

# Auckland's Cost of Congestion

January 2025



ARUP

EY

Building a better  
working world

<b>1. Executive Summary</b>	<b>03</b>
<b>2. Purpose</b>	<b>05</b>
<b>3. What is congestion</b>	<b>06</b>
<i>Defining congestion</i>	
<i>Increasing impacts on society with each additional vehicle</i>	
<b>4. Congestion in Auckland</b>	<b>08</b>
<i>State of congestion in Auckland</i>	
<i>International comparisons</i>	
<i>Key drivers of Auckland's congestion problem</i>	
<i>The problem is only expected to get worse</i>	
<b>5. The impact of congestion in Auckland</b>	<b>19</b>
<i>Implications for individuals, families, and businesses</i>	
<i>Other implications for society</i>	
<b>6. Conclusion</b>	<b>30</b>
<b>7. References</b>	<b>31</b>

## 1. Executive Summary

# Auckland's traffic congestion problem will cost us \$2.6 billion a year by 2026.

Congestion occurs when a road becomes overcrowded to the point that movement is slow and the flow of cars is limited. This everyday reality has a larger cost than just being late.

### Transport modelling suggests that Aucklanders sit in congestion for 29 million hours a year.

In addition, based on international traffic indices, Auckland central is the 77th worst congested city, out of 500 globally (TomTom, Auckland traffic report, 2024).

### Auckland's congestion is driven by high demand for our roading network.

Congestion is caused by a number of different factors, the most direct being when demand exceeds capacity on a given road.

Auckland's demand for its roading network is underpinned by its population and economic growth. Its geography, comprised of dispersed economic hubs in a city that is surrounded by natural constraints, such as the Waitematā and Manukau harbours is also a key factor.

### Each of us experiences the cost of congestion...

The time you spend sitting in traffic is time that you are not working, learning, exercising, spending time with friends or family, and relaxing. By 2026, it is predicted that Aucklanders on average will spend over 17 hours stuck in traffic each year (per person, based on 2023 Census data). This is concentrated amongst Aucklanders driving to and from work in the peak periods, but also affects other work-related travel, freight movement, shopping trips, those travelling to and from school / university, and any other travel.

Moreover, each additional minute using extra fuel and increasing the wear and tear of your vehicle causes an increase in direct costs.

Even if you do not drive a car, the cost of congestion may be experienced on a bus, or through indirect economic costs as a result of overcrowded roads. For example, reduced accessibility can influence housing choices and land use patterns and potentially impact on things like housing affordability.



# 1. Executive Summary

## ...It can be felt by our businesses...

As with individuals, businesses bear a cost from congestion. Increased delays, fuel costs, and maintenance expenses increase the challenge of running a business.

Tradespeople, truck drivers, and other employees sitting in traffic both contribute to congestion but are also impacted, with implications for commercial costs and the wellbeing of individuals.

Labour supply is also disrupted as the costs of travel can make it harder to get to employment hubs. Supply chains face challenges with freight delivery delays and scheduling complications, affecting the steady flow of goods and services.

Additionally, the benefits of agglomeration such as knowledge sharing, increased competition, efficient supply chains, and market accessibility can be reduced.

For hospitality and retail businesses, ease of accessibility, including things like congestion and parking once you get there, can have material impacts on customer decisions.

## ...And it's tough on our planet too.

The vehicles we use daily emit carbon dioxide, nitrous oxide, and particulate matter. These emissions not only degrade air quality and affect our health, but also play a substantial role in greenhouse gas levels. The consequences of these emissions are far-reaching, leading to extreme weather conditions, threats to both biodiversity and marine life, rising sea levels, and an increased risk of severe weather events. Congestion exacerbates this issue by causing traffic flows to break down to stop-start conditions that increase fuel use.

## This problem is only expected to get worse.

As Auckland's population continues to grow, Auckland's congestion problem is only projected to worsen.

## The story in numbers:

**Auckland's congestion problem will cost us \$2.6 billion a year by 2026.**

**\$1.9**  
Billion

By 2026, we are expected to face congestion costs of \$1.9 billion per year in time delays.

**\$0.7**  
Billion

The macro-economic costs are expected to exceed \$700 million by 2026.



Additional costs may arise from emissions and vehicle operating costs (presented as sensitivity analysis)

## 2. Purpose

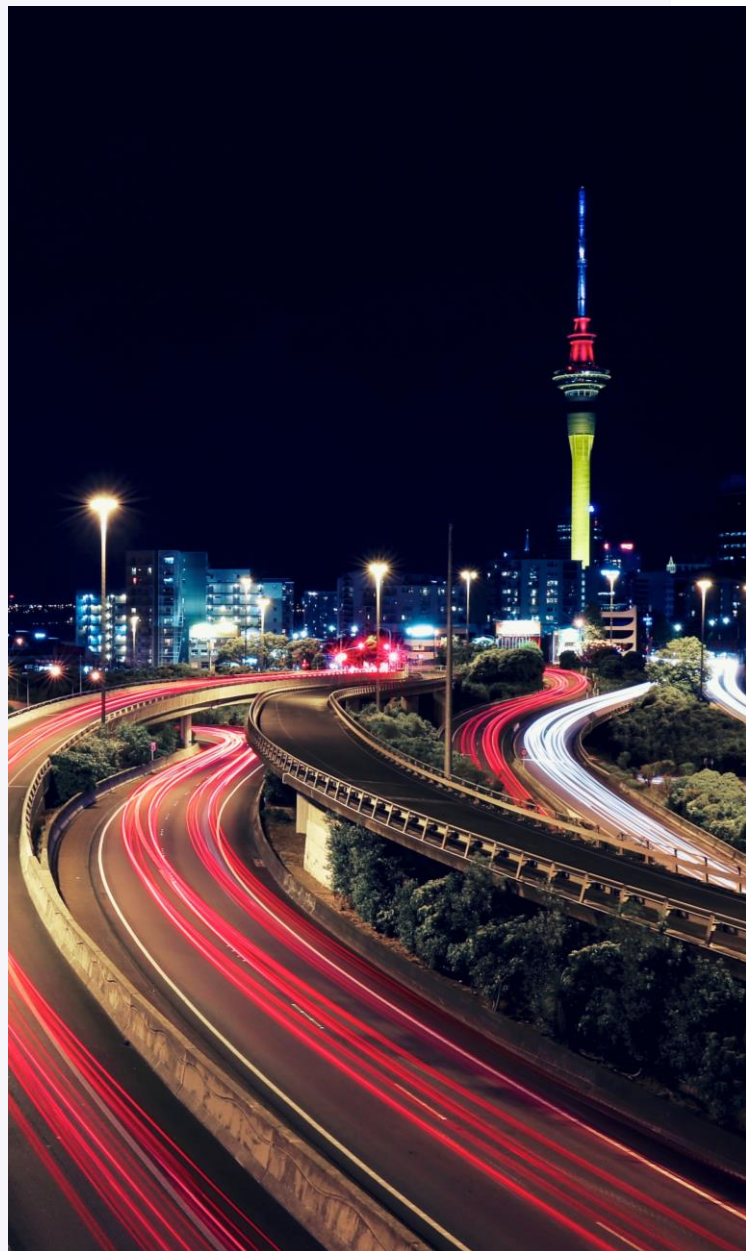
**This Report explores the cost of congestion to Auckland's people, businesses, and society.**

The implications of congestion go beyond increased travel time. As such, our approach investigates its consequences on us as individuals, businesses, the environment, and the economy.

This is not the first time that the cost of congestion in Auckland has been estimated or understood as a major issue. However, there have been significant changes in the transport network and trends since the last time it was considered. This report builds on the analysis completed by others to provide an updated picture of the cost of Aucklanders sitting in traffic.

This paper does not consider solutions to the congestion challenges experienced in Auckland. Instead, it intends to inform decision makers about the scale and impact of congestion to support future policy decisions.

All estimates of cost in this paper are based on transport modelling results from the Auckland Forecasting Centre, combined with EY's macroeconomic model to explore the impact on our local economy. Technical details can be found in the Appendices.



## 3. What is congestion

### 3.1 Defining congestion

Being stuck in traffic is a common experience for those who have lived, worked, and travelled around modern cities, and is something that hundreds of millions of people around the world deal with every day.<sup>1</sup>

When more and more people drive through the same road at the same time, traffic begins to build up, causing cars to slow down or stop altogether. Each commuter is delayed, and fewer additional cars are able to drive through the link.

**Congestion occurs when the demand for a road exceeds its capacity, reducing the flow of cars on a road - at this point we experience much slower speeds and longer trip times (Wallis and Lupton, 2013)**

Each person will experience road traffic differently. This paper measures congestion from a network performance perspective - from the view of society.

This scenario provides the definition of congestion for this Paper - congestion starts when the speed and flow of cars simultaneously begin to decrease. Network congestion is illustrated in Figure 1 and described below.<sup>2</sup>

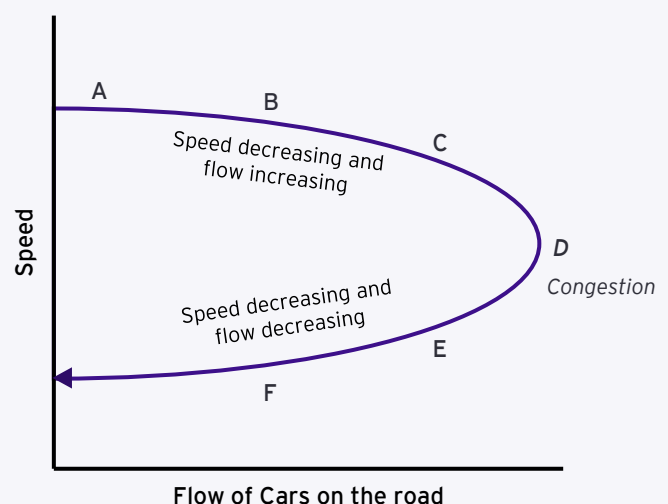
**Point A:** When there are no, or very few vehicles on a road you can travel as fast as the speed limit allows. While this is great for you as an individual, it also represents an under-utilised transport network. This is the point TomTom's world traffic index uses in its analysis.

**Point B & C:** As more cars join the road, you may have to slow down - but only a little. At this point, more people are using the road, while speed stays relatively high, resulting in more benefits to society. Although you might slow down to below the speed limit, you are still getting to your destination in an acceptable amount of time - a win-win for everyone.

**Point D:** At the point in which a road is so constrained by its physical space that the flow of traffic begins to decrease and speed significantly decreases, there becomes a cost to you as the individual and to society as a whole (as seen in the backwards bending line in Figure 1). This is the point we have used to quantify the costs of congestion.

