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2013 FLEET REPORT HIGHLIGHTS

Light vehicle registration and scrappage

Light vehicle registrations increased markedly in 2013. New registrations were at an all-time record level, and used registration exceeded 100,000 for the first time since the financial crisis. The high level of light vehicle registrations was accompanied by the lowest level of scrappage in over a decade, so the fleet grew in size. The aging of the fleet suggests this low level of scrappage is not sustainable.

Light vehicle entry and exit

The fleet growth in 2013 was the highest since the financial crisis, and not far short of the very high growth in 2003-2005.

Light fleet size

The light fleet grew significantly in 2013, which has not happened since 2007. That was due to the high levels of registrations, as well as the low level of scrappage.

Light fleet growth

The light vehicle average scrappage age

The average age that light vehicles are scrapped at has been increasing, while scrappage volumes have dropped.

Light fleet average age

Vehicle registrations dropped after 2005, and the average age of the light vehicle stock started to increase. The increase was less in 2013 due to the large number of vehicles that entered the fleet.

Light fleet age structure

The new vehicle registrations in 2013 also reduced the growth in the percentage of the fleet that is 15 or more years old. However, the absolute number of these vehicles remains high, and many are approaching end of life.
Travel was almost static from 2005 to 2012. This means that travel per person and per vehicle fell as the population and vehicle fleet grew.

**Travel**
Recent travel trends are covered in the Quarterly Fleet reports, and the 2013 travel will be released in August.

**Light travel per person**
Annual light vehicle travel per capita levelled out in 2012, after dropping since 2005.

**Travel per light vehicle**
Annual travel per light vehicle has been declining. Up to 2007 the increase in vehicles per capita contributed to the decline, and after that the economic situation and fuel prices impacted on it.

**Petrol prices**
Real regular petrol prices remained high and steady. These prices (cents/litre) have been converted to a December 2011 basis using the consumer price index.

**CO₂ emissions of light vehicles**
The CO₂ emissions (grams per km driven) of light vehicles entering the fleet dropped in 2011 and 2012 but remained steady in 2013.

**Growth in other segments of the fleet**
All sectors of the fleet grew in number in 2013. All but the truck segment now exceed the numbers in 2008.

**Hybrid and electric light vehicles**
Hybrid and electric vehicles offer good levels of fuel economy and fuel sustainability respectively. Their penetration into the fleet is very limited with 108 electrics and 8,861 hybrids in the December 2013 fleet.
The graphs and information presented in this report, and the report itself, are available on the research tab of the Ministry of Transport website [http://www.transport.govt.nz/research](http://www.transport.govt.nz/research). A series of brief quarterly fleet reports are also available there.

The Ministry has developed a set of Transport Indicators, which include further information on the vehicle fleet, including some regional breakdowns. The Transport Indicators are available at the top left of the Ministry of Transport’s homepage [www.transport.govt.nz](http://www.transport.govt.nz).

**Describing the vehicle fleet**

This report is based on data from the Motor Vehicle Register. The statistics presented in this publication have been categorised differently to the traditional motor vehicle statistics produced by the Transport Registry Centre of the New Zealand Transport Agency (NZTA). The objective was to produce a categorisation better suited to the estimation of fuel use and levels of emissions.

There are two significant differences:

1) **Vehicle categorisation**

The vehicle categories used in this report are:

- Light passenger
- Light commercial
- Truck
- Bus
- Motorcycle

<table>
<thead>
<tr>
<th>NZTA categorisation</th>
<th>Fleet statistics categorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger car/van</td>
<td>Light passenger</td>
</tr>
<tr>
<td>Goods vans/trucks/utilities</td>
<td>Light commercial if under 3500kg</td>
</tr>
<tr>
<td></td>
<td>Truck if over 3500kg</td>
</tr>
<tr>
<td>Buses</td>
<td>Light commercial if under 3500kg</td>
</tr>
<tr>
<td></td>
<td>Bus if over 3500kg</td>
</tr>
<tr>
<td>Motor caravans</td>
<td>Light commercial if under 3500kg</td>
</tr>
<tr>
<td></td>
<td>Truck if over 3500kg</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>Motorcycles</td>
</tr>
<tr>
<td>Mopeds</td>
<td>Motorcycles</td>
</tr>
</tbody>
</table>

2) **Vehicles leaving the fleet**

The second difference is in judging when a vehicle has left the fleet. Unless a vehicle owner actively de-registers it, or the vehicle has not been re-licensed for 12 months, then the practice of the New Zealand Transport Agency has been to include those vehicles in fleet statistics. This is likely to over-estimate the size of the active fleet, as some vehicles will become inactive well within the 12 months.

In this report vehicles are considered to have left the fleet when their warrant of fitness or certificate of fitness\(^2\) renewal is more than six months overdue. This is considered more realistic.

Appendix A expands on the reasons for these approaches.

---


2 Warrant of Fitness is a 6 or 12 monthly vehicle inspection for private light vehicles (under 3500kg), and Certificate of Fitness is a 6 monthly vehicle inspection of commercial and heavy vehicles (over 3500kg).
3) Travel estimation

The vehicle travel estimates in this report are derived from the odometer readings recorded when vehicles undergo inspection (warrant of fitness and certificate of fitness). These readings were first recorded in this way in 2000 and the estimates derived from them become usable from 2001 onwards.

Although the current method of collecting data generally provides accurate data, a range of matters, discussed below, mean that all figures presented are estimates and may be revised in subsequent years in light of more complete data. The level of change is under one percent.

There was a major change to the data starting with the 2012 fleet report. Previous travel estimates did not include odometer data from vehicles that failed their warrant or certificate of inspection. While most vehicles pass their inspection on the day presented a percentage are not passed until some time later, while some never pass and leave the fleet. Data from vehicles which failed the inspection tests were first utilised in the 2012 report. That provides more odometer readings and better travel estimates.

The travel estimates for a year are calculated in August the following year, and make use of 6 months of inspections data after the end of that analysis period. This approach results in a high number of vehicles having an inspection after the end of the analysis period, but it is still a compromise.

One reason that travel estimates vary from year to year is some vehicles that have been in the fleet for less than one year. For instance, consider a vehicle that entered the fleet in August 2013. It will be on an annual inspection cycle so its first annual inspection will not have occurred before June 30th the following year (ie not within the 6 months of extra data used for the December analysis). An estimate of the vehicle’s travel between August and December 2013 cannot be made from its own inspection data. To address this omission, the travel is estimated based on travel by similar vehicles in the previous year.

Other vehicles that have had a series of inspections, may not have an inspection in the six months after the analysis period. Eventually these vehicles are likely to undergo more inspections, and the estimated travel for the analysis period can be confirmed up. That is why there is a limited degree of change when estimates for previous years are republished.

It also means that similar overall annual travel estimates (for instance 39.9 billion and 40.1 billion) are best regarded as the same, as that level of difference may disappear when extra inspections lead to better estimates.
1. SETTING THE SCENE – THE VEHICLE FLEET IN CONTEXT

How much is the fleet growing?

Figure 1.1 shows the light fleet (shown as light passenger and light commercial vehicles) makes up over 90 percent of the total vehicle fleet. The light fleet is made up of cars, vans, utes, four wheel drives, sports utility vehicles (SUVs), buses and motor caravans under 3.5 tonnes. Figure 1.2 shows the light fleet grew by 19 percent between December 2000 and December 2006 but only by 4.4 percent from December 2006 to December 2012. Growth was 2.9% in 2013 reflecting the high numbers of registrations.

The light fleet is not the fastest growing segment of the fleet. Figure 1.2 shows that bus numbers have grown by 70 percent since December 2000, and motorcycle/ moped numbers have grown by 60 percent.

Figure 1.1 : Fleet composition

Figure 1.2 : Fleet composition relative to Jan 2000
What part of the fleet travels the most?

Travel on New Zealand roads is dominated by the light fleet. Light passenger vehicles contributed 77 percent of road travel in 2012 and light commercial vehicles a further 15 percent. Only eight percent of road travel was by other vehicles (motorcycles, heavy trucks and buses).

Comparing Figures 1.2 and 1.3b shows that growth in travel and vehicle numbers have been similar, except for light passenger vehicles. Their numbers have increased relatively more than their travel has.
Is the light fleet travel done by New Zealand-new or used imported vehicles?

Breaking the information in 1.3a down further shows that the light passenger and light commercial fleets are significantly different. Light passenger travel is almost equally split between vehicles imported new into New Zealand, and vehicles imported second-hand. Light commercial travel is dominated by New Zealand-new vehicles.

Also see Section 8.2, which provides a diesel/petrol breakdown.

What are the trends in travel?

Total annual travel in New Zealand was increasing until 2006 (up 10 percent from 2001 to 2006), but since then three periods of high oil prices and the economic downturn have seen a slight fall in travel (down 1 percent from 2007 to 2012).

The growth in travel by the light fleet of 10.0 percent from 2001 to 2012 is less than the 16.9 percent growth in truck, bus and motorcycle travel during the same period.

