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Sustainable Energy Management: Private Transportation and Taxation

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Abstract

In this article a case is made for the introduction of tax measures that affects sustainable energy use in the transport sector, particularly passenger vehicles in the road transport industry. This article explores whether there is a harmonious relationship between the transportation and tax policy in Australia and whether a change in tax policy is required to promote the use of more fuel efficient vehicles, vehicles using cleaner fuels, a reduction in the use of vehicles and reduction in congestion. The tax should relate to the power and weight of the vehicle and its use and not where the vehicles are manufactured. A new way of thinking is required as the world resource of liquid fuel is being depleted. It takes millions of years for our planet to produce liquid fuel, but it takes an instant to burn it, and once burnt, it is irrecoverable. Therefore, the Australian Government should take the responsibility and implement appropriate taxation policies to promote the efficient movement of people and goods with the least consumption of liquid oil.

The Liquid Fuel Problem

Australia's energy management policy needs to focus on the liquid fuel problem, and in particular the passenger vehicles within the road transport industry, being the greatest consumer of liquid oil. According to the Australian Government Department of Resources Energy and Tourism (2010), Australia is the world's ninth largest energy producer accounting for around 2.4 per cent of the world's energy production. It has 38.2 per cent of total world resources of uranium; 18.5 per cent of total world resources of coal; 1.4 per cent of total world resources of gas and only 0.3 per cent of total world resources of petroleum. Petroleum is the generic term used for all hydrocarbon oils and gases including refined petroleum products. Although Australia is a net energy exporter, it is a net importer of crude oil and refined petroleum products

The Australian Government Department of Resources Energy and Tourism (2010) states that in the year 2007-08, Australia's primary energy consumption was 5772 Petajoules (PJ) (one joule is defined as the amount of work done by a force of one newton moving an object through a distance of one meter), of which 40 per cent was coal, 34 per cent was petroleum products and 22 per cent was gas. Petroleum products are hydrocarbons used directly as fuel and include liquefied petroleum, automotive gasoline, automotive diesel, aviation gasoline, fuel oil and kerosene. Liquid fuels are all liquid hydrocarbons, including crude oil, condensate, liquefied petroleum gas (LPG) and other refined petroleum products.

Of the 5772 PJ of energy consumed in 2007-08, only 3917 PJ was available for disposal as 1856 PJ was required for conversion of energy to usable form. Table 1 shows that road transport was the largest consumer of energy in Australia in 2007-08.

Table 1: Energy Consumption in Australia 2007-08

Industry	PJ
Agriculture	92.6
Mining	449.7
Food, beverages, textiles	212.1
Wood, paper and printing	75.1
Chemical	202.3
Iron and Steel	117.4
Non-ferrous metals	461.5

Other industry	150.4
Construction	26.4
Road transport	1,027.5
Rail transport	37.5
Air transport	226.3
Water transport	70.6
Commercial services	278.9
Residential	425.7
Lubes, bitumen, solvents	62.9
Total	**3,916.9**

Source: Australian Government Department of Resources Energy and Tourism, 2010.

A further examination of energy consumption within the road transport industry reveals that passenger vehicles consumed about 61.7 per cent of the total consumption in 2006-07 as demonstrated in Table 2.

Table 2: Australian Road Fuel Consumption by Type of Vehicle 2006-07

Vehicle Type	Percentage
Passenger vehicles	61.7
Buses	2.2
Motorcycles	0.4
Light commercial vehicles	15.8
Other trucks	0.2
Articulated trucks	12.0
Rigid trucks	7.7
Total	**100**

Source: Australian Government Department of Resources Energy and Tourism, 2010.

The energy used in Australian road transport comes mainly from automotive gasoline and automotive diesel oil as demonstrated in Table 3.

Table 3: Australian Consumption of Petroleum Products 2008-09

Petroleum Product	Million Liters
LPG	3,996
Automotive gasoline	18,734
Avgas	96

Turbine fuel	6,173
Kerosene	25
Heating oil	7
Automotive diesel oil	18,587
Industrial diesel fuel	16
Fuel oil	1,423
Lubes and grease	437
Bitumen	809
Other	311
Total	**50,614**

Source: Australian Government Department of Resources Energy and Tourism, 2010.