**Points E & F:** As additional cars are added to a road, space becomes more and more constrained, leading to traffic jams and potentially 'standstill' speeds.

Figure 1: The Relationship Between Vehicle Flow and Driving Speed



## 3. What is congestion

### 3.2 Increasing impacts on society with each additional vehicle

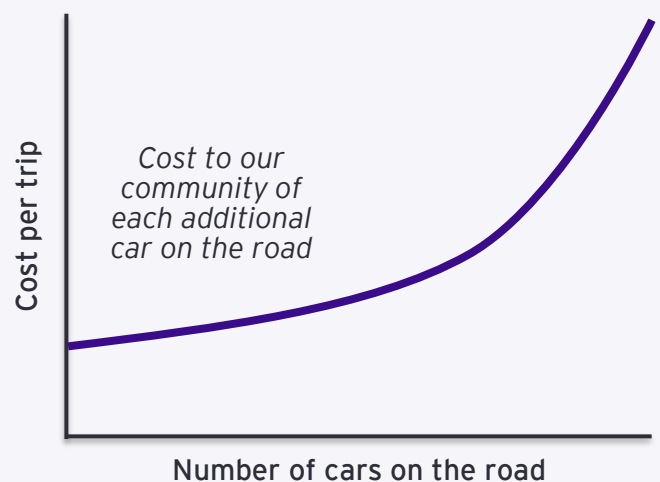
The effect of congestion is not linear. For example, if there are only five vehicles on a road and a sixth is added, the speed at which you can travel may decrease by a small amount. However, when the seventh vehicle is added, a more significant reduction in speed is experienced.

This is largely due to the way vehicles interact. When traffic is light, vehicles can be easily manoeuvred and maintain desired speeds. As density increases this is more difficult to achieve. The reduction in speed will continue to grow more rapidly with each additional car added to the road (the eighth

car having a larger impact than the seventh and so forth). Moreover, the sixth vehicle will only impact the five vehicles on the road, whereas the seventh will impact six etc. As the flow of vehicles on a constrained network increases, the societal costs rise quicker as a larger amount of people are impacted.<sup>3</sup>

This effect is illustrated in Figure 2. As the numbers of cars on the road increase, their social cost (e.g., travel delays leading to reduced time spent at your destination) increases at a faster and faster rate.

Figure 2: Marginal Social Cost of Congestion



## 4. Congestion in Auckland

### 4.1 State of congestion in Auckland

#### 4.1.1 Auckland's congestion

**International indices estimate that Auckland drivers lose an average of 66 hours each year. <sup>4</sup> This equates to more than a weekend's worth of time.**

According to international traffic data, 32% of average annual travel time in rush hour was congested in 2024 (compared to free flow conditions).<sup>5</sup>

These indices apply a distinct methodology, designed to support global comparisons. Results are not comparable with Auckland-specific estimates (including total costs).

#### 4.1.2 Congestion trends

In Auckland, the most severe traffic levels occur during the morning and evening periods, broadly aligned to the AM and PM peak. These surge hours make up about half of all congested trips, largely driven by travel to / from work, based on local analysis.<sup>6</sup>

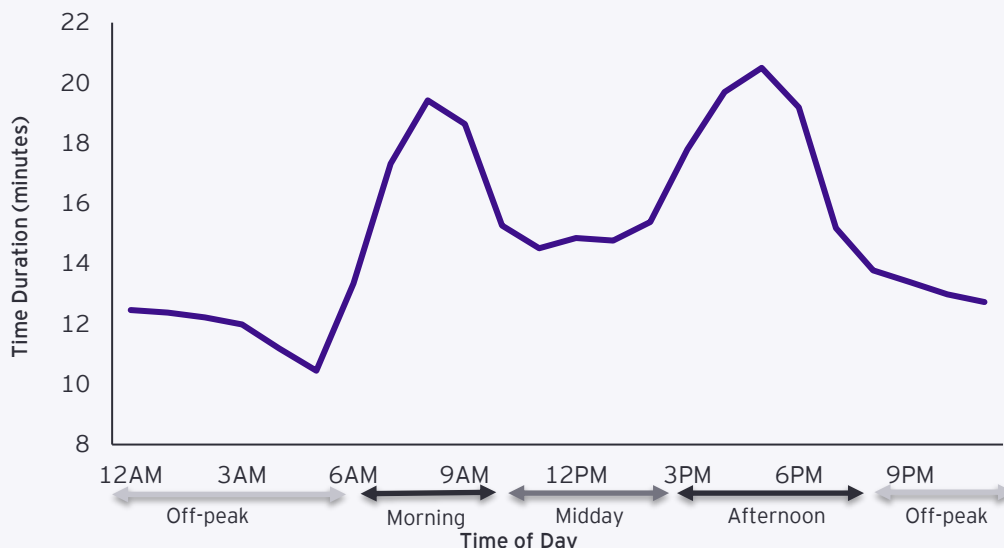
Congested morning traffic begins around 7 AM, reaching its highest levels at 8 AM. At this time, vehicles are on average exceeding 19 minutes per 10 kilometres. Congestion begins to decline from 10am.

In contrast, the 'surge' in afternoon traffic stretches from approximately 3-7 PM. The evening rush hour is most congested at 5 PM, with travel times surpassing 20 minutes per 10 kilometres on average. This extended period of heavy traffic is influenced by various factors including parents picking up children from school and the staggered departure times of workers leaving their place of employment.

While the evening rush hour lasts about an hour longer and sees slightly higher peak times compared to the morning, both periods of congestion are nearly double the time of travel during overnight trips.<sup>7</sup>

Figure 3 illustrates the described congestion patterns throughout an Auckland weekday, based on international traffic data, measuring travel time per 10km on average.<sup>8</sup>

Figure 3: Average Weekday Travel Durations Throughout the Day in Auckland, per 10km (international indices)





## 4. Congestion in Auckland

Figure 4 illustrates the breakdown of congested trips by travel purposes, canvassing the morning peak, interpeak, and evening peak periods. These figures reveal that both morning and evening peak times are predominantly characterised by travel to / from work, while the interpeak period is dominated by trips for other purposes.<sup>9</sup> Note that the heavy vehicles category, throughout this analysis, extends to medium-sized trucks (with a gross vehicle mass of more than 3.5 tonnes).

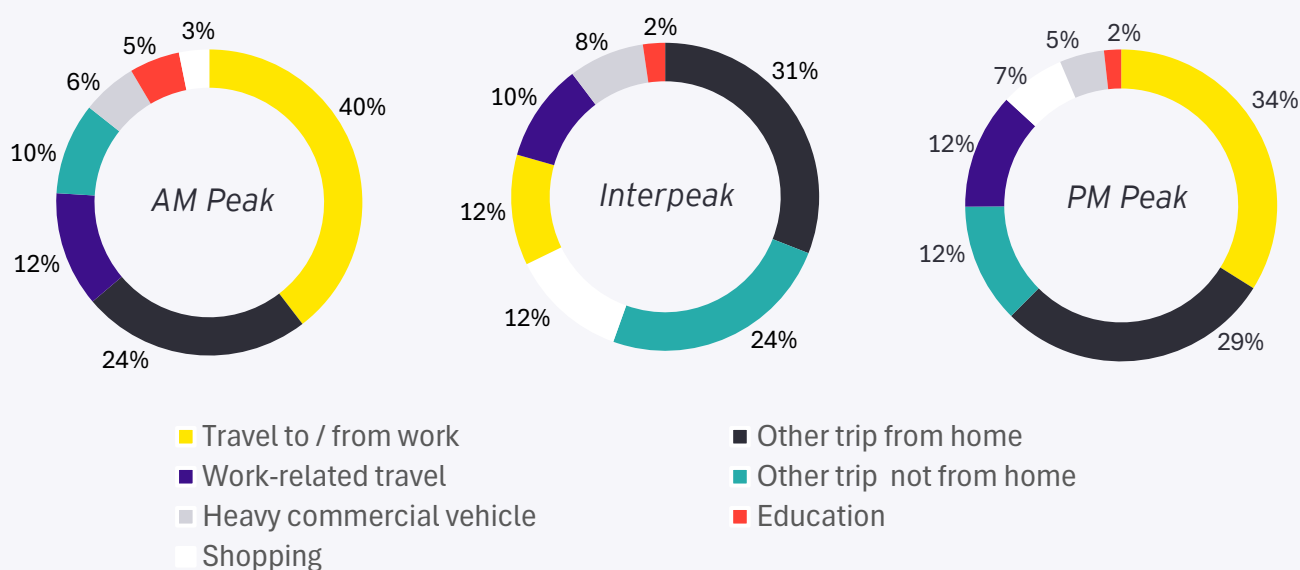
Cars dominate traffic across Auckland during all time periods, accounting for over 90% of congested trips across morning, interpeak, and evening peak periods. Heavy vehicles constitute a smaller but significant portion of traffic, making up only 7% of vehicle movements citywide - about 141,000 congested trips daily.<sup>10</sup>

Heavy vehicle movements are more concentrated in specific areas. Two local board areas, Maungakiekie-Tamaki and Mangere-Otahuhu, experience approximately twice the number of these vehicle trips starting or ending in these suburbs relative to smaller vehicles.

Maungakiekie-Tamaki particularly stands out as the most common origin and destination for congested heavy vehicle trips across all time periods in Auckland - around 14-19% of such trips compared to 8-11% for cars.<sup>11</sup> This may be due to the inland port at Wiri and the Onehunga metro port.

Heavy vehicles are less likely than cars to make congested trips to / from the city centre, averaging 7% for heavy vehicles versus 9% for cars. The notable exception is during interpeak hours, when the proportion of congested heavy vehicle trips from the city (12%) surpass car trips (9%).<sup>12</sup> This pattern may reflect daytime freight from the Port of Auckland or other hub in the city centre.

Figure 4: Proportion of congested weekday travel trips by purpose in Auckland, 2026



## 4. Congestion in Auckland

### 4.2 International Comparisons

Comparing Auckland to other cities supports us to assess the severity of our congestion problems. International measures help put traffic challenges in perspective.

**In 2024, the Auckland central area was ranked the 77th worst congested city globally.**

This is illustrated in Figure 5.<sup>13</sup> Ranking reflects 'time lost per year in congestion' for the metro area.