Ownership per capita of light vehicles increased significantly between 2000 and 2005. The increase reflected a number of factors, including the high value of the New Zealand dollar (which made vehicles cheaper), high employment and the positive economic outlook that typified that time. Light vehicle ownership per capita declined in recent years, but

---

3 Travel has been estimated using the odometer readings from the vehicle inspection system (warrant of fitness and certificate of fitness).

The New Zealand Vehicle Fleet increased in 2013 and is almost back to the peak level of 2007. The peak rate was 698.2 light vehicles per thousand population in December 2007, and was 697.4 in December 2013.

The increased ownership rate up to 2005 was accompanied by increased travel per capita. Light travel per capita (and fleet travel) dropped in response to the fuel price surges in 2006, rose slightly in 2007 and has continued to drop since then. This reflects that travel has remained largely static since 2007 (see Figure 1.4) while the population has grown.
The very high level of vehicle ownership (see Figure 1.5) does not translate proportionately into increased travel. The amount of travel per light vehicle declined during each year since 2002, with the exception of 2009. It rose in 2009 after the large drop in 2008, which was associated with an oil price spike. Part of this decline is due to the increase in vehicles per capita from 2000 to 2005. (Also see Figures 1.5 and 1.6)

How does the age of the New Zealand fleet compare internationally?

This comparison has been confined to countries with high levels of motorisation, and with similar patterns of development to New Zealand. The United Kingdom has not been included as its motorisation level is comparatively low.

Source: USA Polk, Canada Derosiers and Automotive Industries Association, Australia Bureau of Statistics
This page will be updated in August 2014 when travel estimates for 2013 are available.

Light petrol fleet fuel economy

The economy of the light petrol fleet has been estimated by comparing the travel of the light petrol fleet with petrol deliveries, less estimated other uses of petrol.

The fuel that has been removed from the calculation is:

- fuel used on-road by other parts of the fleet (motorcycles, heavy goods and buses), which is estimated as 0.97 percent of petrol deliveries\(^5\)
- fuel used off-road (boats and jet skis, lawnmowers, circuit racing, rallying, speedway, off-road motorcycling and agricultural quad bikes), which is estimated as 3.7-4.7 percent of petrol deliveries\(^6\)

The bars on the chart in Figure 1.9 show the petrol economy estimates, which are based on the minimum non-light fleet estimate (4.7 percent of petrol) and maximum non-light fleet estimate (5.7 percent of petrol).

The resulting rates are indicative of what happens on New Zealand roads in New Zealand driving conditions. These values are higher than the vehicle fuel test cycle values shown in Section 9, which are based on European and Japanese laboratory test cycles. There is evidence that real world fuel economy is higher than the manufacturers test values, and the gap between them is widening\(^7\).

The graph indicates that real world petrol economy has only improved slightly between 2006 and 2011, despite the entry of more fuel efficient vehicles into the fleet (also see Section 9).

Possible data issues in 2012

The drop in fleet economy in 2012 seems too large to be credible (from 10.1 litres/100km to 9.8 litres/100km). The light petrol travel in 2012 was very similar to 2011 (up 0.3% on 2011) but the reported fuel sales are well down (down 2.4%).

The fuel economy rates for 2004 and 2005 are also possibly not correct. The travel estimates were stable in that period which suggests that too much fuel was reported in 2004, and too little in 2005, resulting in the high economy estimate in 2004 followed by a low estimate the year after. Something similar may be happening again.

The petrol estimates used are the Ministry of Business, Innovation and Employment (MBIE) "observed" values, which MBIE collates from fuel company reporting.

---

\(^5\) Ministry of Transport Vehicle Fleet Emissions Model.

\(^6\) Detailed in the accompanying data spreadsheet, see the research tab at [www.transport.govt.nz](http://www.transport.govt.nz).

\(^7\) [http://www.theicct.org/laboratory-road](http://www.theicct.org/laboratory-road) and [http://www.intechopen.com/download/get/type/pdfs/id/41021](http://www.intechopen.com/download/get/type/pdfs/id/41021)
Vehicle fleet CO$_2$ emissions

Vehicles produce CO$_2$ in direct proportion to the amount of fuel used. Modern vehicles are typically engineered to reduce their harmful emissions, and sometimes this is confused with their CO$_2$ emissions. CO$_2$ emissions are purely a product of the fuel consumed, and are not affected by any controls a vehicle has to reduce harmful emissions (such as fine particulates, NOx, carbon monoxide, volatile organics and hydrocarbons). CO$_2$ emissions per kilometre driven are reduced by improved fuel economy, not improved harmful emission controls.

Figure 1.10 : 2012 CO$_2$ emissions

Source : Vehicle Fleet Emissions Model
2. COMPOSITION OF THE FLEET

New Zealand new and used imported vehicles

Used imported vehicles make up a large proportion of the light vehicle fleet. Figure 2.1 shows their share reached almost 50 percent in 2006 before dropping slightly. The share declined recently due to the decrease in imports of used vehicles and increase in new vehicle sales.

Figure 2.2 shows the used import share of the bus and truck fleet is also dropping. The used imported segment of the bus and truck fleets was growing faster than the used imported segment of the light fleet. This growth has ceased since the 2007 Vehicle Exhaust Emissions Rule effectively prevented the import of older used diesel vehicles. There have also been increased sales of new buses since 2007 (see Figure 5.1d).

![Figure 2.1: Light fleet composition](image1)

![Figure 2.2: Fleet used import percentage](image2)
Average vehicle age

The average age of the light fleet (13.35 years) and the truck fleet (15.7 years) have been increasing in recent years. This is not isolated to New Zealand and one possible influence is improved mechanical reliability leading to vehicles lasting longer. The average age of the bus fleet (15.3 years) has dropped slightly in recent years in response to increased new vehicle purchasing (see Figures 2.8a and 5.1d), although it remains relatively high.

The average age of the vehicles in the light fleet is high by international standards (see Figure 1.8). Figure 2.4 shows that the average age of the used imported vehicles in the fleet is increasing and that the average age of the NZ new light vehicles in the fleet is remaining about the same.

The aging of the light vehicle fleet is discussed in a separate report.

---

Figure 2.3: Fleet average age

Figure 2.4: Light fleet average age

---

The New Zealand Vehicle Fleet

**Light fleet year of manufacture**

The light vehicle fleet age mix includes a significant number of used imports manufactured in the mid 1990s.

The 1996 year of manufacture peak in the New Zealand fleet is in part a consequence of the Frontal Impact Standard\(^9\), which had the effect of restricting used car imports to those vehicles manufactured during or after 1996 (and some older vehicles that met the standard).

As these mid-1990s vehicles age, we expect a significant effect on the age of the fleet. The actual effect will depend on future vehicle import and scrappage patterns (also see Figure 2.5b, 2.11a-2.11b, 2.12a-2.12d and Table 2).

Figure 2.5b shows the relative numbers and ages of the vehicles in the light fleet. There are many vehicles manufactured in the mid 1990s in the light fleet.

Tables 1 and 1a provide a cumulative view of the age structure of the December 2013 light fleet.

### Table 1 December 2013 light fleet age structure

<table>
<thead>
<tr>
<th>Light vehicle age</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 1 year old</td>
<td>3.5%</td>
</tr>
<tr>
<td>Upto 2 years old</td>
<td>6.7%</td>
</tr>
<tr>
<td>Upto 3 years old</td>
<td>9.3%</td>
</tr>
<tr>
<td>Upto 4 years old</td>
<td>11.3%</td>
</tr>
<tr>
<td>Upto 6 years old</td>
<td>17.5%</td>
</tr>
<tr>
<td>Upto 8 years old</td>
<td>25.9%</td>
</tr>
<tr>
<td>Upto 10 years old</td>
<td>36.7%</td>
</tr>
<tr>
<td>Upto 15 years old</td>
<td>59.8%</td>
</tr>
<tr>
<td>Upto 20 years old</td>
<td>85.5%</td>
</tr>
</tbody>
</table>

