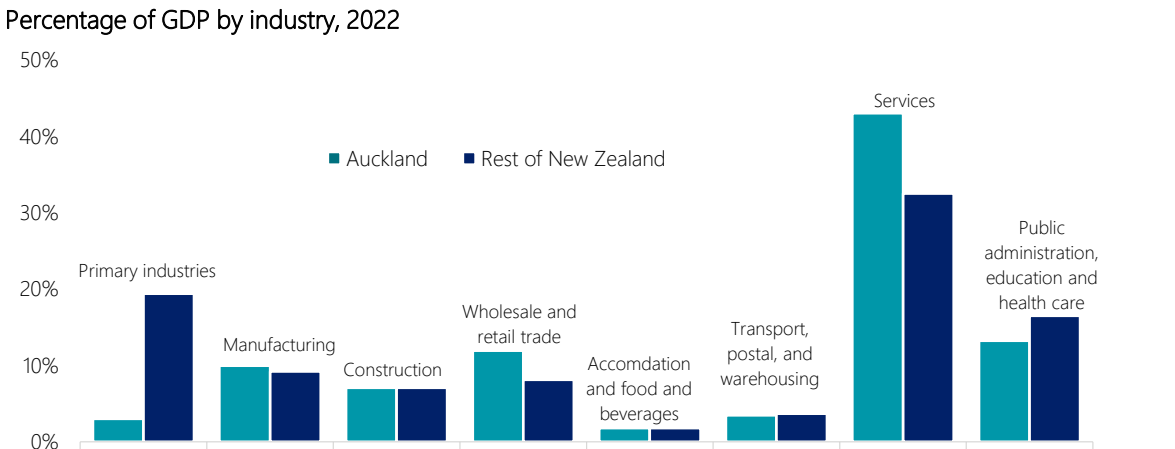


### A services, manufacturing and trade hub

The region acts as an innovation hub and the economic centre of New Zealand, generating 38% of the nation's GDP.<sup>14</sup> Auckland's economic makeup differs to the rest of the country, with services, wholesale and retail trade and manufacturing being key contributors to the region's economic activity. Auckland also plays a critical role in the tourism and travel industry, being home to the nation's largest international airport, and serving as the first port of call for the majority of overseas tourists. The airport not only supports Auckland with travel and tourism, but also with trade, as does the Ports of Auckland. The port is the second-largest port in the country by container throughput and the largest by value of imports.<sup>15</sup> In contrast to the rest of New Zealand, the primary sector plays a relatively smaller role for the region.



Source: Statistics New Zealand; Deloitte Access Economics



Source: Statistics New Zealand; Deloitte Access Economics. Excludes GST on production, import duties and other taxes.

# Auckland's unique position

Auckland has a unique emissions profile, reflecting the differing makeup of its economy. Auckland faces its own set of challenges to achieve emission reduction targets.

## Auckland's unique emissions profile

As a major urban centre, Auckland significantly contributes to country's overall carbon footprint. Auckland is New Zealand's third-highest GHG emitter by region and in 2019 accounted for 13.3% of all of New Zealand's gross emissions.<sup>16</sup> While the region has achieved emissions reductions, it has a distinct and more 'city-like' emissions profile when compared to the rest of the country, which presents specific challenges. Auckland's 'city-like' profile supports the decision to join the C40 Cities Climate Leadership Group, and to collaborate with and learn from 96 of the world's leading cities to confront climate change.<sup>17</sup>

The top emitting sectors in Auckland are:



### Transportation

This includes private and commercial transport via road, rail, water, and air and accounts for 34.1% of all of Auckland's emissions. The majority of GHG emissions for transportation (22.3%) in Auckland can be attributed to household transportation, in the form of cars and light vehicles.



### Manufacturing

The manufacturing sector accounts for 29.4% of all Auckland's GHG emissions. This includes energy use in the sector but also non-energy related GHG emissions from industrial processes. Currently in Auckland, steel production is the largest emitter of GHGs.<sup>18</sup>

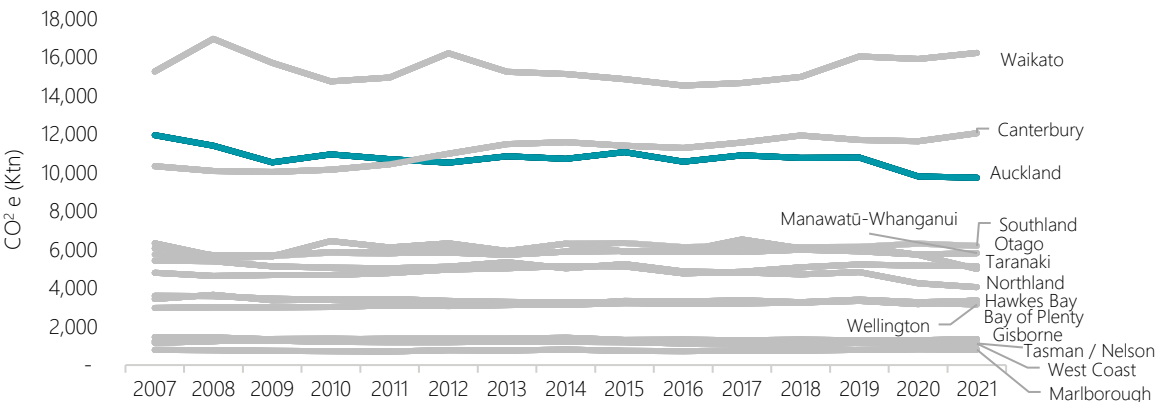


### Services

Owing to Auckland's role as a services hub, the sector also contributes significantly to GHG emissions, accounting for 10.3% of the total. GHG emissions come from energy use in buildings, including electricity and natural gas.

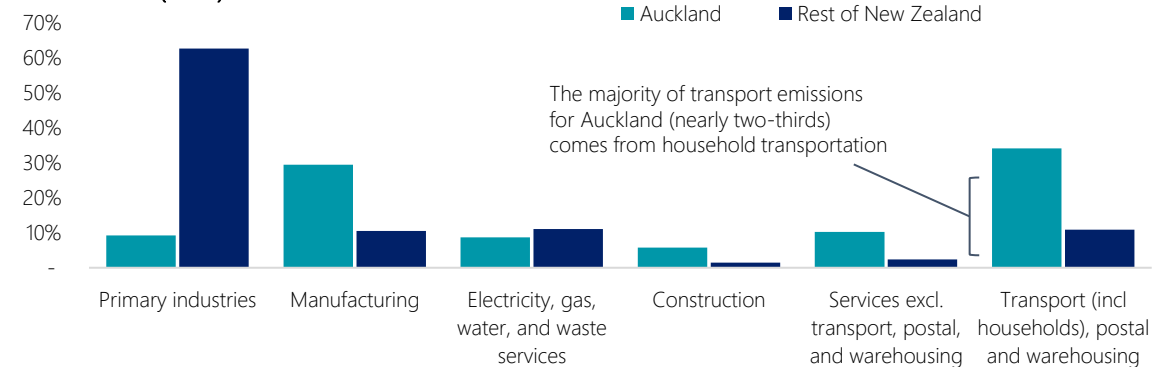
In contrast, as a country, over 50% of New Zealand's total GHG emissions come from the primary industries, the majority of which come from biogenic methane in agriculture.<sup>19</sup> Agriculture is a relatively small sector in Auckland due to a variety of factors, including urbanisation, geographic limitations, and Auckland's role as a services hub for the country.

Gross GHG emissions by region, 2007 to 2021



Source: Statistics New Zealand; Deloitte Access Economics

Proportion of GHG emissions by industry and households for Auckland and Rest of New Zealand (2021)



Source: Statistics New Zealand; Deloitte Access Economics. This excludes household heating, cooling and other household emissions.

## 4. Economics for a new climate



# Economics for a new climate

## The economic modelling accounts for the effects of climate change.



### Accounting for climate change in our modelling

Many economic projections don't account for climate change and the costs on the economy. Economies – the world's, New Zealand's, and Auckland's – cannot continue to grow completely unaffected by the negative economic impacts of climate change. Therefore the costs of climate change should be reflected in how decision-makers evaluate their choices.

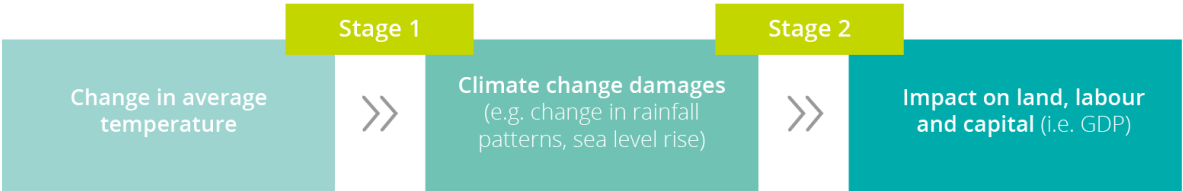
The modelling explicitly factors in the economic costs of climate change and the impact of rising global temperatures. To align with Auckland's Net Zero targets and the long-term nature of climate change, the modelled period goes to the year 2050.

Many uncertainties come with modelling over a long time-period and, as such, the results in this report should be viewed as an *economic scenario analysis*, rather than as a forecast. This means the modelling is designed to answer "What if?" and prompt debate and discussion for decision-makers and key stakeholders in Auckland's Net Zero journey.

