Annual fleet statistics 2019
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Executive summary

In 2019 there were over 4.4 million registered motor vehicles in New Zealand that were driven almost 49 billion kilometres. This report presents a trend analysis *what* and *how* New Zealanders driving of motor vehicles has changed since the early ’00s. 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

- 2019 had the largest fleet size to date. Vehicle numbers have increased since 2012; a trend that could be partly attributed to a stronger economy and increased net migration.
- Annual light travel per capita decreased in 2019 for the first time since 2012 - after a long period of increase, between 2013 and 2018.
- Reported CO₂ emissions per kilometre travelled of light vehicles entering the fleet have improved in the last couple of years after a few years’ plateau.
- The light fleet continues to be dominated by petrol and diesel. Despite the increasing presence of light electric vehicles, their market share is very low: about 14 in 1000 light vehicles are petrol/diesel hybrids (including plug-in hybrids), and only 4 in 1000 light vehicles are fully electric. These minor contributions are completely eclipsed by diesel and petrol - which make up 98.2% of the light fleet engine types.
- New Zealand’s light fleet is much 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 heavy fleet has continued to grow in annual travel since 2013 and contributes 8% of the kilometres travelled by the entire New Zealand fleet
- The average age of the heavy fleet has been increasing and is now almost 18 years. However, in 2009 there was dramatic reduction in the average age of used heavy imports entering the fleet.

Impact on transport outcomes

In the medium term, the future fleet will likely continue to be dominated by petrol and diesel engine vehicles. Combined with the increasing trends in both heavy and light vehicle travel, there will be significant demand on New Zealand roads. These trends ensure that emissions from the road fleet will remain a key focus in achieving national environmental and transport outcomes.

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>
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</thead>
<tbody>
<tr>
<td>VKT</td>
<td>Vehicle kilometres travelled. The total distance driven by all vehicles.</td>
</tr>
<tr>
<td>Heavy/light vehicles</td>
<td>Vehicles above/below the threshold of 3,500kg (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 2019 vehicle fleet, just over 90% are light vehicles – cars, vans, utes, four-wheel-drives, sports utility vehicles (SUVs), 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 2019 was almost 49 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 2019.

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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.
Although they only make up 16% of the light vehicle fleet, 21% of total light travel in 2019 was completed by LCVs. In 2019, LPVs and LCVs contributed to 73% and 19% of the total fleet VKT respectively, while heavy and other vehicles made up the remaining 8%.

High levels of vehicle ownership
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. This has resulted in a record high light vehicle ownership per capita in 2019.

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.

Only two regions have changed their position with respect to the national average: Taranaki and West Coast. Both regions exceeded the national average in 2007. While Taranaki has reverted to below the national average since 2016, the West Coast continues to be higher.

What is New Zealand driving?
Mostly petrol vehicles
Despite the gradual introduction of electric vehicles into the fleet, just about 14 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 2019 LPV fleet is fuelled by petrol while 76% of the 2019 LCV fleet runs on diesel.

**New vehicles with large engines**

The average engine capacity of the light fleet increased by 10% within a decade – between 2000 and 2010. However, an average light vehicle engine size of 2300cc (2.3L) has been consistent since 2011.

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.
Vehicles entering light fleet with decreasing reported CO₂ emissions

The average 2019 new light petrol, used light petrol, and new light diesel vehicles entering the fleet all have a lower reported CO₂ emissions per kilometre travelled than in 2005. For new light petrol there has been a reduction of 27% from 214 g/km in 2005 to 156 g/km in 2019. For used light petrol there has been a reduction of 18% from 201 g/km in 2005 to 165 g/km in 2019. For new light diesel, the reduction has been smaller at 11% from 235 g/km in 2005 to 209 g/km in 2019.

These reductions in CO₂ emissions are partly due to changes that have improved the fuel efficiency, but also due to manufacturers improving their vehicles’ performance in official test procedures that may not (fully) translate to improved performance in real-world conditions³.

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² Note on the calculation: the used import fuel consumption data is not as reliable as the new vehicle data. The Ministry of Transport has estimated values from the used petrol imports that have a fuel consumption test value, and the Japanese test cycle values have also been converted to European test cycle values. Used diesel imports are not included in the analysis, as too few of them have known fuel consumption.

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%.

Older vehicles compared to international standards
While the average age of the light fleet hasn’t changed much since 2012, there has been a significant change since 2000: the light vehicles in 2019 are almost 20% older than in 2000. The persistence in the fleet of used imports made in the ‘90s is a key factor for the old light fleet.

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 14.1 years in 2019; older than that in the USA (11.8 years for light vehicles in 2019)\(^4\), Australia (10.4 years for all vehicles in 2019)\(^5\) and Canada (9.7 years for light vehicles in 2017 – the most recent data)\(^4\).