### Table 1a December 2013 light fleet age structure

<table>
<thead>
<tr>
<th>Year of manufacture</th>
<th>Vehicles</th>
<th>Cumulative vehicles</th>
<th>Cumulative share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>109532</td>
<td>109532</td>
<td>3.5%</td>
</tr>
<tr>
<td>2012</td>
<td>98057</td>
<td>207589</td>
<td>6.7%</td>
</tr>
<tr>
<td>2011</td>
<td>82629</td>
<td>290218</td>
<td>9.3%</td>
</tr>
<tr>
<td>2010</td>
<td>80318</td>
<td>370536</td>
<td>11.9%</td>
</tr>
<tr>
<td>2009</td>
<td>70491</td>
<td>441027</td>
<td>14.2%</td>
</tr>
<tr>
<td>2008</td>
<td>104597</td>
<td>545624</td>
<td>17.5%</td>
</tr>
<tr>
<td>2007</td>
<td>122891</td>
<td>668515</td>
<td>21.5%</td>
</tr>
<tr>
<td>2006</td>
<td>139147</td>
<td>807662</td>
<td>25.9%</td>
</tr>
<tr>
<td>2005</td>
<td>160253</td>
<td>967915</td>
<td>31.1%</td>
</tr>
<tr>
<td>2004</td>
<td>174264</td>
<td>1142179</td>
<td>36.7%</td>
</tr>
<tr>
<td>2003</td>
<td>140978</td>
<td>1283157</td>
<td>41.2%</td>
</tr>
<tr>
<td>2002</td>
<td>148973</td>
<td>1432130</td>
<td>46.0%</td>
</tr>
<tr>
<td>2001</td>
<td>147449</td>
<td>1579579</td>
<td>50.7%</td>
</tr>
<tr>
<td>2000</td>
<td>144947</td>
<td>1723076</td>
<td>55.3%</td>
</tr>
<tr>
<td>1999</td>
<td>137638</td>
<td>1860714</td>
<td>59.8%</td>
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<tr>
<td>1998</td>
<td>150417</td>
<td>2011131</td>
<td>64.6%</td>
</tr>
<tr>
<td>1997</td>
<td>180064</td>
<td>2191195</td>
<td>70.4%</td>
</tr>
<tr>
<td>1996</td>
<td>208843</td>
<td>2400038</td>
<td>77.1%</td>
</tr>
<tr>
<td>1995</td>
<td>140392</td>
<td>2540430</td>
<td>81.6%</td>
</tr>
<tr>
<td>1994</td>
<td>119932</td>
<td>2660362</td>
<td>85.5%</td>
</tr>
<tr>
<td>1993</td>
<td>84290</td>
<td>2744652</td>
<td>88.2%</td>
</tr>
<tr>
<td>1992</td>
<td>78815</td>
<td>2823467</td>
<td>90.7%</td>
</tr>
<tr>
<td>1991</td>
<td>61162</td>
<td>2884629</td>
<td>92.7%</td>
</tr>
<tr>
<td>1990</td>
<td>53414</td>
<td>2938043</td>
<td>94.4%</td>
</tr>
<tr>
<td>1989</td>
<td>35589</td>
<td>2973632</td>
<td>95.5%</td>
</tr>
<tr>
<td>1988</td>
<td>21013</td>
<td>2994645</td>
<td>96.2%</td>
</tr>
<tr>
<td>1987</td>
<td>13490</td>
<td>3008135</td>
<td>96.6%</td>
</tr>
<tr>
<td>1986</td>
<td>10077</td>
<td>3018212</td>
<td>97.0%</td>
</tr>
<tr>
<td>1985</td>
<td>8101</td>
<td>3026313</td>
<td>97.2%</td>
</tr>
<tr>
<td>1984</td>
<td>5784</td>
<td>3032097</td>
<td>97.4%</td>
</tr>
<tr>
<td>1983</td>
<td>3648</td>
<td>3035745</td>
<td>97.5%</td>
</tr>
<tr>
<td>1982</td>
<td>3357</td>
<td>3039102</td>
<td>97.6%</td>
</tr>
<tr>
<td>1981</td>
<td>2901</td>
<td>3042003</td>
<td>97.7%</td>
</tr>
<tr>
<td>1980 or before</td>
<td>2943</td>
<td>3113108</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
There is a significant difference between the make-up of the light passenger and light commercial fleets. Light commercial vehicles are typically relatively young New Zealand-new vehicles, whereas the passenger fleet has a far higher proportion of older used imports.
Motorcycle and moped year of manufacture

The motorcycle and moped fleet grew rapidly from 2004 to 2008 (see Figure 1.2). The age structure shown in Figure 2.6a shows that registrations peaked in 2008, and that New Zealand-new motorcycles and mopeds predominated. Also see Figure 2.6b.

Motorcycles and mopeds have typically been purchased new in recent years, although there is a higher proportion of used imports among the older bikes.
**Truck year of manufacture**

The truck age structure shows large numbers of 1990s used imports in that fleet, which is a characteristic of the light fleet as well. Also see Figure 2.7b.

The peaks in used vehicle models that were made in the mid-1990s reflected the effective banning of these vehicles in many Japanese cities for air quality reasons. This was achieved by a retrospective requirement for vehicles to meet more recent emission standards. Many owners chose to export their vehicles rather than fit aftermarket emission controls. Imports of used diesel trucks fell after 2005 (see Figure 5.1c). Truck registrations have increased significantly since the low point in 2009.

![Figure 2.7a: Truck year of manufacture Dec 2013](image)

![Figure 2.7b: Truck fleet composition Dec 2013](image)
Bus year of manufacture

The bus fleet has a different age profile to the truck fleet. It has a larger proportion of older used imported vehicles manufactured in the late 1980s and early 1990s rather than the mid 1990s. There have been substantial purchases of new buses in recent years.

Figure 2.8a: Bus year of manufacture Dec 2013

Figure 2.8b: Bus fleet composition Dec 2013
Heavy fleet gross vehicle mass

The used imported vehicles in the heavy fleet are concentrated in the small to medium mass range.
Light fleet age structure

Figures 2.11a and 2.11b show how the age structure of the light fleet has changed since 2000. In 2000, 23.8 percent of the light fleet was 15 or more years old, but by 2013 this had increased to 40.2 percent. Vehicle replacement volumes dropped significantly from 2008 and the effect can be seen in the levelling off of the light fleet size (see Figure 2.11a) until the increase in vehicle registrations in 2013.

In December 2013 the proportion of the light fleet that was 15 years old or older had risen to just over 40 percent. It was only 27 percent five years earlier, in December 2007. It is expected that many of these older vehicles will require replacement in the next five years, and it is possible that vehicles per capita could decline.

The light fleet size increase in 2013 was partially due to a drop in the number of vehicles leaving the fleet (see Figures 5.1a and 7.2c), but the increasing age of the used import light fleet (see Figure 2.4) means that low level of scrappage will not continue indefinitely.
1990s vehicles in the light vehicle fleet

As discussed in section 2.5, the New Zealand light vehicle fleet has a disproportionate number of vehicles built in the mid-1990s in it. These older vehicles tend to have lower levels of crash worthiness (protecting their occupants in a crash) and higher levels of harmful emissions than vehicles built more recently, so there is interest in how quickly they are leaving the fleet. The following section is new and presents more detailed information about the registration and subsequent scrappage of the vehicles built in the 1990s.

Figure 2.12a shows that the 1990s vehicles peaked at 1.77 million in the 2006 fleet, and had dropped by 31% to 1.21 million by 2013.

Figure 2.12b shows the entry of large numbers of 1996 model cars between 2000 and 2008, with 50,000 more of these in the fleet than any other model year. This remains the largest model year with 209,000 1996 vehicles still in the fleet in 2013. The next largest block from the 1990s are the 180,000 1997 vehicles.

The graph also shows the lower rate of scrappage of more recent model years (1998 and 1999), which is shown in another way in Figure 2.12c.
The New Zealand Vehicle Fleet

Table 2 shows the rates of entry and exit of 1990s vehicles in the 2001-2013 fleets. Green shaded cells show when vehicle numbers were increasing (positive growth rates shown in the cells) and the red cells show when vehicle numbers were dropping (negative growth rates):

- the average scrappage rate of all 1990s vehicles in 2013 was 7.2% ie 7.2% of those vehicles in the fleet at the start of 2013 left during the year
- the scrappage rate for 1990-1993 vehicles was above 10% in 2013. That has been the pattern for several years
- the scrappage rate for 1996 and 1997 vehicles, while increasing, was lower at 6% and 5.1% respectively
- large numbers of 1994-1997 vehicles will be in the fleet for some time (currently 649,000 vehicles, down from 696,000 a year ago or 6.7%)

