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Road vehicle-kilometres travelled estimated from state/territory fuel sales

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Abstract

In Australia, the volume of motor vehicle traffic is expressed as vehicle kilometres travelled (VKT). Estimates of VKT are used extensively in transport planning for allocating resources, estimating vehicle emissions, computing energy consumption, assessing traffic impact and road safety policy. Therefore, it is critical to have an accurate timely estimation of VKT.

This paper describes an approach for estimating quarterly VKT by vehicle type by fuel type from the state/territory fuel sales data for all eight states/territories in Australia. Quarterly estimates cover the period March 1965 to June 2010. It also produces estimates of quarterly VKT on capital city roads. The motor vehicle types used were cars, motor cycles, light commercial vehicles (LCVs), rigid trucks, articulated trucks and buses, while three different types of fuel were considered, (petrol, diesel and liquefied petroleum gas (LPG)).

There are several potential uses for the data. First, the data can be used in time–series analyses of concepts of interest to policymakers. Secondly, the fuel intensity series derived in the study can be used to examine questions about trends in the energy intensity of the transport sector over the long–term. Thirdly, it can be used to benchmark policy decisions about road funding allocations based on traffic trends.

1. Introduction

Road transport is an essential element of the Australian transport network, and enabler of the Australian economy and society. However, a number of externalities arise from motor vehicle usage on roads, including pollution, congestion and road traffic accidents. Motor vehicle activity levels are characterised in terms of traffic volume or vehicle–kilometres travelled (VKT). Total VKT provides a proxy measure of the overall pressure on the environment from all forms of road transport (NZ Ministry for the Environment 2009). Annual VKT at the national level can be defined as the number of kilometres travelled in a country by all vehicles during a one year period and it is expressed as (EIA 2005):

VKT (i.e. Traffic volume) = Number of Vehicles × Distance Travelled

However, the estimation of VKT is not as straightforward as the traffic flow. VKT has always been a difficult indicator, because it is not measured directly, rather it is always estimated (Fort Collins LUTRAQ Team 2001).

VKT estimation methods can be classified into two broad categories —traffic measurement methods and non–traffic measurement methods (Kumapley and Fricker 1996). The traffic measurement VKT estimation methods are more preferable than the non–traffic measurement methods, because the former methods are based on actual data for vehicle movement (EPA 1992). Under these two broad categories, there are four basic methods. Traffic measurement methods are of two types, e.g. odometer readings (vehicle-based method) and traffic counts (road-based method), while non–traffic measurement methods consist of household/driver survey method and fuel sales method (Leduc 2008; Azevado and Cardoso 2009).

Since estimates of VKT are used extensively in transport planning for allocating resources, estimating vehicle emissions, computing energy consumption and assessing traffic impact, the estimation of VKT by Australia's states and territories is important for planning purposes, environmental monitoring, accident analysis, highway fund allocation, trend extrapolation, and estimation of vehicle emissions. In addition, VKT is the best available measure of exposure with which to transform fatalities into a rate (i.e. the number of deaths per billion vehicle kilometres driven). Furthermore, VKT estimates can also contribute information necessary to inform infrastructure investment decisions and road safety policy. Due to its importance to policy decisions, it is critical to have accurate estimates of VKT.

The objective of this study was to develop a methodology for estimating quarterly VKT by state/territory and capital city from state/territory fuel sales data. An associated sub-objective was to assemble the necessary datasets covering 45 years, from 1965 to 2010. The specific aims were to answer two important questions:

- How can a quarterly measure of VKT be generated from states/territories fuel sales data?
- How can the results be incorporated into a simple model that can be used to keep road authorities up-to-date with what is happening per quarter?

2. Sources and size of data

The size of the fuel sales database was huge: 22 fuel categories (including sub-categories) by 8 states/territories and total Australia by 45 years by 12 months – about 107 000 data points. The transport fuel/VKT database was also large: 6 vehicle types by 3 fuel types by 3 fuel intensities by 8 states/territories and total Australia by 45 years by 4 quarters – about 90 000 data points. Less than half the fuel sales data was available on computer, and almost none of the transport data was. The main sources were: (1) 'Survey of Motor Vehicle Use' (SMVU) publication (produced by the Australian Bureau of Statistics (ABS)), and (2) 'Australian Petroleum Statistics' publication (produced by the Department of Resources, Energy and Tourism (RET)).

3. Methodologies of the study

The methodology adopted for linking fuel sales to traffic levels consisted of two basic steps. The first step was done on an annual basis, and linked annual estimates of VKT to state/territory fuel sales. Once that linkage was established on an annual basis, the second step reversed the procedure, linking quarterly fuel sales to quarterly estimates of VKT by state/territory. Figure 1 shows the two-step basic procedure in a very simplified form, without the complication of vehicle types and fuel types.

Note that detailed methodologies for estimating annual VKT and quarterly VKT by vehicle type by fuel type from the state/territory fuel sales data for all eight states/territories as well as quarterly VKT on capital city roads are presented in BITRE (2011). Brief description of the methodologies is presented below, in terms of annual and quarterly VKT estimates by states/territories, and quarterly VKT estimates by capital cities.

Figure 1: Basic methodology of the study

Annual	Quarterly
VKT	Total fuel sales
times	*times*
l/100km	Transport fraction
equals	*equals*
Transport fuel use	Transport fuel use
equals	*divided by*
a fraction	l/100km
of	*equals*
Total fuel sales	VKT

3.1 Constructing the Annual Datasets for States/Territories

The series of annual datasets for each state and territory was constructed as follows:

First, a BITRE series estimating VKT by vehicle type for 1965 to 2007 formed the basis for the estimation. This dataset was estimated by David Cosgrove of BITRE and represents the best estimate available, based on various years of the ABS Survey of Motor Vehicle Use (SMVU) from 1971 to 2007.

Secondly, using the various SMVU surveys, fuel type fractions time-series for each vehicle type were estimated. For example, in 1965, petrol-fuelled vehicles accounted for almost 100 per cent of the car fleet. By 2007, that had dropped to 89 per cent, with diesel at six per cent and LPG/CNG at five per cent. So in 1965, the estimate of car VKT times the fraction of 1.0 for petrol gave the petrol car VKT estimates (same as the total car VKT).

Thirdly, estimates of litres/100 km fuel intensities by vehicle type by fuel type were derived from the various SMVU surveys (for example, l/100 km for petrol cars).