Of the consumption of 50,614 liters of petroleum products, 78 per cent or 39,546 liters came from the petroleum refining industry in Australia. However, Australian refineries consumed 38,808 million liters of crude oil and condensate, of which 80 per cent was imported. This is partly because Australian crude oil is generally light and getting lighter and Australian refineries require the heavier crude oils. This means that Australia is very dependent on imported crude and petroleum products (liquid fuel).

Since Australia is dependent on imported liquid fuel, it is necessary to examine the world resource of liquid fuel. The estimates of known oil reserves in the world, being reserves that can be recovered with reasonable certainty from known reservoirs under existing economic conditions, vary from one reporting agency to another as some are optimistic whereas others are pessimistic. Known oil reserves from selected agencies have been reported as shown in Table 4.

Table 4: Oil Reserves Reported from Selected Agencies

Name of Reporting Agency	**Timing**	**Billion Barrels (Gb)***
Oil and Gas Journal	Jan 2009	1342
World Oil	Year end 2007	1184
Energy Information Administration	2008	1241
B P Statistical Review	June 2009	1258
Australian Bureau of Agriculture and Resource	End of 2008	1408

Source: Owen, Inderwildi & King, 2010.
*One barrel equals 158.987 liters of oil.

The recent Geoscience Australia and ABARE (2010: 47-48) report states that at current levels of world production the estimated proven oil reserves in the whole world are only enough to last for around 42 years. This creates a liquid fuel problem, not an "energy crisis". Hirsh, Bezdek and Wendling (2005) argue that technology has not developed engines that commonly use renewable energy such as solar, wind, photovoltaic, nuclear power, geothermal or fusion. Motor vehicles, ships and airplanes still commonly run on oil.

Since passenger vehicles in Australia consume about 61.7 per cent of liquid fuel, it is necessary to examine the Australian transport policy and the growth of private vehicles and whether a change in taxation policy is required to steer the energy management policy in this area.

Australian Transport Policy and the Growth of Private Vehicles

Australia does not have a national transport policy, as transportation falls within the jurisdiction of the States. However, in February 2008, the Australian Transport Council Ministers began the process of developing a National Transport Policy Framework. The policy framework objectives include the promotion of efficient movement of people and goods in order to support sustainable economic development and prosperity, and the minimization of emissions and consumption of resources and energy (National Transport Commission, 2009). An examination of transportation data below indicates that these desired policy objectives are not currently being met as Australians continue to rely on private motor vehicles for personal transportation that have high power and high power to weight ratios.

Since the end of the Second World War, Australian cities have grown, with an increase in suburbs. The government policies that have shaped our cities are housing and land, transportation and taxation. A rapid increase in motor vehicle ownership has encouraged the improvement and spread of the road system, thereby influencing urban land use. In the 1920s, Australia had only 76,000 registered cars and station wagons, compared with 769,000 in

1950 and 10.4 million in 2003 (Australian Bureau of Statistics, 2005). In 1995, private road vehicles represented 95 per cent of city passenger transport. In March 2009, 92 per cent of Australian households kept at least one registered motor vehicle at home. The proportion of households with two or more registered vehicles increased from 51 per cent in 2006 to 56 per cent in 2009 (Australian Bureau of Statistics 2010: 84). In 2009, 80 per cent of people in Australia used private motor vehicles to travel to work or full-time study, 14 per cent took public transport, 4 per cent walked and 2 per cent cycled. Ninety four per cent of people who used a private motor vehicle to travel to work or full-time study did so as a driver or rider and only 6 per cent travelled as a passenger. The most common reasons for Australians not using public transport are: lack of service at right or convenient time; convenience, comfort and privacy; travel time too long; and own vehicle needed (Australian Bureau of Statistics 2010: 85).

A Senate inquiry on investments of Commonwealth and State funds in public passenger transport infrastructure and services reported in August 2009 that metropolitan travel passenger-kilometers are about 85-90 per cent by car, 10 per cent by public transport and the rest by cycling and walking. The most prominent comment in the submissions was the need for improvements to public transport service and the encouragement of public transport use. A number of recommendations were made, which included that the Government should investigate options for tax incentives for public transport and that the Government should support behavioral change programs (Parliament of Australia, 2009).

The Infrastructure Australia State of Australian Cities (2010) report states that the level of car dependency in Australian cities has increased at a faster rate than population growth, creating traffic congestion problems, which are projected to cost $20.4 billion by 2020. This dependency on motor vehicles can only be sustained by an abundant supply of liquid fuel.