### TABLE 2 Change in 1990s vehicles in the fleet

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td>4.2%</td>
<td>14.1%</td>
<td>11.3%</td>
<td>21.2%</td>
<td>15.3%</td>
<td>16.2%</td>
<td>6.0%</td>
<td>4.5%</td>
<td>0.9%</td>
<td>9.5%</td>
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<tr>
<td>2002</td>
<td></td>
<td>-2.0%</td>
<td>0.4%</td>
<td>3.8%</td>
<td>7.1%</td>
<td>10.0%</td>
<td>28.3%</td>
<td>21.5%</td>
<td>26.3%</td>
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<td>6.1%</td>
<td>8.9%</td>
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<tr>
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<td>-3.8%</td>
<td>-2.1%</td>
<td>0.2%</td>
<td>1.7%</td>
<td>9.5%</td>
<td>16.7%</td>
<td>37.7%</td>
<td>20.8%</td>
<td>21.3%</td>
<td>8.1%</td>
<td>8.7%</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td>-5.5%</td>
<td>-3.8%</td>
<td>-2.1%</td>
<td>0.1%</td>
<td>3.1%</td>
<td>16.9%</td>
<td>17.5%</td>
<td>28.5%</td>
<td>15.0%</td>
<td>15.6%</td>
<td>6.8%</td>
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<tr>
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<td></td>
<td>-7.6%</td>
<td>-5.7%</td>
<td>-4.0%</td>
<td>-2.2%</td>
<td>0.8%</td>
<td>5.8%</td>
<td>19.3%</td>
<td>15.1%</td>
<td>22.6%</td>
<td>9.7%</td>
<td>4.5%</td>
</tr>
<tr>
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<td></td>
<td>-10.1%</td>
<td>-8.0%</td>
<td>-6.3%</td>
<td>-4.7%</td>
<td>-2.7%</td>
<td>0.7%</td>
<td>4.8%</td>
<td>16.2%</td>
<td>13.1%</td>
<td>14.9%</td>
<td>1.2%</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td>-11.6%</td>
<td>-9.5%</td>
<td>-7.7%</td>
<td>-6.1%</td>
<td>-4.2%</td>
<td>-2.3%</td>
<td>2.0%</td>
<td>5.7%</td>
<td>17.5%</td>
<td>12.0%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td>-14.0%</td>
<td>-11.7%</td>
<td>-9.7%</td>
<td>-7.9%</td>
<td>-5.9%</td>
<td>-4.2%</td>
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<td>2009</td>
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<td>-11.2%</td>
<td>-9.5%</td>
<td>-7.9%</td>
<td>-6.0%</td>
<td>-4.4%</td>
<td>-3.2%</td>
<td>-2.4%</td>
<td>-1.1%</td>
<td>2.0%</td>
<td>-5.0%</td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>-12.7%</td>
<td>-11.4%</td>
<td>-10.4%</td>
<td>-8.4%</td>
<td>-6.7%</td>
<td>-5.2%</td>
<td>-3.1%</td>
<td>-2.4%</td>
<td>-1.5%</td>
<td>-1.5%</td>
<td>-5.7%</td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td>-14.4%</td>
<td>-13.4%</td>
<td>-12.2%</td>
<td>-10.5%</td>
<td>-8.6%</td>
<td>-6.6%</td>
<td>-5.1%</td>
<td>-4.2%</td>
<td>-3.3%</td>
<td>-2.3%</td>
<td>-7.0%</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td>-14.1%</td>
<td>-13.7%</td>
<td>-12.8%</td>
<td>-10.9%</td>
<td>-9.0%</td>
<td>-7.5%</td>
<td>-5.7%</td>
<td>-4.7%</td>
<td>-3.5%</td>
<td>-2.8%</td>
<td>-7.3%</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td>-12.3%</td>
<td>-12.3%</td>
<td>-12.2%</td>
<td>-10.6%</td>
<td>-9.3%</td>
<td>-7.6%</td>
<td>-6.0%</td>
<td>-5.1%</td>
<td>-4.1%</td>
<td>-3.2%</td>
<td>-7.2%</td>
</tr>
</tbody>
</table>
The information in Table 2 shows that the survivability of vehicles of a given age is higher if they were manufactured more recently (i.e., the percentage scrapped is lower). While the 2008 global financial crisis may have influenced that, scrappage rates have continued to drop after 2008 so improvement in mechanical longevity is part of that picture.

For instance consider the scrappage rates for 18 year old vehicles made in 1991-1995 (these vehicles reached 18 years old after 2008). Figure 2.12c shows that the scrappage rates are lower for these vehicles if they were made more recently. In the year that the vehicles manufactured in 1990 reached 18 years old 14% of them were scrapped, whereas only 7.6% of the 1995 models were scrapped in the year they reached 18 years old.

Figure 2.12c: Vehicle scrappage - same age, different year of manufacture

![Graph showing scrappage rates for different years of manufacture.](image)

Figure 1.12d tracks the percentage change in the numbers of 1990-1999 vehicles in the 2001-2013 fleets. Positive numbers on the vertical axis show the rate of increase in numbers of that year of manufacture, and negative numbers show that the rate of decrease (scrappage).

For instance, the numbers of 1996 vehicles increased by 37% in 2003, and close to 15% of the remaining 1990 vehicles have left the fleet every year since 2008.

Figure 2.12d: Vehicle scrappage

![Graph showing percentage change in numbers of vehicles per year.](image)

Diesel light fleet age distribution

The age of the light diesel fleet is related to the emissions controls in those vehicles, and their health impacts. See tab 2.13 in the accompanying spreadsheet for the age distribution of the light diesel fleet, and tab 9.11 for a breakdown of the emissions standards the light fleet was built to.
3. VEHICLE TRAVEL AND AGE

This page will be updated in August 2014 when travel estimates for 2013 are available.

The breakdown of travel is shown in Figure 3.1. A substantial proportion of travel is by light used imported vehicles manufactured during the 1990s (also see Figures 2.5b and 3.2a).

Light passenger vehicle travel makes up the majority of travel. A significant component of this travel is done by used imported vehicles manufactured during the mid 1990s.

![Figure 3.1: Fleet travel in 2012](image)

![Figure 3.2a: Light passenger fleet travel in 2012](image)
The New Zealand Vehicle Fleet

This page will be updated in August 2014 when travel estimates for 2013 are available.

New Zealand-new light vehicles do more travel overall than used imported light vehicles (see Figure 3.5).

Used imported light passenger vehicles do the same amount of travel as New Zealand-new light passenger vehicles (see Figure 3.2c for light commercial fleet travel and Figure 3.1 for a breakdown of total travel by vehicle age).

Figure 3.2b: Light private fleet travel 2012

Light commercial travel shows a different pattern from the fleet as a whole. A far higher proportion of travel is done by recently purchased New Zealand-new vehicles (also see Figure 2.5c).

Figure 3.2c: Light commercial fleet travel in 2012

<table>
<thead>
<tr>
<th>Period of manufacture</th>
<th>Used import light commercial</th>
<th>NZ new light commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre1980</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1980-1984</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1985-1989</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1990-1994</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1995-1999</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2000-2004</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2005-2009</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2010-2014</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Half of all the travel by trucks is by New Zealand-new vehicles built after 2005, although they make up a much smaller part of the fleet than that (see Figure 2.7b).

As with trucks, newer buses travel the greatest distance. However a much greater proportion of bus travel is done by vehicles manufactured in the 1980s and 1990s.
Average vehicle travel by vehicle age

This page will be updated in August 2014 when travel estimates for 2013 are available.

There is a clear relationship between vehicle age and travel - older vehicles are not driven as far each year. The patterns of used and new light vehicle travel also vary with vehicle age.

There is a difference in travel patterns between light commercial and light passenger vehicles. Light commercial vehicles are driven further each year than passenger vehicles until they reach an age of about 15 years, after which the annual distances are similar.

The travel by vehicles manufactured in 2012 pulls the average for 2010-2014 vehicles down, as on average they were only in the fleet for 6 months of 2012.

On average diesel vehicles travel further than petrol vehicles of the same age. Many light diesel vehicles are used for commercial purposes (utes and vans) though many SUVs are diesel powered.
Figures 3.4c and 3.4d show that buses typically travel further than trucks per year and both travel more than light vehicles. Total travel by heavy vehicles is much less than that by light vehicles (see Figures 3.4c, 3.4d and 3.4e) as they are only a small part of the fleet (see Figure 1.1).

The travel by vehicles manufactured in 2012 pulls the average for 2010-2014 vehicles down, as on average they were only in the fleet for 6 months of 2012.

![Figure 3.4c: Truck travel per vehicle in 2012](image1)

![Figure 3.4d: Bus travel per vehicle in 2012](image2)
Light commercial vehicles are typically driven further than light passenger vehicles early in their life. This effect starts to diminish as the vehicles age, and has disappeared by the time they are 15 years old. There has been little change in this pattern since 2001.

Figure 3.5 Light fleet average travel in 2012, by vehicle age
4. LIGHT FLEET ENGINE CAPACITY TRENDS

The average engine capacity of the fleet grew between 2000 and 2011, but has levelled off since then. These graphs show the averages for the vehicles in the fleet from January 2000 through to December 2013.

The New Zealand-new component of the fleet has a significantly larger average engine capacity than the used imported component. This is mainly due to Australian-made vehicles imported new into New Zealand.

The trends in diesel and petrol engine capacities are quite different, as shown in Figure 4.1b. The capacity of New Zealand-new petrol vehicles within the fleet showed the greatest level of increase. It also shows that the average diesel engine is significantly larger than the average petrol engine.

New Zealand did not record fuel consumption data on the vehicle register before 2005. Therefore, engine capacity was previously used as a proxy for fuel consumption, but it does not take improvements in engine efficiency into account, or other factors, such as vehicle weight gain.

Figure 4.1a: Light fleet average engine capacity

Figure 4.1b: Light fleet average engine capacity
The mix of engine sizes in the light fleet has been changing. The smallest class of vehicles (under 1350cc) has declined in number, while there has been significant growth in the 2000–2999cc class.