### Damage function overview

A key feature of both the 'inadequate' and 'decisive' action scenarios are climate damages. Climate damages acknowledge that rising temperatures induce climate change, impacting economic output by physical damages that affect productivity and / or the stock of production factors.

Two-stage economic damages relationship:



The D.Climate framework is built on an economic modelling framework that accounts for the economic impacts of climate change and follows the below methodology:

Model	DAE - RGEM	MAGICC**	Damage functions	D. Climate
Output	Economic growth and emissions pathway	Temperature pathway	Economic impacts to factors	Damaged growth path
Example	Aligned with SSP2 – 4.5	3° warming at 2100	Reduced labour productivity	GDP 5% lower at 2050
	With 'inadequate action' economic growth produces more greenhouse gas emissions globally.	Increased emissions result in a change in average temperature for different regions.	Average temperature change causes the climate to change. This results in physical damages to the environment and world around us.	Climate change damage impacts how land is used, how people work and how money is spent in the economy. This negatively impacts economic growth.

\* Deloitte Access Economics Regional General Equilibrium Model  
\*\* Model for the Assessment of Greenhouse Gas Induced Climate Change

# Climate damages

The modelling considers how climate change negatively impacts the economy through the six climate damages below.



## Heat stress

Lost labour productivity from extreme heat 'slows down' workers and reduces their ability to perform tasks.

This analysis estimates the effect of rising temperatures and changing relative humidity levels on labour productivity using Wet Bulb Globe Temperature (WBGT) as a measure of heat stress. Analysis is conducted at a country level. The impacts of heat stress on labour productivity are estimated for each modelled geography/region at monthly intervals, across each of the three 4-hour intervals assumed to comprise the working day.



## Stalling productivity and investment

Economies suffer as investment goes to repairing existing assets rather than contributing to new, more productive capital.

Estimates for this climate damage use data on global mean surface air temperature (GSAT) relative to the pre-industrial (1750) period from MAGICC and translates it to the percentage of annual capital investment diverted to repair and replace damaged assets due to an associated rise in average temperature in a modelled region.



## Sea level rise causing loss of productive land

Rising sea levels result in loss of productive land, both agricultural and urban, and reduced productivity of low-lying and coastal areas.

Estimated losses in agricultural and urban land area due to sea level rise (i.e., a combination of erosion, inundation, and salt intrusion) along the coastline are estimated using World Bank data describing the extent of low-elevation coastal zones (LECZ) for each modelled geography or region.



## Tourism loss

Loss of tourism and disrupted flow of global currency circulating in economies, impacts business, jobs and livelihoods.

To estimate tourism damages, functions that relate visitor arrivals and departures to average temperature are employed. Forecast average temperatures from MAGICC are used as inputs to these functions to determine a resulting net flow of foreign currency.



## Health and wellbeing

Increased incidence of disease and mortality disrupts living standards and the lives of the working population.

Studies that translate the impact of increased temperatures on extra cases of mortality and morbidity are used and are equated as changes in labour productivity. For temperature changes, emissions produced by the model are translated into global mean surface air temperature (GSAT) relative to the pre-industrial (1750) period based on these emissions trajectories using MAGICC.



## Agricultural loss

Reduced agricultural yields from changing climate patterns.

Research that reports the variation in output per hectare as a function of temperature, precipitation, and CO2 concentration is used for this damage function. Emission projections, MAGICC, and Wet Bulb Globe Temperature data are used to determine the reduction in agricultural yields.

# Climate damages

Real-life examples show how the effects of climate change are already being felt in Auckland.



## Heat stress

### Heat-related illness and productivity loss

While the current risk rating related to heat stress is insignificant across sectors in Auckland, select sectors such as agriculture and construction are expected to feel the effects of heat stress in the long-term. Expected impacts include heat-related illnesses for workers and cattle, and reduced productivity.<sup>20</sup>



## Health and wellbeing

### Heat-related deaths

Extreme heat events and the number of hot days in Auckland are expected to increase, with an extra three months of hot days expected per year by beginning of the next century. This poses a significant risk to the health and wellbeing of the population, especially more vulnerable groups including those over 65 or under 5 years old, ethnic minorities, and low income households.<sup>23</sup>



## Sea level rise causing loss of productive land

### Coastal instability and erosion

Auckland's long coastline is highly exposed and vulnerable to erosion, with many beaches frequently needing to rebuild following storms. Sea level rise is expected to increase the current rate of erosion and the increased frequency of extreme weather events will accelerate the impacts.<sup>21</sup>



## Tourism loss

### Extended warm season

The mean temperature is expected to increase in Auckland, potentially resulting in an extended warm season. This would effect both cold and warm season tourism and leisure activities,<sup>24</sup> possibly leading to both opportunities and disruptions for tourism operators and customers. Auckland may become a more desirable destination to visit as temperatures rise due to the relatively temperate climate.



## Stalling productivity and investment

### Storm damage

Auckland is used to spending money on storm clean up, although weather-related damages appear to be a worsening issue. Prior to the Auckland Anniversary floods, IAG had stated that property damage claims from bad weather in 2022 were up a third on 2021, with Aucklanders suffering the brunt of the damage.<sup>22</sup>



## Agricultural loss

### Droughts and rising food prices

Periods of drought and unusually dry conditions in Auckland have made it a challenging time for those in the agriculture industry. In 2022, growers in Pukekohe said drought conditions proved increasingly challenging to manage and contributed to higher prices for consumers.<sup>25</sup>

## Auckland's extreme weather in 2023

The start of 2023 impacted Aucklanders as several extreme weather events battered the region. Within the first third of the year, Auckland had experienced 90% of its annual rain fall.<sup>26</sup>

Since the Auckland Anniversary weekend flooding, and Cyclone Gabrielle in February, the region has been dealing with a range of issues, including, but not limited to:

- Coastal erosion and landslides
- Contaminated waterways and overwhelmed storm/wastewater systems
- Uninhabitable housing
- Disruption to businesses, due to damage to premises and road and rail infrastructure

Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan noted that as the average temperature increases, so does the probability of more extreme weather events.



# 'Inadequate action'

The 'inadequate' action scenario represents a 3°C world. The population, economic growth and emissions pathways underpinning this scenario are consistent with the SSP2-4.5 scenario.



## Overview

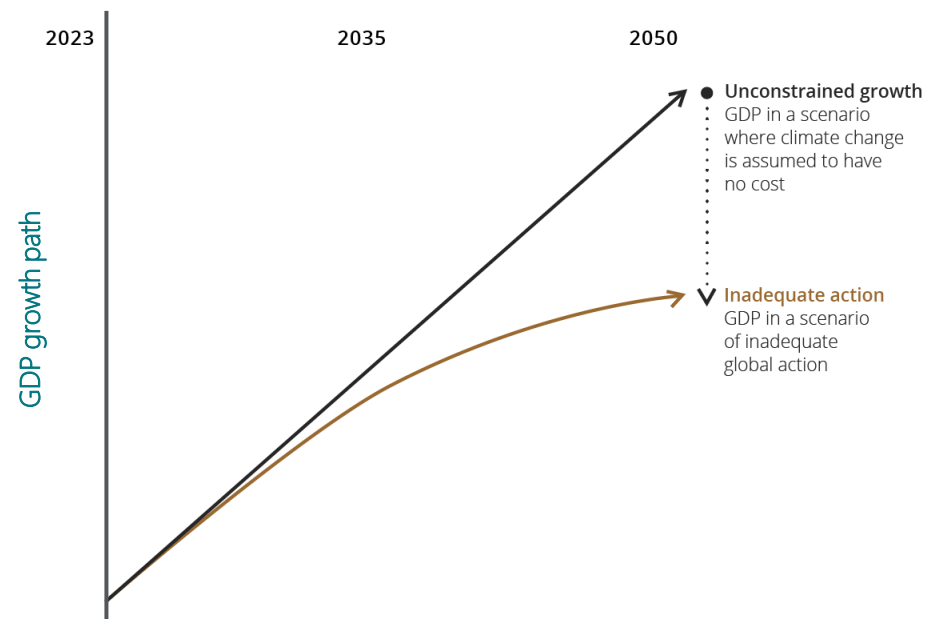
This inadequate action scenario presents a future with a high rate of global green house gas (GHG) emissions. The scenario assumes current technologies and strategies to reduce GHG emissions mean that temperatures increase by 3°C.

## Modelling assumptions

The modelling for this scenario reflects a widely adopted set of emissions, economic and population estimates, referred to as SSP2-4.5:

- The SSP2-4.5 narrative reflects a continuation of current social, economic, and technological trends, as well as slow global progress toward achieving sustainable development goals.
- It assumes socioeconomic trends do not shift markedly from historical patterns and emissions continue to 2100.
- It projects an emissions pathway that plateaus by mid-century and then declining to 2100

The 'inadequate' action scenario is presented as a deviation to a world where the impacts of climate change are assumed to have no cost.



# Decisive action

'Decisive' action is based on SSP1-1.9. This is a pathway to net zero for the world that limits global average warming to 1.5°C compared to pre-industrial levels, in alignment with current Paris Agreement objectives.