Multiplying the VKT by vehicle type by fuel type *times* the fuel intensity by vehicle type by fuel type, then gave the estimated total fuel use by fuel type by vehicle type. For example, the petrol car VKT derived from the second step *times* the l/100 km for the petrol cars from step three gave the estimate of total petrol use by cars (million litres). Then summing over the vehicle types gave an estimate of total transport use of petrol for each year (the third database on the left hand side of Figure 1).

This total was then compared with the total sales of petrol in each state and territory (the last step on the left hand side of Figure 1), to derive an estimate of the transport fraction for petrol (the fourth step on the left hand side of Figure 1).

These annual datasets having been estimated (going from annual VKT to annual fuel sales), it was then possible to reverse the procedure and go from quarterly fuel sales to quarterly VKT (the right hand side of Figure 1).

3.2 Quarterly VKT estimates by States/Territories

The methodology developed for estimating quarterly VKT by states and territories was based on *ten* basic steps. Using *petrol* as an example, these steps are, as shown in Figure 2:

Step 1: Due to variability, volumes of raw RET quarterly fuel sales data were seasonally adjusted to smooth the data.

Step 2: Due to inconsistencies in the petrol, diesel and LPG sales data in recent years, adjustment factors have been used to smooth these data. The annual adjustment factors were then interpolated quarterly.

Step 3: 'Volumes of seasonally adjusted quarterly fuel sales were added (for petrol and LPG) or multiplied (for diesel) (Step 1) to the 'interpolated quarterly adjustment factor' (Step 2) to get the 'volumes of adjusted quarterly petrol sales'.

Step 4: Volumes of 'adjusted quarterly petrol sales' (Step 3) were multiplied by the 'interpolated (annual to quarterly) fraction of petrol used by road transport' (Step 4).

Step 5: This gave the volumes of 'quarterly road transport petrol use`.

Step 6: Volumes of 'quarterly road transport petrol use` (Step 5) were multiplied by the 'interpolated (annual to quarterly) petrol fraction used by vehicle types'.

Step 7: This gave the 'petrol use by vehicle type'.

Step 8: Volumes of 'petrol use by vehicle type' (Step 7) were divided by the 'petrol fuel intensity (l/100 km) by vehicle type.

Step 9: This gave the 'quarterly VKT (billion km) by petrol by vehicle type'.

Step 10: This step involved the summation of quarterly VKT for each vehicle type over the different fuel types.

Figure 2: Schematic diagram showing sequential steps for estimating 'quarterly' VKT (petrol as an example)

Volumes of seasonally adjusted RET quarterly petrol sales (Dataset 1)

plus[a]

Adjustment factor interpolated quarterly (Dataset 2)

equals

Adjusted quarterly petrol sales (Dataset 3)

times

Interpolated (annual to quarterly) fraction of petrol used by transport (Dataset 4)

equals

Quarterly transport petrol use (Dataset 5)

times

Interpolated (annual to quarterly) petrol fraction by vehicle types[b] (Dataset 6)

equals

Petrol use by vehicle types (Dataset 7)

divided by

Fuel intensity (l/100km) petrol by vehicle type (Dataset 8)

equals

Quarterly VKT by petrol vehicle types (Dataset 9)

Sum over all fuel types[c] to get quarterly VKT by vehicle type (Dataset 10)

[a] Volumes of actual raw RET quarterly petrol sales are added to adjustment factor interpolated quarterly, while volumes of actual raw RET diesel and LPG sales are multiplied by respective adjustment factor interpolated quarterly

[b] Vehicle types include cars, motorcycles, LCVs, rigid trucks, articulated trucks and buses

[c] Fuel types include petrol, diesel and LPG

3.3 Quarterly VKT estimates by capital cities

The methodology was based on the annual VKT fractions by capital city (BITRE unpublished data) and the quarterly estimated VKT by states/territories. Note that each of the eight capital cities has different annual VKT fractions. The following *three* steps were used to estimate quarterly VKT on capital city roads:

Step 1: Annual VKT fractions on capital city roads were estimated (capital city as a fraction of state/territory).

Step 2: Quarterly VKT fractions were calculated from annual VKT fractions by straight line interpolation.

Step 3: These quarterly VKT fractions were multiplied by the quarterly VKT estimates by state/territory to give capital city quarterly VKT estimates.

4. Results

4.1 Annual estimates of total VKT by states/territories, by vehicle types and by fuel types, 1965–2010

4.1.1 National level (total Australia)

In 2010, Australian vehicles travelled 221.1 billion kilometres, increasing from 54.8 billion km in 1965, an average annual rate of 3.2 per cent (Table 1), although decreases in total VKT were observed in three periods (1982–83, early 1990s and early 2000s). These decreases in VKT were presumably due to the slowdown in the growth of economic activity during those periods. The overall increase in VKT can be attributed to several factors, such as more people, more vehicles in the fleet and more individual travel. Growth in the light vehicle fleet is predicted to moderate in the medium to long term as a result of the combined effects of forecast slower economic growth and a saturation of per-capita car ownership (Cosgrove and Gargett 2007). However, during the last decade (i.e. 2001–2010), the total growth of VKT at national level was 14.1 per cent.

4.1.2 States/Territories

Among the eight states and territories, annual road VKT estimates were much higher in New South Wales and Victoria, followed by Queensland, South Australia and Western Australia (Table 1). On other hand, annual road VKT estimates were much lower in three small states and Territories (i.e. Tasmania, the ACT and the Northern Territory). However, among five major states, the fastest growth in road VKT was observed for Queensland (4.2 per cent per annum, followed by Western Australia (3.9 per cent per annum). By contrast, the VKT on South Australian roads grew by only 2.3 per cent per annum between 1965 and 2010 and by 2.6 per cent on Tasmanian roads. Interestingly, road VKT grew much faster in the two territories (5.3 per cent in the Northern Territory and 4.8 per cent in the ACT), although these two territories had very small amount of VKT (see Table 1).

As can also be seen in Table 1, the total growth of VKT during the last decade (i.e. 2001–2010) was also higher for Queensland (21.1 per cent) and Western Australia (19.7 per cent) compared to other states and territories.

In terms of proportion of VKT for each state and territory to total VKT on Australian roads, more than 75 per cent of total VKT in three major states (i.e. New South Wales, Victoria and Queensland). Between 1965 and 2010, the proportion of VKT decreased in New South Wales, Victoria, South Australia and Tasmania, while the proportion has increased in other four states and territories (data not presented).