*"Connectivity is one of our lowest pillars compared to other cities... The deficits for Auckland are really in the transport connectivity, which won't surprise too many Aucklanders"*

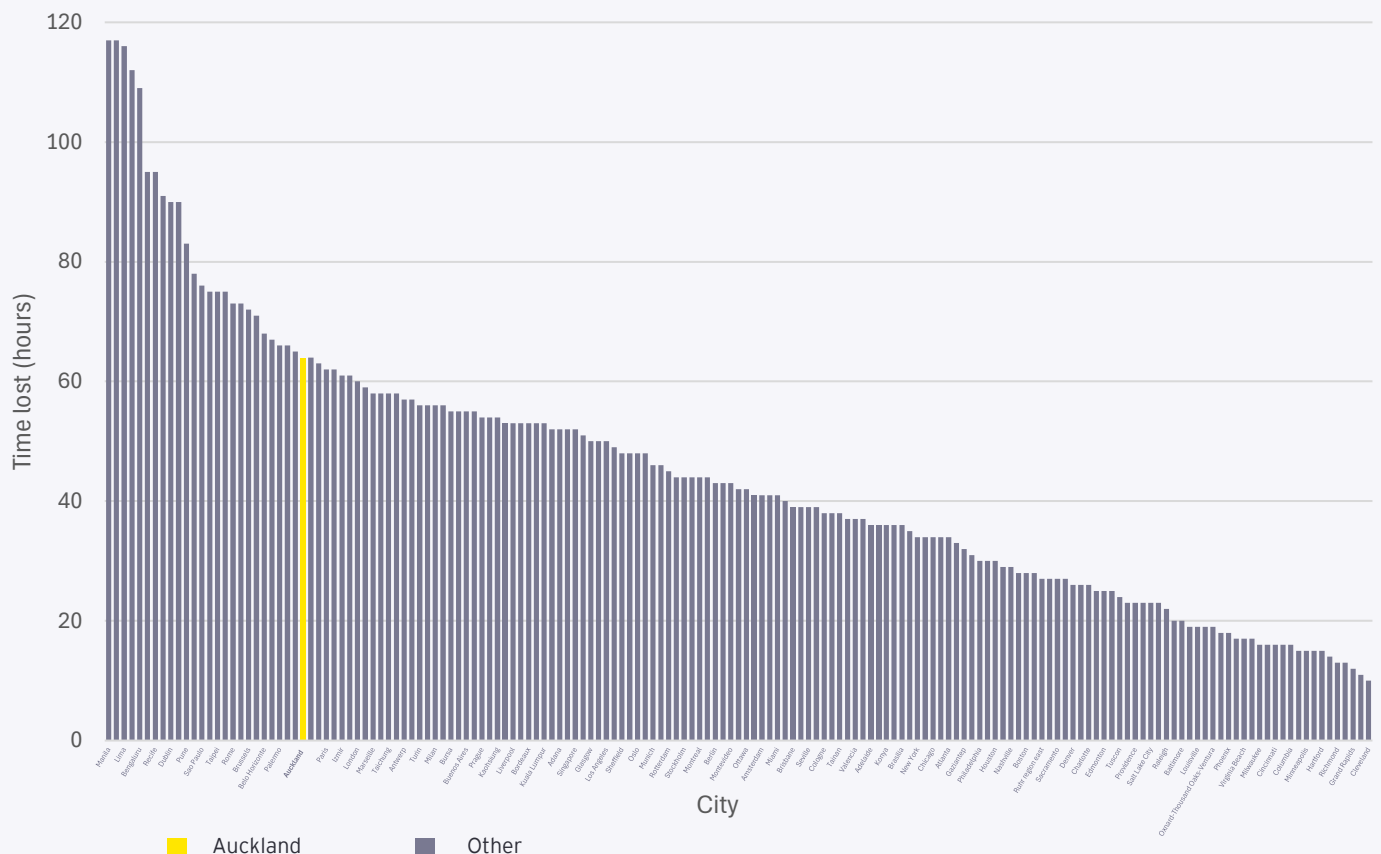
- Mark Thomas, Director of the Committee for Auckland<sup>14</sup>

According to international traffic data, Auckland's congestion ranks poorly internationally. Of 500 cities in the database across 62 countries, Auckland's metro area is ranked 77<sup>th</sup> for its level of congestion, scoring worse than all other New Zealand and Australian cities.

TomTom estimates that drivers in the Auckland metro area lose an average of 66 hours annually due to traffic delays, based on two 10km rush hour trips each weekday. This is considerably more than Sydney and Melbourne, which lose 58 and 47 hours respectively, even though both cities have roughly triple Auckland's population.<sup>15</sup>

Note that these international estimates are distinct from Auckland-specific traffic modelling, and results are not comparable. Annual costs are based on local data only.

Figure 5: Time lost per year in congestion (10km twice a day at peak hours) Auckland v other cities - 2024<sup>16</sup>



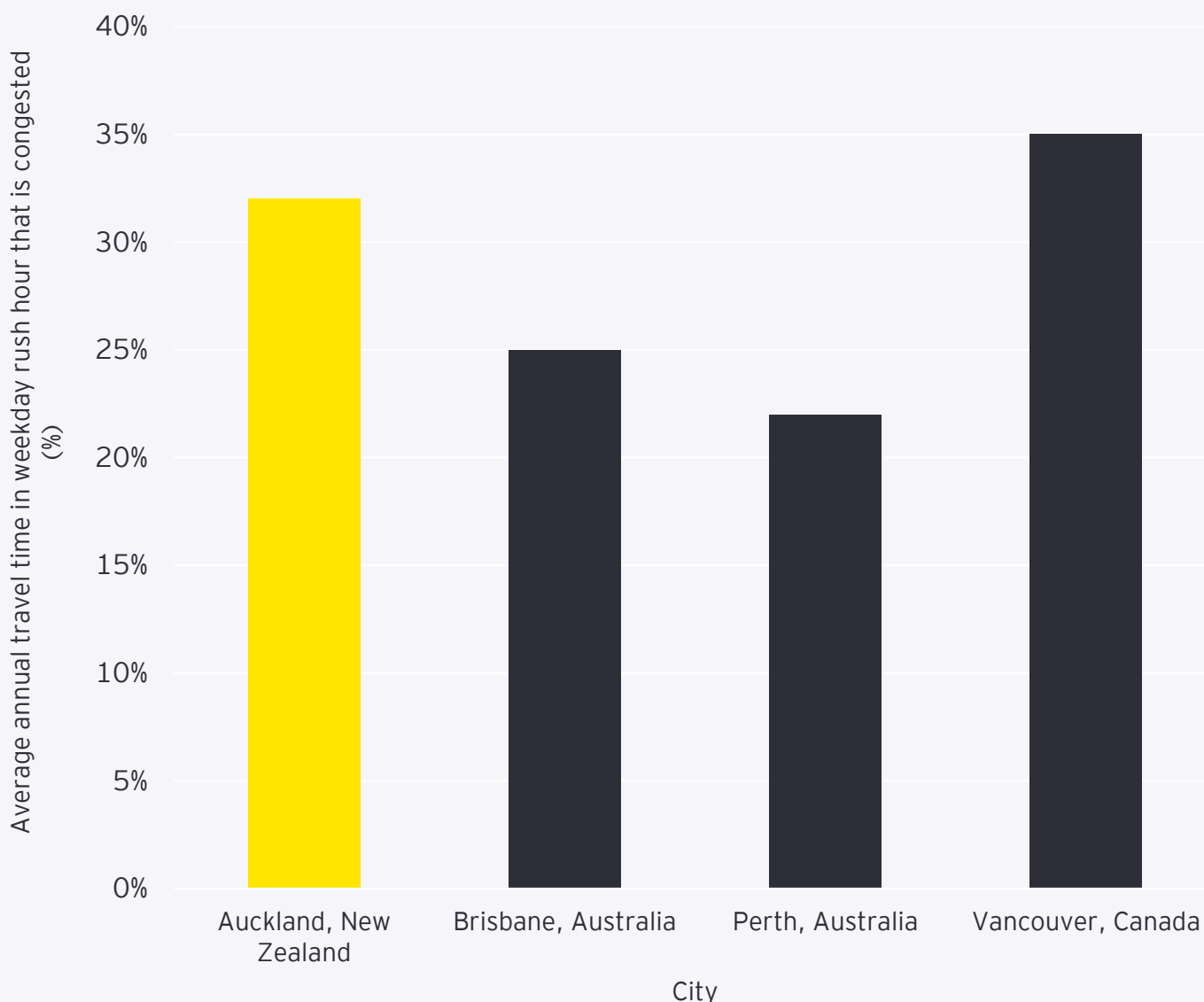
## 4. Congestion in Auckland

The travel time spent in congestion is higher in Auckland than its international comparators as seen in Figure 6. These cities were selected for comparison because:

- Brisbane: A similarly sized comparable Australian city.
- Perth: A similarly sized comparable Australian city.
- Vancouver: A city with similar geographical constraints.

As evidenced in the World Economic Forum's (WEF) Global Competitiveness Index (CGI), infrastructure is one of the main areas hindering Auckland and New Zealand economic growth. In 2019, New Zealand ranked 19<sup>th</sup> of the 141 economies investigated. However, our worst area of performance was infrastructure, in which we only ranked 46<sup>th</sup> out of the 141 investigated economies.<sup>17</sup> To increase our competitiveness, the WEF data suggests that improving our infrastructure - including its efficient utilisation - would have a significant impact.

Figure 6: Percentage of average annual travel time in rush hour that is congested - 2024<sup>18</sup>



## 4. Congestion in Auckland

### 4.3 Key drivers of Auckland's congestion problem

#### Population Growth

The key driver of congestion in Auckland is rapid population growth. Over the last 21 years Auckland's population has grown by 34%.<sup>19</sup>

This is significantly greater than the OECD average of 13% over the same period.<sup>20</sup> In 2023, Auckland's population was estimated to be 1.7 million (StatsNZ, 2023), as illustrated in Figure 7.<sup>21</sup>

As our population grows, so does the demand for transport use. Without a significant change in transport mode usage, the way we work, or the way we live, more people in Auckland will use the roading network to get around.



Figure 7: Auckland's Population Growth



## 4. Congestion in Auckland

### Economic success

Additionally, Auckland's economy has grown steadily over time (traditionally measured through real Gross Domestic Product (GDP), equal to the total value of goods and services produced in a given country, in a given year, adjusted for inflation).

For the year to June 2024 the city experienced a small decline, equivalent to 0.1% of real GDP.<sup>22</sup> However, the overall trend over the last 20 years shows a consistent increase - with GDP growing by approximately 14 billion dollars in the last five years (as seen in Figure 8).<sup>23</sup>



This stays true even when we consider population growth. Auckland's GDP per person has consistently grown over time (illustrated in Figure 9).

A growing real GDP and GDP per capita reflects increased economic activity, typically resulting in a richer populous with a better quality of life. Moreover, cities experiencing economic prosperity attract people in search of superior job opportunities and living conditions. Such migration boosts Auckland's population and again contributes to heightened traffic and congestion.