The engine-size class that showed the greatest rate of growth is 3000–3999cc, but the number of these vehicles is relatively low. The 2000-2999cc class has shown the most growth in terms of numbers of vehicles.
Light fleet travel by engine capacity and age

Smaller-engined vehicles do less annual travel than other vehicles, and vehicles with the largest engines travel more than other vehicles, especially early in their life.

The pattern for light commercial vehicles is similar to that for light passenger vehicles, although the amount of travel is far higher. Again, the vehicles with larger engines do the most travel per vehicle early in their life. Very small light commercials are uncommon, which accounts for the erratic nature of their line in Figure 4.3b.

**Figure 4.3a : Light passenger average travel 2012**

**Figure 4.3b : Light commercial average travel 2012**
The New Zealand Vehicle Fleet

This page will be updated in August 2014 when travel estimates for 2013 are available.

**Light fleet travel trend by engine capacity**

Table 3 provides a different view of travel and engine capacity. The proportion of travel done by vehicles with engine sizes of 2000cc or more grew significantly between 2001 and 2007, but has only changed slightly since then.

<table>
<thead>
<tr>
<th>Period</th>
<th>Engines under 2000cc</th>
<th>Engines 2000+ cc</th>
<th>Travel by vehicles 2000+ cc</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>20,591</td>
<td>13,029</td>
<td>39%</td>
</tr>
<tr>
<td>2002</td>
<td>20,745</td>
<td>13,836</td>
<td>40%</td>
</tr>
<tr>
<td>2003</td>
<td>20,734</td>
<td>14,792</td>
<td>42%</td>
</tr>
<tr>
<td>2004</td>
<td>20,568</td>
<td>15,947</td>
<td>44%</td>
</tr>
<tr>
<td>2005</td>
<td>20,092</td>
<td>16,714</td>
<td>45%</td>
</tr>
<tr>
<td>2006</td>
<td>19,574</td>
<td>17,163</td>
<td>47%</td>
</tr>
<tr>
<td>2007</td>
<td>19,401</td>
<td>17,872</td>
<td>48%</td>
</tr>
<tr>
<td>2008</td>
<td>18,847</td>
<td>17,904</td>
<td>49%</td>
</tr>
<tr>
<td>2009</td>
<td>18,791</td>
<td>18,106</td>
<td>49%</td>
</tr>
<tr>
<td>2010</td>
<td>18,748</td>
<td>18,110</td>
<td>49%</td>
</tr>
<tr>
<td>2011</td>
<td>18,589</td>
<td>17,987</td>
<td>49%</td>
</tr>
<tr>
<td>2012</td>
<td>18,691</td>
<td>18,170</td>
<td>49%</td>
</tr>
</tbody>
</table>

**Motorcycle and moped fleet composition**

The motorcycle and moped fleet grew rapidly from 2004 to 2008, but has been largely static since then. Under 60 cc machines showed strong growth from 2005 to 2008, but are now declining in number.

---

10 Vehicle Kilometres Travelled.
Motorcycle and moped fleet average engine capacity

The growth in the under 60cc sector could have been expected to reduce the average engine capacity of the motor cycle fleet, but in fact the impact is quite minor because of the growth in sales of machines with very large engines. Figure 4.5 shows the average engine capacity is increasing, and is now close to 600 cc (see Figure 4.4 for a detailed breakdown of the fleet composition).

Figure 4.5: Motorcycle/moped fleet average CC
5. VEHICLES ENTERING AND EXITING THE FLEET

Figures 5.1a to 5.1e show the mix of vehicles that entered and exited the fleet between 2000 and 2013. The bars above zero on the vertical axis show vehicles entering the fleet and the bars below zero show vehicles that exited.

The number of vehicles entering and exiting the light passenger fleet has been lower in recent years:

- in 2009 the fleet shrank slightly as more vehicles left the fleet than were registered
- in 2010 registrations were up and fewer vehicles left the fleet, resulting in a slight increase in the fleet size
- in 2011 registrations were slightly down and more vehicles left the fleet, but registrations exceeded the number of vehicles leaving the fleet so the fleet grew slightly
- in 2012 registrations were up and fewer vehicles left the light passenger fleet, and it grew by 26,100 vehicles
- In 2013 registrations were up again and still fewer vehicles left the fleet, so the fleet grew by 67,509 vehicles

More used imports are now leaving the light passenger fleet than New Zealand-new vehicles. This reflects the vehicle mix that entered the fleet during the 1990s.

The light commercial fleet grew slightly in 2010 and 2011, then by 8751 vehicles in 2012. 2013 was an exceptional year, the highest ever level of light commercial registrations and very low scrappage resulted in fleet growth of 20,346 vehicles.

Comparing the light commercial fleet with the light passenger fleet highlights that there are very few diesel-powered vehicles entering the passenger fleet. A high proportion of the new vehicles entering the light commercial fleet are diesel powered. Businesses are again buying significant numbers of vehicles, after the drop that started in 2009.
Figure 2.9 showed that used truck imports are typically lighter weight vehicles. Most of the used truck imports shown in Figure 5.1c have a gross vehicle mass under 10 tonnes (also see Figure 2.9). Used truck imports remain at low levels but have picked up a little as vehicles become available that meet our emission requirements. While purchase patterns were influenced by the rule on used truck entry and the global financial crisis, there was not the same change in disposal patterns, which have remained relatively constant.

Truck registrations in 2013 were up on every year since 2009, and low scrappage resulted in fleet growth of 2,409 vehicles.

The bus fleet was expanding until 2009, and has dropped slightly since (see Figure 1.2). The majority of the buses entering the fleet until 2008 were relatively old used imports. The Vehicle Exhaust Emissions Rule effectively precluded these imports in January 2008. Bus purchase and scrapping patterns do not follow the same patterns as trucks. This may reflect that purchases are linked to government and council funding, which tends to be constant.
The numbers of motorcycles and mopeds registered grew significantly between 2004 and 2008, but has been static since then (see Figure 1.2).
Year of manufacture of vehicles entering and leaving the fleet

Figures 5.2a to 5.2d show the year of manufacture of vehicles that entered (above the axis) and left the New Zealand light fleet (below the axis) in 2013. Virtually all of the new vehicles were manufactured in 2013. Figure 5.2a shows that more used light vehicles manufactured in 2004 entered the light fleet than any other age. Also see Figures 2.4, 2.5a and 6.2b.

Used vehicles leave the fleet slightly earlier than New Zealand-new vehicles.

The numbers of near-new motorcycles leaving the fleet reflects the risk and severity of motorcycle crashes.
Very few used imports entered the truck fleet in 2013. Trucks leave the fleet much later than light vehicles.

Figure 5.2c : Trucks entering or leaving the fleet in 2013

Extremely few used bus imports entered the fleet in 2013. Few buses leave the fleet, which may be influenced by vehicles eventually being converted into mobile homes.

Figure 5.2d : Buses entering or leaving the fleet in 2013
Engine size of vehicles entering and leaving the light fleet

The detailed breakdowns in Figure 5.3 show the patterns of light fleet entry and exit in 2013. There are several trends in vehicle engine size growth.

- the 2000–2249 petrol class is reducing (more vehicles left then entered).
- the 1250–1499, 1750-1999 and 2250–2499 petrol classes are increasing.
- There are substantial numbers of 2500–2999 cc diesels entering the fleet, but also now also smaller-engined diesels (1750-1999) as well.

![Petrol vehicles entering/leaving the light fleet 2013](image)

![Diesel vehicles entering/leaving the light fleet 2013](image)
6. VEHICLES ENTERING THE FLEET

The number of light used imports registered rose in 2013, partly a recovery from the effect of the Vehicle Exhaust Emissions Rule, the most recent stage of which took effect in January 2012 requiring used imports to be built to newer standards. Registrations of new light vehicles continued to grow and were at their highest levels ever in 2013. As in 2012 more new light vehicles were registered than used imports, which had not happened since 1996.

The average age of used imported vehicles entering the light fleet was increasing until 2008. The Vehicle Exhaust Emissions Rule took effect in January 2008, and required vehicles to be built to newer standards. That resulted in the average age dropping in 2009. By 2011 though, the average age of used imports entering the fleet was at an all time high. That was because older vehicles could be sourced for import, as the age range of the vehicles compliant with the rule broadened. The oldest used vehicles that could be imported in 2008 were typically manufactured in 2001, and it was still possible to import those vehicles until December 2011.

The next step of the Vehicle Exhaust Emissions Rule took effect in January 2012, requiring vehicles to be built to 2005 standards. The effect can be seen in the reduced average age on used import registrations in 2012, which continued in 2013.
A breakdown of the 2013 used light vehicle imports by age and fuel type shows they were overwhelmingly petrol powered, and that very few were 10 or more years old.

The average age of used trucks and buses entering the fleet has dropped substantially following the introduction of the Vehicle Exhaust Emissions Rule, January 2008.
Figure 6.3 shows the average engine capacity of petrol vehicles entering the light fleet was increasing until 2004. Figure 4.1a shows the average of all the vehicles in the light fleet.