The reserves of liquid fuel that Australia and the world have are limited. Even though it cannot be predicted with certainty when we may run out of liquid fuel, it is an obvious fact that fossil fuel that took millions of years to form will be depleted as it is non-renewable. With this fact in mind, it is necessary to examine what needs to be done now so that Australians do not suffer when liquid fuel becomes unavailable. This is the Australian Federal Government's task, since motor vehicles are so dependent on liquid fuel and habits needs to be changed fast. There are two broad approaches

that the Government can adopt to change peoples habits: one is the carrot approach and the other the stick approach.

The carrot approach is currently being pursued by governments at all levels in Australia. Moriarty and Honnery (2008: 870) suggest that the carrot approach could include government policies such as lower maximum road speeds, traffic-free precincts and greater parking restrictions in the inner areas, an end to further arterial road building, provision of extra public transport services particularly in the outer suburbs, and incentives for alternative travel modes. This approach is reflected in current and past Commonwealth and State measures such as the green vehicle guide, fuel efficiency labels for vehicles, TravelSmart (The Australian Government, Department of the Environment, Water, Heritage and the Arts, 2005) funding, alternative fuel conversion programs, fleet purchasing policies, investment programs to encourage modal shift of passenger transport, and a cleaner buses fleet (National Transport Commission, 2009: 52).

The carrot approach does work to a limited extent in reducing the vehicle kilometers travelled as reported in the Garnaut Review, *TravelSmart and LivingSmart Case Study – Western Australia* (2008). However, there is no evidence of reduction in the demand for large and powerful motor vehicles that make inefficient use of fuel for personal transportation. This suggests that a stick approach is required in designing a tax policy to promote the use of smaller and lighter vehicles. It is not just the use of a vehicle that needs to be changed, but the design of the vehicles as well. It is worth noting that even though the engines powering our vehicles have become more efficient at extracting energy from liquid fuels, this has not resulted in energy saving. The reason for this is that manufacturers have increased the power output of motor vehicles as a selling point to attract customers, as customers are demanding larger and more powerful motor vehicles.

Greater power output has had a real term net gain in vehicle weight as demonstrated in Table 5 below. For example, the Holden's first family motor vehicle, the Holden FJ, produced in 1953 had a 2.15 liter engine and power output of 45 Kilowatt (KW), but the vehicle weighed only 1018 kilograms (kg), which gave a power-to-weight ratio of 44.46 KW per tonne. However, the average family car in 2008, for example the Holden Commodore VE, has power output of 180 KW, weighs 1700 kg and has a power-to-weight ratio of 105.88 KW per tonne (Holden Specifications,

2008). If a 45 KW output engine was produced today, it would not require a 2.15 liter engine, but would only require about an 855 cc engine with a much lower weight and fuel consumption, and the vehicle would be able to accelerate from 0 to 100 km per hour in approximately 12 seconds. This is based on 0.052 KW per cubic capacity as demonstrated by Schefter (2008) through the "Smart Fortwo", which has a 1 liter engine producing 52 KW of power and accelerates from 0 to 100 km in 12.8 seconds. This would be more than adequate to drive on most roads.

Table 5: Specifications of Holden Family Car: 1948-2008

Car Model	Year Introduced	Engine Size (liter)	Power in KW	Weight kg	Power to Weight Ratio KW per tonne	Performance 0-100km/h in seconds	City Consumption Liter/100km Highest
Holden48-215 (FX)	Nov 1948	2.15	45	1,012	44.46	20	9.4
Holden FJ	Oct 1953	2.15	45	1,012	44.46	20	10.5
Holden FE	July 1956	2.15	53	1,080	49.07	20.4	
Holden FC	May 1958	2.15	53	1,084	48.89	19.5	
Holden FB	Jan 1960	2.26	56	1,122	49.91	20.8	
Holden EK	May 1961	2.26	56	1,121	49.95	20.8	
Holden EJ	July 1962	2.26	56	1,130	49.56	18	
Holden EH	Aug 1963	2.45	75	1,185	63.29	15.8	11.80
Holden HD	Feb 1965	2.45	86	1,216	70.72	13.2	
Holden HR	Apr 1966	2.45	86	1,217	70.66	15.3	
Holden HK	Jan 1968	2.65	85	1,300	65.38	15.2	
Holden HT	May 1969	2.65	85	1,300	65.38	10.1	
Holden HG	July 1970	2.65	85	1,300	65.38	12.8	
Holden HQ	July 1971	3.3	101	1,338	75.48	13.1	
Holden HJ	July 1974	3.3	96	1,338	71.75	13.1	
Holden HX	July 1976	3.3	82	1,330	61.65	16.4	
Holden HZ	Oct 1977	3.3	81	1,342	60.35	16.8	

