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The Secretary 12-2-06
Senate Rural and Regional Affairs and Transport Committee
Inquiry into Australia's future oil supply and alternative transport fuels

Submission to the inquiry by Alan Parker Design

This submission consists of this introductory letter, Appendix A entitled "If world oil production peaks before 2020 it puts the well being of all Australians at risk" and Appendix B entitled "The census data for urban commutes reveals the growth of oil dependence since 1976". All three documents are attached as pdf files.

(APsubmOilLetSenate.pdf)(APsubmAppendAOil.pdf)(APsubmOilAppenB.pdf)

Introductory letter

This submission focuses on the timing of world conventional oil production peaking and the uncertain but potentially dangerous impact on Australia's future oil supplies. Appendix A states why it is uncertain when oil production will peak and then decline and why an early peak is such a serious threat to Australian national security that it must be addressed well before it occurs. Appendix B shows the past and predicted growth in oil dependence in the passenger transport sector. Appendices A and B propose measures to conserve oil and reduce the demand for oil in urban passenger transport

A risk management approach is taken to the uncertain timing of world oil production peaking and the the following issues are addressed:

a. projections of oil production and demand globally and the implications for availability and pricing of transport fuels in Australia; Appendix A .

b. potential of new sources of oil and alternative transport fuels to meet a significant share of Australia's fuel demands, taking into account technological developments and environmental and economic costs; Appendix A.

c. flow-on economic, social and greenhouse gas impacts in Australia and globally from continuing rises in the price of transport fuel and potential reductions in oil supply; Appendices A and B.

d. options for reducing Australia's transport fuel demands :

(1) Appendix A recommends: creating a strategic oil reserve, using gas as a transitional fuel, greening the tax system to reduce oil demand, setting vehicle fuel efficiency standards and creating a national energy security plan.

(2) Appendix B recommends: enhanced Travel Smart programs, substitution of bicycles for short car trips and to access public transport, institutional changes to road agencies to make them oil demand management agencies, taking an all of government approach to reducing oil dependence, encouraging the sustainable transport modes and the use of electric bicycles, planning for the ecologically sustainable development of cities, encouraging and introducing congestion pricing in the central areas of Melbourne, Sydney and Brisbane.

Why a risk management approach?

Of great concern is research published in 2005 showing that reducing oil dependence on both the supply and demand sides must be initiated more than 20 years in advance of oil peaking to avoid a global economic meltdown. However, it is likely that oil peaking may occur much earlier than that. According to a US Department of Energy report there are three possible outcomes. (Hirsch 2005)

1. In the bleakest outcome peak oil occurs before 2010 inducing a world wide depression, collapsing world food production, and wrecking the Australian economy. As urban economies collapse business can no longer afford to move goods and people. People struggle to survive in increasingly isolated outer urban communities that have to learn to become self-sufficient, with most journeys made by bicycle, on foot or by limited public transport services. Note that the Association for the Study of Peak Oil (ASPO) predicts that oil will peak around 2010 and states that oil peaking is a risk management problem of global proportions that is not being addressed by governments.

2. If oil peaks between 2015 and 2025 a less painful adaptation is possible; provided that most developed nations agree to reduce oil dependence with strong government market intervention, including the introduction of fuel rationing and fuel efficiency standards. Some of these measures enabled the US and the UK to survive World War 2 however none of these measures are being currently applied or developed with significant funding. See Appendix A for further details.

3. If oil peaks after 2025 a timely adaptation with mutually agreed supply and demand side oil conservation measures as recommended by the International Energy Agency (IEA) will be feasible. Sadly this optimistic scenario envisages that alternatives to conventional oil are available in abundance, allowing the present trend towards greater globalisation to continue apace. This outcome is far from certain and assumes that non-conventional oil can be produced from shale and tar sands without large increases in greenhouse gas emissions, or from coal or gas using unproved carbon sequestration and other technologies yet to be developed. Like President Bushs "Hydrogen economy" this outcome is most uncertain and carries within it the risk of destabilising the climate.

4. Appendix A concludes that the growing demand for more car based mobility is unsustainable and a "fail safe" Energy Security Plan is urgently needed to reduce growing oil dependency which is the greatest threat to Australian national security since Federation.

5. Appendix B recommends frugal measures to conserve oil that are just as essential as protection from an invading force for the preservation of high living standards and a democratic way of life.

6. This submission argues that a package of measures designed to decouple the increasing demand for oil from increases in living standards is the most important risk management measure in the next ten years.

7. Yours sincerely

8. Alan A. Parker

9. Reference

Hirsch, R.L. Bezdek, R and Wendling, R. (2005) "Peaking of world oil production: impacts, mitigation, & risk management" *ASPO IV. International workshop on oil and gas depletion 19-20 May 2005, Lisbon, Portugal,*

Note the Lisbon paper was extracted from the authors report to the US Department of Energy available from www.projectcensored.org/newsflash/The_Hirsch_Report_Proj_Cens.pdf

If world oil production peaks before 2020 it puts the well being of all Australians at risk

By Alan A. Parker Melbourne, Victoria, Australia, 12th February 2006.

INTRODUCTION

Over the last forty years Australia has become addicted to cheap oil, especially for transport which uses almost 80% of Australia's petroleum; 55% of road transport fuel is petrol, 39% diesel and 6% is LPG. The oil dependent transport sector is responsible for 76% of oil consumption and that has to be reduced as it poses a very serious threat to Australia's future economy and as a consequence the well being of all Australians. This paper discusses the impact of future oil shortages due to world oil production peaking well before 2030. The aim is to stimulate discussion with reference the latest research papers published in 2005.