4.1.3 Vehicle types

In 1965, total VKT by cars was 39.8 billion km and it increased to 162.1 billion km in 2010. Similarly, total VKT in Australia by LCVs was 8.3 billion km and this increased to 39.6 billion km in 2010 (see Table 2). Between 1965 and 2010, average annual growth rates of VKT for cars and LCVs were 3.2 per cent and 3.5 per cent, respectively.

Although VKT for other vehicles were less than 10 billion km during the period from 1965 to 2010, the average annual growth rates have been highest for articulated trucks (4.5 per cent) and lowest for rigid trucks (1.2 per cent).

During the last decade (i.e. 2001–2010), the total growth of VKT for cars was 10.1 per cent, while total growth of VKT for LCVs, rigid trucks and articulated trucks were much higher (26.0 per cent, 19.9 per cent and 27.4 per cent, respectively) (Table 2).

In 2010, cars were responsible for 73 per cent of the total VKT, followed by LCVs (17.8 per cent) and the remaining 9.2 per cent was from other vehicle types (i.e. motor cycles, rigid trucks, articulated trucks and buses) (data not presented). During the last 45 years from

1965 to 2010, the proportion of VKT by rigid trucks decreased from 8.9 per cent to 3.8 per cent, while the VKT share increased for LCVs from 15.1 per cent to 17.8 per cent. All other vehicle types showed no major changes in their shares.

Table 1: Annual estimates of annual total VKT (billion km), on Australian roads, by states/territories 1965–2010

Year	Total Australia	By states/territories							
		NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1965	54.8	19.3	15.4	7.6	5.7	4.5	1.7	0.2	0.4
1966	57.9	20.4	16.2	8.0	5.9	4.9	1.8	0.2	0.5
1967	61.2	21.5	17.1	8.5	6.2	5.3	1.9	0.2	0.6
1968	64.6	22.7	17.9	8.9	6.4	5.7	2.0	0.3	0.6
1969	69.8	24.5	19.2	9.6	6.8	6.4	2.1	0.4	0.7
1970	74.8	26.3	20.5	10.3	7.2	7.0	2.2	0.4	0.8
1971	78.5	27.7	21.4	10.8	7.4	7.5	2.3	0.5	0.9
1972	83.4	29.3	22.8	11.5	7.8	8.0	2.4	0.6	1.0
1973	86.7	30.2	23.7	12.2	8.0	8.4	2.5	0.6	1.1
1974	92.7	32.0	25.2	13.2	8.6	9.1	2.7	0.7	1.3
1975	97.2	33.1	26.4	14.1	9.1	9.6	2.7	0.7	1.4
1976	101.1	34.0	27.5	14.9	9.5	10.2	2.8	0.7	1.5
1977	106.7	35.6	29.0	15.8	10.0	10.9	3.0	0.8	1.6
1978	110.9	36.8	30.1	16.7	10.3	11.5	3.1	0.9	1.6
1979	114.5	38.2	30.8	17.6	10.4	11.8	3.1	0.9	1.7
1980	116.0	38.9	30.8	18.2	10.3	12.0	3.2	1.0	1.7
1981	118.8	39.9	31.3	19.1	10.3	12.2	3.2	1.0	1.8
1982	125.1	41.8	33.0	20.6	10.7	12.8	3.3	1.1	1.9
1983	125.0	41.2	33.1	20.8	10.7	12.7	3.3	1.1	1.9
1984	131.4	43.3	34.7	21.9	11.3	13.5	3.5	1.2	2.0
1985	137.0	45.1	36.2	22.8	11.8	13.9	3.7	1.3	2.1
1986	140.8	45.9	37.5	23.6	12.1	14.3	3.8	1.3	2.2
1987	143.7	46.5	38.6	24.2	12.4	14.6	3.8	1.4	2.3
1988	150.9	48.3	40.9	25.7	12.9	15.4	4.0	1.4	2.4
1989	157.7	49.9	43.0	27.3	13.3	16.2	4.1	1.4	2.5
1990	161.5	50.8	44.0	28.2	13.5	16.6	4.3	1.5	2.6
1991	160.2	50.1	43.5	28.5	13.3	16.5	4.3	1.4	2.7
1992	163.4	50.8	44.2	29.7	13.4	16.7	4.3	1.5	2.8
1993	168.4	52.2	45.1	31.3	13.7	17.3	4.5	1.5	2.9
1994	173.0	53.5	46.1	32.6	13.8	18.1	4.6	1.5	2.9
1995	179.4	55.2	47.4	34.3	14.0	19.2	4.7	1.6	3.0
1996	183.0	55.7	48.4	35.5	14.1	19.7	4.8	1.7	3.1
1997	185.2	55.9	49.4	36.1	14.2	20.0	4.8	1.7	3.1
1998	188.2	56.8	49.9	37.0	14.4	20.4	4.8	1.8	3.1
1999	192.3	58.0	51.1	37.9	14.8	20.9	4.8	1.8	3.2
2000	196.0	59.2	51.7	39.0	15.1	21.2	4.8	1.8	3.2
2001	194.7	58.9	51.1	39.1	15.0	21.0	4.7	1.8	3.2
2002	200.1	60.0	52.9	40.6	15.2	21.5	4.8	1.8	3.3
2003	205.3	60.9	54.5	42.0	15.7	22.1	5.0	1.8	3.4
2004	213.6	63.3	56.7	44.6	15.8	22.6	5.2	1.9	3.5
2005	214.8	63.6	56.8	45.3	15.6	23.0	5.2	1.9	3.5
2006	215.5	63.3	56.6	45.9	15.5	23.5	5.2	1.9	3.5
2007	218.8	64.0	57.1	47.2	15.6	24.1	5.3	1.9	3.6
2008	220.9	64.2	57.4	48.4	15.6	24.3	5.3	2.0	3.6
2009	220.0	63.8	56.6	47.6	15.8	25.4	5.2	2.0	3.6
2010	222.1	65.5	57.1	47.4	16.0	25.1	5.3	2.1	3.6
Average annual growth rate (per cent), 1965–2010									
	3.2	2.8	3.0	4.2	2.3	3.9	2.6	5.3	4.8
Total growth (per cent), 2001–2010									
	14.1	11.2	11.9	21.1	6.7	19.7	13.2	16.8	13.8

Source: BITRE estimates

Table 2: Annual estimates of total VKT (billion km) on Australian roads by vehicle types and by fuel types, 1965–2010

