

***Submission to Senate Rural and Regional Affairs and Transport References Committee
Inquiry into Australia's transport energy resilience and sustainability***

Philip Laird, University of Wollongong, October 2014

This submission has drawn on research conducted at the University of Wollongong and in part addresses energy efficiency, road pricing and fuel excise. It also draws on earlier papers and submissions, including to the Committee, of the writer. However, the submission does not necessarily reflect the views of the University.

1. Energy efficiency in land transport

During 2011-12, cars, buses and trucks used nearly 32 billion litres of petrol, diesel, and LPG (Australian Bureau of Statistics, *Survey of Motor Vehicle Usage for 12 months ended 30 June 2012. Cat. No. 9208.0* at abs.gov.au). Most of this fuel was imported.

By way of contrast, rail used 1.67 billion litres of diesel (or its equivalent in electricity use) over a year for a smaller passenger task but a larger freight task than road (see the Australasian Railway Association Australian Rail Industry Report 2013 at ara.net.au). This reflects the fact that rail is much more energy efficient than road transport to move people and freight.

In a technical sense, for moving passengers, the preferred unit of energy efficiency is passenger kilometres (pkm) per megajoule (MJ) where, for example, one litre of petrol is equivalent to 34.7 MJ of end use energy and one Kilowatt Hour of electricity is 3.6 MJ. Cars average about 0.35 pkm per MJ and urban rail averages about 0.65 pkm per MJ. Of course, there are variations - a car with three passengers in freely moving traffic could get to 0.65 pkm per MJ, and a four wheel drive with no passengers in a congested city will do less than 0.2 pkm per MJ whilst a fully laden train double decked train will give 2 pkm per MJ.

For freight, the preferred unit of energy efficiency is net tonne kilometres (ntkm) per megajoule (MJ) where, for example, one litre of diesel is equivalent to 38.6 MJ of end use energy. Rigid trucks in urban areas give less than 0.3 ntkm per MJ, intercity articulated trucks in recent years have averaged about 0.9 ntkm per MJ, whilst intercity freight trains average about 2.7 ntkm per MJ.

There is much more that Australia could be doing to conserve energy in the movement of people and freight. Most energy used in transport is liquid fuel, with two approaches to its use:-

A Regard liquid fuel only as a financial input into operating costs, and let market forces decide on its use.

B Regard liquid fuel as needing government support and intervention to conserve its use in transport because of factors including:-

i) effect on balance of payments of net oil and vehicle imports,

- ii) externalities arising from fuel use, including air pollution and noise, with associated health effects,
- iii) a generally agreed need to limit Greenhouse gas emissions, and,
- iv) achieving less dependence on imported oil, which in the future may well be subject to increasing international prices and/or supply disruptions.

Over the last 40 years, Australia has seen both approaches at work, with Approach A (market forces only) being persistent, coupled with occasional adoption of Approach B. Approach B was noticeable with the oil price rises in the early 1970s producing one "wave" of transport energy research and the second oil price rises in the late 1980s producing a new "wave" of such research.

Some fuel conservation by liquid fuel users was undoubtedly assisted by the decision of the Federal Government in 1978 to move oil prices to then world parity pricing. This action included, in the area of land freight transport, a demonstration project in 1982 by the NSW Department of Energy of fuel saving in Sydney - Melbourne and Sydney - Brisbane trucking operations, Queensland Railways mainline electrification in the 1980s and the Mainline Upgrade of the 1990s.

Ongoing improvements in road truck energy efficiency and rail freight energy efficiency have also assisted in fuel saving, as did the annual indexation of fuel excise up to to March 2001.

During the mid 1980s it appears that the momentum gained in transport energy research was allowed to dissipate. Whilst there may have been a revival in the late 1980s and 1990s with increasing concern about the Greenhouse effect (and also with the effects of air pollution), with increased interest in oil about 2004 (when oil prices were escalating) it could well be that, at present:

1. Fully effective transport energy research (that includes data collection and analysis) is not being sustained by the Federal Government, and
2. If anything, we are now continuing with Approach A. At any time, international oil prices escalate, this could cause some pain to people heavily dependent on road transport.