Holden WB	1980	3.3	81	1,220	66.39		
Holden VB	Oct 1978	3.3	71	1,220	58.20	16.4	16.8
Holden VC	Mar 1980	2.85	76	1,158	65.63	13.9	
Holden VH	Oct 1981	2.85	76	1,152	65.97	10.2	
Holden VK	Feb 1984	3.3	86	1,250	68.80		
Holden VL	Mar 1986	3.0	114	1,250	91.20	7.04	13
Holden VN	Aug 1988	3.8	125	1,226	101.96	8.1	13
Holden VP	Sept 1991	3.8	125	1,332	93.84	8.1	13
Holden VR	July 1993	3.8	130	1,362	95.44		12
Holden VS	Apr 1995	3.8	145	1,385	104.69	8.9	12
Holden VT	Aug 1997	3.8	147	1,512	97.22	9.1	13.5
Holden VX	Sept 2000	3.8	147	1,519	96.77	9.1	13
Holden VY	Oct 2002	3.8	152	1,522	98.55	9.0	15
Holden VZ	Aug 2004	3.6	180	1,700	105.88	8.6	13.5
Holden VE	July 2008	3.6	180	1,700	105.88	8.6	

Source: Holden Specifications, 2008

Based on the data in Table 5, it can be concluded that from 1948 to 2008 the average family vehicle has progressively increased in weight, power and performance. The extraction of power per cubic centimeter of engine capacity in 1948 was 0.021 KW (45K W/2150 cc) compared to 0.05 KW (180/3600 cc) in 2008, an increase of 138 per cent. However, this power could have been better utilized by producing a smaller and lighter motor vehicle that would save energy and reduce consumption. Lighter vehicles do not have to sacrifice on safety as racing Formula 1 cars are lighter and yet safe.

The question this raises is whether the current Australian tax policy has the potential to bring about the changes required in our attitude towards the use of large motor vehicles and if not, what objectives are required in developing a tax policy that would change people's practices towards the choice for personal transportation in order to preserve our precious resource of oil.

Australian Taxation Policy and its Influence on Transportation Choices

In order to determine whether reform of motor vehicle transportation taxation is required in Australia to promote the efficient movement of people and goods with the least consumption of liquid oil, it is first necessary to analyze if existing tax policies play a role in determining a person's attitude towards the use of large motor vehicles. The transport sector is highly taxed and involves crude oil excise and royalties, fuel excise, Goods and Services Tax (GST), Fringe Benefits Tax (FBT), Luxury Car Tax (LCT), tariffs on imported vehicles, taxes on insurance, stamp duty on motor vehicles, and license and registration fees.

The tax revenues from the transportation sector are summarized in Table 6.

Table 6: Revenues from Taxes

TAX	**REVENUE**
COMMONWEALTH TAXES	Year 2007-08 ($Million)
Fuel Excise on Petrol and Diesel	13,633
Import Tariff on passenger motor vehicles	1,400
Luxury Car Tax	464
Fringe Benefits Tax	< than 3,796
STATE TAXES	Year 2006-07 ($Million)
Motor Vehicle Registration Duty on Transfer	1,989.7
Annual Motor Vehicle Registration Fees and Taxes	3,806
Surcharge and Levies on Compulsory Third Party Insurance	222.6

Source: Clarke and Prentice, 2009.

The Australian Federal and State Governments impose Petroleum Resource Rent Tax (PRRT), royalties and crude oil excise depending upon where projects are located. These do not affect pump prices, but being a tax on profits, it reduces the gains made by the producers.

The Federal Government also imposes GST and excise on petroleum products, including commonly used fuels. These do affect the pump prices. For every liter of petrol or diesel, whether imported from overseas or produced in Australia, an excise of $0.3814 cents per liter is imposed. Table 7 shows how Caltex calculated its petrol price as at 12 June 2009 using the Singapore benchmark price for refined petrol and diesel.