## Overview

This scenario presents a future where governments, businesses and citizens in New Zealand *and the rest of the world* take decisive action to limit global warming to as close to 1.5°C above pre-industrial levels as possible and is based on a widely adopted set of emissions, economic and population assumptions, referred to as SSP1-1.9

## Modelling assumptions

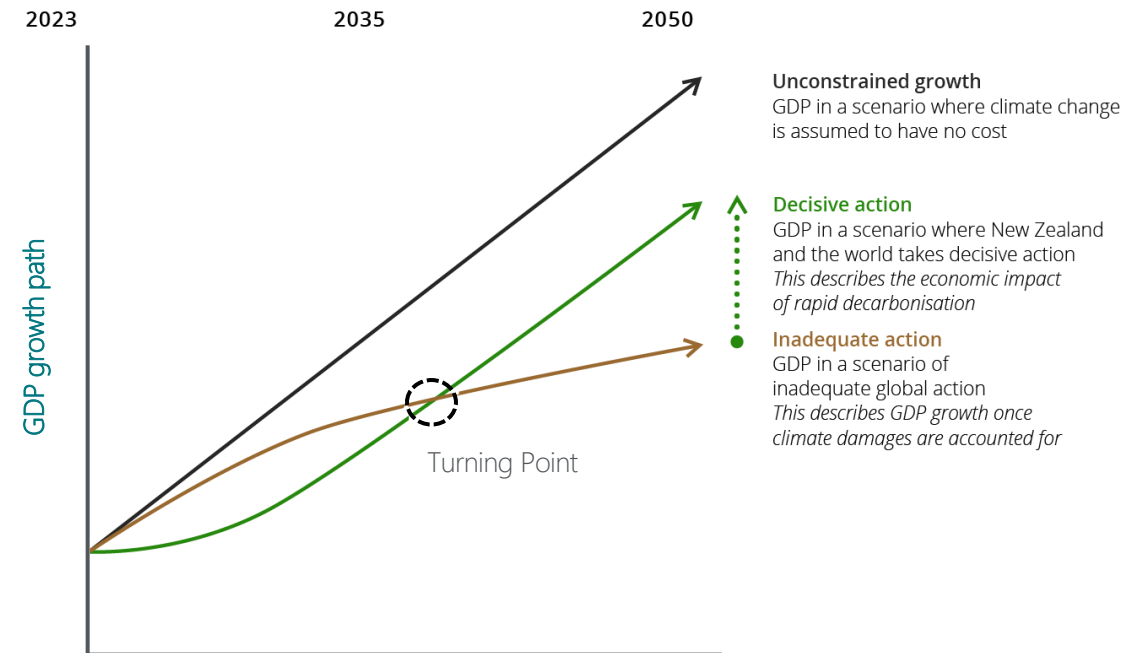
The modelling assumes 1.5°C of warming. There are "locked-in" climate damages in this scenario, driven by historical emissions already in the atmosphere:

- Decisions by governments, businesses and citizens around the world are successful in achieve global economy net zero emissions in 2050.
- The emissions price increases substantially by 2050 in New Zealand and across the world as a means of incentivising citizens and businesses to switch to renewable sources of energy. The emissions price covers agricultural emissions in New Zealand and the world.
- Transition assistance is applied to certain sectors in Auckland and the rest of New Zealand, reflecting signalled and likely targeted assistance as sectors decarbonise.

## NZ Steel announcement

In May 2023, the Government announced an emissions reduction partnership with NZ Steel, with the aim of replacing half of the coal being used the Glenbrook Steel Mill with electricity. This partnership is set to be the country's largest emissions reduction project to date.<sup>27</sup>

The NZ Steel subsidy has been explicitly incorporated into the decisive action scenario, as it represents targeted assistance towards particular sectors to assist with emissions reductions.



The NZ Steel subsidy is modelled as reducing the effective price for renewable electricity the Heavy Manufacturing sector (which includes steel production) pays in the Auckland region. This results in the Heavy Manufacturing sector switching away from fossil fuel energy sources, mimicking the intended outcome of the subsidy.

## 5. Inadequate action



# Inadequate action scenario

Auckland could stand to lose \$847m in GDP between 2023 and 2050, and 1,217 job opportunities with inadequate action on climate change. These costs are likely to escalate exponentially beyond 2050.

## Overview

If the Auckland region, New Zealand and the world do not take decisive action on climate change, it could cost Auckland's economy \$847m in GDP between 2023 and 2050, in net present value terms. In addition, inadequate action result in 1,217 fewer jobs created. Climate damages could cost the rest of the New Zealand economy \$3.6b in GDP between 2023 and 2050 and result in 1,951 fewer jobs created.

By 2039, climate damages escalate to the point that the output by Auckland's and the country's economies begins to fall relative to an unconstrained growth path.

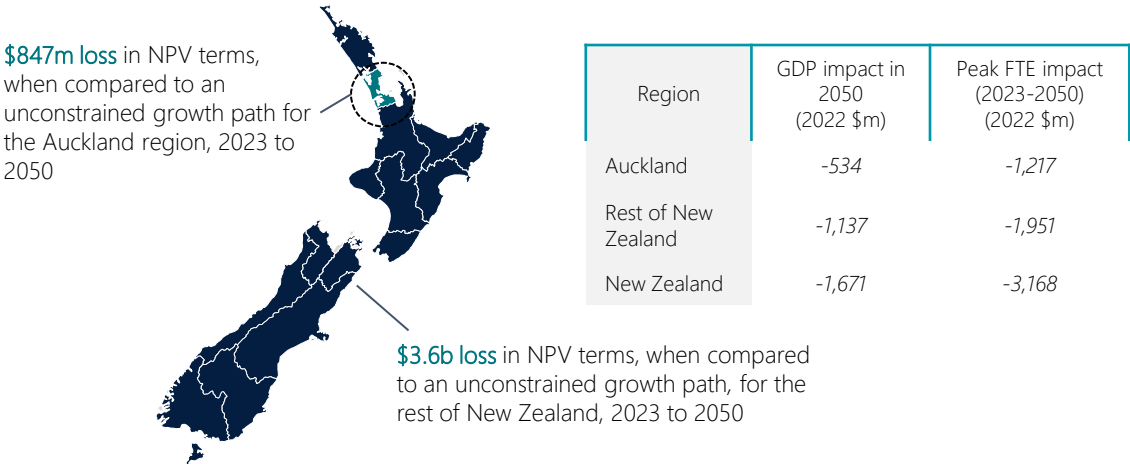
Previous modelling suggests the economic **cost of inadequate action could increase exponentially beyond 2050, escalating to \$48b by 2070 for New Zealand as a whole.**<sup>28</sup> Unlike the economic impacts of the Global Financial Crisis or COVID-19, which were followed by a period of economic rebound,<sup>29</sup> the modelled costs of climate change would be permanent, sustained, and likely to increase with time.

The economic impacts of an inadequate action scenario should be considered as conservative. The modelling draws upon established literature on the impacts of rising temperatures on economic factors of production and is necessarily limited to a select set of damages. Damages not modelled include individual natural disasters, changes in energy demand, water scarcity, social impacts and ocean acidification.

GDP impact under *Inadequate action* scenario, relative to an unconstrained growth path

Region	GDP impact by 2030 (% change)	GDP impact by 2040 (% change)	GDP impact by 2050 (% change)
Auckland	+0.05%	0.00%	-0.22%
Rest of New Zealand	+0.02%	-0.03%	-0.25%

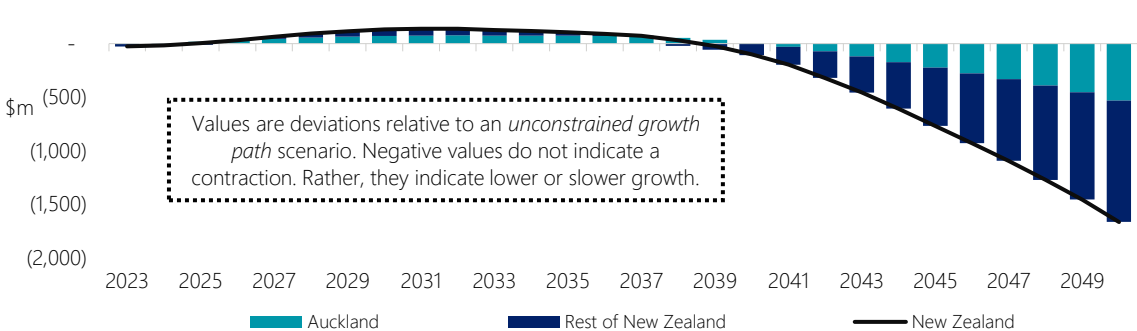
Economic impact under the *Inadequate action* scenario, relative to an unconstrained growth path



Source: Deloitte

GDP impact - *Inadequate action* scenario

Value of deviations relative to an *unconstrained growth path* (\$ millions, 2022, real)



Source: Deloitte

# Inadequate action scenario

Auckland's services sector could be \$400m smaller by 2050 compared to under an unconstrained growth path.

## The economic burden will not fall equally in Auckland

The economic cost of climate damages is not expected to be borne equally by Auckland's sectors, with services (incorporating government, financial services, insurance, real estate, dwellings, business services and recreational services) set to bear a disproportionate share of the cost, contracting \$398m by 2050 relative to a scenario of unconstrained growth.