Year	By vehicle types						By fuel types		
	Car	MC	LCV	Rigid	Artic	Bus	Petrol	Diesel	LPG
1965	39.8	0.4	8.3	4.9	1.0	0.5	53.0	1.8	0.0
1966	42.6	0.4	8.5	4.8	1.0	0.5	56.0	1.9	0.0
1967	45.3	0.4	8.8	4.9	1.2	0.5	59.1	2.1	0.0
1968	48.4	0.5	9.1	4.8	1.3	0.5	62.4	2.3	0.0
1969	52.8	0.6	9.5	4.8	1.4	0.6	67.3	2.5	0.0
1970	57.4	0.8	9.6	4.9	1.5	0.6	72.1	2.7	0.0
1971	60.7	1.0	9.8	4.7	1.7	0.6	75.7	2.9	0.0
1972	64.8	1.1	10.4	4.7	1.8	0.6	80.1	3.2	0.0
1973	67.3	1.2	11.0	4.7	1.8	0.6	83.0	3.6	0.1
1974	72.0	1.3	12.0	4.9	1.9	0.6	88.6	4.1	0.1
1975	75.2	1.4	13.0	5.0	1.9	0.7	92.6	4.5	0.1
1976	78.4	1.6	13.1	5.2	2.0	0.7	96.0	5.0	0.1
1977	82.1	1.7	14.8	5.1	2.2	0.7	100.8	5.7	0.2
1978	85.0	1.7	16.1	5.1	2.2	0.7	104.4	6.3	0.2
1979	87.6	1.8	16.7	5.2	2.6	0.7	107.0	7.3	0.3
1980	88.1	1.9	16.8	5.7	2.8	0.8	107.1	8.4	0.5
1981	89.6	2.0	17.3	6.2	2.9	0.8	108.5	9.4	0.8
1982	94.1	2.2	17.9	7.0	3.1	0.9	113.0	10.9	1.2
1983	94.6	2.2	17.9	6.3	3.0	1.0	112.5	11.2	1.4
1984	99.1	2.3	19.3	6.2	3.4	1.0	117.2	12.5	1.6
1985	103.1	2.3	20.5	6.4	3.6	1.1	121.2	13.9	1.9
1986	106.4	2.1	21.2	6.2	3.7	1.2	123.6	14.6	2.7
1987	108.8	2.0	21.7	6.3	3.7	1.3	124.9	15.4	3.4
1988	114.2	1.9	22.7	6.7	4.0	1.4	129.6	16.9	4.4
1989	119.8	2.0	23.7	6.7	4.0	1.5	134.4	18.0	5.4
1990	123.4	1.8	23.8	6.8	4.1	1.5	136.3	19.0	6.3
1991	123.7	1.6	23.2	6.1	4.1	1.5	134.4	18.8	7.0
1992	126.3	1.6	24.1	5.8	4.1	1.5	136.4	19.3	7.8
1993	130.3	1.6	24.9	5.8	4.4	1.5	139.7	20.2	8.6
1994	133.7	1.6	25.7	6.0	4.5	1.5	142.3	21.3	9.4
1995	138.0	1.6	27.2	6.3	4.8	1.6	146.2	22.8	10.4
1996	140.1	1.5	28.1	6.6	5.0	1.6	147.7	24.1	11.2
1997	141.2	1.5	28.5	7.1	5.2	1.7	147.9	25.4	11.9
1998	142.7	1.5	29.8	7.2	5.4	1.7	149.0	26.6	12.7
1999	146.0	1.4	30.5	7.1	5.6	1.7	151.6	27.5	13.2
2000	148.8	1.4	31.1	7.2	5.7	1.8	153.8	28.7	13.5
2001	147.2	1.5	31.5	7.1	5.6	1.8	152.2	29.1	13.4
2002	150.8	1.6	32.7	7.3	5.8	1.8	155.6	30.7	13.7
2003	154.7	1.5	33.7	7.6	6.0	1.9	159.1	32.2	14.0
2004	161.4	1.6	34.8	7.7	6.2	1.9	165.3	33.8	14.5
2005	161.8	1.7	35.1	8.0	6.3	1.9	165.4	35.0	14.4
2006	161.0	1.9	35.9	8.2	6.5	2.0	164.8	36.4	14.3
2007	162.3	2.1	37.3	8.4	6.7	2.0	166.2	38.1	14.5
2008	162.6	2.3	38.3	8.6	7.0	2.1	166.8	39.8	14.4
2009	161.3	2.5	38.7	8.4	7.0	2.1	165.6	40.0	14.5
2010	162.1	2.6	39.6	8.5	7.2	2.1	166.6	41.0	14.5
Average annual growth rate (per cent), 1965–2010									
	3.2	4.2	3.5	1.2	4.5	3.3	2.6	7.2	nd
Total growth (per cent), 2001–2010									
	10.1	80.1	26.0	19.9	27.4	17.5	9.5	40.7	8.6

nd – Not determined
Source: BITRE estimates

4.1.4 Fuel types

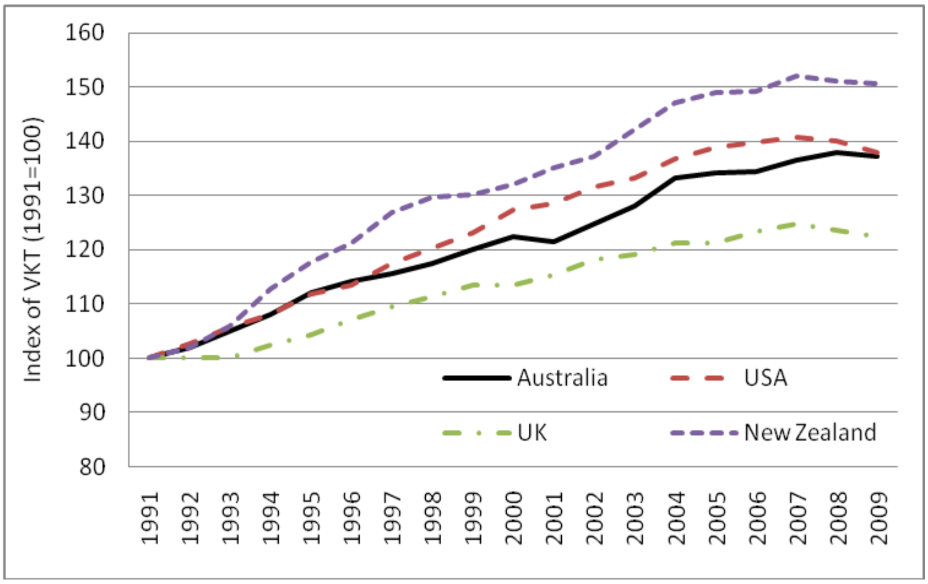
Petrol is the main fuel type used for road transport in Australia. Total annual VKT by petrol-powered vehicles increased from 53.0 billion km in 1965 to 166.6 billion km in 2010, an average annual growth rate of 2.6 per cent (Table 2). However, annual VKT by diesel-powered vehicles has increased sharply since mid-1970s. In 1965, annual VKT by diesel vehicles was 1.8 billion km, increasing to 41.0 billion km in 2010, an average annual growth rate of 7.2 per cent (Table 2). This diesel vehicles average annual VKT growth was much higher than the average annual growth of VKT by petrol vehicles.