Appendix A has a list of relevant reports in the past 35 years relating to energy use and/or emissions in land transport. Of particular note is the 1979 Australian Transport Advisory Council *Transport and Energy Overview*.

The report followed the second world oil price shock. Although the data used in this report is now dated, the approach is commended, as are the conclusions. In part: "... rail is relatively energy efficient compared to road for long distance freight ... (and) ... does have fuel substitute options, such as coal-oil slurries or electrification As far as possible pricing and cost recovery policies should be consistent across the modes so as to encourage use of modes appropriate to particular tasks. Appropriateness may be defined broadly as minimising the total social cost of transport services, including externalities.

Also of note is a 1986 Department of Energy Booklet on Energy Conservation, that noted, inter alia (p46) "*there are potential energy savings from more use of*

the less energy intensive sea and rail freight transport modes, and, that such greater use would be more likely with improved road cost recovery from heavy truck operations."

This submission shall briefly address road cost recovery in section 7.

Of interest is the Senate Standing Committee on Industry, Science and Technology in its 1991 report *Rescue the Future: reducing the impact of the greenhouse effect* that addressed, inter alia, transport. The Committee made six specific transport recommendations.

As observed in 1999 by Paterson¹ and noted that year by Scafton *"rail and sea transport are not achieving their potential in the current system, while road and air transport are over-used to compensate. The result is a system that inflates national costs and energy use."*

In the late 1990s, two notable contributions to the transport and fuel use debate in Australia were made by non government organisations. One was from the Chartered Institute of Transport in Australia who issued a statement at its 1998 National Symposium: *"Our greatest ever source of cheap energy may soon contract and the 'Petroleum Age' in which we live now can be seen to be approaching an eventual end. ...The Symposium heard that a clear consensus is emerging that cheap oil production outside the Middle East will begin permanent decline around the year 2000, to be followed by permanent world decline within 15 years ...'More of the same' in our current transport plans and ways of thinking is no longer tenable. ..."*

The Institution of Engineers, Australia (1999)² found that we have major problems in major cities, and, there is a need to respond to the challenges. In brief:

- A Taxation and fiscal policy instruments should encourage sustainable transport. At present, these measures encourage car and truck use.
- B There is a strong case for increased investment in transport infrastructure that is more sustainable and less greenhouse gas intensive. Where market forces fail, government should intervene.
- C More holistic approaches to transport decisions are needed that integrate considerations of impacts on health, sustainability and greenhouse gas emissions.
- D There is a need for research to support cleaner transport fuels and technologies, along with transport pricing, economics and demand management technologies.

The Bureau of Infrastructure Transport and Regional Economics has more than once examined reducing energy use and greenhouse gas emission from transport, including

¹ Paterson, J. (1999). A national transport strategy? Submission to inquiry into rail reform productivity commission. pc.gov.au as cited, Scafton, D. (1999). *The way ahead: Australian transport in the 21st century* The William Fraser commemorative address to the Chartered Institute of Logistics and Transport in Australia.

² Institution of Engineers, Australia (IE Aust -1999) *Sustainable transport: responding to the challenges*.

in 2002³. Measures included reducing vehicle kilometres travelled (VKT), reducing emissions per VKT, and four road pricing measures (mass-distance charges for heavy trucks, tolls, internalising transport externalities and emission charging), carbon taxes and tradable permits. Optimal road pricing was held to offer the best way forward.

The situation of increasing dependence on imported oil has continued to date, despite oil prices escalating from under \$20 per barrel during 1999.

Despite many observations such as these, and attention to energy conservation in land transport overseas, the growing use of oil in road transport and the cost of oil imports was of little apparent concern to government in Australia. In 2004, oil prices were rising, yet there were government forecasts that oil could be expected to drop back to \$20 a barrel. However, by mid 2008, oil prices had peaked at about \$146 per barrel. With the global recession, oil prices have since receded and have moved to about \$100 a barrel.

A case has been made⁴ that international oil prices may be restrained this decade. However, to quote former PM Rudd ((June 2008?) more and more people in the world are chasing less and less oil. The next decade could well pose problems for Australia with securing oil at an affordable price.