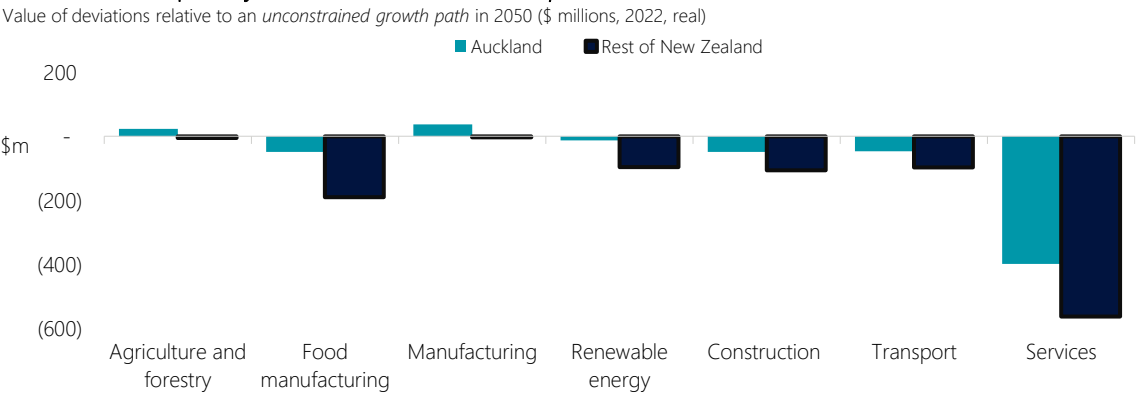
- The driver of the outsized impact of climate damages on Auckland's services sector is two-fold.
- Firstly, the services sector, being labour-reliant sector, is sensitive to the likely productivity impacts of modelled heat stress, and health and wellbeing climate damages.
  - Secondly, the services sector is a key input into other sectors of the economy (performing functions such as directing capital flows and providing head office services), which means it also suffers from a fall in demand from the impact of climate damages to other sectors.

The economic implications of this for Auckland are significant, with services currently contributing 43% of Auckland's economic output. By 2050, climate damages could cost Auckland's services workforce 933 FTE jobs, relative to an unconstrained growth path.

The next largest cost could fall on Auckland's food manufacturing sector, which could see annual output shrink \$48.9m by 2050, followed by construction (\$48.8m) and transport (\$46.4m), relative to a scenario of unconstrained growth.

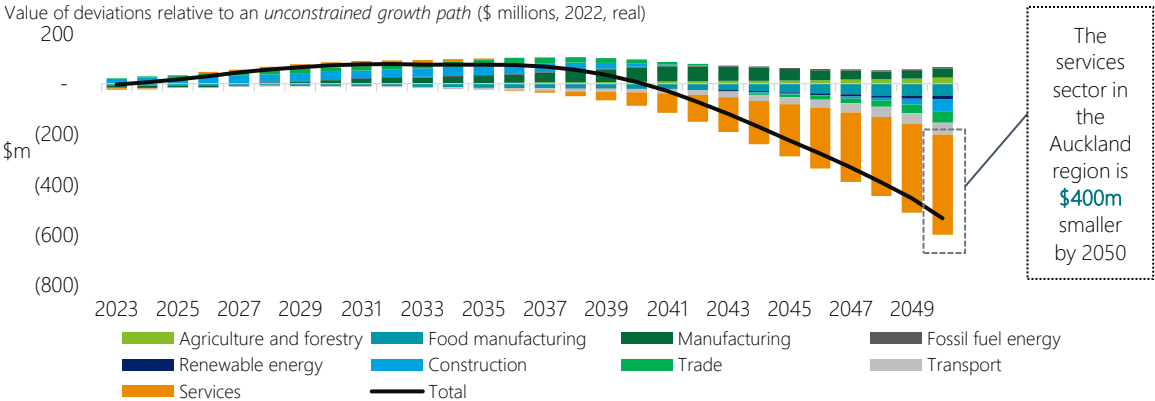
Some sectors are expected to be insulated from some of the negative effects of climate change relative to others. In a world with rising global temperatures, New Zealand's (and Auckland's) relatively temperate climate means economic activity in certain sectors will be less disrupted. However, the negative impacts of climate change on these sectors will likely only accelerate beyond 2050.

Sectoral GDP impact by 2050 for Auckland - *Inadequate action scenario*



Source: Deloitte

GDP impact by sector for Auckland - *Inadequate action scenario*



Source: Deloitte

## 6. Decisive action



# Decisive action scenario

## The benefits of rapidly decarbonising Auckland's economy are potentially substantial and outweigh upfront costs.

### Decisive action on climate change presents a significant opportunity for the Auckland region

If the Auckland region, New Zealand and the world take decisive action on climate change, Auckland could add \$22b to its GDP between 2023 and 2050, in net present value terms. This is equivalent to an average GDP gain of \$815m per year for Auckland, in discounted terms. In addition, decisive action would mean there could be 19,048 additional jobs created in the region.

By 2050, Auckland's annual GDP could be \$7.9b greater than under the *inadequate action* scenario in 2022 dollars. For context, Auckland's GDP in 2022 was \$136b.<sup>30</sup>

### There is an upfront cost associated with decisive action

Decisive action on climate change would involve an upfront cost. Policies to transition economies off fossil fuel energy sources, such as the rising price on emissions, is costly. During the transition to a low emissions economy, GDP growth in the Auckland region is lower, relative to the inadequate action scenario. At its lowest point, GDP growth is 1.2% lower than in the inadequate action scenario, occurring in 2032.

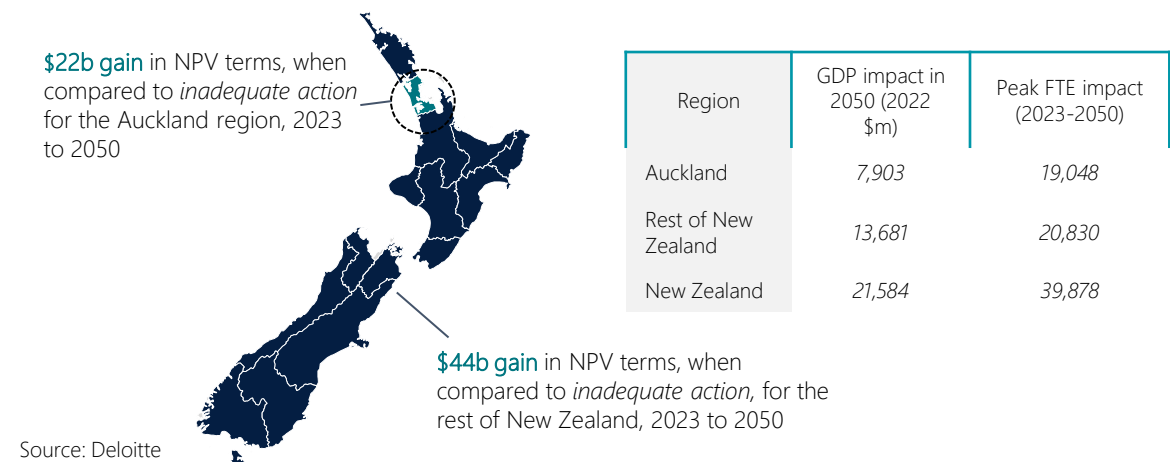
### The Auckland region reaches its turning point in 2037

**Auckland and New Zealand can't do it alone.** If the Auckland region, New Zealand and the world stay on track and continue to rapidly reduce emissions, the upfront costs of doing so begin to be outweighed by benefits of decisive action. For the Auckland region, this turning point occurs in 2037.

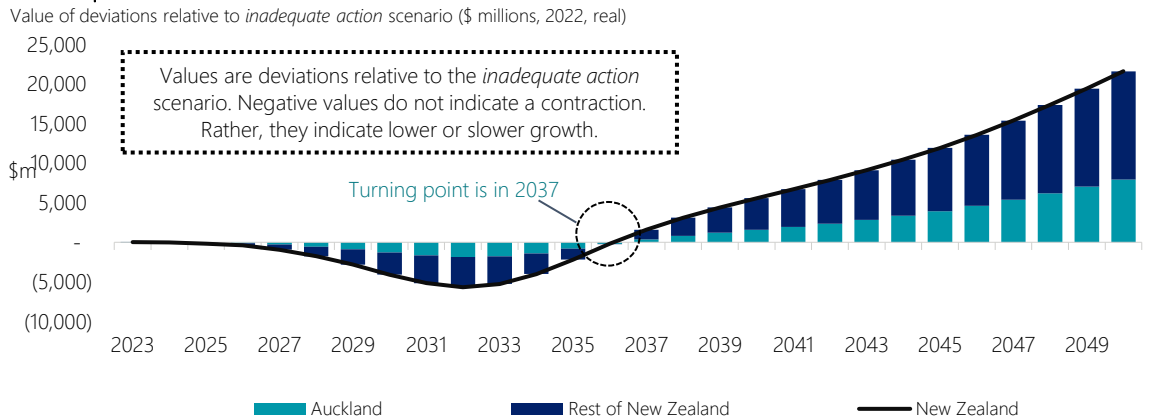
Fundamental drivers of the benefits of decisive action include limiting the worsening climate change impacts in a world where temperatures rise to 3°C above pre-industrial levels (i.e., in a scenario of inadequate action). By limiting temperature increases to as close to 1.5°C above pre-industrial levels as possible, the worst of the impacts of six dimensions of climate damages modelled are avoided.

In addition, an expanding renewable energy sector has flow-on impacts for the rest of the Auckland region's economy. While the expansion of the renewable energy sector is largely centred outside of the Auckland region (discussed next), an expanding renewable energy sector results in increased demand and input from the services and construction sectors.