Figure 8: Auckland's Real GDP Growth

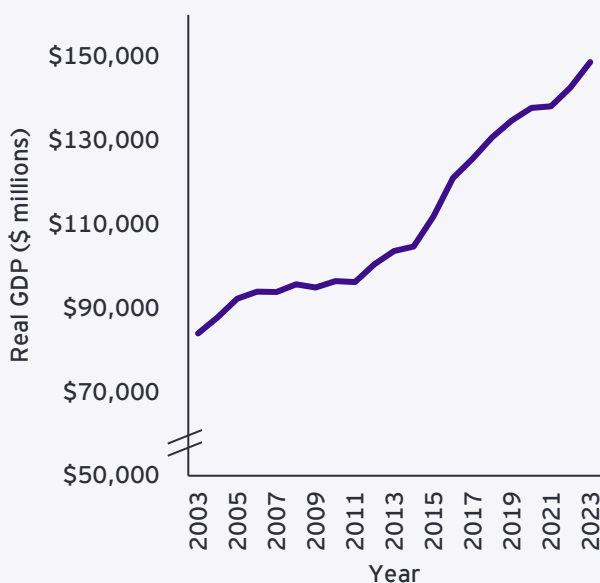
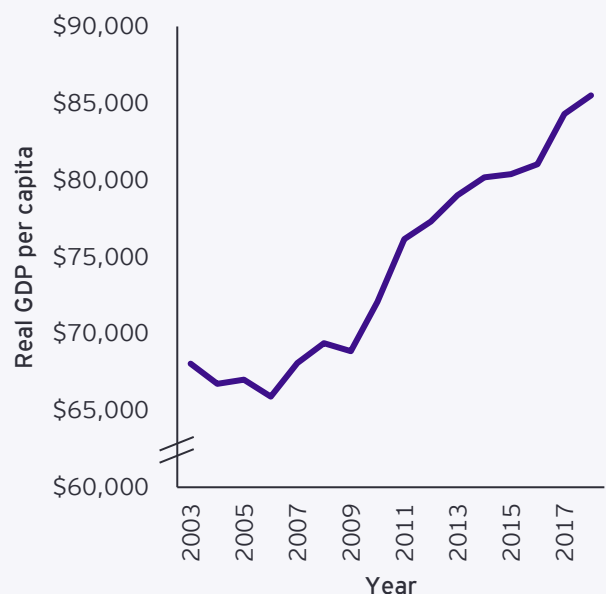


Figure 9: Auckland's Real GDP Per Capita Over Time



## 4. Congestion in Auckland

### Historic development and geographic factors constraining our transport network

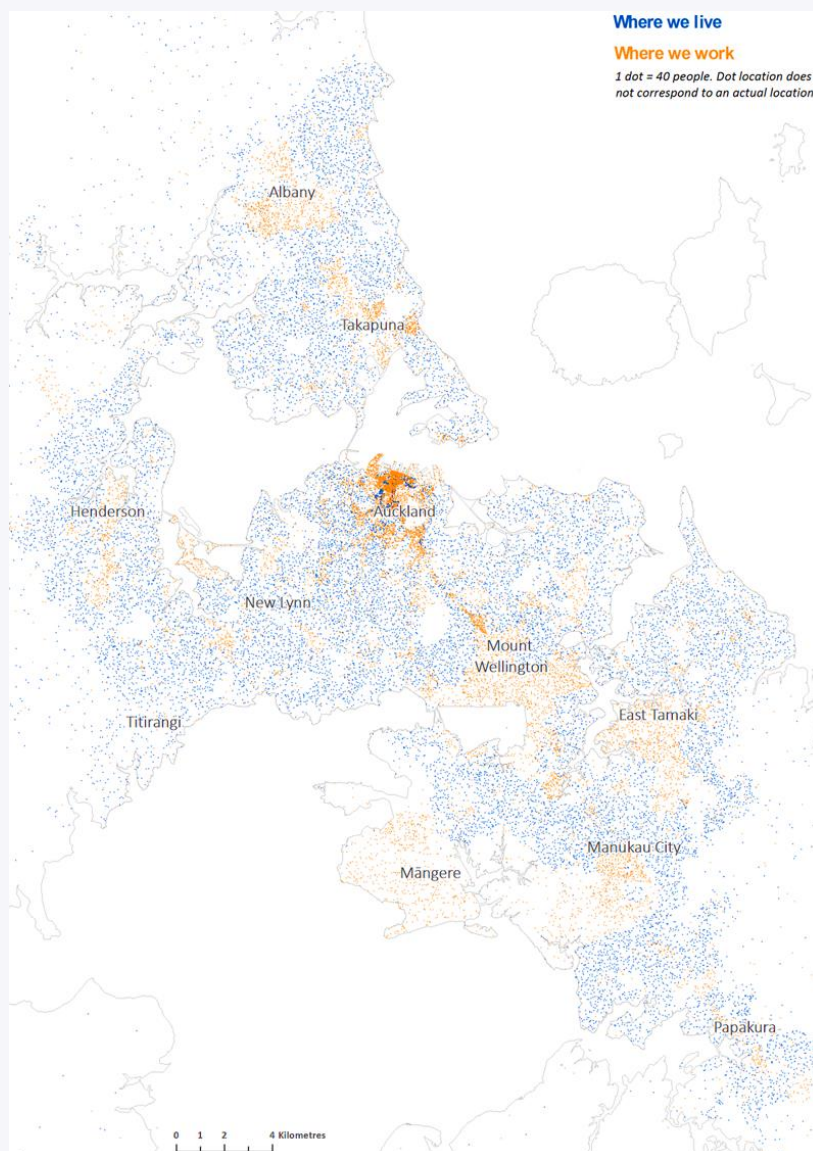
The city's natural and geographic landscape dictates and constrains the layout of Auckland's transportation system. As population and economic growth boosts transport demand, there are limited areas to expand. Auckland is a coastal city with many waterways and seaside suburbs, as such key transport routes are restricted to limited areas and bottlenecks.<sup>24</sup>

Auckland's previous investment and geography has led to the existence of multiple economic hubs throughout the city. Growth in the city centre is complemented by growth in other key centres such as Albany, Henderson, Manukau, Mount

Wellington, and Takapuna. These economic hubs are illustrated in Figure 10 (orange dots show the central business districts / commercial or industrial areas where people work while the blue represents residency).<sup>25</sup> Figure 10 provides an idea of where we live versus where we work based on the 2018 census. Since then, it is anticipated that further economic hubs have been developed through greenfield investment.

As a result of these economic hubs, and most road congestion occurring within the same or neighbouring areas (60% - 90% of daily trips)<sup>26</sup>, Auckland has a complex commuting pattern where there is no one solution to improve travel times or congestion.

Figure 10: Where we live versus where we work



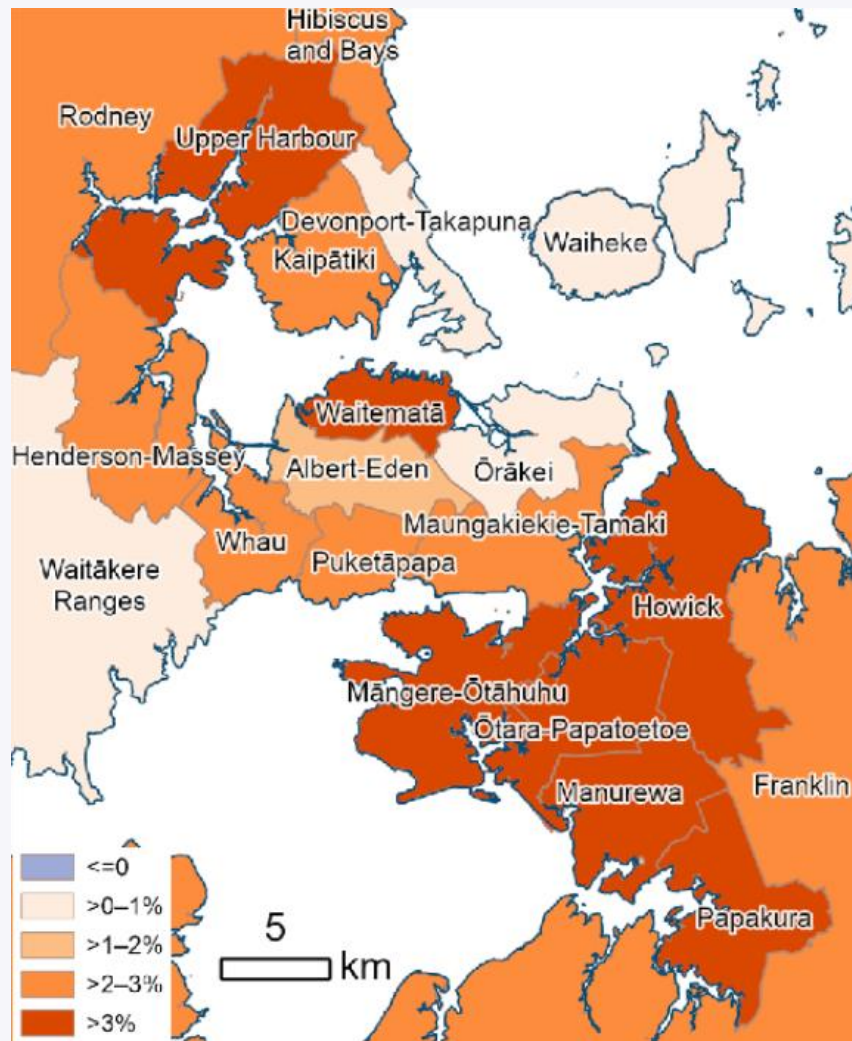
## 4. Congestion in Auckland

### Outwards growth

Over time, to accommodate population growth, Auckland has expanded outward through new developments. In the year ending June 2023, population growth was observed across various Auckland local board areas. While the Waitemata city centre experienced the highest population increase, significant growth was also noted in the far northern and southern suburbs (highlighted in dark red in Figure 11).<sup>27</sup>

Auckland's layout and past urban planning settings have sculpted the city into a low-density area, spread across a large land mass. With the city centre still being the largest employment centre, this expansion increases the need for travel and the time it takes to travel.

Figure 11: Estimated resident population growth in Auckland 2022-2023



## 4. Congestion in Auckland

### Reliance on private transport

Auckland's past investment, layout, and growth has created a city where private vehicles are the most practical and common choice for travel. According to the 2023 census, Aucklanders most common means of travelling to work and school is private or company cars - as opposed to public transport.