Table 7: How Caltex Calculates Petrol Prices: Price Calculated as at 12 June 2009

	US DOLLARS PER BARREL	AUSTRALIAN CENTS PER LITRE
Price of petrol from Singapore refineries	76.81	
Add negotiated quality premium	2.75	
Add shipping costs Singapore to Australia	2.04	
Add cargo insurance	0.28	
Subtotal - convert to Australian cents per liter	81.88	65.19
Add Australian port costs		0.2
Import parity price		65.39
Add government fuel excise		38.14
Subtotal - import parity price + excise		103.53
Add wholesale margin		Varies
Subtract wholesale discounts		Varies
Add freight		Varies
Add retail margin		Varies
Subtotal (indicative only)		114.55
Add 10 per cent GST		11.45
Retail price (indicative only		125.9

Source: Caltex, 2009.

A straight increase in fuel excise is unlikely to affect the consumption of fuel as it has been noted in various studies that the consumption of fuel is inelastic. The reason for this is that people have a need to drive. It is difficult to reduce demand for fuel without changing habits, for example, buying a fuel efficient vehicle, using more public transport or driving less. Moreover, there is no readily available substitute for liquid fuel that can be used without making major alterations to the current design of vehicles.

The Senate Select Committee on Fuel and Energy (2009: 184, 185) conducted an inquiry on the impact of Carbon Pollution Reduction Scheme on consumers, which revealed arguments from organisations such as the Commonwealth Scientific and Industrial Organisation (CSIRO), Caltex Australia and the Royal Automobile Club of Queensland (RACQ) acknowledging that both international and local research confirms that the use of fuel is quite inelastic, so an increase in fuel price will reduce the demand for fuel only slightly. The RACQ argued that in the short term, car fuel use declines about 1.5 per cent with any 10 per cent concurrent increases in the price of fuel. Caltex Australia commented that the price of fuel does little to change motorists' consumption behaivour. Thus, a new way of thinking is required to change motorists' consumption behaivour. Other taxes like the FBT and the LCT also do not have any impact on motorists' purchasing or driving habits.

Employers that provide vehicles or other benefits for use by employees in Australia are liable for FBT. Two methods may be used to calculate liability for FBT: the operating cost method and the statutory formula method. The operating cost method requires a logbook to be kept to determine actual operating costs and the actual proportion of the time that the car is in private use. The benefit to which FBT applies (the taxable value) is then equal to the private fraction of the actual vehicle operating costs as determined from the logbook. The statutory formula method determines the taxable value to which FBT applies by multiplying the purchase value of the vehicle by a statutory percentage that varies with total distance travelled by the car during the year. The greater the distance travelled, the lower the taxable value. The reason for this is that the Government assumes that if the distance travelled is greater, the proportion of private use is lower and, therefore, the FBT should be reduced. However,

a lower FBT acts as an incentive to drive more rather than less and wastes our precious resource of oil.

The LCT was first introduced on 1 July 2000 when the GST was introduced and the wholesale sales tax was abolished in Australia. The tax applies to vehicles whose GST-inclusive value exceeds the indexed threshold of $57,123 for 2007-08. The LCT applies to both domestically produced and imported vehicles (*Tax Laws Amendment (Luxury Car Tax) Act 2008* (Cth))

In an effort to impact on choice of motor vehicle, the Federal Government also made recent amendments to the LCT in the *Tax Laws Amendment (Luxury Car Tax) Act* 2008 (Cth) which came into effect on 1 July 2008 increasing the rate of LCT from 25 per cent to 33 per cent. When debating the amendments to the LCT, Senator Milne (2008) pointed out that a reduction in cars on the road would solve congestion problems and would also improve the quality of our air. However, this will require a huge investment in public transport, in cycle-ways and in making cities more pedestrian friendly, requiring the Government to examine Australian infrastructure and urbanization policies.

In this article it is argued that the current tax law contained in the LCT is unlikely to change the behaivour of the Australian population at large. The purpose of the LCT was to prevent luxury cars becoming cheaper with the introduction of the GST. However, the purpose should have arguably been to encourage people to purchase smaller, lighter and low emission vehicles. Only a small number of taxpayers are affected by LCT. Only 1,100 suppliers paid the LCT during 2006-07 and the Australian Government collected $365 million in revenue out of total revenue of $262,511 million (Commonwealth of Australia, 2008a: 12). Moreover, the LCT is imposed only when the price of the car is above the legislated threshold of $57,123 for 2007-08. The increase in price of the vehicle as a result of LCT is not indicative of its fuel efficiency or its emissions. The need for a tax to change behaivour, to drive less in more fuel efficient motor vehicles, was recognized by the Australian Government and referred to the review of Australia's Future Tax System commonly known as the "Henry Tax Review" (Commonwealth of Australia, 2008a).