### Economic impact under *Decisive action* scenario



### GDP impact - *Decisive action* scenario



# Decisive action scenario

The renewable energy sector expands significantly under decisive action, with flow on impacts for the services sector in the Auckland region.

## Decarbonisation efforts could create a renewables ‘boom’

Under a decisive action scenario, the renewable sector nationally could see its annual value add increase by \$6.6b relative to inadequate action by 2050, creating 4,600 jobs in the process. This will be largely driven by activity outside of the Auckland region, with a value-add to Auckland of \$895m in 2050 and 886 jobs created. As a capital-intensive, rather than labour-intensive, sector, the renewable energy sector tends to have a smaller workforce impact relative to its wider economic impact.

A rising price on emissions is a key driver of renewables growth under decisive action. The price on emissions makes use of fossil fuel energy sources relatively more expensive, meaning demand shifts to renewable sources. This increase in demand results in a redirection of investment to the sector, stimulating economic activity and its expansion.

Activity in the renewables sector is likely to be concentrated in regions outside of Auckland due to land (for wind and solar farms) and natural resource (for hydroelectricity dams) constraints in the Auckland region. However, the indirect benefits of a growing renewables sector are likely to be felt throughout the economy, including in the Auckland region.

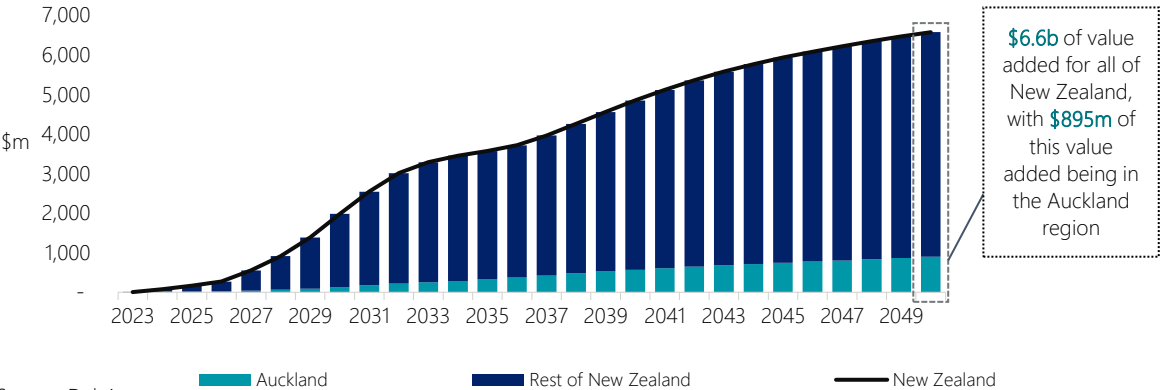
## But Auckland’s services sector stands to gain

Auckland’s services sector could increase \$3.4b in value-added by 2050, after reaching a turning point in 2037. By 2050, the services sector also creates 11,000 additional jobs, when compared to the inadequate action scenario. The services sector in Auckland has an outsized impact and makes up most of the value added by the sector nationally.

This is driven in part by the impact the renewable energy sector experiencing growth under decisive action. The services sector is a key input for the renewables sector, and a significant portion of the country’s services are provided in Auckland. More generally, the services sector is a significant component of the goods and services produced by most other sectors in New Zealand’s economy and so benefits from the increased and more sustainable economic activity under the decisive action scenario.

## Renewables value added impact - Decisive action scenario

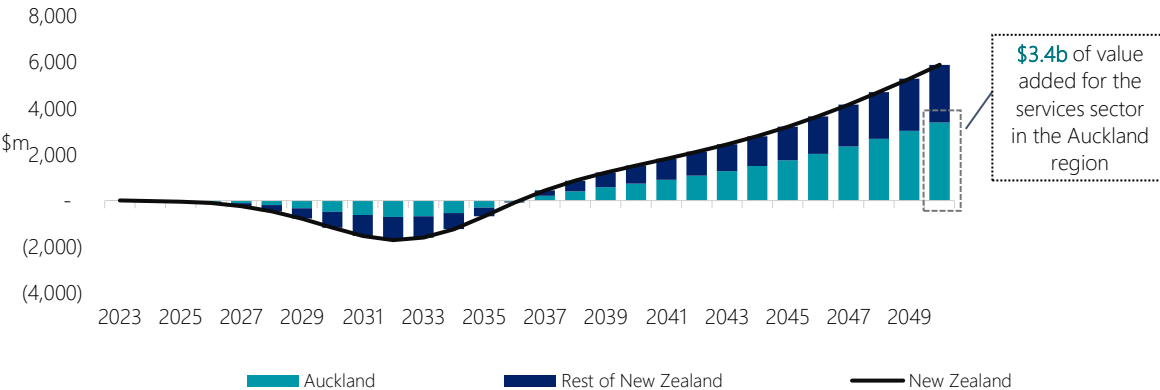
Value of deviations relative to inadequate action scenario (\$ millions, 2022, real)



Source: Deloitte

## Services value added impact - Decisive action scenario

Value of deviations relative to inadequate action scenario (\$ millions, 2022, real)



Source: Deloitte



# Decisive action scenario

Both the retail trade and tourism and transport sectors reach turning points in the Auckland region, although the timing and magnitude of impacts differ.

## Retail trade and tourism

Auckland's retail trade and tourism sector could gain \$719m in annual value add by 2050 and create 2,950 additional jobs under a decisive action scenario. Reaching a turning point in 2035, this sector is likely to benefit from avoiding the worst impacts of climate change inherent in the inadequate action scenario. In addition, the sector is likely to benefit from increased and more sustainable economic activity in general, feeding through to higher household spending.

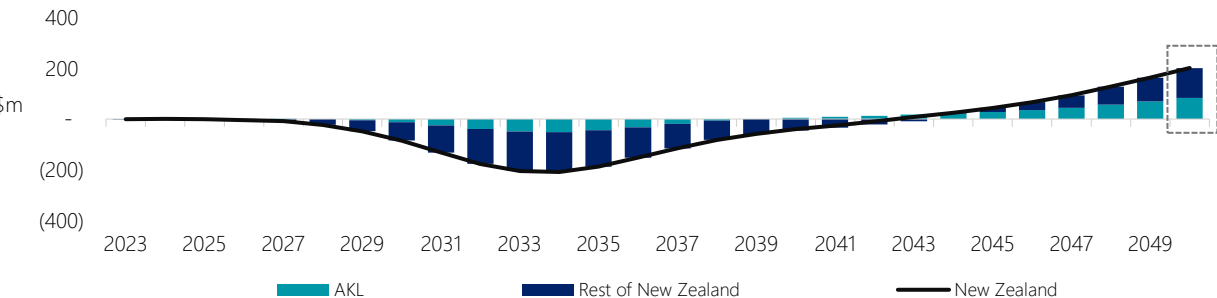
## Transport

The transport sector has a relatively late turning point, due to the difficulties associated with decarbonising heavy water and air transport. However, Auckland's transport sector reaches its turning point in 2040 and adds \$83m of additional value, relative to the inadequate action scenario, by 2050.

The Auckland region's road transport sector adds \$66m of additional value by 2050, compared to inadequate action. Auckland has a significant impact and makes up a large proportion of the value added by the sector nationally. By 2050, the region's air transport sector adds \$14m of additional value, relative to the inadequate action scenario. The value that Auckland's air transport sector adds is outsized and makes up the majority the value added by the sector nationally, reflecting region's role as a key gateway to New Zealand.

## Transport value added impact - Decisive action scenario

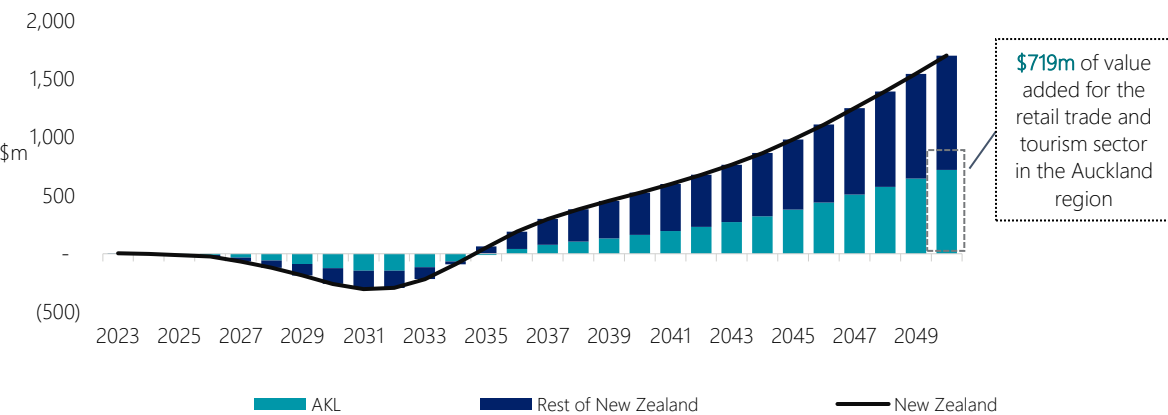
Value of deviations relative to inadequate action scenario (\$ millions, 2022, real)



Source: Deloitte

## Retail trade and tourism value added impact - Decisive action scenario

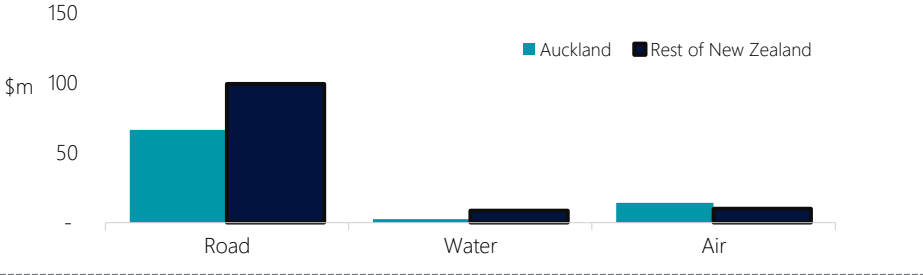
Value of deviations relative to inadequate action scenario (\$ millions, 2022, real)



Source: Deloitte

## Transport value added as at 2050 - Decisive action scenario

Value of deviations relative to inadequate action scenario (\$ millions, 2022, real)



# Decisive action scenario

The construction sector benefits from an expanding renewable energy sector and the increased, and the more sustainable economic activity in general, under the decisive action scenario. The manufacturing sector, on the other hand, has a later turning point owing to the challenges associated with decarbonising the sector.