During the last decade (i.e. 2001–2010), the total growth of VKT for petrol and LPG fuelled vehicles were less than 10 per cent, while total growth of VKT for diesel fuelled vehicles was more than 40 (Table 2), suggesting that diesel fuelled vehicles are becoming increasingly popular in recent years.

4.1.5 International comparison

An attempt was made to use annual VKT data from other developed countries (e.g. the United States, the United Kingdom and New Zealand) to compare trend in VKT on Australian roads. Figure 3 shows the comparison of total VKT among these four countries from 1991 to 2009 (indexed VKT, 1991=100).

Figure 3: Comparison of annual road VKT (billion km) between Australia, USA, UK and New Zealand, 1991–2009



Sources: Table 1; US Department of Transportation (2010), UK Department for Transport (2010); NZ Ministry for the Environment (2010)

Although the magnitude is different, the trend in total annual VKT on Australian roads is very similar to the trends of the USA, the United Kingdom and New Zealand. Between 1991 and 2009, the growth of VKT in Australia (1.78 per cent per annum) is very similar to the growth in the USA (1.81 per cent per annum), but lower than the growth in New Zealand (2.30 per cent per annum) and higher than the growth in the United Kingdom (1.13 per cent per annum) (data not presented). Total VKT estimates in all four countries declined in 2009 compared to that in 2008 due to the global financial crisis experienced in 2008–09.

In a recent study (BITRE 2011), BITRE showed that the proportions of total VKT by cars decreased in all four countries, while the proportions of total road VKT by LCVs increased. The proportion of VKT by cars tended to increase in Australia, the USA and New Zealand, while the proportion of VKT by cars decreased in the UK. Similarly, the proportion of VKT by other vehicles (i.e. motorcycles and buses) increased in Australia, the USA and New Zealand, while the proportion of VKT by other vehicles remained stable in the UK.

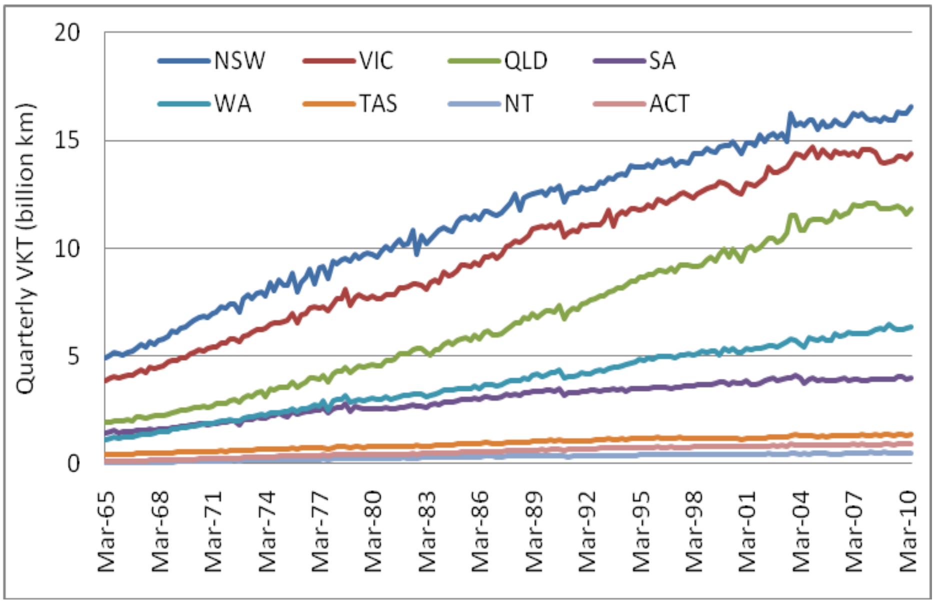
4.2 Quarterly estimates of total VKT by states/territories, by vehicle types and by fuel types, March 1965–June 2010

4.2.1 States/Territories

In March 1965, total VKT in New South Wales was 4.91 billion km and it increased to 16.56 billion km in June 2010, while total VKT in Victoria increased from 3.86 billion km to 14.36 billion km during the same period (Figure 4). Similarly, quarterly total VKT in Queensland was 1.91 billion km in March 1965 and it increased to 11.84 billion km in June 2010, from 1.11 billion km to 6.35 billion km in Western Australia and from 1.42 billion km to 3.95 billion km during the same period. By contrast, total VKT estimates were much lower in three small states and territories (i.e. Tasmania, the Northern Territory and the ACT).

Between March 1965 and June 2010, quarterly VKT as a proportion of total 'State/Territory' (i.e. total Australia) VKT increased largely in Queensland (from 13.8 per cent to 21.2 per cent) and Western Australia (from 8.9 per cent to 13.1 per cent) (data not presented). However the proportions were also increased in the Northern Territory (from 0.4 per cent to 0.9 per cent) and the ACT (from 0.9 per cent to 1.7 per cent) during the same period. By contrast, quarterly VKT as a proportion of total 'State/territory' VKT decreased in New South Wales (from 35.5 per cent to 29.7 per cent), Victoria (from 28.0 per cent to 25.7 per cent), South Australia (from 10.3 per cent to 7.1 per cent) and Tasmania (from 3.1 per cent to 2.4 per cent) during the same period (data not presented).