Figures 12 and 13 illustrate our reliance on private transport to get to work or education. The majority of travel to work is by car, truck, or van while nearly half of those travelling to education (school and tertiary) are a passenger in a car, truck, or van.<sup>28</sup>

**The 2023 census showed that when travelling to work, 84.7% of Aucklanders use their private or company vehicles.<sup>29</sup>**

Figure 12: How Aucklanders travel to work (2023)

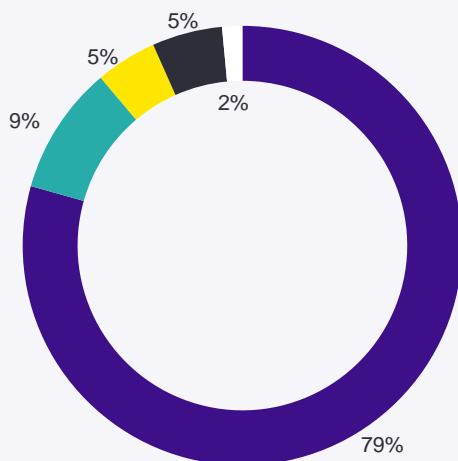
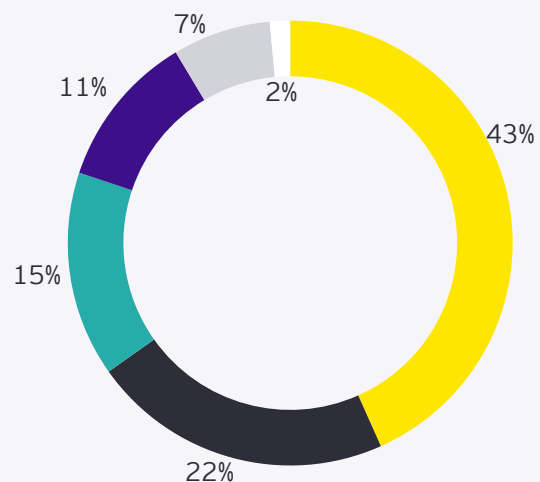


Figure 13: How Aucklanders travel to education (2023)



■ Passenger ■ Walked, jogged or cycled ■ Public transport ■ Car, truck, or van ■ School bus ■ Other



## 4. Congestion in Auckland

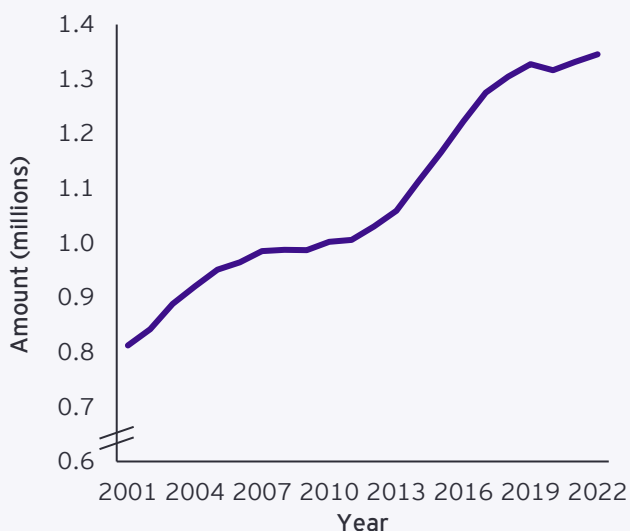
We can see the impacts of these key drivers in the growth in demand for our transport network.

Despite a temporary reprieve during the pandemic, our demand for the roading network has quickly rebounded, resuming its long-term growth pattern.

### Increase in Car Ownership

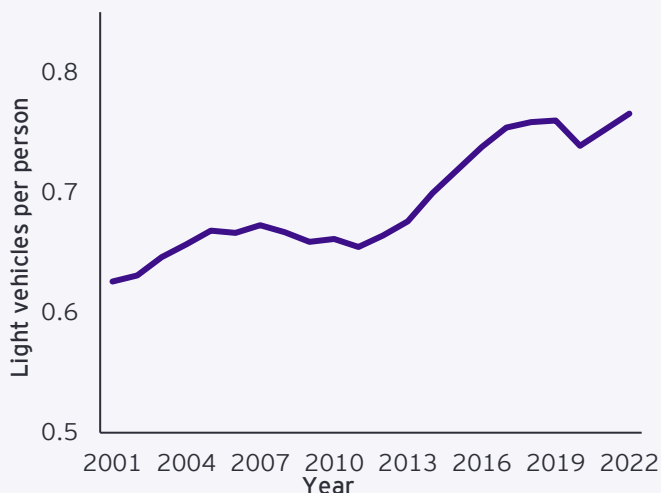
The number of cars owned by Aucklanders has been increasing as seen in Figure 14. Since 2001, private car ownership in Auckland has increased significantly, rising by 70% at an average annual growth rate of 3%.<sup>30</sup>

Figure 14: Auckland Light Vehicle Ownership (million per year)



Aucklanders are not just owning more cars in total they're owning more cars per person. Vehicle ownership has increased on an annual per person basis - indicating vehicle ownership is growing faster than local population, as shown in Figure 15.<sup>31</sup>

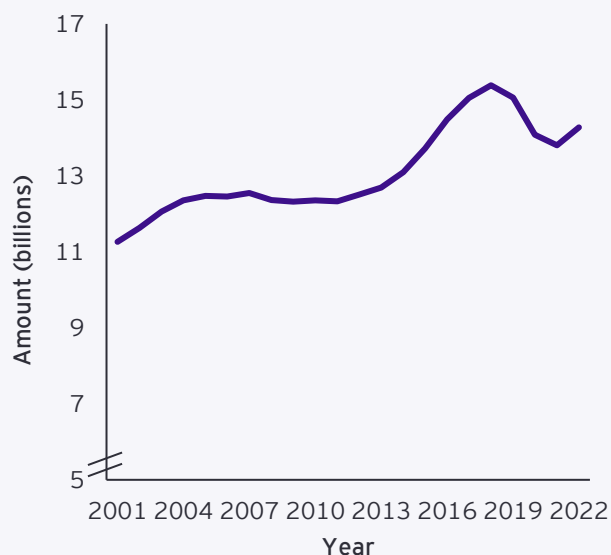
Figure 15: Auckland Light Vehicles Ownership per Person



### Increase in Vehicle Kilometre Travelled

Figure 16 illustrates the constant increase of vehicle kilometres travelled (VKT) across the city.<sup>32</sup>

Figure 16: Auckland Vehicle Kilometres Travelled (billion per year)



Given there are more vehicles available to be used on the roads at any given time, and people are travelling longer distances, the potential for congestion increases significantly.

## 4. Congestion in Auckland

### Increase in Public Transport Use

Annual public transport investment per Aucklanders has increased by almost 71% since 2009 and the number of people using public transport has significantly increased - growing at an average of 4% each year since 2009 (notwithstanding the COVID-19 years).<sup>33</sup>

Figure 17 shows the rolling 12-month total of public transport patronage. As seen in this graph, public transport use in Auckland has continued to grow over the last 20 years. The only notable exception to this trend occurred in 2020, when COVID-19 lockdowns led to a significant drop in ridership. However, public transport usage has quickly recovered.<sup>34</sup>

During the week of 12-18 February 2024, nearly two million trips were taken on Auckland's public transport network, marking the highest ridership since before the COVID-19 pandemic. Furthermore, on 21 February 2024, Auckland's public

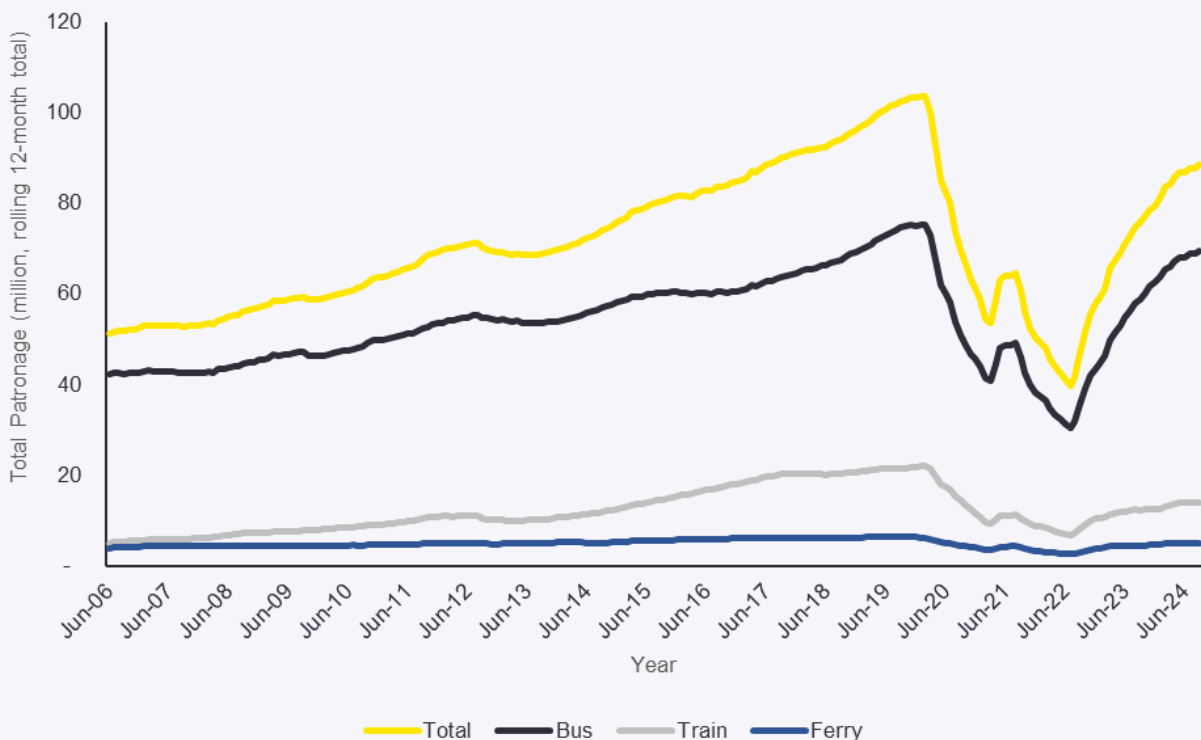
transport system recorded 345,000 boardings, making it the busiest single day in almost five years.<sup>35</sup>

The increasing use of public transport in combination with the increase in light vehicle ownership / vehicle kilometre travelled demonstrates the growing demand for Auckland's transport network.

### This is only expected to increase.

Over the course of the next 10 years, Auckland's population is expected to grow by 10% (another 172,000 people).<sup>36</sup> With the continued geographical constraints Auckland faces, and without significant behavioural change, we can expect that the Auckland congestion problem will only worsen.

Figure 17: Auckland Public Transport Patronage over time



## 5. The Impact of Congestion in Auckland

### 5.1 Approach to estimating the cost of congestion

To estimate the impact of congestion on people, businesses, families, and our economy we have applied two models. These techniques estimate the social and macro-economic costs of congestion, enabling us to account for both individual and market-level effects. The real impact on people, the environment, and the economy are additive implications that each contribute to a holistic view of the cost of congestion in Auckland.