## Construction

The construction sector experiences only a shallow loss of value added relative to the inadequate action scenario, with a turning point reached relatively early in 2031. The sector nationally grows rapidly, fuelled in part by the rapid expansion of the renewable energy sector. This effect is likely to help offset the costs associated with decarbonising the sector, which explains why the period of lower growth for the sector is relatively muted compared to other sectors in the decisive action scenario.

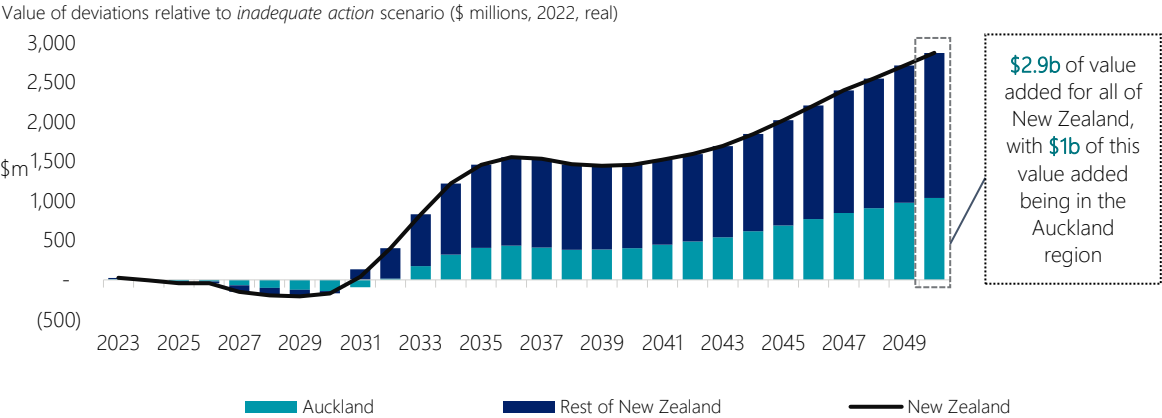
Auckland’s initial share of the value added by the construction sector is relatively small as a large proportion of this activity takes place in other regions. However, activity in Auckland is expected to pick up around 2040, likely driven by increased economic activity more generally. By 2050, Auckland’s construction sector could see \$1b of annual value added.

## Manufacturing

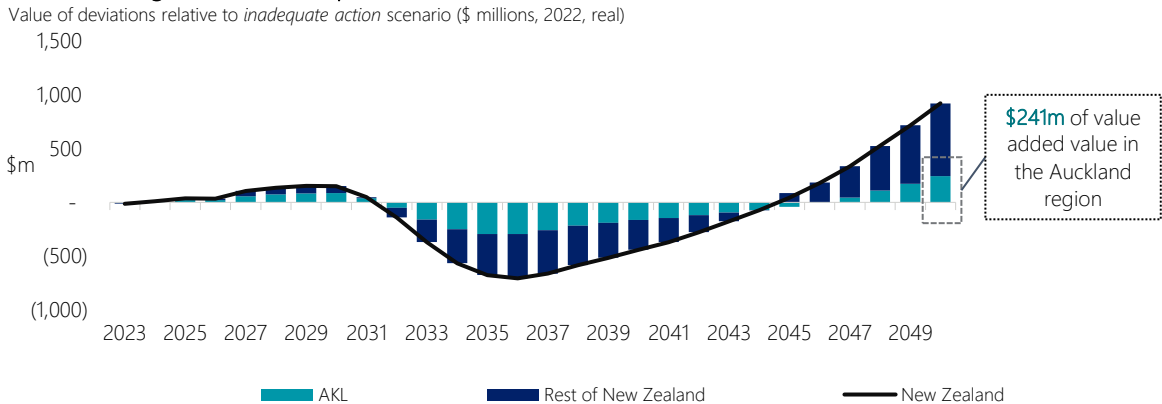
Auckland’s manufacturing sector initially adds more value relative to the inadequate action. This is driven in part by the NZ Steel subsidy, which is explicitly incorporated into the decisive action scenario. The impact of the subsidy is to lower the effective price of renewable energy for the heavy manufacturing sector in the Auckland region.

Despite the initially adding value up to 2031 when compared to the inadequate action scenario, the rising emissions price means the overall manufacturing sector faces a transition cost and adds less value from this point onwards. The manufacturing sector has a relatively late turning point in 2047, as it will be largely reliant on the development of new technologies for industrial heating and processing requirements. By 2050 the sector’s annual value added in Auckland is \$241m, demonstrating the sector grows rapidly after reaching its turning point.

Construction value added impact - *Decisive action scenario*



Manufacturing value added impact - *Decisive action scenario*



## 7. What does this mean for Auckland?



# What does this mean for Auckland?

While work is already underway to meet Auckland's net-zero targets, more holistic system shifts will help accelerate the pace of change and support an inclusive and sustainable path to decarbonisation.



Auckland, like the rest of New Zealand, is on its climate journey and has a range of policies and actions in place – some set nationally and which Auckland can give effect to, and others set locally by entities like Auckland Council and Auckland Transport. This means the region has a greater or lesser degree of influence on how these various policies are implemented, and their effectiveness in emissions reduction.

The region also has a unique position when it comes to its net-zero journey, by nature of its distinct cultural make-up, role as the economic hub of the country, and 'city-like' emissions profile. These distinguishing factors provide both challenges and opportunities for the region in combating and mitigating the impacts of climate change but, if done well, Auckland's reduction efforts can have a significant impact on the country's overall emissions profile, with modelled results suggesting it could contribute 22.7% of New Zealand's emissions reduction between 2023 and 2050.

Work has already been done around a range of initiatives and plans including the National Adaptation Plan (NAP) and Emissions Reduction Plan (ERP), which influence emissions reduction in Auckland. Additionally, national sector specific plans such as the Advanced Manufacturing Industry Transformation Plan (ITP) and the NZ Steel subsidy will play a role and support Auckland in decarbonising some of its top emitting sectors.

Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan and the Transport Emissions Reduction Pathway (TERP) support and accelerate emissions reduction over time in order to help the region, with a range of initiatives underway. Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan is a joint adaptation and mitigation plan, with a strong consideration for Te Ao Māori, focussed on building climate resilience. The Auckland Council is also in the process of consulting on the Auckland region's Future Development strategy. This will look at how Aucklanders live, work, and move around the region. It will also look at resilience to natural hazards and regional growth in ways that both reduce emissions and adapt to climate change.

Whatever action Auckland takes will have an impact on the rest of the country due to its size and contribution to the country's economy. It also holds the enviable position of being in the top 10 of the world's most liveable cities.<sup>31</sup> Sensible climate decisions can help the region remain an attractive destination to live and to visit in the future, and enhance its reputation for liveability.



The modelling presented in this report provides the results of the inadequate and decisive action on climate change scenarios. The modelling presented focusses on the GDP and employment impacts of these scenarios. The impacts of inadequate and decisive action on climate change will have a number of impacts, ranging from effects on New Zealand's natural environment to individuals' subjective wellbeing and safety. The modelling presented in this report does not speak to these wider impacts.

Nevertheless, the modelling provides answers to 'what if' scenarios but does not provide specific actions. Research indicates that a range of underlying principles need to be taken into account when making decisions regarding climate change.<sup>32</sup>

Helping Auckland achieve decisive action, and the benefits such a scenario entails, is not just about selecting certain actions to pursue in isolation, or saying all actions need to be done faster – rather, it's about considering system shifts to help the region and the rest of the country achieve its climate goals in an inclusive and sustainable fashion.

This section of the report focuses on some of those underpinning principles which could be considered to help amplify those system shifts. This section also focuses on how those principles can link to some of Auckland's top emitting sectors, where the region's big gains could be made.

# What does this mean for Auckland?

There are a number of underpinning principles the region will need to take into account as it takes steps towards implementing and accelerating emission reductions.



# What does this mean for Auckland?

The right policy settings and behaviour change will be needed for the Auckland region to achieve emission reduction targets.



## The right regulations, incentives and policy certainty will be crucial

Emissions reduction in Auckland will be driven by the transport, manufacturing and services sectors, many of which will rely on the same solutions and face the same challenges.

Due to the importance and intertwined nature of sectors in the Auckland region and New Zealand's economy, a wider policy context needs to be taken into account when making decisions relating to emissions reductions. Policies can also benefit from interdependence. For example, policies on housing or green buildings will influence the construction and manufacturing sectors, and vice versa.