2. Two international views

A mid 2014 United States report examined energy efficiency in 16 OECD countries on the four fronts of national efforts, buildings, industry and transport. The 2014 ACEEE International Energy Scorecard (via <http://www.aceee.org>) is based on points awarded for 31 key metrics using OECD, International Energy Agency and other independent data. On a combined policy and performance basis, Germany was ranked first, Australia tenth and Mexico last at 16th.

Regretfully, (page 16) *"One country in which a clear backward trend exists is Australia."* The report notes that this has occurred recently.

Moreover, in the transport sector, using 8 key metrics, Australia was ranked last (16th) with just 7 points out of 25. Of the 8 metrics, Australia scored zero points for each of three metrics: Fuel economy of passenger vehicles on both performance and the setting of future standards, and, for having no fuel efficiency standards for heavy trucks.

For each of four metrics including the use of public transit, and, investment in rail transit versus roads, Australia scored just one point each. Only in the metric "energy intensity of freight transport" did Australia get full marks. This score was assisted by the very high energy efficiency of the iron ore railways in the Pilbara region of WA.

Such a low ranking for transport energy efficiency policy and performance (the lowest of the 16 OECD countries surveyed) should act as an incentive for Australia to do better.

³ BTRE (2002) *Greenhouse policy options for transport - Australian trends to 2020* Report No 105

⁴ Gargett D (2010) Petrol prices in Australia, Australasian Transport Research Forum (www.atrf.info)

2.1 A 2007 report

On 14 December 2007 the "**International Symposium-Climate Change and Transport Strategy**" was held at Nagoya with a total of approximately 350 experts in attendance from Japan and around the world, who specialize in climate change, transportation and the economy.

The Symposium's Keynote Speaker was Lord Nicholas Stern, Professor at the London School of Economics who spoke on "Climate Change, Economics of a Global Deal and the Role of Transport". What follows is edited from an account at the website <http://ecotransport.jp/en/eventreport.html>

- Unless action is taken now to reduce greenhouse gases (GHG), there is positive scientific evidence that a major disaster will result.

Targets must be established to prompt action now to reduce CO₂e (CO₂ equivalent) throughout the world by 50% (80% in developed nations). For example, targets achievable by 2020 need to be set.

- There is no specific remedy, but a combination of mitigating mechanisms are required, including a pricing system (taxes, ETS), regulations, infrastructure investment, public transportation systems, and technology.
- Transport is a principal source of GHG emissions, and thus one major cause of climate change
- Such emissions account for 13~14% of CO₂e and 23~24% of CO₂ emissions (30% in OECD nations)
- On the per passenger-kilometer basis, railways have a much smaller impact on the environment and climate change than aircraft or automobiles.
- The demand for aircraft and airports is continuing its rapid increase (5% annually on a global scale). Airports and aircraft management systems are directly confronting a serious problem of capacity.
- It was reported that the development of high-speed railways on high-density urban lines can alleviate problems of congestion as well as automobile and aircraft transport capacity, in addition to being consistent with appropriate climate change policies.

In brief summary, ***"delaying climate change mitigation is dangerous and costly"*** and when we consider passenger transportation from the perspective of the global environment, it is necessary to increase the traffic share allocated to railways.

The question of transport emissions is mainly related to the consumption of liquid fuels. Efforts to reduce transport emissions by increasing the energy efficiency of transport will also reduce dependence on imported oil.

3. Oil Vulnerability

Road transport is highly energy intensive. Energy efficiency and oil vulnerability issues affecting the transport of people and freight are identified in many reports, including a report released 7 February 2007 of the Senate Rural and Regional Affairs and Transport Committee from the Inquiry into Australia's future oil supply and alternative transport fuels. The report noted that *"if there is a long term rise in the price of fuel, this will favour rail because fuel is a greater proportion of costs for road transport. This may suggest a need to increase the pace of catchup investment in rail infrastructure."*

In this regard, the 2008 Garnaut Climate Change review report noted (Chapter 21 'Transforming transport', p 503) that *"Governments have a major role in lowering the economic costs of adjustment to higher oil prices, an emissions price and population growth, through planning for more compact urban forms and rail and urban public transport. Mode shift may account for a quarter of emissions reductions in urban public transport..."*

If international oil prices continue to trend upwards, or even if they stay about the same as at present and the Australian dollar falls to levels of several years ago, Australians will be looking at petrol prices of \$2 per litre. An increase in Australian petrol prices to \$2 per litre will put a lot of pressure on existing public transport. This would likely result in an increased level of scrutiny as to past government failure to extend Australia's urban rail network.