Both models rely on Auckland Forecasting Centre (AFC) transport modelling to predict the vehicle hours per year spent in congestion, where congestion is defined at Level of Service D (as seen in Figure 1). This represents travel times under a 'maximum sustainable flow' state of the network.

We utilised AFC's Macro Strategic Model (MSM) to forecast travel conditions for the year 2026. To explore the ongoing cost that Aucklanders will face, modelling takes account of committed and funded transport activities to the year 2026, including the opening of City Rail Link.

To calculate uncongested travel times, the volumes on the links in the MSM were set to match the LoS D capacity of each link, followed by recalculating the travel times.

The underlying MSM scenario represents an average working weekday and, as such, excludes travel on weekends and public holidays. Consequently, our analysis does not include congestion costs associated with weekend and public holiday travel.

#### Social costs

Direct user costs reflect the value, in dollar terms, of travel time in congested urban conditions. This represents the opportunity cost of Aucklanders sitting in traffic.

Vehicle operating costs and emissions are provided as sensitivity analysis.

#### Macro-economic impacts

Whole of economy impacts are measured through Computable General Equilibrium (CGE) modelling. This estimates the economic impact generated from the social costs felt by society. These effects are additive and therefore do not double count social costs, instead measuring different aspects of the same issue.

More detail of the underlying methodology can be found in the Appendices.



## 5. The Impact of Congestion in Auckland

### 5.2 Implications for individuals, families, businesses, and our environment

#### 5.2.1 Individuals and their families

As Auckland's population has increased over time, so has the pressure on the roading network. As a result, the overall liveability and affordability of Auckland has decreased.

For a family living in Auckland, congestion can affect travel to / from work, social visits, education, recreational, accompanying others on their trips, and more.

#### Hindering careers, education, and other opportunities

As roads become busier mobility is reduced, limiting access to communities, services, and other destinations across the city.

**Almost 30,000 road trips in Auckland each morning face congestion when travelling to school or other educational institutions.<sup>37</sup>**

Non-business travel for essential activities such as education and leisure will become more challenging and time consuming as congestion increases. Not only might congestion cause travel delays, but the increased cost of driving may deter us from going to or participating in these activities altogether.

#### Health challenges

The prolonged exposure to harmful vehicle emissions inhaled from the exhaust of cars and trucks is a silent threat to our physical health, and the health of our families. The pollutants of most concern are those from fuel combustion, brake / tyre wear, and road dust.<sup>38</sup>

Possible health impacts include cancer, cardiovascular and respiratory disorders, and reduced lifespan.<sup>39</sup>

Moreover, spending a significant amount of time in a car every day can have an impact on stress, wellbeing, and work-life balance.<sup>40</sup> In particular, there is less time in the day to recharge, visit family and friends, and attend events that positively impact community cohesion.<sup>41</sup>

**According to Auckland Council Air Quality Report in 2016, more than 900 Aucklanders prematurely died and over 4,500 people were admitted to hospital due to air pollution. 83% of these impacts are due to vehicle emissions.<sup>42</sup>**

## 5. The Impact of Congestion in Auckland

### Housing affordability and other financial burdens

Reduced accessibility influences housing choices and land use patterns, exacerbating housing affordability issues. The desire to reside closer to a workplace or nearer better public transport increases relative property prices around those areas and can force out those who cannot afford the higher cost.<sup>43</sup>

The value of property in more accessible areas increases due to congestion. As a result, those with lower incomes typically end up residing in less accessible areas where transport costs are high.

Moreover, road congestion creates almost \$120 million in additional vehicle operating direct costs a year, including higher fuel and car maintenance costs.<sup>44</sup> This follows the same methodology as Wallis and Lupton (2013), as is included as sensitivity analysis. Although difficult to measure, congestion-related delays can also lead to higher indirect costs such as childcare resulting from parents spending more time in the car on the way to and from childcare.

### Impediments to accessing opportunities

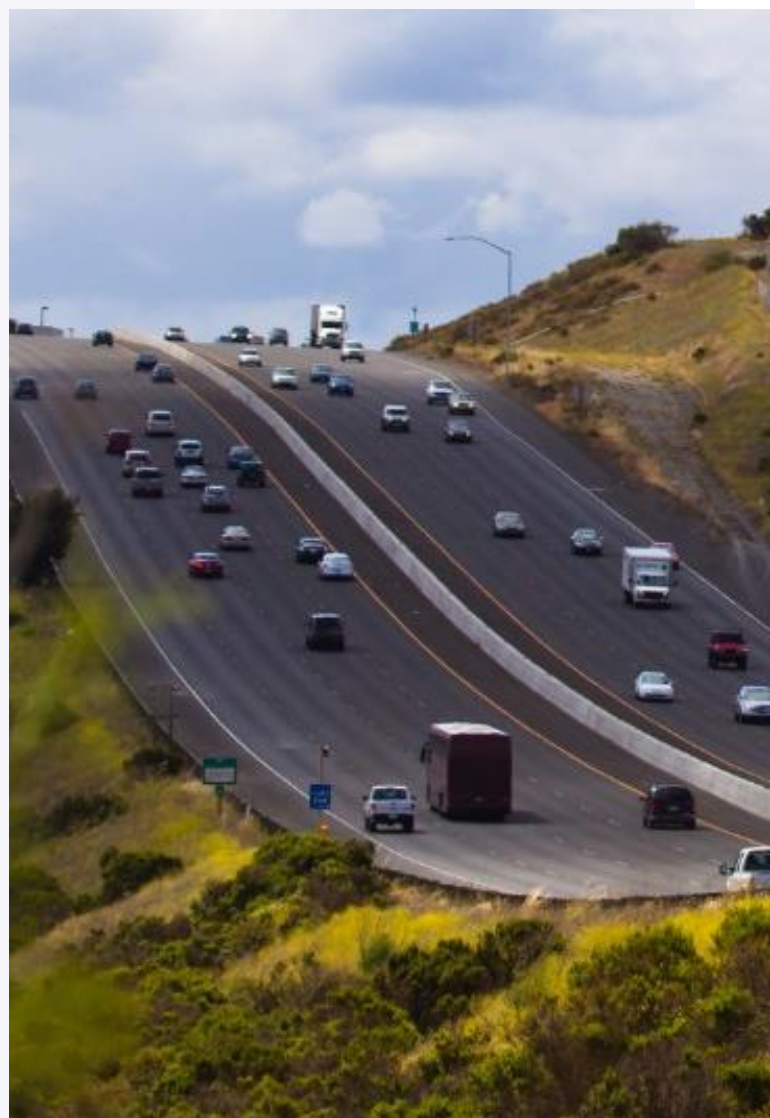
The ability for individuals or groups to explore opportunities that have the potential to change their social status, wealth, or occupancy is heavily influenced by their accessibility to a range of workplaces, social activities, and other community activities. The Socioeconomic Deprivation Index suggests that poverty is most prevalent in four board areas of Auckland: Maungakiekie - Tamaki, Otara - Papatoetoe, Manurewa, and Mangere - Otahuhu.<sup>45</sup>

Almost 550,000 congested trips originate from these suburbs each day (out of 2.1 million), equivalent to almost \$500 million in annual delay costs.<sup>46</sup>

The city centre - the largest economic hub in Auckland - is not a common destination for

these board areas, with the proportion of congested vehicle trips to central Auckland falling below the regional average (3-7% throughout the day, vs. 6-10% elsewhere).

The only exception is Maungakiekie - Tamaki in the morning peak, of which 12% of congested trips are to the city centre. However, this level is still well below suburbs such as New Lynn, Mt Albert, Mt Eden, and Orakei.<sup>47</sup> Auckland's congested transportation network inhibits easy access into large economic hubs. As such, those in Maungakiekie, Otara, Manurewa, and Mangere face barriers to pursuing new jobs, expanding their education, and attending events across the city.



## 5. The Impact of Congestion in Auckland

### 5.2.2 Businesses

Traffic congestion in Auckland is costing businesses and reshaping the way they operate, which may impact on long-term planning as well as day-to-day processes. Out of the total 2.1 million congested trips per day, Aucklanders experience almost 400,000 congested business and freight journeys each day (excluding commutes to and from work).<sup>48</sup>

**A 2019 survey completed by Auckland Council and Auckland Tourism, Events, and Economic Development concluded that 33% of respondents view traffic congestion as the main impediment to growth and operations for Auckland businesses, compared to 5% in 2015.<sup>49</sup>**

#### Increased direct and indirect costs

As congestion on the roads worsens, employees travelling as part of their job face longer periods behind the wheel. This uptick in travel time caused by traffic jams results in a noticeable increase in fuel consumption, vehicle wear and tear, and overall elevated operating costs for the business. As noted prior, vehicle operating costs in isolation, are roughly \$120m higher for Aucklanders than would be the case without road congestion.<sup>50</sup> For businesses where delivery or employee work travel is crucial to deliver outputs, having an employee sit in traffic reduces productivity and increases business labour costs. In a competitive market, it is likely that businesses are taking on these costs, reducing profitability, and limiting opportunities for innovation and expansion.

#### Business performance and quality of service

Travel delays can cause disruptions to the punctuality and reliability of operations. Deliveries become harder to maintain, and employees cannot get to required destinations as quickly or reliably as before. When this consistently occurs, businesses may be forced to reduce the volumes they deliver in a day or the number of sites their employees can visit. In some instances, Auckland businesses could avoid delivering to certain areas or impose an 'out of area' charge. This occurs when costs are too high to justify travelling e.g., due to congestion. Put simply, businesses may be unable to perform as well as they would like and quality is compromised due to any travel delays caused by congestion.

**Although there has been growing demand for freight movement, Mainfreight experienced a 30% reduction in freight by volume of freight delivered between 2015 and 2020 due to congestion.<sup>51</sup>**

#### Supply chain impacts

Businesses can suffer from freight delivery delays, scheduling complications, and unpredictable intermodal connections. For example, the National Road Carriers Association reported that the number of crosstown trips possible for transport firms in a working day has halved over the last nine years.<sup>52</sup>

Our freight sector's reliance on our roading network is significant. The Port of Auckland and Auckland Airport combined transported \$62 billion in total trade value to the year June 2024 - 41% of all cargo value in New Zealand.<sup>53</sup> As of 2020, 95% of freight movements originating in Auckland were transport via road.<sup>54</sup> The roading network connects these critical hubs to each other, as well as the rest of the New Zealand economy.