Figure 4: Quarterly road VKT estimates (billion km) by states/ territories, March 1965–June 2010



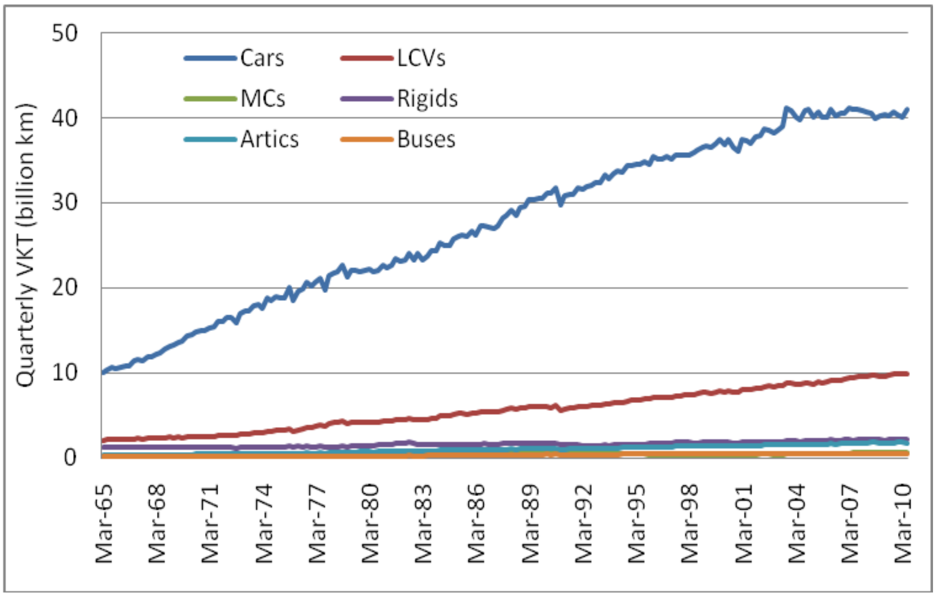
Source: BITRE estimates

4.2.2 Vehicle types

Total quarterly VKT (billion km) by cars increased from 10.02 billion km in March 1965 to 40.92 billion km in June 2010, in absolute magnitude much higher than other vehicle types (Figure 5). Total quarterly VKT estimates by LCVs increased from 2.08 billion km in March 1965 to 9.89 billion km in June 2010. Total quarterly VKT estimates by rigid trucks increased from 1.23 billion km in March 1965 to 2.09 billion km in June 2010. However, other three vehicle types (i.e. motor cycles, articulated trucks and buses) have very similar quarterly VKT during this period, although total VKT by articulated trucks grew faster.

Between March 1965 and June 2010, quarterly VKT as a proportion of total VKT stayed relatively constant for cars and buses, while articulated trucks and motor cycles increased their shares, rigid trucks decreased and buses remained the same (BITRE 2011).

Figure 5: Quarterly 'states/territory' road VKT estimates (billion km) by vehicle types, March 1965–June 2010

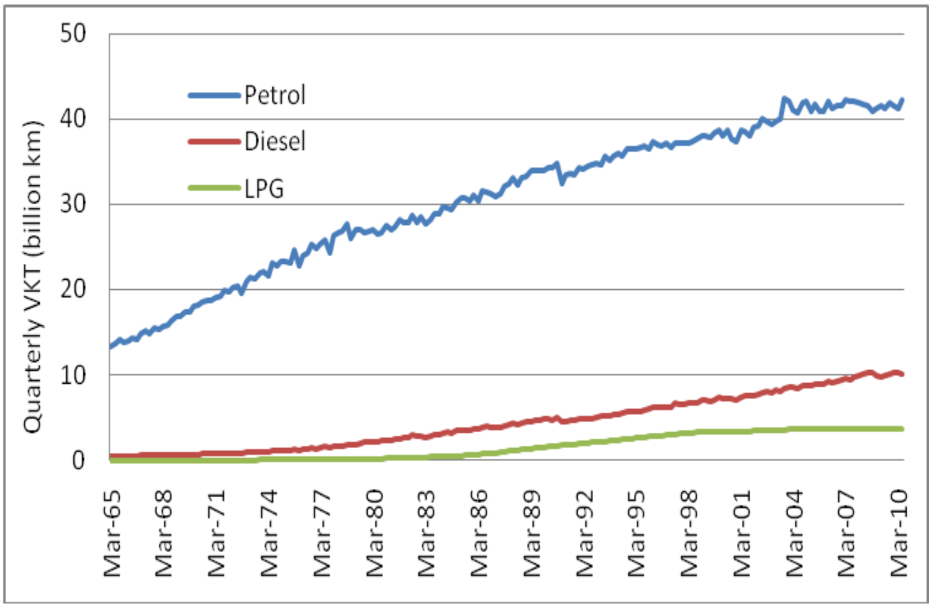


Source: BITRE estimates

4.2.3 Fuel types

Total quarterly VKT by petrol–powered vehicles increased from 13.33 billion km in March 1965 to 42.14 billion km in June 2010 (Figure 6). Similarly, total quarterly VKT by diesel–powered vehicles increased from 0.47 billion km in March 1965 to 10.09 billion km in June 2010. Note that the use of LPG as a transport fuel only started in late 1970s. Total quarterly VKT estimates by LPG–powered vehicles increased to 3.63 billion km in June 2010.

Figure 6: Quarterly 'states/territories' road VKT estimates (billion km) by fuel types, March 1965–June 2010



Note: No LPG data in the earlier period
Source: BITRE estimates

Between March 1965 and June 2010, quarterly VKT as a proportion of total VKT decreased for petrol vehicles (from 96.6 per cent to 75.4 per cent), while diesel–powered quarterly VKT as a proportion of total VKT increased (from 3.4 per cent to 18.1 per cent) (data not presented). By June 2010, quarterly LPG vehicles increased their share to 6.5 per cent.

