Te tatauranga rāngai waka a tau 2020 | Annual fleet statistics 2020

Report of Te Manatū Waka the Ministry of Transport

December 2021

ISBN: 2324-2116 (Online)
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Executive summary
In 2020 there were over 4.4 million registered motor vehicles in New Zealand which were driven around 46 billion kilometres. This report presents a trend analysis what and how New Zealanders driving of motor vehicles has changed since the early 2000s. These broad trends of what and how can be used to understand underlying mechanisms (e.g. driving behaviours, mediating factors, externalities) and help discern the contribution of the road fleet to transport outcomes.

Trends
- For over a month in 2020, parts of the country were subject to COVID-19 alert level restrictions which directly affected the amount most people were allowed to travel. This has had significant effects on the annual distance travelled and e.g. the number of vehicles sold during these restrictions (some of which were recovered).
- 2020 had the largest fleet size to date. Vehicle numbers have generally increased since 2000 with a slight decrease from 2008 to 2012.
- Annual light travel per capita decreased in 2020 for the second year in succession.
- Reported CO₂ emissions per kilometre travelled of light vehicles entering the fleet have decreased in recent years.
- The light fleet continues to be dominated by petrol and diesel powered vehicles. Despite the increasing adoption of light electrified vehicles, their fleet share is very low: about 2% of the light fleet petrol/diesel hybrids (including plug-in hybrids), and only 0.45% (45 per 1000) are fully electric. Petrol and diesel powered vehicles make up the majority of the remainder with fleet shares of 77% and 20% respectively.
- New Zealand's light fleet is older than comparable countries (USA, Canada and Australia) due to the advanced age of vehicles leaving the fleet and the widespread use of used imports (already several years old at entry in the fleet).
- The distance travelled by heavy vehicles in 2020 decreased slightly from 2019 levels.
- The average age of the heavy fleet has been increasing and is now around 18 years.

How to read this report
This report presents a high level trend-analysis of the road motor vehicle fleet to inform the transport sector. Cycles and micro-mobility (e.g. e-scooters, electric skateboards) are not included. Due to the prominence of light motor vehicles in the fleet, the report focuses on their particular characteristics and trends. The appendix studies plausible explanations of certain trends in the light fleet. While attempts have been made to identify underlying mechanisms of the trends, the explanations are likely not exhaustive and do not carry a rigorous causal interpretation.
Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>VKT</td>
<td>Vehicle kilometres travelled. The total distance driven by all vehicles.</td>
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<tr>
<td>Heavy/light vehicles</td>
<td>Vehicles above/below the threshold of 3,500 kg (gross vehicle mass).</td>
</tr>
<tr>
<td>LPV</td>
<td>Light passenger vehicles. Light motor vehicles whose primary use is considered transporting people/passengers, e.g. passenger cars, sports utility vehicles (SUVs). This classification concerns the body type, not the intended use.</td>
</tr>
<tr>
<td>LCV</td>
<td>Light commercial vehicles. Light motor vehicles whose primary use is considered to be transporting goods or for services, e.g. utility vehicles and goods vans. This classification concerns the body type, not the intended use.</td>
</tr>
</tbody>
</table>

Introduction

New Zealand’s motor vehicle fleet has been increasing since 2012. Of the 4.4 million vehicles in the 2020 vehicle fleet, just over 90% are light vehicles – cars, vans, utes, four-wheel-drives, sports utility vehicles (SUVs), small busses and motor caravans (camper vans) with a gross vehicle mass up to 3.5 tonnes. The heavy fleet consists of trucks and buses. ‘Other’ includes motorcycles and unclassified vehicles such as agricultural equipment.

![Fleet composition (vehicles)](image)

In addition to dominating the motor vehicle numbers, the light fleet constitutes more than 90% of the travel on New Zealand roads. Total travel in 2020 was around 46 billion km.
For this reason, the main section of the report presents trends and characteristics of light vehicles.

**Light fleet trends**

**Record number of vehicles**

Light vehicles can be split into two main types\(^1\): light passenger vehicles (LPV) and light commercial vehicles (LCV). Passenger vehicles, LPVs, comprise 84% of the 4 million strong light vehicle fleet. Since 2013, this subset has seen significant growth, increasing annually by 3% on average and culminating in the highest vehicle numbers yet in 2020.