## 5. The Impact of Congestion in Auckland

### 5.2.3 Environmental impacts

Not only are vehicle emissions detrimental to our health but they are damaging to the health of our planet. Increased vehicle emissions due to pollutants such as carbon dioxide, nitrous oxide, and particulate matter contribute to degrading air quality and the greenhouse effect. When released, greenhouse gas emissions cause warming of the atmosphere leading to extreme weather events, threats to biodiversity and marine life, rising sea levels, and possible loss of life.<sup>55</sup>

Over a third of Auckland's greenhouse gas emissions are produced by household travel or other transport.<sup>56</sup>

When driving in congested traffic, car flow breaks down and / or there is a high level of stop-start movement. When this occurs, travel is highly inefficient, subsequently causing high emissions. Wallis and Lupton (2013) suggest that greenhouse gas emissions costs are roughly proportional to 8% of vehicle operating costs.

**In Auckland, the cost of greenhouse gas emissions due to congestion is approximately \$9 million per year.<sup>57</sup>**



## 5. The Impact of Congestion in Auckland

The core social costs of congestion sum to \$1.9 billion, with potential further social impacts of \$126 million (presented as sensitivity analysis).<sup>58</sup> This is comprised of:

**\$1.9  
Billion**  
in opportunity  
costs

According to Auckland Forecasting Centre transport modelling, Aucklanders sit in congestion for 29 million hours a year or 17 hours per person.

Given all of the possible options or opportunities described in this report that could be realised with this time if it were not used stuck in traffic, the cost of this time is expected to be \$1.9 billion.

**\$117  
Million**  
in operational  
costs

The additional time spent driving due to congestion increases vehicle maintenance and operational costs, wear and tear, fuel requirements.

**\$9  
Million**  
in costs from  
emissions

Cars are a significant source of greenhouse gases, primarily carbon dioxide which is released into the atmosphere through the combustion of fossil fuels. These emissions contribute to the greenhouse effect, leading to global warming and climate change.

Additional time spent in cars due to congestion results in increased emissions every year.



## 5. The Impact of Congestion in Auckland

### 5.3 Other implications for society

Congestion leads to a range of costs to our society and economy, beyond the impacts directly perceived and documented in the section above. These can include:

#### Decreased economic growth and productivity

Economic growth and productivity loss refer to the reduction in the production of goods and services (GDP) and a decrease in the efficiency with which goods are produced (output per unit of input).

The key reasons for decreased economic growth and productivity include:

#### 1. Decrease in labour supply:

In theory, congestion can significantly impact labour supply by making it more challenging for individuals to access employment opportunities. The costs of commuting, either financial or other may discourage or create a disincentive for people to work. As travel times increase, the areas for which businesses can attract employees narrows (note that this has not yet been proven).

When traffic levels are high, some businesses also opt to hire staff that live within close proximity given the need for them to quickly respond to job needs. This is likely to significantly reduce the pool of potential job applicants. Both these challenges contribute to a gap between labour supply and demand across the city.

#### 2. Lost productivity:

A proportion of the time used commuting to work, school, and leisure activities could have been spent on other productive activities such as work. As such, we lose that productivity as a society. With lost productivity and economic growth it is expected that the region would experience

lower wages, employment rates, and disposable incomes / consumption, further impacting economic growth - the start of a continuous downwards spiral.

#### 3. Decreased connectivity:

Agglomeration is when businesses and people gather in cities or regions, creating a hub of activity that can lead to better economies of scale, opportunities, and sharing of ideas. It's like having a big, bustling marketplace where everyone can benefit from being close to each other. If it becomes more expensive to travel - whether that's because of congestion, higher fuel prices etc. - it can make things a little more challenging.

Businesses might find it harder to get to employees because fewer people can afford the trip and people have less accessibility to jobs in the same area. People may have a harder time meeting up, reducing the number of casual interactions that can lead to big ideas and new projects. In essence, when travel costs go up, the energy and connections that make agglomeration so valuable can start to fade away.

**It is estimated that Auckland congestion reduces employment by over 1,200 Full Time Equivalent (FTE) jobs per year by 2026.<sup>59</sup>**

## 5. The Impact of Congestion in Auckland

### Wider New Zealand impacts

Auckland is a nationally significant economic hub that generates 40% of New Zealand's total GDP. Its economic development and success has attracted people from around the country and migrants to the city.<sup>60</sup> Although GDP is understood as a driver of congestion, economic growth is also reliant on effective accessibility. If congestion continues to impact our largest city, it will continue to impact the national economy.

Reductions in GDP caused by congestion can be estimated through methods, such as CGE modelling, which estimates the macro-economic impacts of congestion.



## 5. The Impact of Congestion in Auckland

The macro-economic impacts caused by congestion result in a cost of \$707 million per annum.<sup>61</sup> This is comprised of:

**\$1.4**

**Billion**

in reduced investment by businesses

Congestion reduces productivity, negatively affecting profitability and funds available for spending.

This might look like:

- Hiring less staff
- Purchasing less goods and services as inputs into their business (e.g., a builder purchasing less timber)
- Businesses choosing not to expand or grow

**\$0.1**

**Billion**

in reduced government expenditure

Tax revenue is then reduced because of reduced consumer and business expenditure (there is less money to go around).

This might look like:

- Less money to invest in upgraded transport systems
- A reduction in government provided services
- Increases in other taxes to maintain tax revenue

**\$1.6**

**Billion**

in reduced spending by families

On-average every Auckland household will spend \$3,000 less with businesses due to congestion.

This might look like:

- Commuters forgoing recreational events to avoid peak hour traffic
- Less spending on retail goods and services
- Reduced engagement with educational activities or further study

*Less*

**\$2.4**

**Billion**

From an increasing net trade balance

Congestion results in New Zealand exports being undervalued. Due to congestion inducing a less resilient domestic economy, the New Zealand dollar becomes weaker on the international stage. This results in New Zealand goods becoming underpriced for international buyers, which results in increased exports. New Zealanders also suffer, as importing goods becomes more costly which reduces total imports.

These dampening effects have a side impact of increasing the trade balance, which reduces cost of congestion by \$2.4 billion, but results in a more fragile New Zealand economy.

## 5. The Impact of Congestion in Auckland

The impact of overcrowded roads differs across local communities, as well as the various sectors of Auckland's economy. Putting ourselves in the shoes of our neighbours can provide a greater understanding of the overarching congestion problem. If it continues to grow, we can expect to face a range of challenges across local families, freight providers, and other businesses.



### Persona One: The impact on Auckland families

Due to congestion Auckland families may experience increased financial and time costs of taking their children to sports, hobbies, and social activities. As a result, their children have less opportunities to participate in social and recreational activities.

Moreover, these costs may deter some families from turning up to dental / health appointments.

The reduced macro-economic consumption impact on Auckland families is estimated to be \$3000 per household, per year.<sup>62</sup> One of the trade-offs the parents may have to make is whether to spend time with family and have less disposable income (working locally) or limited time with family and a higher disposable income to give them greater opportunities.

The macro-economic consumption cost on Auckland households is estimated at over \$1.6 billion per annum.<sup>63</sup> With a further \$0.7 billion in social costs felt every year through work, education, and shopping trips.

## 5. The Impact of Congestion in Auckland



### Persona Two: A company in the freight sector

As a result of congestion, the business is forced to shift to a greater number of smaller vehicles to distribute goods and services. This allows greater navigation through traffic using alternative routes and for vehicles to be dispatched more frequently. The challenge with this shift is that it further contributes to congestion and increases labour costs due to the increase in drivers, fuel costs, and insurance costs - heavily impacting the bottom line.

Congestion-induced travel time unpredictability has affected the service quality that can be delivered, through no fault of their own. This has forced the business to acquire additional freight depots across the region, further escalating their operating expenses. These plots of land could also have been better used for another purpose if congestion were not apparent.

When looking for solutions, the business looked into operating outside of peak hours, however this opportunity was limited due to growing customer wants for on-demand delivery during peak periods and liveability / amenity conflicts such as noise in residential areas - giving minimal solutions to a situation that could cause the business to close.<sup>64</sup>

The social costs for the freight sector are estimated to be \$130 million per year, on top of indirect disruption to Auckland and New Zealand supply chains.

Looking at the economy as a whole, businesses in Auckland have a congestion related cost of \$1.4 billion per annum.<sup>65</sup>



### Persona Three: Businesses without a fixed place of work e.g., construction contractor

The cumulative effect of delays caused by congestion has resulted in missed project milestones and incurrance of late completion penalties. This unreliability and delay at no fault of their own has meant that the quality of service has been reduced, impacting their reputation in the market. Contractors are also having to spend a significantly longer period of time on the road, increasing labour costs to the business and decreasing productivity due to a reduced on-site working hours.

This adds up to a significant increase in costs for the business. The construction sector faces some of the largest macroeconomic costs of congestion, estimated at over \$800 million.<sup>66</sup>

The construction industry suffers due to reduced expenditure from consumers, businesses and the government. Through congestion these three parties face costs that cause Auckland GRP to decrease by over \$3 billion per annum.<sup>67</sup>

## 6. Conclusion

The Auckland population is expected to continue to grow, as such so will congestion.

By 2026, the social costs to Aucklanders from time spent in congestion is estimated at \$1.9 billion per year.

By 2026, it is predicted that Aucklanders on average will spend 17 hours stuck in traffic each year (per person, based on congestion levels). Within affected routes, this is equivalent to a 30% increase in annual vehicle hours.<sup>68</sup>

This time could be spent elsewhere and therefore comes at a cost - \$1.9 billion per year.

**\$126 million costs may arise from emissions and vehicle operating costs.**

Car emissions are significantly increased due to congestion. These emissions degrade air quality, affect our health, and play a substantial role in climate change.

The direct costs of sitting in traffic are increased fuel prices and maintenance costs as a result of greater wear and tear. These values are included as sensitivity analysis only.

**The impacts congestion has on our economy (e.g., behavioural responses to price changes and international linkages to imports and exports) is estimated to cost the Auckland and New Zealand economies \$707 million per year.**

This cost is derived by the ripple effect congestion has on our society. Lost time spent in congestion hinders our ability to consume goods and services, and limits business confidence to investment in the future.

**In total, Auckland's congestion problem will cost us \$2.6 billion a year by 2026.**

**There are options to reduce the cost of congestion.**

To improve the wealth and lives of Auckland and its residents and the New Zealand economy as a whole, a wide range of policies and investments will be required.