The 2013 Queensland Freight Strategy recognised oil vulnerability as an issue. However, the Australian government denying funds to urban public transport, and also providing generous funding to the Bruce Highway but no funds whatsoever to the Queensland North Coast railway increases dependence on imported oil.

In addition, oil vulnerability topic was addressed in early 2014 by the NRMA in a commissioned report *Australia's Liquid Fuel Security Part 2*, which, inter alia, recommended improved public transport.

4. Some more Australian views

By the late 1990s, Australia had excessive car dependency and the highest road freight, per capita in the world. As noted above, the late 1990s, both Engineers Australia and the Chartered Institute of Logistics and Transport gave considered warnings that cheap oil would not last forever, and more energy efficient transport was needed.

These warnings were followed in 2002 with one from the then Secretary of the Australian Treasury, Dr Ken Henry in an address to the ATRF and BTRE Colloquium in October 2002 (http://archive.treasury.gov.au/documents/440/PDF/Transport_Speech.pdf) about the very challenging problems posed to future generations on the projected increases in urban traffic and interstate road freight.

As noted above, some ten years ago, international oil prices were trending upwards causing some pain, particularly in people living in outer suburban areas poorly served by

public transport.⁵ In 2003, the world scene in regards to oil supply and demand was also changing. This led to the Senate Rural and Regional Affairs and Transport Legislation Committee holding an Inquiry during 2006 into Australia's future oil supply and alternative transport fuels.⁶

As a 2011 PMC Issues Paper on energy efficiency noted on page 13 *"The transport sector accounts for around 39 per cent of Australia's final energy use (including energy used by passenger motor vehicles and motorbikes). Australia is increasingly reliant on imports to supply our demand for transport fuels."*

"The scope for energy efficiency improvements in transport is very broad – improvements can potentially come from making existing technologies more efficient, switching to more efficient modes of transport, and (over the longer term) improving the liveability of our cities in ways which reduce the need for travel."

As the 2007 Prime Ministerial (Howard Government) Task Group on Emissions Trading issues paper noted, inter alia, in 'Context setting': ***"Significant effort will also be needed to restrain emissions in other sectors, especially transport."***

A further reason for reform is the sheer amount of money spent on road transport. In the early 1990s, research commissioned by the Australian Automobile Association found that the total cost of road vehicle operations, including the fuel they use, buying and maintaining the vehicles, road works, road crashes and external costs was about 11 per cent of GDP. In 2013-14 terms, this is some \$173 billion (<http://www.rba.gov.au/inflation/measures-cpi.html>). Due to fuel costs and road outlays increasing faster than inflation over the past 20 years, and growing road congestion, this estimate is conservative.

There are numerous hidden costs of road vehicle use. Including the cost of road crashes, environmental costs, health impairment from motor vehicle emissions, and foregone tax revenue, but not including road congestion, leading to leading to a "road deficit" of about 1 per cent of GDP.⁷

Road congestion costs add a further 1 per cent or so of GDP. These costs simply cannot be reduced by building more roads. The overseas experience is that a more balanced strategy, including rail, is needed to reduce road congestion.

5. A recent Australian report

Informed comment on our land transport policy (or lack thereof) has been provided in a recent report ***Spend more, waste more Australia's roads in 2014: moving beyond***

⁵ Dodson, J. and Sipe, N. (2007) Shocking the suburbs: urban location, homeownership and oil vulnerability in the Australian city. *Housing Studies*, 23(3), 377-401.

⁶ The findings and recommendations of this Committee in its Final Report of February 2007 are of note, and include integrating transport planning and land use planning to reduce car and making more use of rail for long distance freight.