4.3 Quarterly estimates of total VKT on capital city roads by capital cities and by vehicle types, March 1965–June 2010

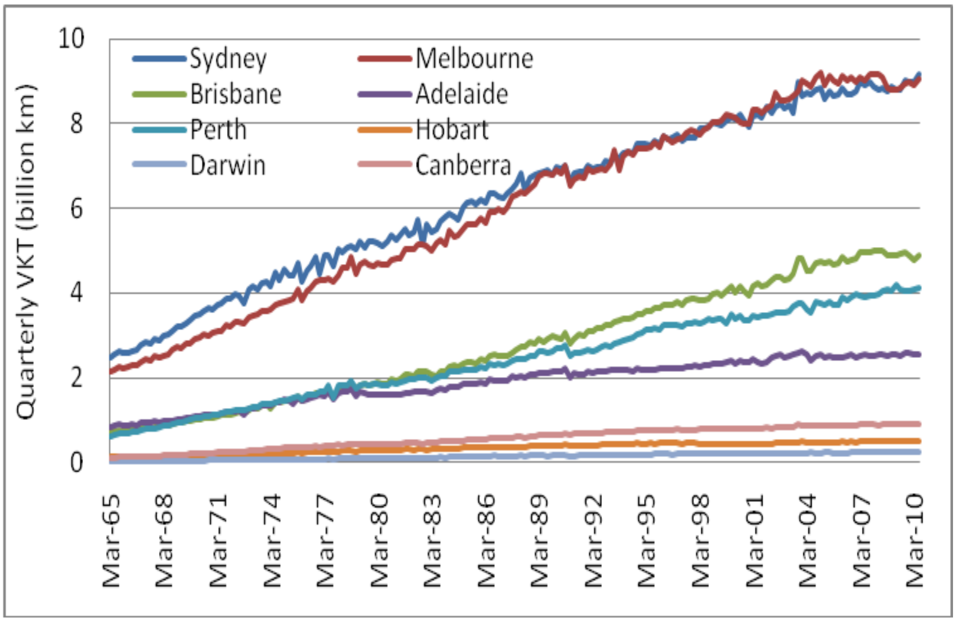
4.3.1 Capital cities

Between March 1965 and June 2010, quarterly total 'capital city' VKT increased from 7.08 billion km to 31.45 billion km (sum of all eight capital cities in Figure 7). As a proportion of total 'State/Territory' (i.e. total Australia), total 'capital city' VKT estimates increased from 51.3 per cent in March 1965 to 56.3 per cent in June 2010 (data not shown).

Among five major capital cities, quarterly 'capital city' VKT estimates were much higher in two major capital cities (i.e. Sydney and Melbourne). Since 1990, VKT estimates were similar for these two capital cities, but increased slightly in Melbourne compared to Sydney, from December 2003 quarter to September 2008 quarter, then declined marginally (Figure 8). By contrast, road VKT estimates were much lower in three small capital cities (i.e. Hobart, Darwin and Canberra).

Between March 1965 and June 2010, quarterly VKT as a proportion of total 'capital city' VKT increased in Brisbane (from 10.1 per cent to 15.6 per cent), Perth (from 8.9 per cent to 13.1 per cent), Canberra (from 1.7 per cent to 2.9 per cent) and Darwin (from 0.3 per cent to 0.8 per cent), while decreased in Sydney (from 35.2 per cent to 29.1 per cent), Melbourne (from 30.2 per cent to 28.7 per cent), Adelaide (from 11.8 per cent to 8.1 per cent) and Hobart (from 1.8 per cent to 1.6 per cent) during the same period.

Figure 7: Quarterly road VKT estimates (billion km) on capital city roads by capital cities, March 1965–June 2010



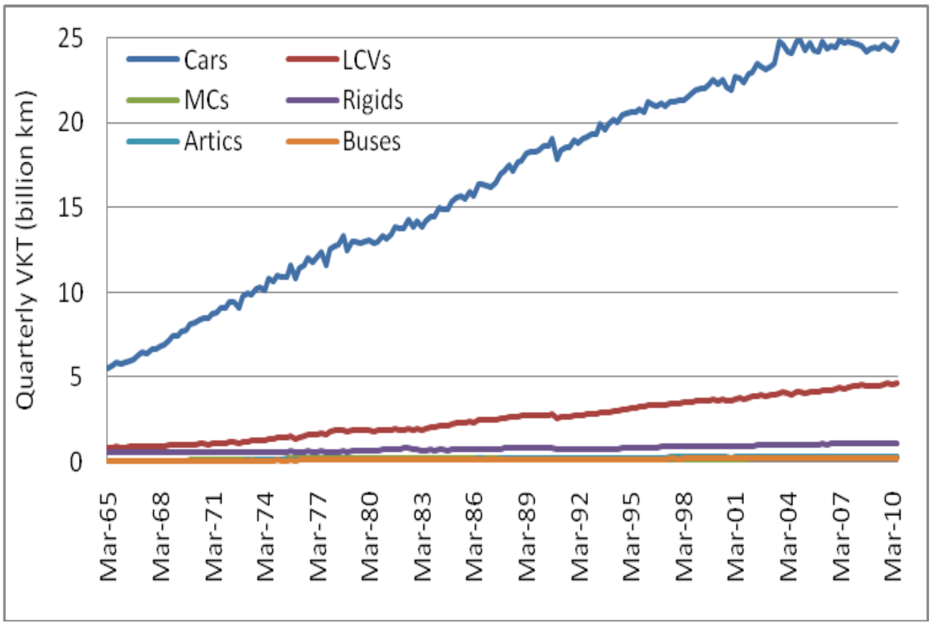
Source: BITRE estimates

4.3.2 Vehicle types

Between March 1965 to June 2010, quarterly 'capital city' VKT estimates by cars increased from 5.49 billion km in March 1965 to 24.78 billion km in June 2010, much higher than other vehicle types (Figure 8). Quarterly 'capital city' VKT by LCVs increased from 0.85 billion km in March 1965 to 4.63 billion km in June 2010 and quarterly 'capital city' VKT by rigid trucks increased from 0.56 billion km in March 1965 to 1.07 billion km in June 2010. However, other three vehicle types (i.e. motor cycles, articulated trucks and buses) have very small quarterly VKT during this period.

Among cars, LCVs, rigid and articulated trucks, average quarterly growth rates of ‘capital city’ VKT between March 1965 and June 2010 was highest for articulated trucks (1.10 per cent per quarter) and lowest for rigid trucks (0.35 per cent per quarter). However, car VKT grew by 0.84 per cent per quarter and VKT by LCVs grew by 0.94 per cent during the same period. Similarly, quarterly growth rates for motor cycles and buses were 1.00 per cent and 0.62 per cent, respectively.