![Light fleet composition (vehicles)](image)

Although they only make up 17% of the light vehicle fleet, 22% of total light travel in 2020 was completed by LCVs. In 2020, LPVs and LCVs contributed to 71% and 20% of the total fleet VKT respectively, while heavy and other vehicles made up the remainder.

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\(^1\) This classification is based on the *shape* of the vehicle using a set of criteria rather than the *purpose* the vehicle was purchased for.
High levels of vehicle ownership

2020 saw a modest decrease in per-capita motor vehicle ownership; the first since 2011. In general, the light fleet has been growing steadily. Following the slump between 2007 and 2011 due to the global financial crisis, ownership returned to annual growth rates seen before 2006.

As shown in the chart below, while the national average of light vehicle ownership is high (shown in black), there is significant regional variation. For the last decade, Wellington and Gisborne have had the lowest ownership rates while all the South Island regions, except Otago, are well above the national average. In the North Island, only the Bay of Plenty is consistently above the national average.
What is New Zealand driving?
Mostly petrol vehicles
Despite the gradual introduction of electric vehicles into the fleet, only about 20 in 1000 light vehicles are petrol/diesel hybrids (including plug-in hybrids) and only 4 in 1000 light vehicles are fully electric. The light fleet continues to be dominated by petrol.
It is worth noting that LCVs and LPVs are not equally fuelled by petrol and diesel. 91% of the 2020 LPV fleet is fuelled by petrol while 77% of the 2020 LCV fleet runs on diesel.

**New vehicles with large engines**

The average engine capacity of the light fleet increased by 10% in the decade between 2000 and 2010 and remained fairly constant at around 2300cc (2.3L) since, a slight decrease is evident in recent years.

It is worth noting here that the MVR does not record whether a vehicle is turbo- or super-charged, which is a way to produce more power (and increase fuel consumption and CO₂ emissions) from the same engine capacity. So changes in engine size may not reflect changes in installed power or fuel consumption/CO₂ emissions.

New light vehicles have significantly larger average engine capacity than used imported vehicles. The gap between engine capacity of new and used vehicles also grew between 2000 and 2010 – from 100cc to ~300cc.

![graph](image)  
**Light fleet average engine capacity (cc)**

**Vehicles entering light fleet with decreasing reported CO₂ emissions**

In 2020, the average of new light petrol, used light petrol, and new light diesel vehicles entering the fleet is 191 g/km, which represents a 19% decrease compared to 2005. The equivalent CO₂ emissions value for new light petrol is 175g/km (30% decrease), used light petrol is 184g/km (17% decrease), and new light diesel vehicles is 236g/km (14% decrease).

All CO₂ values quoted are according to the three phase Worldwide Harmonised Light Vehicle Test Procedure (3P-WLTP) (low, medium, and high speed phases). Where values are not available for the WLTP, the available values have been converted from available test results³.

These reported reductions in CO₂ emissions are due to changes that have improved the fuel efficiency in real-world use, but also due to manufacturers improving their vehicles’ performance in official test procedures that may not (fully) translate to improved performance in real-world.

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conditions. The development of the WLTP is intended to address many of the aspects of current testing regimes which allow the difference between real-world and test fuel consumption/CO$_2$ emissions.

Fewer used imports but their significant market share persists
The used imports share of the light fleet has been decreasing steadily since 2008. However, the rate of decrease is nowhere close to the large rise between 2000 and 2007 – when the used import market share increased from 39% to 49%.

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4 Real-world fuel efficiency of light vehicles in New Zealand:
Older vehicles compared to international standards

The average age of the light fleet showed a significant increase from 2019 to 2020, after several years steady at around 14 years. The persistence in the fleet of used imports made in the ‘90s is a key factor for the old light fleet.

![Graph showing the average age of the light fleet](image)

New Zealand’s light fleet is older compared to other OECD countries – like Canada, USA and Australia who have high levels of motorisation, and similar patterns of development to New Zealand. The United Kingdom has not been included as its motorisation level is comparatively low.

The average age of New Zealand’s light vehicle fleet increased from 11.8 years in 2000 to 14.3 years in 2020; older than that in the USA (11.8 years for light vehicles in 2019), Australia (10.4 years for all vehicles in 2019) and Canada (9.7 years for light vehicles in 2017 – the most recent data).