⁷ P Laird, 2011 *Railways in Australia: Federation Unfulfilled*
http://www.parkesfoundation.org.au/Projects_oration2011.htm

gambling. The report, prepared for Infrastructure Australia was briefly placed on their website, and then withdrawn. It now may be found at the website (<http://www.ycat.org.au>) of the Yarra Campaign for Action on Transport who would much prefer a better rail system for Melbourne rather than the proposed East West motorway that could cost up to \$1 billion per kilometre - that is \$1 million per metre!

The latest report notes Australia's three levels of government and the private sector are now spending over \$20 billion a year on road construction and maintenance; and, *"between 2008-09 and 2011-12, over \$4.5 billion more was spent on roads than was raised in almost all road taxes and charges"* (from Bureau of Infrastructure Transport and Regional Economics Infrastructure Statistics Yearbook (2013) p.41).

After noting the need for reform in road pricing, including mass distance location for the heavier trucks, the report considers that the big annual outlay of roads, which is set to grow even larger at the expense of federal funding of urban rail, is a *"road spend [that] can only be described as hideously inefficient."*

6. Some Pacific Rim urban rail advances

In the Asia Pacific region, metro rail systems are operational, under construction, or being planned.

One notable example is the expansion of the Shanghai Metro system which opened in 1995 with just one line. By 31 December 2013, with two new lines (12 and 16) recently opened, Shanghai had more than 500 km of track with 329 stations and that year had carried a record 8.9 million passengers. The current plan of the city of Shanghai is by 2020 to have total of 22 lines with a combined length of track of 877km. It is one of the fastest-growing and longest metro systems in the world.

Hong Kong has construction of metros being advanced on four fronts as well as completing a High Speed Rail link to China. Other cities in the Pacific Rim region such as Vancouver have an expanding urban rail system, Macau is getting a new metro and a start on an underground rail link in Auckland is expected this decade. However, in Australia, we are falling behind.

7. Road cost recovery in Australia

In brief, road pricing for cars and trucks has been discussed for years, with the options of congestion pricing in major cities and mass distance location charges for trucks raised in the 2002 AusLink Green Paper and the 2004 AusLink White Paper. In 2014, these options, which would improve economic efficiency, remain as elusive as ever.

One move that would assist would be to implement the recommendations of the 2010 Henry Tax Review for transport (some follow in part).

Recommendation 61: Governments should analyse the potential network-wide benefits and costs of introducing variable congestion pricing on existing tolled roads (or lanes), and consider extending existing technology across heavily congested parts of the road network.

Beyond that, new technologies may further enable wider application of road pricing if proven cost-effective. ...

Recommendation 62: The Council of Australian Governments (COAG) should accelerate the development of mass-distance-location pricing for heavy vehicles, to ensure that heavy vehicles pay for their specific marginal road-wear costs. Revenue from road-wear charges should be allocated to the owner of the affected road, which should be maintained in accordance with an asset management plan. ...

Recommendation 64: On routes where road freight is in direct competition with rail that is required to recover its capital costs, heavy vehicles should face an additional charge on a comparable basis, where this improves the efficient allocation of freight between transport modes.

Recommendation 67: Governments should continue to reform road infrastructure provision, applying economic assessment to investments comparable to that for other forms of infrastructure.

Recommendation 68: COAG should develop a National Road Transport Agreement to establish objectives, outcomes, outputs and incentives to guide governments in the use and supply of road infrastructure. COAG should nominate a single institution to lead road tax reform, and ensure implementation of this agreement.

The Committee's attention is invited to these recommendations.

8. Fuel excise

In July 2014, the Senate Economics Legislation Committee held an inquiry into the Fuel Indexation (Road Funding) Bill 2014 and 3 related bills. The Government proposal to index fuel excise and divert all proceeds to roads is still before the Senate.