## 7. References

- 1 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 2 Wallis, I., & Lupton, D, The costs of congestion reappraised, 2013, <https://www.nzta.govt.nz/assets/resources/research/reports/489/docs/489.pdf>
- 3 Ministry of Transport. Defining Congestion. February 2019. <https://www.transport.govt.nz/assets/Uploads/Paper/DefiningCongestion.pdf>
- 4 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 5 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 6 EY Analysis of Auckland Forecasting Centre Modelling
- 7 EY Analysis of Auckland Forecasting Centre Modelling
- 8 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 9 EY Analysis of Auckland Forecasting Centre Modelling
- 10 EY Analysis of Auckland Forecasting Centre Modelling
- 11 EY Analysis of Auckland Forecasting Centre Modelling
- 12 EY Analysis of Auckland Forecasting Centre Modelling
- 13 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>. Note that only a subset of cities are labelled on the x-axis due to space constraints.
- 14 Stuff, State of the City: Benchmarking Tāmaki Makaurau Auckland: Auckland slipping backwards against similar international cities, 2024, <https://www.stuff.co.nz/nz-news/350374300/auckland-slipping-backwards-against-similar-international-cities#:~:text=It%20measured%20Auckland%27s%20performance%20against,similar%20governance%20and%20institutional%20contexts.>
- 15 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 16 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 17 The Global Competitiveness Report, 2019, [https://www3.weforum.org/docs/WEF\\_TheGlobalCompetitivenessReport2019.pdf](https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf)
- 18 TomTom, Auckland traffic report | TomTom Traffic Index, 2024. <https://www.tomtom.com/traffic-index/auckland-traffic/>
- 19 Statistics New Zealand. Estimated Resident Population for Territorial Authority Areas, 2023, <https://infoshare.stats.govt.nz/ViewTable.aspx?pxID=0fd9c962-0443-425a-95ed-23f41ea9af50Greater>
- 20 World Bank Group. Population Growth (annual %) - OECD members. 2023. <https://data.worldbank.org/indicator/SP.POP.GROW?end=2023&locations=OE&start=2003&view=chart>
- 21 Statistics New Zealand. Estimated Resident Population for Territorial Authority Areas, 2023, <https://infoshare.stats.govt.nz/ViewTable.aspx?pxID=0fd9c962-0443-425a-95ed-23f41ea9af50Greater>
- 22 Auckland Council, Auckland Economic Update, 2024, <https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/economic-advice-publications/Documents/auckland-economic-update.pdf>
- 23 Statistics New Zealand. Gross domestic product, by region and industry (Annual-Mar) 2024, <https://infoshare.stats.govt.nz/ViewTable.aspx?pxID=c818e648-31d7-4141-8b07-eac5ae1c8228>
- 24 Saiz, A., & Wang, L. Physical geography and traffic delays: Evidence from a major coastal city. *Environment and Planning B: Urban Analytics and City Science*, 50(1), 218-243. 2023, <https://doi.org/10.1177/23998083221108406>

## 7. References

- 25 Statistics New Zealand. Where we live versus where we work. 2020. <https://storymaps.arcgis.com/stories/6f8b5f981ad34f11bedaf1725e9cb698>
- 26 EY Analysis of Auckland Forecasting Centre Modelling
- 27 Statistics New Zealand. Subnational population estimates: At 30 June 2023. 2023. <https://www.stats.govt.nz/information-releases/subnational-population-estimates-at-30-june-2023/>
- 28 Statistics New Zealand, Aotearoa Data Explorer, 2024, [https://explore.data.stats.govt.nz/vis?fs\[0\]=2023%20Census%20%7CTransport%23CAT\\_TRANSPORT%23&pg=0&fc=2023%20Census&bp=true&snb=6&vw=tb&df\[ds\]=ds-nsiws-disseminate&df\[id\]=CEN23\\_TBT\\_008&df\[ag\]=STATSNZ&df\[vs\]=1.0&dq=teu999%2Btwu999%2BtwuTS%2Btwu016%2Btwu012%2Btwu010%2Btwu009%2Btwu007%2Btwu006%2Btwu005%2Btwu004%2Btwu003%2Btwu002%2Btwu001%2BteuTS%2Bteu010%2Bteu009%2Bteu008%2Bteu007%2Bteu006%2Bteu005%2Bteu004%2Bteu003%2Bteu002%2Bteu001.9999%2B02.2023&ly\[rs\]=CEN23\\_TBT\\_GEO\\_006&ly\[rw\]=CEN23\\_TBT\\_IND\\_03&to\[TIME\]=false](https://explore.data.stats.govt.nz/vis?fs[0]=2023%20Census%20%7CTransport%23CAT_TRANSPORT%23&pg=0&fc=2023%20Census&bp=true&snb=6&vw=tb&df[ds]=ds-nsiws-disseminate&df[id]=CEN23_TBT_008&df[ag]=STATSNZ&df[vs]=1.0&dq=teu999%2Btwu999%2BtwuTS%2Btwu016%2Btwu012%2Btwu010%2Btwu009%2Btwu007%2Btwu006%2Btwu005%2Btwu004%2Btwu003%2Btwu002%2Btwu001%2BteuTS%2Bteu010%2Bteu009%2Bteu008%2Bteu007%2Bteu006%2Bteu005%2Bteu004%2Bteu003%2Bteu002%2Bteu001.9999%2B02.2023&ly[rs]=CEN23_TBT_GEO_006&ly[rw]=CEN23_TBT_IND_03&to[TIME]=false)
- 29 Statistics New Zealand, 2023 Census population, dwelling, and housing highlights, 2024, <https://www.stats.govt.nz/information-releases/2023-census-population-dwelling-and-housing-highlights/#travelwork>
- 30 Ministry of Transport. Annual Fleet Statistics. 2022. <https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/annual-fleet-statistics/>
- 31 EY analysis of Ministry of Transport Fleet Statistics.
- 32 Ministry of Transport. Annual Fleet Statistics. 2022. <https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/annual-fleet-statistics/>
- 33 Auckland Transport. AT Metro patronage report. 2024. <https://at.govt.nz/about-us/reports-publications/at-metro-patronage-report>
- 34 Auckland Transport. AT Metro patronage report. 2024. <https://at.govt.nz/about-us/reports-publications/at-metro-patronage-report>
- 35 Auckland Transport. Public transport hits highest usage in five years. 2024. <https://at.govt.nz/about-us/news-events/media-centre/2024-media-releases/public-transport-hits-highest-usage-in-five-years>
- 36 Auckland Council. Auckland Council population projections (total Auckland). 2023. <https://knowledgeauckland.org.nz/publications/auckland-council-population-projections-total-auckland-march-2023/>
- 37 EY Analysis of Auckland Forecasting Centre Modelling
- 38 New Zealand Transport Agency, The effect of speed on emissions: summary report, 2023, <https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Climate-change/Mitigation/Speed-summary-report-REVISED-september-2023.pdf>
- 39 Statistics New Zealand. Human health impacts of PM<sub>2.5</sub> and NO<sub>2</sub>. 2023. <https://www.stats.govt.nz/indicators/human-health-impacts-of-pm2-5-and-no2/>
- 40 Marta Aranha Conceição, Mayara Moraes Monteiro, Dena Kasraian, Pauline van den Berg, Sonja Haustein, Inês Alves, Carlos Lima Azevedo & Bruno Miranda (2023) The effect of transport infrastructure, congestion and reliability on mental wellbeing: a systematic review of empirical studies, *Transport Reviews*, 43:2, 264-302, DOI: 10.1080/01441647.2022.2100943
- 41 Ghazali, Wan Noratikah Wahidah Binti. (2019). The Effect Of Traffic Congestion On Quality Of Community Life. 759-766. 10.15405/epms.2019.12.77.
- 42 Auckland Council. Auckland Air Quality - 2022 Annual Data Report. 2023. <https://www.knowledgeauckland.org.nz/media/ansfn5r2/tr2023-08-auckland-air-quality-2022-annual-data-report.pdf>
- 43 New Zealand Infrastructure Commission Te Waihanga, The decline of housing supply in New Zealand: Why It happened and how to reverse it, 2022, <https://media.umbraco.io/te-waihanga-30-year-strategy/ekejyOt1/the-decline-of-housing-supply-in-new-zealand.pdf>



## 7. References

- 44 EY Analysis of Auckland Forecasting Centre Modelling
- 45 Atkinson et al. NZDep2023 Index of Socioeconomic Deprivation. 2024.  
<https://www.otago.ac.nz/wellington/research/groups/research-groups-in-the-department-of-public-health/hirp/socioeconomic-deprivation-indexes-nzdep-and-nzidep-department-of-public-health#2023>
- 46 EY Analysis of Auckland Forecasting Centre Modelling
- 47 EY Analysis of Auckland Forecasting Centre Modelling
- 48 EY Analysis of Auckland Forecasting Centre Modelling
- 49 Auckland Council Business Survey: Auckland Region Wave 6 Results (2019), Auckland Council and ATEED
- 50 EY Analysis of Auckland Forecasting Centre Modelling
- 51 Auckland Transport, Auckland Freight Plan, 2020, <https://at.govt.nz/media/1983652/item-137-auckland-freight-plan-attachment-1-summary-report.pdf>
- 52 RNZ News, Auckland traffic congestion costs city almost \$2b a year, 2024,  
<https://www.rnz.co.nz/news/national/336352/auckland-traffic-congestion-costs-city-almost-2b-a-year>
- 53 Statistics New Zealand, Total Exports by New Zealand Port (Annual-Jun), 2024,  
<https://infoshare.stats.govt.nz/ViewTable.aspx?pxID=c8e85207-5d2a-44a2-8373-1e336dc40748>
- 54 Auckland Transport, Auckland Freight Plan, 2020, <https://at.govt.nz/media/1983652/item-137-auckland-freight-plan-attachment-1-summary-report.pdf>
- 55 Ministry for the Environment, Our atmosphere and climate 2023, 2023,  
<https://environment.govt.nz/assets/publications/Environmental-Reporting/Our-atmosphere-and-climate-2023.pdf>
- 56 Statistics New Zealand, Greenhouse gas emissions by region (industry and household): Year ended 2023, 2024, <https://www.stats.govt.nz/information-releases/greenhouse-gas-emissions-by-region-industry-and-household-year-ended-2023/>
- 57 EY Analysis of Auckland Forecasting Centre Modelling
- 58 EY Analysis of Auckland Forecasting Centre Modelling
- 59 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 60 Auckland Council, About Auckland, 2024, <https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/about-the-auckland-plan/Pages/about-auckland.aspx#:~:text=The%20economy,the%20nation's%20gross%20domestic%20product.>
- 61 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 62 EY Analysis of Auckland Forecasting Centre Modelling
- 63 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 64 Auckland Transport, Auckland Freight Plan, 2020, <https://at.govt.nz/media/1983652/item-137-auckland-freight-plan-attachment-1-summary-report.pdf>
- 65 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 66 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 67 EY CGE Analysis of Auckland Forecasting Centre Modelling
- 68 EY CGE Analysis of Auckland Forecasting Centre Modelling (comparison against efficient flow vehicle hours, within LoS D)