The average engine size of entrants has decreased since 2004, however, the average engine capacity of the light fleet continued to increase for some years as the vehicles entering the fleet had larger engines than those exiting.

![Figure 6.3: Average engine size of vehicles entering the light fleet](image)

- **Petrol**
- **Diesel**
Used import versus new zealand-new engine capacity mix

Figure 6.4a shows the engine size mix of the used imports entering the light fleet is different to that of New Zealand-new vehicles. There are relatively more smaller-engined used imported vehicles than New Zealand-new. Figure 5.3 provides a more detailed breakdown. It shows both entry and exit, and splits petrol and diesel.

**Figure 6.4a : Engine size of NZ new vehicles entering the light fleet**

**Figure 6.4b : Engine size of used imports entering the light fleet**
The New Zealand Vehicle Fleet

Much of the growth in new motorcycle registrations in recent years has been in machines under 60cc, although the number of larger machines has also increased.

**Figure 6.5a : New Zealand new motorcycles entering the fleet**

Used motorcycle imports increased from 2005 to 2008, but to a far lesser degree than new motorcycles (see above).

**Figure 6.5b : Used motorcycles entering the fleet**
7. VEHICLES EXITING THE FLEET

Until 2005 more New Zealand-new vehicles left the fleet than used imported vehicles, but Figure 7.1a shows that this has changed now that used imports make up half the light fleet. The increase also reflects that used imports tended to leave the fleet earlier than NZ-new, although this is changing (see Figure 7.2a).

Figure 7.1a : Vehicles leaving the light fleet

Figure 7.1b : Vehicles leaving the heavy fleet
Used imports are leaving the light fleet at an average age of 19.1 years in 2013, whereas New Zealand-new vehicles averaged 21.2 years old (see Figure 7.2a). The gap between the average ages at which New Zealand-new and used imports leave the fleet has continued to close.

The age at scrappage for both NZ new and used imports has been increasing in recent years.

The average age of light diesel vehicles when scrapped has risen as the light diesel fleet has changed from being very commercially orientated (vans and utes) to including large numbers of SUVs and some diesel cars. The distance covered in the lifetime of light diesel vehicles exceeds that of petrol vehicles on average, even though they are scrapped earlier (see Figure 7.3a).
In recent years, coinciding with the economic downturn, we have seen a change in the pattern of used imports leaving the fleet. Figure 7.2c shows how the volume of used imports leaving the fleet, and the age of those vehicles, had been increasing until the economic downturn began in 2009.

The number of used imported vehicles leaving the fleet in 2009-2013 have been lower than the record number in 2008. The number leaving dropped in 2009, dropped again in 2010, increased in 2011 and dropped each year after that (see Figure 7.2c).

The average age at scrappage of used imports has increased every year since 2006.

Many of the used imports manufactured in the mid 1990’s will be reaching the end of their lives over the next 5 years, and the numbers leaving the fleet will increase. Figures 2.5a, 2.5b, 2.11 and 2.12 show the age structure of the light fleet.

While not many buses leave the fleet, the average age when they do is high (also see Figure 5.2d), although this has dropped in recent years to be much closer to that of trucks.
How far have vehicles travelled before they leave the fleet?

The final warrant of fitness or certificate of fitness odometer reading provides a good estimate of lifetime travel. Figures 7.3a, 7.3b and 7.3c show that the average lifetime distance travelled had been increasing, but dropped slightly for petrol and used imports in 2013. It is not clear why this occurred.

The lesser lifetime distance covered by used imports may reflect their smaller average engine size (see Figure 4.1a). Figure 7.3e shows that larger-engined vehicles typically cover a greater lifetime distance.

![Figure 7.3a: Final odometer reading of vehicles leaving the light fleet](image)

![Figure 7.3b: Final odometer reading of vehicles leaving the light fleet](image)
An examination of the engine sizes of vehicles leaving the fleet shows that the average size has been increasing. This may explain why the average lifetime distance has been increasing.
If the final odometer reading is broken down by vehicle type and engine capacity, then one underlying factor becomes clearer. Figure 7.3d shows that engine size of vehicles leaving the fleet has been increasing. Figures 7.3e and 7.3f show that larger-engined vehicles travel further in their lifetime, which, combined with 7.3d, explains in part why the fleet average lifetime distance is increasing.

In addition, Figures 7.3e and 7.3f show that lifetime distance has been increasing for vehicles of all engine sizes. When these two effects are combined, we get the lifetime distance increases seen in 7.3a, 7.3b and 7.3c.

Although the average lifetime travel has been rising for most CC bands, it has remained remarkably flat for engine sizes greater than 3,000cc. It is not known why travel has not grown in this class, but there are 68,000 of these vehicles so low numbers are not the explanation.

**SCRAPPAGE CURVES**

The accompanying spreadsheet (available from the research tab on the Ministry of Transport website: [www.transport.govt.nz](http://www.transport.govt.nz)) includes scrappage curves for 2012. The curves show the percentage of vehicles of each age that were in the fleet at the start of January 2012, but gone from the fleet by the end of December 2012. They are shown in table 7.4 in the website spreadsheet.
8. THE DIESEL FLEET, DIESEL TRAVEL AND VEHICLE FUELS

The proportion of diesel vehicles in the fleet

The proportion of the light fleet, which is diesel powered, grew from 11.7 percent in 2000 to 16.7 percent in 2013. The diesel share has only grown slightly since 2006. Most light diesel vehicles are commercial vehicles (also see Table 4 and Figures 8.2a, 8.2b and 8.3.)

![Figure 8.1a: Diesel vehicles within the light fleet](image)

Most trucks are diesel powered. The petrol trucks in Figure 8.1b are either very old, or large American SUVs that weight more than 3500 kg.

![Figure 8.1b: Diesel vehicles within the truck fleet](image)
Figure 8.1c: Diesel vehicles within the bus fleet

- Diesel bus used
- Diesel bus new
- Petrol bus used
- Petrol bus new
- Electric bus

Vehicles

Year


0 2000 4000 6000 8000 10000

The New Zealand Vehicle Fleet
Diesel vehicles in the light fleet

Table 4 shows the segment of the light fleet that is diesel powered and the percentage of light fleet travel by diesel vehicles. Figures 8.2a and 8.2b show this information for the entire light fleet (also see Figure 1.3a, which shows travel for the entire fleet).

The vehicle percentages are based on the vehicles that recorded travel during 2012. They were not necessarily still in the fleet at the end of the year.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>Diesel vehicles 2012</th>
<th>Diesel travel 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 Light fleet overall</td>
<td>16.4%</td>
<td>20.8%</td>
</tr>
<tr>
<td>2012 Light passenger fleet</td>
<td>8.5%</td>
<td>10.0%</td>
</tr>
<tr>
<td>2012 Light commercial fleet</td>
<td>68.2%</td>
<td>76.4%</td>
</tr>
</tbody>
</table>

Figure 8.2a : Light fleet makeup by fuel type 2012

Figure 8.2b : Light fleet travel by fuel type 2012

This page will be updated in August 2014 when travel estimates for 2013 are available.
Figure 8.2c shows that light diesel vehicles continue to travel further on average each year than light petrol vehicles and that travel per vehicle is dropping slightly, consistent with the increasing average age of petrol vehicles.

Light fleet travel can also be broken down by year of manufacture. Figure 8.3 shows that a high proportion of the light fleet travel by diesel vehicles is by vehicles manufactured in the second half of the 1990’s, when the harmful emissions standards that vehicles were built to were typically far inferior to recent standards.

---

11 The PM (Particulate Matter) column in Table 1 in http://www.dieselnet.com/standards/eu/hd.php shows how successive standards have tightened emission requirements.
Vehicle fuel types

*Primary and secondary fuels*

When vehicles are first registered in New Zealand they are required to indicate a primary fuel type. For the vast majority, this is petrol or diesel, but it can also be CNG, LPG, electricity or "other". The record can also indicate if there is a secondary fuel. This is often CNG or LPG for dual fuel vehicles. Unfortunately the secondary fuel field is not always filled in correctly and some of the data presented in these tables is clearly incorrect or absent. It is extremely unlikely that there are vehicles that operate on both petrol and diesel, for example. We are also aware that the field is not always updated when vehicles are converted to run on LPG or CNG, or if a conversion to another fuel is subsequently removed.

*Hybrids*

There is no specific code on the register to indicate a hybrid vehicle. Hybrid electric vehicles, such as the Toyota Prius or Honda Insight should be recorded as having a primary fuel of petrol and a secondary fuel of electricity (or potentially the other way around). However selecting vehicles known to be hybrid from the register by their model produces a greater result.

Table 5a shows the primary and alternative fuels recorded on the register.

A better approach to identifying hybrids is to select vehicles with either electricity as an alternative fuel, vehicle model “PRIUS” and/or the text “HYBRID” in the sub_model. This produces the result shown in Table 5b.