Around 1,500 formal submissions were received and some of the key messages from the submissions were: use of motor vehicles imposes costs on society; registration, insurance and fuel charges should be replaced by

charges that reflect vehicle mass, distance travelled and location of use; taxes on the purchase of motor vehicles should promote fuel efficiency; and the fringe benefits tax treatment of motor vehicles leads to their over-use (Commonwealth of Australia, 2008b).

The Henry Review made recommendations to the Government: to abolish the luxury car tax; that vehicle registration taxes be replaced by more efficient road user charges; and that congestion tax be introduced to change societal behaivour as congestion tax could be avoided by cutting down unnecessary trips and using public transport where possible (Commonwealth of Australia, 2010). These recommendations, if implemented, would satisfy some of the objectives of the national transportation policy. However, a tax that should be introduced should be for personal or passenger motor vehicles as these consume the most energy, as demonstrated in Table 2 above, and the tax should reflect the power-to-weight ratio of the motor vehicle as demonstrated in Table 5 above. Through taxation, the Government should encourage the manufacture and purchase of motor vehicles that are lower in power-to-weight ratio; reduce the use of motor vehicles; and impact upon the choice of a vehicle from the initial acquisition to its time spanned re-cycling point. The next section explores the tax policy changes made by other countries and lessons that Australia can learn.

Tax Policy Change

Many countries around the world are changing transportation tax policy for a number of reasons, which include the increasing reliance on imported fuel, climate change, congestion and a forecast drop in revenue from excise. If Australia is to change its transport tax policy for personal motor vehicles, then it should take into consideration that motor vehicles have increased in power and weight as demonstrated with data in Table 5. Motor vehicles for transportation should be designed and used as a means of transporting a person safely from one place to another with the least consumption of fuel. Bearing in mind that liquid fuel is non-renewable, it should be considered a luxury and should not be wasted. If liquid fuel is to be considered a luxury, the use of that luxury should be taxed to ensure that the limited resource is not abused, especially for personal motor vehicles. The tax imposed and collected on transportation does not have to be more, but its design criteria should serve other policy aims including

environmental goals and not just the raising of general government revenue. The traditional basis for taxation being income, consumption or wealth cannot affect environmental goals such as preserving a limited resource of fossil fuel. Environmental goals require a specific targeted tax.

Many countries tax motor vehicles on their initial purchase, their annual registration and their use in terms of fuel. Countries including Australia charge a higher tax on larger engine capacities of motor vehicles. Table 8 shows how Australia's one-off tax for small, medium and large motor vehicles compares with other OECD countries.

Table 8: One-Off Motor Vehicle Taxes IN Euro

Country	Small Vehicle*	Medium Vehicle**	Large Vehicle***
Norway	9,230	27,847	152,822
Denmark	18,335	42,380	78,648
Netherlands	3,334	12,457	58,097
Portugal	1,410	11,555	48,944
Turkey	4,440	21,000	37,800
Iceland	3,600	11,250	20,250
Finland	2,271	6,396	19,159
Ireland	2,400	8,000	16,200
Austria	840	4,596	12,844
Korea	1,692	5,300	9,540
Spain	1,170	3,688	6,638
Australia	389	779	5,977
Slovenia	291	1,443	4,054
US	0	0	3,872
Canada	47	158	3,533
Japan	360	750	1,350
Italy	151	464	1,056
France	0	432	643
Switzerland	480	1,000	0

Source: OECD, 2010.

* Small refers to petrol-based car with 53 KW of power, 6.5 l/100 km, 821 kg, 1,000 cc engine,€12,000 pre-tax price;

** Medium refers to a petrol-based car with 132 KW of power, 9.4 l/100 km, 1 468 kg, 2,400 cc engine, EURO 25,000 pre-tax price;

***Large refers to a petrol-based car/SUV with 300 KW of power, 16.8 l/100 km, 2 587 kg, 6,200 cc engine, EURO 45,000 pre-tax price.