Increasing popularity of light commercial vehicles

While the total number of LCVs in the fleet is smaller than LPVs, the growth rate for LCVs has increased since 2012. In 2013 LCVs overtook LPVs in relative growth. This reflects a trend away from the purchase of petrol cars towards diesel-powered, larger and heavier utes and SUVs/4WDs.

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How is New Zealand driving?

Increasing motor vehicle travel per capita

Per capita travel for light motor vehicles has mostly followed the trend of per capita light fleet ownership: an initial increase until the mid-2000s, dropping until 2012 and increasing every year until 2018. In 2019 annual light motor-vehicle travel decreased for the first time since 2012, however, ownership continued to increase. In 2020, travel has decreased further and ownership has decreased slightly, both of these are likely to be influenced by various aspects of the COVID-19 pandemic. Looking at the two series together, annual travel is seen to peak earlier – beginning a decreasing trend almost 3 years before a decrease in vehicle ownership. The reasons for this earlier decline are not fully understood at present.

Decreasing travel per vehicle

Contrary to New Zealand’s increasing rate of motor vehicle ownership, the rate of travel per vehicle has been, in general, steadily decreasing since 2001, with a relatively sharp decreases in 2019 and
more so in 2020. This decreasing trend could be due to older vehicles in the light fleet that are available for use but rarely used (see below).

**Driving further in young vehicles**

In general, per-vehicle light motor vehicle annual travel in 2020 diminished with vehicle age: older vehicles didn’t travel as far per year as newer vehicles. Furthermore, there are significant differences in travel patterns between LCVs and LPVs. For light vehicles aged 10 years and younger, commercial vehicles are driven 30% further than passenger vehicles. This effect starts to diminish as the vehicles’ age increases, and has disappeared by the time they are around 15 years old.

**Driving further in vehicles with larger engines**

Younger light passenger vehicles (LPVs) are driven more than older LPVs. LPVs with engines smaller than 1600cc are driven less annually early in their life compared to vehicles with larger engine
capacities. However, for LPVs older than 15 years there is no obvious difference in the average annual travel across the different bands of engine capacity. LCVs follow a similar drop-off pattern in average annual travel as they age, but, their average annual travel is higher than LPVs.

Driving further in light commercial vehicles

The contribution of LCVs to light travel is disproportionate to their numbers in the light fleet. This asymmetry in travel for a given fleet proportion can be seen in the difference to the orange diagonal line. If the contribution of LCVs to travel was equal to its proportion in the fleet, it would be a point on the orange diagonal line in the graph below.

Between 2003 and 2013, the fraction of light fleet travel undertaken by LCVs grew from 15% to just under 18% while the vehicle fraction remained between 13% - 14% of the light fleet. Since 2013, the fraction of travel and light fleet composition of LCVs has been growing steadily – though travel continues to increase more than the proportion of LCVs. As at 2020, LCVs comprised just over 16% of the light fleet but represented around 22% of light fleet travel.
Heavy fleet trends
In 2020 there were over 167,000 heavy vehicles registered in New Zealand and these vehicles were driven around 3.3 billion kilometres – a significantly lower number of vehicles and kilometres travelled than the light fleet.

Increasing travel by road freight
Trucks, carrying freight, are the major contributor of heavy vehicle travel. Except for the period of 2008 - 2012 which were likely affected by economic conditions, the annual distance covered by the heavy fleet has increased every year since 2000. Since 2013, the trend had been increasing every year, though 2020 saw a slight decrease, likely as a result of COVID-19.

Ageing vehicles affect average truck age
The average truck age increased significantly between 2005 and 2016 before plateauing in recent years, with a slight increase in 2020.
Like the light fleet, the truck age structure also shows large numbers of 1990s used imports. This reflects an externality – in this case, another country’s regulations impacting New Zealand imports. Japan banned mid ‘90s vehicles in many cities for air quality reasons. Vehicles could be retrofitted to meet the new emissions requirements but many Japanese owners chose to export their vehicles instead. Some of these trucks were imported to New Zealand resulting in the largest used truck import spike in 30 years.