Long-term funding commitments and policy signals will prove crucial. Policy settings and complexity can impede businesses by creating uncertainty. Clear signalling from local and central government regarding support of investment into infrastructure, and education on policies, will give organisations reassurance and confidence to make decisions for their own sectors regarding emissions reductions.

Policies need to evolve with technology. The impacts of climate change in Auckland necessitate taking greater climate action through policy intervention. For example, energy sharing is one area where the current regulatory environment, makes sharing difficult between businesses or households on a large scale and is impeding the uptake of decentralised renewable energy.<sup>38</sup>

A balanced consideration for adaptation alongside mitigation is required to better support the needs of Aucklanders and the region, as acknowledged in Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan. Adaptation measures can act to guard against the worst impacts of locked-in climate change, and can have as much of an influence on the prosperity and success of the region as mitigation. Synergies between the measures can result in more efficient climate actions (for example; diversifying energy production such as investment in solar and wind power generation not only makes energy production more resilient, but also helps with emission reductions).<sup>39</sup>



## Behaviour change is needed for emissions reductions

Emissions reductions in the region will require a shift in the daily choices made by Aucklanders – key amongst which is transportation. Low emissions alternatives will need to be affordable, accessible, reliable, pleasant and convenient to encourage mode shift. It will be important to consider how differing needs, lifestyles and preferences will mean varying degrees of feasibility for behaviour change. Options and convenience will be crucial.

**Behaviour change can be enabled by fit-for-purpose infrastructure investment** – because without alternatives, it will be difficult to change people's habits. For this reason, infrastructure needs to consider consumer preferences, and what would truly give people the impetus to change. There is already investment in infrastructure to support a shift towards active modes of transport, and public transport is another approach to reduce emissions. Uptake in active modes such as walking and cycling can be supported by improving accessibility and safety of infrastructure such as cycle ways and footpaths. Behaviour change doesn't only apply to individuals. To encourage lower emissions and mode-shift in the transportation of commercial freight, both rail and road are important. Considerations around how Auckland's role as a logistics hub can benefit from lower carbon solutions – while still maintaining customer and supply chain expectations around timeliness and cost – is equally important.

**Renewable energy will influence both infrastructure and behaviour change** – it is central to decarbonisation and emissions reduction across sectors. Transport is the obvious one – the 2025 Zero-Emission Bus Mandate, which supports the Sustainable Public Transport Framework, proposes new buses purchased from 2025 will need to be zero-emitting at tailpipe. To support an increasing electric fleet size, investment is also necessary into charging infrastructure – for the public transport fleet and also for commercial transport vehicles.

But for many industries in Auckland, a significant portion of emissions can be linked to energy consumption. For example, Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan targets a 23% reduction in GHG emissions from process heat by 2030, supported by transitioning 22% of process heat to electricity by 2030 and 50% by 2050.<sup>40</sup> A range of businesses require the right infrastructure and support.

# What does this mean for Auckland?

Often overlooked, an appropriately sized and skilled workforce will also be essential for reaching emission reduction targets.

Too often transition can be the focus, and skills and workers become the after thought. They become the consequence of transition. In fact, skills should be the driver of the economic dividend of decisive action, not the consequence. This report identifies that over 1,200 workers are highly vulnerable to the effects of climate change. If Auckland takes decisive action, 19,000 additional jobs could be created in the region by 2050, demonstrating a clear policy case for action.

With that much to lose, and even more to gain – how can Auckland make the transition work for all?

- 1

**It's important to start with identifying transitioning occupations.** These will be the roles most vulnerable under the decisive action scenario, those that will be in greatest demand as decarbonisation progresses, and those that will require upskilling or creation. The impact on the workforce is illustrated in the table to the right.

students to facilitate pathways into high-growth sectors with in-demand skills. Key stakeholders from an Auckland perspective include Auckland University, Auckland University of Technology, Manukau Institute of Technology and other education and training providers.
- 2

**Both collaboration and coordination are key** to ensuring the transition takes place at the optimal pace and scale to establish a thriving economy and achieve economic growth and job creation, while mitigating climate impacts and costs to vulnerable workers. This may include an approach more towards “system arrangements” between central government, local government, industry bodies, firms in the Auckland region and research to collectively design and fund to ensure the workforce can deliver growth and thrive in the transition by 2050. Policy settings should also have the workforce at the centre to deliver on rapid decarbonisation at the least cost to the workforce.
- 3





**Emphasising the reform required in the education and training sector** to evolve in line with decarbonisation to realise the economic dividend. The education and training sector will be critical in upskilling and retraining disrupted workers and new
- 4

**Transitioning to net-zero requires more than providing a disrupted worker with a new job opportunity.** Employment pathways are required that represent an equivalent, or higher, quality job opportunity to ensure their living standards and meaningful engagement in work are maintained. **Policy settings for skill pathways** should offer the structure to create better outcomes in terms of wage, working conditions, and job security and equally identify with a worker's career purpose and ambitions.
- 5

**Providing transition assistance** means targeting workforce policy to direct skills to where they are needed. Active transition assistance can also target improved economic, workforce, and skills outcomes based on a “portfolio approach” that targets specific cohorts in the economy. This will be core to successfully designing place-based and cohort-based workforce policy for decarbonisation. An appropriately skilled workforce will be at the heart of transitioning to a net-zero carbon economy and unlocking the economic opportunity it represents.

## The workforce will be impacted by both climate change and a net-zero transition

The table below shows the impact on workforce. While there is a wide range of vulnerable jobs, some existing occupations will significantly transform, others may only need to change at the margins, and entirely new ones will emerge as workforce and decarbonisation shapes the future of work.

Workforce category	Description
Emission-intensive jobs 	Jobs directly related to an emissions-intensive activity or industrial process. Demand for these jobs will decline as new technologies and industries change. For example, reduced demand in highly concentrated fossil-fuel sectors
Transformed jobs 	Existing jobs where the work and worker requirements are expected to change as the Auckland's economy transitions toward net-zero. For example, mechanics working primarily on internal combustion-powered vehicles will need to learn how to service electric vehicles.
In-demand jobs 	Jobs that support general development across the economy and will be a key input to the mergence and expansions of low-emissions sections. Demand for these jobs will increase during transition, but skills will not change dramatically. For example, as the renewable energy sector expands, so will the demand for those involved in designing, planning, managing, and building renewable energy plant and equipment.
New net-zero jobs 	New jobs that will emerge and become prominent as new technology and processes are adopted during transition to net-zero. For example, increasing electrification will increase the demand for expertise in specialist infrastructure development.



# What does this mean for Auckland?

Māori and Pacific peoples make up a significant part of the workforce for the transport/logistics and manufacturing sectors. Focussing on upskilling the Māori and Pacific workforce as these sectors transition towards lower emissions is an opportunity to boost the economy and people's wellbeing.



Prioritising equity, inclusion and a just transition process can enable adaption, ambitious mitigation and allow for climate-resilient development. Attention to equity and broad and meaningful participation of all communities in decision-making, at all scales, can build social trust and deepen and widen support for transformative changes,<sup>41</sup> and this will be equally true for the Auckland region. Businesses will have a key role to play in ensuring the workforce is engaged by investing in the skills and talent of their staff during the transition towards a low-emissions future.

The Auckland region is home to many iwi and hapū, as well as mātāwaka who whakapapa to iwi and hapū in different parts of the country. Māori account for 12% of the region's population<sup>42</sup>, with over a third living in South Auckland<sup>43</sup>. Around 87,200 Māori<sup>44</sup> are employed in the region. However, weekly and annual incomes for this group are below the average compared to the total of other ethnic groups.<sup>45</sup>

Auckland's Pacific peoples population is significant, comprising 16%<sup>46</sup> of the region's total population. Almost two-thirds of the country's Pacific population live in Auckland, with the majority in the south, followed by the west<sup>47</sup>. Around 106,000 Pacific peoples<sup>48</sup> are employed in the region, and weekly and annual incomes are also below the average compared to the total of other ethnic groups<sup>49</sup>. As at 2021, Pacific men were paid 81 cents compared to every dollar earned by a Pākehā man, while Pacific women were paid just 75 cents on the dollar.<sup>50</sup>

By 2043, Māori and Pacific peoples combined are projected to make up 30% of Auckland's working age population.<sup>51</sup>

## Climate impacts

With a large proportion of Pacific and Māori households located in South and West Auckland, many Pacific and Māori have been disproportionately affected by the weather events of early 2023, and some are still recovering their homes and livelihoods in the aftermath. Māori and Pacific peoples are less likely to have general insurance policies than the general population, meaning they are more likely to have to bear the direct financial cost of weather events.<sup>52</sup> Auckland's Pacific peoples and Māori populations are at the confluence of a range of climate impacts.

This from the places they live which have been affected by weather events, to household make-up and size, access to transport routes, and exposure to jobs which may be changed by technology and climate.