The data from Table 8 indicates that Australia lags behind other OECD countries in the amount of one-off taxation it levies on its small, medium and large motor vehicles. As regards fuel taxes, Australia has in fact decreased the taxation by 36.86 per cent from year 2000 to 2009. Table 9 shows the percentage change in real value of fuel taxes from 2000 to 2009.

Table 9: Percentage Change in Real Value of Fuel Taxes 2000-2009

Country	Percentage change in real value of fuel taxes 2000-2009
Greece	41.85%
Portugal	23.46%
Ireland	11.30%
Turkey	9.25%
Sweden	5.82%
New Zealand	3.70%
Japan	3.02%
Germany	0.07%
Luxembourg	-0.79%
Poland	-2.07%
United Kingdom	-2.47%
Finland	-4.14%
Switzerland	-6.88%
Netherlands	-7.65%
Czech Republic	-8.40%
Belgium	-8.44%
United States	-8.69%
Denmark	-8.73%
Austria	-10.56%
Iceland	-12.29%
France	-12.40%
Spain	-13.24%
Italy	-14.16%

Canada	-14.67%
Hungary	-14.67%
Norway	-16.23%
Slovak Republic	-26.36%
Korea	-26.48%
Australia	-36.86%
Mexico	-139.90%

Source: OECD, 2010.

As the decline in revenue from fuel taxation is not sustainable, many governments in the world are investigating ways to increase motor vehicle taxation by imposing tax based on CO_2 emissions or some form of congestion or road user charges. As from April 2010, the UK (HM Government, 2010) has introduced 13 bands of car purchase tax for cars registered on or after 1 March 2001 based on CO_2 emissions. The UK focus has been on congestion and emissions. In the UK, the concept of a generalized road user charge was supported by the House of Commons Transport Committee (2008-09), but has not been implemented.

Ireland also made changes to its motor taxation rules. As of January 2009 (Department of Environment, Heritage and Local Government, 2009) newly registered cars are taxed on their CO_2 emissions. Ireland has seven different bands with tax rates ranging from €104 to €2,100.

The Dutch introduced a mileage tax in November 2009 (Green Car Congress, 2009), but due to a change in government, the implementation of this tax is on hold. The proceeds from this new tax are not expected to exceed the combined cost of the older taxes. Under the new tax, different vehicle types will have different base rates, determined by CO_2 emissions or weight. Higher charges will be levied during rush hour and for travelling on congested roads. Also bigger cars emitting more carbon dioxide will be assessed at a higher rate, while smaller cars will pay less. Each vehicle is required to be equipped with a GPS device that tracks the number of kilometers that are driven and when and where they are driven. This data will then be sent to a collection agency that will send out the bill. Every vehicle type will have a base rate, which depends on its size, weight and carbon dioxide emissions. Starting in 2012, drivers will be charged 3 Euro cents (7 US cents) per kilometer driven. This number will slowly increase to 6.7 Euro cents (16 US cents) per km by 2018. The proceeds from this new

tax are earmarked to go directly to the Infrastructure Fund to support the building of roads and railways.

It is not only the European countries that are at the forefront of transforming their transportation tax policies, but the State of Oregon in the US is in the process of developing a 'Road User Fee' (Oregon Department of Transport, 2007). Unlike the Netherlands model, the Oregon study does not recommend a centralized collection agency, but rather fuel pump stations as collecting agents, with the fee forming part of the fuel purchase.

The Oregon concept involves the fitting of a device in the vehicle that records the number of miles driven by a vehicle within various pre-identified zones. At the fuel pump station, the stored miles driven in each zone are electronically transferred to the station's point of sale system for application of the mileage fee rates. The station attendant would then present a bill for payment that includes the mileage fee and the fuel purchase price, less the state fuel tax.

Oregon's road user fee pilot program indicates the extent to which governments are prepared to go to change motor vehicle taxation regimes. The problem with the Oregon system is that it only focuses on mileage driven and congestion. It does not take into consideration that heavier and more powerful vehicles consume more fuel and thereby emit more CO_2. In fact the Oregon system will benefit heavier and more powerful vehicles that do less mileage as a credit is given for the existing state fuel tax.