Figure 8: Quarterly ‘capital city’ road VKT estimates (billion km) on capital city roads by vehicle types, March 1965–June 2010



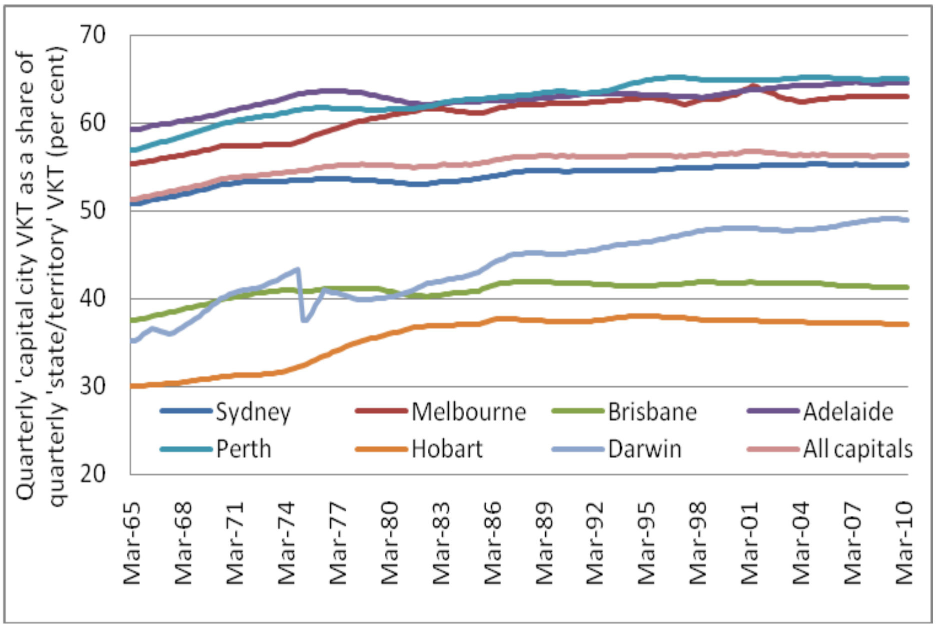
Source: BITRE estimates

4.3.3 Quarterly ‘capital city’ VKT as a proportion of quarterly ‘state/territory’ VKT

Figure 9 shows the quarterly ‘capital city’ VKT estimates as a proportion (per cent) of quarterly ‘state/territory’ VKT between March 1965 and June 2010. Note that data for Canberra was not included, because it was assumed that the quarterly VKT in the ACT was essentially the same as for Canberra.

Between March 1965 and June 2010, the proportions of quarterly ‘capital city’ VKT estimates of respective quarterly ‘State/Territory’ VKT were higher (more than 50 per cent) for Sydney, Melbourne, Adelaide and Perth, while lower (less than 40 per cent during early period and less than 50 per cent during the later period) in Brisbane, Hobart and Darwin. However, the percentage point increase in quarterly ‘capital city’ VKT estimates compared to ‘state/territory’ VKT between March 1965 and June 2010 was highest for Darwin (13.8 percentage points) and lowest for Brisbane (3.9 percentage points) (data not presented). For all capital cities, it increased by 5.0 percentage points during the same period.

Figure 9: Quarterly ‘Capital city’ road VKT estimates as a proportion (per cent) of quarterly ‘State/Territory’ road VKT, March 1965–June 2010



Notes: ‘Cyclone Tracy’ in Darwin, from Christmas Eve to Christmas Day, 1974. Canberra is assumed to be same as the ACT

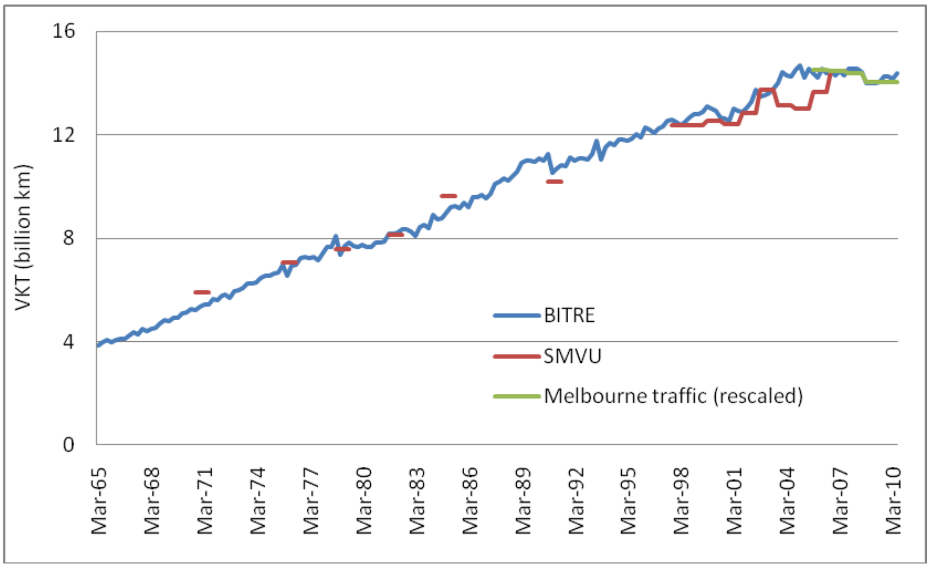
Source: BITRE estimates

4.3.4 Comparison of various ‘capital city’ VKT estimates

Figure 10 shows a comparison of historical SMVU totals for Melbourne with (1) the quarterly estimates for Melbourne, and (2) quarterly estimates using traffic counts in Melbourne (and applying them to the 2005 Melbourne estimate), where three points are evident..

First, the SMVU estimates are extremely variable, but tend to agree with the magnitude of the trend in Victorian VKT estimated from fuel sales. Secondly, the pattern of quarterly VKT estimated from fuel sales and Melbourne traffic counts is quite similar. Thirdly, both the fuel sales estimates and the Melbourne traffic counts confirm a dramatic deviation during 2005–2010 in the long–run upward trend of VKT in Victoria.

Figure 10: Comparison of annual road VKT estimates for Victoria



Source: BITRE estimates

5. Potential uses of the data, policy implications and conclusion

There are multiple potential uses of the data and has the policy implications.

1. The VKT data has been used to derive quarterly road fatality rates in each state/territory (see Gargett 2010). The fatality rates were then analysed against seat belt wearing rates, random breadth testing (RBT) and speed enforcement to produce models of fatality rates for each state/territory (Gargett 2010).
2. The VKT data by vehicle type can be used to benchmark policy decisions about road funding allocations based on traffic trends: (1) it is up–to–date, (2) it is free from the extreme variability inherent in the SMVU sample survey, and (3) it should be broadly accepted by the states/territories as a benchmark.
3. The VKT data can serve to better inform our understanding of the likely future of transport activity in Australia.
4. In addition, fuel intensity time–series data derived in the study can be used to examine questions about trends in the energy intensity of the transport sector over the long term.

The synergy of fuel sales, transport fuel use, vehicle fuel intensity and vehicle kilometres travelled (VKT) presented here generates detailed and up–to–date estimates of all these quantities in all states and territories. These estimates have multiple uses in elucidating trends and issues for policy makers across the country.

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