**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 utes and SUVs/4WDs.

![Light fleet relative growth since 2000](image)

**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. 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, but are likely to be related to the economic situation.

\(^4\) [https://www.autoserviceworld.com/by-the-numbers-average-age-of-u-s-canadian-fleets/]
But decreasing travel per vehicle

Although New Zealand has high levels of motor vehicle ownership, this does not translate proportionately into more travel per vehicle. Since 2000, travel per light vehicle has declined every year until 2019 (with the exception of 2009 and 2016). This decreasing trend could be due to lingering old vehicles in the light fleet that are not driven much (see below).

Driving further in young vehicles

Annual travel in 2019 per light motor vehicle 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 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 2019, LCVs comprised just over 16% of the light fleet but covered 21% of light fleet travel.
Heavy fleet trends
In 2019 there were over 160,000 heavy vehicles registered in New Zealand and these vehicles were driven almost 3.5 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, annual distance covered by the heavy fleet has increased every year since 2000. Since 2013, the trend has been increasing with every year.

Aging vehicles affect average truck age
The average truck age increased significantly between 2005 and 2016 before plateauing in recent years.
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. Some of these trucks ended up in New Zealand resulting in the largest used truck import spike in 30 years.

While 65% of trucks in the 2019 fleet are new, less than half of the new trucks were made in the last 10 years. The persistence of aging new trucks and used imports results in an older fleet.

But 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, the rule caused the average age for heavy vehicles to drop sharply between 2008 and 2009.
Decreasing share of used imports

The preponderance of new trucks has pushed down the share of used imports. The drop in the share of used trucks, and even buses, is more pronounced than for the light fleet. Between 2000 and 2007, the used import segment of the 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.

![Graph of Light fleet vehicles by engine capacity (cc)](graph.png)

Diesel vehicles with larger engines
Though not shown in the previous figure, the highest growth rate since 2000 has been for the second largest engine size band: 3000 - 3999cc. In 2019, 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 – which tend to be 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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6 Migration data from Statistics New Zealand
Why is the light fleet aging?
At the end of 2019, the proportion of very old vehicles was not too different from very young vehicles. Almost 1 in 6 vehicles in the 2019 light fleet are more than 20 years old – due to the persistence of vehicles manufactured in the mid to late 90s.
Aging used imports
The New Zealand light fleet is aging due to old used imports – both passenger and commercial vehicles. Only looking at light passenger used imports, the average age when they entered the fleet is closer to those of whole light fleets in 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 2019 it reached 16.8 years.

The aging of used imports is linked to several factors that drive two main mechanisms: (1) age at entry and, (2) age at exit. Both strongly affect the average fleet age. For example, a low exit age will result in a younger fleet.
The phenomenon of aging used imports can be linked to both increasing age at exit and entry. Each of the mechanisms listed below are expanded in the following sections. Note, they are still not rigorous causal explanations and likely not an exhaustive list of all the elements that impact vehicle average age.

- **Age at exit (scrappage)**
  - Survivability of old vehicles (from the late ‘90s)
  - Due to externalities like a weaker economy
- **Age at entry**
  - Due to externalities like Land Transport rules that affect age of vehicles at entry (possibly not directly, such as safety features made mandatory which may be only or mostly available in newer vehicles)

**Increasing scrappage age for used imports**

The used import segment of the light fleet is older due to an increasing lifespan. Used imports left the light fleet at an average age of 20 years in 2018 and new vehicles averaged 18.9 years. New vehicles have been exiting the fleet at a similar age for that past 18 years with used imports catching up only in 2013. 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.

![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....

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7 **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.
any other year. Vehicles made in 1996 also have a remarkable survivability - with more than 100 thousands vehicles still in the fleet in 2019.

The higher survivability of vehicles manufactured in the late 1990s is due to lower scrappage rates. Within each plot, vehicles are scrapped at the same age and the scrappage rate is given by the manufacture year. These scrappage curves show that vehicles made in the mid to late 90s are always scrapped at a lower rate – regardless of the vehicle age at scrappage. The curves are most extreme for vehicles aged between 15 and 18 years at scrappage. Vehicles scrapped when they’re over 19 years old don’t have the same dependence on manufacture.

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 a 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 spend as New Zealanders became reluctant to trade in their older vehicles for newer ones. Following the recovery from the economic downturn, both average age and volume of the scrapped used imports have risen.

**Vehicle age at entry impacted by vehicle rules**

The light vehicle fleet age mix 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 change¹⁰, which was introduced from 2014, will require all light used vehicles entering the fleet to be fitted with the safety technology known as **Electronic Stability Control**. This standard was required from 2012 in Japan. The change is expected to significantly reduce the age the used light vehicles entering the fleet, but it would take some time to clearly see the effect.

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