While 66% of trucks in the fleet in 2020 are new, less than half of the new trucks were made in the last 10 years. The persistence of ageing new trucks and used imports results in an older fleet.

Younger used imports are entering the fleet
Used trucks entering the fleet are now younger than they used to be. This is largely due to the Vehicle Exhaust Emissions Rule. Unlike the subtle impact on light vehicles, this rule caused the average age for heavy vehicles to drop sharply between 2008 and 2009.
Decreasing share of used imports
Between 2000 and 2007, the used import segment of buses and trucks grew faster than the used light fleet - 15% absolute increase compared to 10% for the light fleet. However, this increase in the used import market share has reversed into a decrease since the 2007 Vehicle Exhaust Emissions Rule prevented the import of older used diesel vehicles.

Appendix: Explanations
This section drills into a few interesting trends with some potential mechanisms that underlie them. Note, the explanations only offer plausible causes that cannot be interpreted as causation.
Why does the light fleet have large engines?
Since 2000, light vehicles with engines between 2000 - 2999cc have been an increasing part of the light fleet. In 2010 light vehicles with engines between 2000 – 2999cc became, and continue to be, the most common light vehicle. Prior to 2010 light vehicles with engines between 1600-1999cc were the most common.

![Light fleet vehicles by engine capacity (cc)](image)

Diesel vehicles with larger engines
The highest growth rate since 2000 has been for the second largest engine size band: 3000 - 3999cc. In 2020, there were over twice as many light vehicles with engine sizes between 3000 – 3999cc than there were in 2000. This is partly driven by the increasing popularity of LCVs (i.e. utilities and vans) – which tend to be larger, heavier vehicles with larger diesel engines.

While the average engine capacity of new petrol vehicles increased significantly between 2000 and 2010, the average diesel engine has always been larger than the average petrol engine. Unlike petrol vehicles, used diesel vehicles have increased engine capacity considerably – even overtaking new imports. The trend appears to be still increasing though at a lower rate than the high growth phase between 2002 and 2010.
Why is light vehicle ownership and travel growing?
The relationships between fleet growth, ownership and travel is an intricate web which includes mediators and externalities. While a growing population is likely to result in fleet growth, fleet numbers are directly due to the conversion of the population into vehicle owners. Similarly, while travel is affected by a growing population it is also mediated by the driving patterns of vehicle owners. Externalities like the economy, fuel prices and driving alternatives all influence individual decisions to drive and purchase vehicles. Note, it is likely this is not an exhaustive summary of all the elements that impact light vehicle ownership and travel.

Net migration driving light fleet growth?
Light fleet growth since 2013 has mostly mirrored population growth. In the figure below, both the population and light fleet numbers show growth, as a change from the previous year, between 2012/13 and 2015/16. Since 2016/17 New Zealand population growth has been slowing, and vehicle growth has slowed since 2017/18.

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7 Migration data from Statistics New Zealand
Why is the light fleet ageing?
The age of the fleet is primarily affected by two factors: the average age of vehicles entering the fleet and the average age when they leave.

At the end of 2020, almost 1 in 6 vehicles in the 2020 light fleet were more than 20 years old – due to the persistence of vehicles manufactured in the 1990s.
The New Zealand light fleet is also ageing due to used imports, i.e. vehicles with a relatively high average age upon entry to the fleet – both passenger and commercial vehicles. The average age of only light passenger vehicles when they enter the fleet is close to the average age of the whole light fleet in the USA and Australia: 10 - 12 years. LCV used imports reached a peak average age of 18.9 years in 2015. The average age of used LPVs has continued to increase since 2000 and in 2020 it surpassed 17 years.

Average age at entry and exit of the fleet are driven by various factors, some of which are explained below. Though it should be noted this is likely not a complete list nor necessarily entirely causal.
- Age at exit (scrappage)
  - Survivability of old vehicles (from the late ‘90s)
  - The economy (people will defer replacing vehicles in poor economic times)
- Age at entry
  - Land Transport rules that affect age of vehicles at entry, e.g.
    - Safety features mandates (only or mostly available in newer vehicles)

**Increasing scrappage age for used imports**

Further compounding the effect of their older age at entry to the fleet, used imports are scrapped at a greater average age also. Used imports left the light fleet at an average age of 20.1 years in 2020; the new vehicle equivalent was 18.8 years\(^8\). New vehicles have been exiting the fleet at a similar age for the past 18 years, but while used imports started from a lower base, their average age at exiting the fleet surpassed that of new vehicles in 2013 and has continued to grow since then. The reason for a consistent scrappage age for new vehicles is likely due to accumulated distance driven but there might be additional underlying causes. Reasons for the increasing scrappage age of used imports will include the high survivability of used imports made in the 1990s and 2000s.