<table>
<thead>
<tr>
<th>Table 5a Vehicle fuel types for vehicles in the fleet at Dec 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Light vehicles</td>
</tr>
<tr>
<td>Petrol</td>
</tr>
<tr>
<td>Diesel</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>CNG</td>
</tr>
<tr>
<td>LPG</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Motorcycles and mopeds</td>
</tr>
<tr>
<td>Petrol</td>
</tr>
<tr>
<td>Diesel</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>CNG</td>
</tr>
<tr>
<td>LPG</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Buses</td>
</tr>
<tr>
<td>Petrol</td>
</tr>
<tr>
<td>Diesel</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>CNG</td>
</tr>
<tr>
<td>LPG</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Trucks</td>
</tr>
<tr>
<td>Petrol</td>
</tr>
<tr>
<td>Diesel</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Fuel</td>
</tr>
</tbody>
</table>
### The New Zealand Vehicle Fleet

#### Alternative Fuel

<table>
<thead>
<tr>
<th>Alternative Fuel</th>
<th>Petrol</th>
<th>Diesel</th>
<th>Electricity</th>
<th>CNG</th>
<th>LPG</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>LPG</td>
<td>70</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>72</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>112,666</td>
<td>67</td>
<td>1</td>
<td>1</td>
<td>33</td>
<td>88</td>
</tr>
</tbody>
</table>

#### Other Vehicle Types

<table>
<thead>
<tr>
<th>Other Vehicle Types</th>
<th>Petrol</th>
<th>Diesel</th>
<th>Electricity</th>
<th>CNG</th>
<th>LPG</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>976</td>
<td>14583</td>
<td>7</td>
<td>1</td>
<td>50</td>
<td>39</td>
<td>15656</td>
</tr>
</tbody>
</table>

#### Table 5b Hybrids(*) and electric vehicles in the 2000-2013 light fleets

<table>
<thead>
<tr>
<th>Fleet year</th>
<th>NZ new Hybrids</th>
<th>Used imported hybrids</th>
<th>Total hybrids</th>
<th>Number of electric vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>43</td>
</tr>
<tr>
<td>2001</td>
<td>7</td>
<td>8</td>
<td>15</td>
<td>42</td>
</tr>
<tr>
<td>2002</td>
<td>10</td>
<td>27</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>2003</td>
<td>29</td>
<td>45</td>
<td>74</td>
<td>34</td>
</tr>
<tr>
<td>2004</td>
<td>247</td>
<td>109</td>
<td>356</td>
<td>32</td>
</tr>
<tr>
<td>2005</td>
<td>555</td>
<td>313</td>
<td>868</td>
<td>29</td>
</tr>
<tr>
<td>2006</td>
<td>1049</td>
<td>683</td>
<td>1732</td>
<td>31</td>
</tr>
<tr>
<td>2007</td>
<td>1657</td>
<td>1050</td>
<td>2707</td>
<td>28</td>
</tr>
<tr>
<td>2008</td>
<td>2326</td>
<td>1380</td>
<td>3706</td>
<td>32</td>
</tr>
<tr>
<td>2009</td>
<td>2887</td>
<td>1517</td>
<td>4404</td>
<td>30</td>
</tr>
<tr>
<td>2010</td>
<td>3669</td>
<td>1687</td>
<td>5356</td>
<td>39</td>
</tr>
<tr>
<td>2011</td>
<td>4359</td>
<td>1807</td>
<td>6166</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>5451</td>
<td>1971</td>
<td>7422</td>
<td>75</td>
</tr>
<tr>
<td>2013</td>
<td>6480</td>
<td>2381</td>
<td>8661</td>
<td>108</td>
</tr>
</tbody>
</table>

(*) vehicles identified as having “PRIUS” in the vehicle name, “HYRBID” within the sub-model and/or electricity as an alternative fuel.
Figure 8.4a shows that the number of light vehicles primarily fuelled by CNG, LPG or electricity is very low. Figure 8.4b shows that the number of light vehicles with an alternative fuel of CNG or LPG has also dropped to very low levels over the last decade. As already noted, the vehicles with an alternative fuel of electricity are typically hybrids, but not all hybrids are recorded in the vehicle register in this way.
9. HOW FUEL-EFFICIENT IS THE LIGHT FLEET?

The CO₂ emissions of new light vehicles entering the fleet

Figure 9.1a shows the CO₂ emissions\(^\text{12} \) per kilometre of travel (g CO₂/km) of New Zealand-new light vehicles that entered the fleet from April 2005. The market share of the more fuel efficient petrol vehicles (up to 200g CO₂/km) has been growing. This may be partly due to a move to diesel SUVs instead of large-engine petrol vehicles.

The values shown are for vehicles tested using the European test methodology (cold start). A small number of new vehicles are tested to the Japanese test standard (warm start) and their values have not been included as they are not directly comparable. A cold start test generally returns a higher consumption value than a warm start test for the same vehicle. The technical notes on page 64 detail how the g CO₂/km calculations are done.

\(^{12}\) Vehicles using petrol or diesel produce CO₂ in direct proportion to the amount of fuel used.
The CO₂ emissions of used light petrol vehicles entering the fleet
Figure 9.2a is an estimation\(^\text{13}\) of the carbon dioxide emissions of light used imported vehicles. The lower consumption segments (under 200 g/km) have been increasing their market share, although the segment with the highest consumption (over 250 g/km) has remained relatively constant.

\(^{13}\) The estimation process:
1. Convert the Japanese test values to European test values, using the Ministry’s Japanese warm cycle to Euro cold cycle test converter (unpublished).
2. Split each quarter’s new registrations into engine capacity bands.
3. Use the vehicles with known consumption values, in each engine capacity band, to establish a CO₂ mix for that engine capacity band and quarter.
4. Apply the CO₂ mix for each engine capacity band to the vehicles without a value for that quarter.
The CO₂ emissions of used diesel vehicles entering the fleet

Only 5 percent of used import diesel vehicles had known fuel consumption, therefore it is not possible to analyse their fuel economy (see Table 6 in the Fleet Statistics spreadsheet).

Typically, used diesels will have higher fuel consumption than the used petrol vehicles, as the diesel engines are larger.

The number of used diesels imported is now very low (see Figure 5.3) and their omission from the figures below will not affect the result.

The quarterly fleet report provides more detailed analysis of trends in CO₂ emissions.

The CO₂ emissions of petrol vehicles and new diesel vehicles entering the light fleet

Figure 9.3a shows the CO₂ emissions of the new and used petrol vehicles combined.

New Zealand-new vehicles with Japanese test cycle values have been included, after their values have been converted to the equivalent European test value. The fuel economy of used imports without fuel economy values has been estimated using the methodology described on page 65.

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14 See page 59 for a description of the CO₂ emissions estimation process.
Figure 9.3c shows the CO₂ emissions of the new diesel vehicles. Used diesel vehicles could not be analysed as too few of them have known fuel consumption values.
Average CO₂ emissions of light vehicles entering the fleet

Figure 9.4 is a summary of the information that has been presented in Figures 9.1, 9.2 and 9.3. It shows some response to the increased fuel prices in 2006\(^\text{15}\), 2008, 2011 and 2012.

Note, however, that 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.

The used diesel imports are not included in the analysis, as too few of them have known fuel consumption. Used diesels make up a very low fraction of used imports now.

Figure 9.4 shows that there was an improvement in fuel economy of light vehicles entering the fleet from 2005 to 2009. There was little improvement in 2010 and 2011, but there has been marked drop since mid 2011 (also see Figure 9.6). Figure 9.4 is updated each quarter in the Quarterly Fleet Statistics. Fuel economy and CO₂ g/km are in direct proportion, and CO₂ is used in Figure 9.4 so diesel and petrol vehicles can be combined neatly.

![Figure 9.4: Light vehicle registrations - Average CO₂ emissions](image)

**Year and quarter**

**CO₂ g/km**

**NZ New Petrol**

**NZ New Diesel**

**Used Petrol**

**All**

**TECHNICAL NOTES**

How CO₂ per km is calculated

The fuel consumption test results recorded on the vehicle register have been converted from litres per 100km (L/100km) to grams of CO₂ per kilometre driven. This allows direct comparison of petrol and diesel vehicles, which have different fuel consumption and CO₂ emissions (diesel vehicles typically have lower fuel consumption than their petrol equivalents, but there is more carbon in a litre of diesel compared with a litre of petrol). The conversions that have been used are:

- Diesel g CO₂/km = \(26.05 \times \text{diesel consumption (L/100km)}\)\(^\text{16}\)
- Petrol g CO₂/per km = \(22.961 \times \text{petrol consumption (L/100km)}\)\(^\text{17}\)

The petrol factor is based on the carbon content of the regular/premium mix sold in New Zealand in 2005 (premium petrol has a higher carbon content than regular petrol).