## COVID-19 impacts

Research on the impacts of COVID on Pacific peoples living in South Auckland shows 18% of such households surveyed lost half or more of their income due to COVID-19, while 28% found it difficult to pay for basic household costs (compared to an average among New Zealanders of 9%).<sup>53</sup> Jobseeker Support numbers suggest Māori disproportionately bore the workforce impacts of COVID.<sup>54</sup>

## The future workforce

While a range of occupations and jobs in Auckland will evolve, be created, or perhaps be overtaken by technology, the impacts of transition to a 'green collar' workforce may disproportionately affect the region's Māori and Pacific peoples population, because of the sectors they work in. As was seen during the COVID pandemic, economic shocks are likely to have a disproportionate impact on Māori and Pacific peoples in the labour market.<sup>55</sup>

The transport/logistics and manufacturing sectors have a critical role to play for emission reductions in the Auckland region, and are likely to be particularly impacted during the transition towards a net-zero economy. They are also sectors with significant Māori and Pacific workforces. As at March 2022, Māori and Pacific peoples make up 9.6% and 19.9% of Auckland's logistics sector and 8.0% and 15.6% of Auckland's manufacturing sector workforce respectively.<sup>56</sup> Māori and Pacific peoples are over represented in lower-skilled roles and have not shared equally in the move towards upskilling many working in these sectors have recently experienced.<sup>57</sup> The manufacturing sector was impacted significantly by COVID-19 and, while total employment in manufacturing rebounded to above pre-COVID levels, the employment of Pacific peoples and Māori did not. By March 2022, Māori employment in manufacturing sits at 90% of pre-COVID levels while Pacific peoples is at 95%.<sup>58</sup>

The change required to transition to a low-emissions economy is an opportunity for employers in a range of emissions-intensive sectors. Investing, upskilling and ultimately uplifting their Māori and Pacific staff and team members will help people share in future economic benefits, and provide the opportunity to lift household incomes.



# What does this mean for Auckland?

A systems focus is needed for the Auckland region to build on and accelerate the pace of change needed for decisive action on climate change.



## Auckland has systemic considerations

A wide, multi-faceted and systemic approach is recognised as being essential to enabling rapid and far-reaching transitions across sectors and system to achieve deep and sustained emissions reductions.<sup>59</sup> Auckland is not unique nor unusual in needing to implement a systemic view as it meets the challenge of climate change. While the choices before Auckland may be different from those facing other parts of the country, they will be similar to other cities in other parts of the world, as many grapple with ageing infrastructure, populations changing in their composition, and the impact of technological change.

**It's not just infrastructure - Auckland's population is also ageing.** As the region moves towards net-zero, the proportion of Aucklanders aged 65 and over is expected to increase and, so with it, the dependency ratio.<sup>60</sup> All up, the 65+ population in New Zealand is expected to reach one million by 2028, potentially comprising a quarter of the population by 2050. Auckland's 65+ population is expected to increase from an estimated 238,400 in 2023 to 286,500 by 2028.<sup>61</sup> Ageing well – and equitably – will be a significant challenge. Decisions must be made now that have the future population in mind, but also support older residents. This throws up complex choices: solutions such as '15 minute cities' may be convenient and affordable to an older age-group and attractive from a public policy and planning perspective, but may be less realistic – or affordable – for families who require cheaper housing, on less costly land.

The choices Auckland can make will be a mix of those at the national and local levels. The people who may be best placed to make those changes are those who are prepared to **identify emerging trends**, see the opportunities within them, and take advantage, in order to lead thoughtfully and courageously. It also means understanding and delivering on Te Tiriti obligations, and meaningful and sophisticated partnering with communities and business.

Auckland needs to work **effectively and collaboratively** across local and central government, and with communities and businesses to provide Aucklanders the services they deserve and expect while addressing the big issues and opportunities with climate mitigation and adaptation that cannot be the preserve of one department – or even the public service – alone. The interplay between housing, water, transport, education, health, is too complex to be dealt with in isolation.

**Investment needs to be thought about differently.** Investing in what Aucklanders value must consider a broader set of investment impacts associated with climate change: economic and social wellbeing, equity and resilience. The benefits and outcomes of investment decisions can go further in prioritising a range of considerations; non-financial outcomes could be considered differently or described more clearly to influence an outcome.

**Strategic investment** has the ability to create the resilience to insulate New Zealanders from climate challenges, and safeguard the wellbeing of future generations. A future-focused investment capability will broaden definitions of value and better align what is spent with what matters. Reducing the time it takes to release the value of climate-related investments – coupled with "big bet" investments – has the potential to create transformational moments.

Many countries are seeking to attract public and private capital for climate initiatives. Part of New Zealand's success in doing so will be having the right incentives in place, particularly to bring quality overseas investment and technology to create impact for businesses, families and communities.

Ultimately, thinking about investment in decisive action as a drain on the economy is one lens – but viewing investment as creating benefits for the future is another. Reframing the debate and showing the connection between climate action and Auckland's future prosperity can help people discuss and debate the possibilities up for grabs.

# Appendix A: End notes



# End notes

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1. [Statistics New Zealand \(2023\) \*Regional gross domestic product: Year ended March 2022\*](#).
  2. See end note #1.
  3. [Statistics New Zealand \(2022\) \*Greenhouse gas emissions by region \(industry and household\): Year ended 2021\*](#).
  4. See end note #1.
  5. [NIWA \(n.d.\) \*Climate change scenarios for New Zealand\*](#).
  6. [Pearce et al. \(2020\) \*Auckland Region climate change projections and impacts\*](#).
  7. [Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan \(2020\)](#). Note: this is the source for timeline of events from 2012 to 2017.
  8. See end note #7. Note: this is the source for timeline of events from 2018 to 2020.
  9. [Niall, Todd \(2022\) \*Auckland mayor Phil Goff's final budget - \\$57m a year for climate action\*](#).
  10. [Transport Emissions Reduction Pathway \(2022\)](#).
  11. [Statistics New Zealand \(2022\) \*Subnational population projections: 2018\(base\)-2048 update\*](#).
  12. [Statistics New Zealand \(n.d.\) \*Auckland Region\*](#).
  13. [Auckland Plan 2050 \(2018\) \*Auckland's population\*](#).
  14. See end note #1.
  15. [Te Manatū Waka Ministry of Transport \(n.d.\) \*Air and sea transport: Sea freight\*](#).
  16. See end note #3.
  17. [C40 Cities \(n.d.\)](#).
  18. See end note #7.
  19. See end note #3.
  20. [AECOM \(2020\) \*Auckland Economy Climate Change Risk Assessment\*](#).
  21. [Roberts et al. \(2020\) \*Predicting Auckland's exposure to coastal instability and erosion\*](#).
  22. [Radio New Zealand \(2022\) \*Auckland worst hit as IAG notes sharp rise in weather damage claims\*](#).
  23. [Joynt, J. & Golubiewski, N. \(2019\) \*Development of the Auckland Heat Vulnerability Index\*](#).
  24. [Lorrey et al. \(2017\) \*Auckland Region climate change projections and impacts: Summary report\*](#).
  25. [Forbes, Stephen \(2022\) \*Drought in Auckland's rural south pushing up food prices, growers say\*](#).
  26. [Radio New Zealand \(2023\) \*Weather: Auckland at 90 percent of annual rainfall in first third of 2023\*](#).
  27. [Ministry of Business, Innovation & Employment \(2023\) \*Government announces emissions reduction partnership with New Zealand Steel\*](#).
  28. [Deloitte \(2023\) \*Aotearoa New Zealand's Turning Point\*](#).

# End notes

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29. Statistics New Zealand Infoshare, Economic Indicators, Regional Gross Domestic Product - RNA
30. See end note #29.
31. Ball, James (2023) *Auckland makes top 10 in world's most liveable cities index*.
32. Intergovernmental Panel on Climate Change (2023) *Climate Change 2023: Synthesis Report*.
33. Auckland Council (2020) *Māori in Tāmaki Makaurau: 2018 Census results*.
34. Customised Statistics New Zealand data request on workforce data.
35. 'Tātaki Auckland Unlimited (2022) *Teu Le Vā Pacific Work Programme – Evaluation*
36. See end note #34
37. Te Kāhui Tika Tangata Human Rights Commission and Pacific Pay Gap Inquiry (2022) *Voices of Pacific peoples: Executive Summary and top recommendations*
38. Climate Connect Aotearoa (2023) *Challenges and opportunities for energy sharing in Tāmaki Makaurau*.
39. See end note #32.
40. See end note #7.
41. See end note #32.
42. See end note #33
43. See end note #33
44. Wilson, Ross (2022) *Auckland Regional Household Labour Force Survey: Quarterly Overview as at March 2022*.
45. Statistics New Zealand, NZ.Stat, Income by region, sex, age groups and ethnic groups.
46. Auckland Council (2020) *Pacific Peoples in Auckland: 2018 Census results*.
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48. See end note #43
49. See end note #44
50. See end note #37
51. See end note #11
52. For Māori: Te Ara Ahunga Ora Retirement Commission (2021) *New Zealand Financial Capability: Focus on Māori*; For Pacific Peoples: Te Ara Ahunga Ora Retirement Commission (2021) *New Zealand Financial Capability: Focus on Pacific Peoples*.
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# End notes

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- 56. See end note #34
- 57. Logistics: Hanga-Aro-Rau (2023) *Workforce development needs in New Zealand's logistics sector*;  
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- 59. See end note #32.
- 60. Statistics New Zealand (2022) *One million people aged 65+ by 2028*.
- 61. Statistics New Zealand, NZ.Stat, Population Projections, Subnational population projections, Statistical area 2 population projections, by age and sex, 2018(base)-2048.

# Appendix B: Limitations and disclaimer



# Limitations and disclaimer

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## Restrictions and limitations

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