The issue of putting all extra revenue from fuel excise indexation into roads was raised in the 2014 inquiry of the Productivity Commission into public infrastructure. As seen by Consult Australia in a submission to this inquiry: "... revenue generated from a user-pays model should be hypothecated to transport infrastructure in the broadest sense, not restricted to roads. This point of difference is important and acknowledges that roads operate as part of the broader transport system, and that funding for public transport, rail, buses, light rail, trams, and active transport infrastructure will likely include significant flow-on benefits for road-users, principally through reduced congestion."

The submission goes on to note: "Overseas experience has demonstrated that public support for a user pays model will be assisted where modal shift is encouraged, and where that shift is supported by revenue hypothecated from the user charges into complementary infrastructure."

These views are supported. For fuel excise indexation, some form of compromise is now appropriate. The Government should be prepared to allocate at least surely half of the proceeds of an increase in fuel excise to urban public transport and minority parties should be able to accept half of the proceeds going to roads.

It is of note that most fuel consumed in Australia is by motorists driving in Australia's five largest urban regions (mainland capital cities and adjoining urban areas). All motorists in Sydney, Melbourne, Brisbane, Adelaide and Perth, and Canberra, have an interest in less road congestion and improved urban public transport.

9. Conclusions

Australia, like other OECD countries, needs to address oil vulnerability and take positive steps to improve the energy efficiency of its transport. This will require attention to road pricing and also some mode shifting from road transport to the more energy efficient modes of rail and sea transport.

A better balance between federal spending on urban roads and urban public transport, and between intercity highway upgrades and intercity rail upgrades, than what is currently proposed is needed. These measures would improve energy efficiency of urban passenger transport and reduce emissions along with reducing dependence on imported oil. Other benefits of a more balanced approach to road and rail investment would also reduce carbon dioxide emissions and reducing road congestion.

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APPENDIX A SOME REPORTS RELEVANT TO REDUCING OIL USE AND GREENHOUSE GAS EMISSIONS IN TRANSPORT (including improved road pricing)

During the late 1970s

1979 Australian Transport Advisory Council *Transport and Energy Overview*

During the 1980s

1980 Sydney - Melbourne rail electrification study
1984 National Road Freight Industry Inquiry
1986 Federal Department of Energy,
1987 Inter-State Commission - various reports

During the 1990s

1991 Senate Standing Committee on Industry, Science and Technology *Rescue the Future: reducing the impact of the greenhouse effect*
1991 Industry Commission Rail Transport, and Greenhouse Gases (two inquiries)
1991 Ecologically Sustainable Development (ESD) Working Group on Transport
1994 Industry Commission Urban Transport
1994 National Transport Planning Taskforce

1996 Bureau of Transport and Communications Economics in its 2002 Report No 105
Greenhouse policy options for transport 2020
1997 Australian Academy of Technological Sciences and Engineering re urban air
pollution
1998 House of Representatives Standing Committee on Communications, Transport and
Microeconomic Reform, Tracking Australia
1999 Productivity Commission Progress in rail reform
1999 Prime Ministers Rail Projects Task Force 'Revitalising Rail'

During the past fourteen years

2000 Senate Environment, Communications, Information Technology and the Arts
Reference Committee *The heat is on: Australia's greenhouse future*
2001 Australian Rail Track Corporation: Interstate Track Audit
2002 Fuel taxation inquiry report (is rejected by Federal Government)
2002 Bureau of Transport and Regional Economics in its 2002 Report No 105
Greenhouse policy options for transport 2020 /AusLink Green Paper
2003 Parry Inquiry (NSW Ministry for Transport) Sustainable Transport
2004 AusLink White Paper

2005 House of Representatives Standing Committee on Environment and Heritage
Sustainable Cities
2005 Senate Rural and Regional Affairs and Transport Legislation Committee re
AusLink
2007 Senate Rural and Regional Affairs and Transport Committee re Inquiry into
Australia's future oil supply and alternative transport fuels
2007 House of Representatives Standing Committee on Transport and Regional Services -
The Great Freight Task: Is Australia's transport network up to the challenge?
2009 Senate Rural and Regional Affairs and Transport (RRAT) Committee re urban public
transport

2014 RRAT Committee - Role of public transport in delivering productivity outcomes
2014 Senate Economics Legislation Committee Re Fuel Indexation (Road Funding) Bills