![Graph showing age at exit for new and used light vehicles (years)](image)

**High survivability of late ‘90s vehicles**

The **Frontal Impact Standard** introduced large numbers of vehicles made in the 1990s to the light fleet between 2000 and 2008. Of these, 1996 is over-represented with 50,000 more vehicles than any other year. Vehicles made in 1996 also have a remarkable survivability - with more than 90,000 vehicles still in the fleet in 2020.

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\(^8\) **Note:** Due to the new method of determining which vehicles have left the fleet, 2019 data has been suppressed in this year's publication. The 2019 result is likely to change because of ambiguity between scrappage and the timing of relicensing: vehicles that appear to have been scrapped in 2019 can be relicensed between 7 and 12 months after licence expiry. Thus, stable results for 2019 will only be available in 2021.
The below graph shows this effect in a different way. Each panel in the plot below shows the age of vehicles when they are scrapped (whenever this occurs), with the year of manufacture on the x axis and the rate of scrappage on the y axis. These scrappage curves show that vehicles made in the mid to late 90s are mostly scrapped at a lower rate than at other years of manufacture in the 1990s. The curves are most extreme for vehicles aged between 15 and 18 years at scrappage.

**Externalities impact vehicle age**

Like the ownership trends, the average age of the light fleet is dependent on several mediating factors and externalities. The types of vehicles that enter and exit the fleet are impacted by externalities like:

- **The strength of the economy**: which influences purchasing behaviour and thus, the number and type of vehicles both entering the fleet and exiting the fleet.
- **Vehicle rules**: which influence the type of vehicles entering the fleet, and as implemented abroad, these may also affect vehicles’ age at scrappage (e.g. if stringent air quality standards are enacted).

**Scrappage age affected by economy**
While the underlying mechanisms of scrappage are hard to pin down, there is an association between scrappage of used imports and economic strength. At fleet level, vehicle scrappage and purchase are intertwined. Just as vehicle purchase is responsive to people’s belief in the economy, scrappage volumes and age are also affected, though the relationship is less clear.

The volume of used import scrappage increased annually until the economic downturn began in 2008/2009. During the downturn, the age at scrappage increased but volumes decreased. This reflects a decrease in consumer spending as people became reluctant to trade in their vehicles. Following the recovery from the economic downturn, both average age and volume of the scrapped used imports have risen, though this is reversed in 2020.

**Vehicle age at entry impacted by vehicle rules**
The light vehicle fleet includes a significant number of used passenger vehicles manufactured in the mid 1990s (20 - 25 year old vehicles) and those made in the mid 2000s (10 – 15 year old vehicles).
The 1996 year of manufacture peak in the New Zealand fleet is partly due to the Frontal Impact Standard set in New Zealand. This rule had the effect of restricting used imports to vehicles manufactured during or after 1996 (and some older vehicles that met the standard).

The 2005 year of manufacture peak is likely due to the amendment of the Vehicle Exhaust Emissions Rule that came into effect in 2012 to meet the Japanese 05 Emission Standard. From 2012, most vehicles built before 2005 could no longer be registered.

The amendments to the Vehicle Exhaust Emissions Rule have affected the average age of vehicles entering the fleet:

- After the introduction of the rule in 2008, the average age dropped in 2009 and 2010 – though the magnitude is very small.
- A broadening of compliant vehicles increased the average age in 2011.
- The Japanese 05 Emission Standard inclusion decreased the average age in 2012 and 2013.

From March 2020, the implementation of the last phase of a rule change, which was introduced in 2014, will require all light used vehicles entering the fleet to be fitted with the safety technology known as Electronic Stability Control, which was required from 2012 in Japan. The change is expected to significantly reduce the age the used light vehicles entering the fleet, but it will take some time to clearly see the effect.

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