The lesson for Australia should be to focus on energy being a luxury, with vehicles that are heavier and more powerful bearing more tax. The tax design for Australia should incorporate the following four factors of a motor vehicle: weight, engine capacity, power output and CO_2 emissions. The focus should be to change people's perception as the car has evolved from an expensive luxury for a few to an important tool for the everyday lives and employment of the majority of people, a status symbol and a hobby. Vehicles have become bigger and heavier but technological efficacies have not been utilized to save fuel and emissions.

The Australian Government has not brought about awareness to the Australian people that the nation only has about 10 years' supply of liquid fuel and the world only has about 42 years' supply of liquid fuel (Geoscience Australia and ABARE, 2010). The Australian Government bears this responsibility. Although people do not like the idea of having to

change, with environmental pressures building and economic impacts of limited liquid fuel, we might be forced to change. A number of surveys carried out in the UK on awareness of climate change and who bears the responsibility reveal that 63 per cent of people approved green tax to discourage behaivour that harms the environment and 48 per cent believe that the Government does have a right to intervene and guide people to behave in a more sustainable way (Anable, Lane & Kelay, 2006). In a 2006 UK comprehensive review of the literature and consultation with experts on how to motivate 'green' behaivour, Hounsham (2006) concludes that we should expect very little from the provision of information alone. On the basis of his evidence review, he offers the following synopsis:

> *Unfortunately, most of the lifestyle decisions we seek to influence are not determined mainly by rational consideration of the facts, but by emotions, habits, personal preferences, fashions, social norms, personal morals and values, peer pressure and other intangibles.*

The National Consumer Council (2006) in the UK also recognizes that some travel decisions are made at an emotional level:

> *Consumers believe that government and industry have an important role in taking unsustainable products off the market. Cars are a notable exception to the general support for phasing out unsustainable products. Many consumers feel a more personal bond with their cars than with other products and for them sustainability would not be a consideration.*

The momentum is building for Australia to reform its transportation taxes. Instead of just following the examples of other countries and adding on congestion taxes and road user charges, the Australian Government should take the lead and replace the transportation taxes with a Luxury Energy Tax (LET) not only to bring about an awareness of the limited resource of fossil fuel, but also to influence consumers to change their perception of ownership and use of motor vehicles, and for the manufacturers to change their vehicle design considerations from selling dreams to selling sustainable vehicles.

The purpose of the LET in Australia should be to influence the decision to purchase a fuel efficient car, its use and its ongoing upkeep up

until its appropriate time spanned re-cycling point. The tax should be imposed at four taxing points based on the vehicle's gross weight, engine capacity, power output and CO_2 emissions. There is enough technology that would enable a tax design to impose tax at four taxing points as demonstrated by systems in place in other countries. Such a tax is required as the four taxing points would work together to inform people that larger engine capacities mean larger power outputs from vehicles, which bring about heavier vehicles that consume more fuel and emit more emissions. The taxation at the four levels would also discourage extra power being added to smaller engines by other means, such as turbo or super charging, or adding nitrous oxide injections. Taxation has to be used as a means of promoting redesign of motor vehicles as it is not necessary to have such weight and power to move a person from one place to another for personal transportation.

The purpose of LET should be to educate the user and the manufacturer of motor vehicles that energy is a luxury and should be paid for if the use is so desired. As demonstrated in the Holden family vehicles in Table 5, we have moved away from smaller lighter vehicles. The Holden FJ, produced in 1953, had a 2.15 liter engine and power output of 45 KW, but the vehicle weighed only 1018 kg. Taking into consideration current technologies, if a 45 KW output engine was produced today, it would not require a 2.15 liter engine, but would only require approximately 855cc engine with a much lower weight and fuel consumption.

Conclusion

Since Ford's invention of the constantly moving assembly line in the early part of the 20th century, motor vehicles have become bigger and more powerful and consume more fuel. This has created the problem of diminishing a finite resource of liquid fossil fuel. The world's energy source is not just for the people of today, but for future generations and all mankind to share. In this article a case is made for the introduction of tax measures in order to lead to a new way of thinking about energy. The tax should relate to the power and weight of vehicle and its use, and not where it is manufactured. A new way of thinking is required as it takes millions of years for our planet to produce fossil fuel, but it takes an instant to burn it, and once burnt, it is irrecoverable. Therefore, the Australian Government should take the responsibility and implement appropriate taxation policies

such as the LET to promote its transportation policy of the efficient movement of people and goods with the least consumption of liquid oil.

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