The CO₂ emissions of used import light diesel vehicles entering the fleet

Ideally it would be possible to present the same information shown in Figures 9.5a and 9.5b for the used import light diesels. Table 6 in the Fleet Statistics spreadsheet shows few of these vehicles have a fuel consumption test value recorded, so reporting is not possible.

\(^{15}\) See Section 12.


How have these economy gains come about?

Figure 9.4 shows the fuel economy of light vehicles entering the fleet has improved from about 220g CO₂/km in 2005 to 183g/km in 2013.

Figures 9.10a and 9.10b shows the economy trends within each engine cc band. The decreases have not been particularly marked (apart from the two largest categories of petrol vehicles), which suggests that some of the fleet CO₂ reduction has been achieved by downsizing the engine purchased, or by purchasing diesels rather than the largest petrol vehicles.

The economy trend for diesels with engine capacity under 1300cc varies as the sales of those vehicles are very limited.

There were no under 1300c diesels registered in 2011.

Emissions standards of vehicles in the light fleet

How many NZ new and used import light vehicles were built to a known harmful exhaust emissions standard, and what those standards are, is shown in Fleet Statistics spreadsheet tab 9.11. This information was first recorded on the vehicle register in early 2005, so it is not comprehensive. Since 2004 vehicles entering the NZ fleet have been required to be built to recognised exhaust emissions standards. These relate to air quality and gases harmful to human health, and are not related to CO₂ emissions.
10. WHAT IS THE AVERAGE VEHICLE ENGINE SIZE AND AGE OF THE VEHICLES IN USE?

This page will be updated in August 2014 when travel estimates for 2013 are available.

The average vehicle age and engine capacity of the light fleet has already been detailed. But how does it compare with the average vehicle that is actually travelling on the road?

The technique to establish this is to weight engine size and age by travel.

If the fleet consisted of a 1000cc car that did 5,000 km/year and a 2000cc van that did 12,000 km/year:

- The average engine size of the fleet would be 1500cc = (1000+2000)/2.
- The travel-weighted engine size would be (1000x5000 + 2000x12000) / (5000+12000) = 1706cc.

Similarly, if the fleet consisted of a 10-year-old vehicle doing 4,000km/year, and a 4-year-old vehicle doing 10,000km/year:

- The average fleet age would be seven years = (4+10)/2.
- The average travel-weighted fleet age would be (10 x 4000 + 4 x 10000) / (4000 + 10000) = 5.7 years.

Using this technique, we learn in Figures 10.1 and 10.2 that the average vehicle actually travelling is younger than the average vehicle in the fleet, and that it has a larger engine capacity than the average vehicle in the fleet.
11. ROAD FREIGHT

The Road Freight section of this report was based on road user charges (RUC) data but changes to RUC in August 2012 mean this analysis can no longer be carried out. The results for 1992-2011 are available in the Fleet Statistics spreadsheet, tab 11.1, 11.2.

Acknowledgements

Kheang Chrun of the New Zealand Transport Agency, for advice on Motor Vehicle Register data
Stuart Badger, Sarah Wheaton, Iain McGlinchy of the Ministry of Transport
APPENDIX A: COMPARABILITY WITH OTHER PUBLISHED DATA

The fleet statistics in this analysis are not directly comparable with data published by the Transport Registry Centre of the NZTA. This analysis is based on a slightly different categorisation of the vehicle fleet and assessment of the number of active vehicles.

The information in this publication has been derived from a data extract from the New Zealand Motor Vehicle Register (MVR) which holds information on all active vehicles in New Zealand.

VEHICLE CATEGORISATION

The vehicle categorisation is the one used in the Vehicle Fleet Emissions Model (VFEM)\textsuperscript{18}, rather than the vehicle split traditionally found in statistics published annually by the New Zealand Transport Agency.

The major difference from the New Zealand Transport Agency statistics is that in this analysis, light vehicles (under 3.5 tonnes) have been categorised into light passenger vehicles and light commercial vehicles. In the New Zealand Transport Agency data, light commercial vehicles are included with trucks, but they may actually be cars, vans, utes or SUVs. The New Zealand Transport Agency categorisation is therefore not as useful when projecting the make-up of the fleet for the purposes of estimating fuel use or the level of emissions.

The objective of the Vehicle Fleet Emissions Model is to estimate the size and activity of the on-road fleet. For this reason, vehicles exempt from licensing (typically those used off-road) and vehicles with restoration licences are excluded from the analysis.

\begin{table}[h]
\begin{tabular}{|l|l|l|}
\hline
\textbf{Table 9} & \textbf{Motor Vehicle Register vehicle types} & \textbf{Mass} \\
\hline
Light Passenger Fleet & Passenger car/van & Up to 3500 kg \\
\hline
Light Commercial fleet & Goods van/truck/utility & Up to 3500 kg \\
& Motor caravan & \\
& Bus (*) & \\
\hline
Bus & Bus & Over 3500 kg \\
\hline
Truck & Passenger car/van & Over 3500 kg \\
& Goods van/truck/utility & \\
& Motor caravan & \\
\hline
Motorcycles & Motorcycle & \\
& ATV & \\
& Moped & \\
\hline
Miscellaneous (**) & Mobile machine & \\
& Special purpose vehicle & \\
& Tractor & \\
& Agricultural machine & \\
\hline
\end{tabular}
\end{table}

(*) Light buses have been included in the light fleet as they have the same fuel use and emissions characteristics. Physically they are vans and SUVs.

(**) A small number of vehicles are classified as ‘miscellaneous’. Many of these vehicles are exempt from licensing and therefore not included in these analyses.

\textsuperscript{18} The VFEM is a computer model of the New Zealand vehicle fleet that is used to predict emissions. Much of the analysis in this report was carried out as part of work by the Ministry of Transport to improve the accuracy of the VFEM.
The New Zealand Vehicle Fleet

**VEHICLE CATEGORISATION VS MOTOR VEHICLE REGISTER VEHICLE BODY TYPE**

The breakdown of vehicle categorisation by vehicle body type for the December 2012 fleet is shown in Table 10.

<table>
<thead>
<tr>
<th>Motor Vehicle Register Body Type</th>
<th>Fleet Statistics category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light passenger vehicle</td>
</tr>
<tr>
<td>Articulated Truck</td>
<td>-</td>
</tr>
<tr>
<td>Cab And Chassis Only</td>
<td>-</td>
</tr>
<tr>
<td>Convertible</td>
<td>25,954</td>
</tr>
<tr>
<td>Flat-Deck Truck</td>
<td>-</td>
</tr>
<tr>
<td>Hatchback</td>
<td>651,610</td>
</tr>
<tr>
<td>Heavy Bus</td>
<td>-</td>
</tr>
<tr>
<td>Heavy Van</td>
<td>200</td>
</tr>
<tr>
<td>Light Van</td>
<td>40,121</td>
</tr>
<tr>
<td>Minibus</td>
<td>-</td>
</tr>
<tr>
<td>Mobile Machine</td>
<td>-</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>424</td>
</tr>
<tr>
<td>Other Truck</td>
<td>0</td>
</tr>
<tr>
<td>Saloon</td>
<td>945,444</td>
</tr>
<tr>
<td>Self-Propelled Caravan</td>
<td>-</td>
</tr>
<tr>
<td>Service Coach</td>
<td>-</td>
</tr>
<tr>
<td>Sports Car</td>
<td>48,427</td>
</tr>
<tr>
<td>Station Wagon</td>
<td>915,319</td>
</tr>
<tr>
<td>Tractor</td>
<td>-</td>
</tr>
<tr>
<td>Unknown</td>
<td>-</td>
</tr>
<tr>
<td>Utility</td>
<td>5,879</td>
</tr>
<tr>
<td>Total</td>
<td>2,633,378</td>
</tr>
</tbody>
</table>

**NUMBER OF ACTIVE VEHICLES**

The number of potentially active vehicles is a critical factor in estimation of travel and fuel use by the fleet. The traditional administrative practice of New Zealand Transport Agency has been to include vehicles in fleet statistics unless either their owner actively de-registers them, or the vehicle has not been re-licensed for 12 months. This approach is likely to over-estimate the size of the active fleet, as some vehicles will become inactive well within the 12 months.

An alternative approach has therefore been taken in this analysis. In this case, as with the New Zealand Transport Agency practice, vehicles are included in these fleet statistics unless they are de-registered. However, we have also excluded those vehicles where their warrant of fitness or certificate of fitness renewal is more than six months overdue. This is considered more realistic.  

**VEHICLE TRAVEL ESTIMATES**

Vehicle travel estimates have been calculated on the basis of the difference between successive warrant of fitness or certificate of fitness odometer readings. The resulting fleet travel estimate has been validated against three large-scale traffic counting exercises conducted by the former Land Transport Safety Authority (LTSA).  

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19 It is acknowledged that a small number of vehicles will continue to operate without a warrant of fitness or registration. As the number of these vehicles is unknown, no attempt has been made to include them, however including the vehicles in the active fleet until their warrant of fitness/certificate of fitness is six months overdue may compensate.