Since 1980 the gap between oil demand and oil supply, once considerable, has steadily narrowed and today is almost negligible. When oil consumption begins to exceed production by even a small amount, the price of oil could soar to well over US$100 a barrel, greatly increasing the cost of transport fuels, the petrochemicals used to make thousand of plastics products, fertilizers and pesticides for food production. With in a year or so this would create a global recession. The impact on the well being of Australians with outer suburban lifestyles, hinged on two or three car families and constant car trips to work, school and supermarkets, would be disastrous (Parker 2005).

It is uncertain when oil production will peak and then decline. Some governments are very concerned about this uncertainty but our government is unaware of the serious threat of reduced oil supplies prior to 2025. Therefore the aim is to stimulate serious discussion on this potentially dangerous energy security issue.

Of great concern is research published in 2005 showing that reducing oil dependence on both the supply and demand sides must be initiated more than 20 years in advance of oil peaking, but is likely that peaking may occur much earlier. Several future outcomes are possible (Hirsch 2005) (Aleklett 2005).

- Oil production peaks then declines around 2010 inducing a world wide depression, wrecking the Australian economy and producing mass unemployment.
- Oil peaks between 2015 and 2025 making a less painful adaptation possible; provided that most developed nations agree to reduce oil dependence with strong government. market intervention, the introduction of fuel rationing, fuel efficiency standards etc.
- Oil peaking after 2025 allows a timely adaptation with mutually agreed supply and demand side oil conservation measures recommended by the International Energy Agency (IEA).

Also of concern are the predictions of the Association for the Study of Peak Oil (ASPO) which predicts that oil will peak around 2010. The latest research shows that oil peaking presents the world with a risk management problem of global proportions because there is now an energy security-planning vacuum in Australia and many other countries.

Energy security is vital to every country's well being and all need a stable economy with assured supplies of oil. Indeed, frugality, the conservation of oil is as essential as, protection from an invading force, for the preservation of a democratic way of life. This appendix concludes that a national Energy Security Plan is urgently needed to reduce oil dependency. Several practical long term transport measures to reduce oil consumption and road congestion are recommended as well as IEA oil emergency measure.(see Table1 p12)

Conventional and non-conventional oil reserves

Some oil Industry terminology is used to describe the two basic types of oil reserves referred to in this paper "Conventional oil" and "Non-conventional oil". Also when "CO2 "emissions are referred to it is shorthand for "all greenhouse gas emissions", as methane emissions from some sources of oil are high and even more potent than CO2 emissions.

"Conventional oil" is typically high quality, free flowing light oil that is under pressure and in most cases pumps itself out of the ground until about half of the oil had been extracted from an oil reservoir. The "peaking of world conventional oil production" is the sum total of all reservoir production when it reaches a peak and is referred to as **"oil peaking"** or **"peak oil"** (Campbell 2005A). However, as the reserves of conventional are used up the remaining oil gets heavier and is less free flowing with more impurities, thus increasing the refining costs for vehicles that will require much cleaner fuels to reduce air pollution. Even so, compared to non-conventional oil the remaining heavy and sour conventional oil requires less energy, produces less CO2 and costs less to extract and refine into fuel and petrochemicals.

"Non-conventional oil" reserves are mostly heavy and tar like requiring a lot more investment and energy to extract from sands or rocks on the surface or under ground and then refine into usable oil products. It includes some high quality, free flowing light oil that is recovered from oil fields in deep water (<500 m) or from Polar Regions. Non-conventional oil can also be synthesized from coal or gas which will greatly increase its price and CO2. emissions which needs to be buried underground in a safe way that prevents it leaking back into the atmosphere. This infant technology is called "carbon geo-sequestration" and is referred to here as **"sequestration"**

CONVENTIONAL OIL AND WORLD FOOD PRODUCTION 1938 TO 2035

The future of the oil industry is plagued by many uncertainties the two most important of which are knowing when conventional oil production will peak and then decline and how long it will take for oil shortages to cripple economies and world food production.

Figure 1 shows that conventional oil production increased from 2.5 billion barrels of oil in 1938 to 26 billion barrels in 2003. As oil production went up, so did food production and the world's

population increased from 2.2 billion in 1938 to 6.3 billion in 2003 the greatest increase in world history in a mere 65 years. Access to cheap conventional oil made possible the green revolution which introduced new strains of higher yielding crops, or crops that could be planted more than once a year but needed more and cheaper fertilizer and pesticides made from oil and gas. World fertilizer (nitrogen) production was 3 million tons in 1938; by 2003 it was 90 million tons. The world's fleet of tractors, cars, trucks and buses increased from 15 million in 1938 to 800 million today.

The synergetic interaction of the oil production peaking with other environmental "time bombs" that have been ticking away for many years will result in world food production peaking and then declining at a rapid rate in a few years. Oil production will be declining in the same time frame as increased drought, storm damage and rising sea levels due to global warming; resulting in a decline in the availability and quality of fresh water; increasing salinity and soil loss and the spread of deserts.

All of these environmental problems are beginning to reduce food production when UN estimates show that the world will have 1.7 billion more people to feed in the next 25 years (Heinburgh 2005) (Murrey 2005).

The oceans are warming and warmer water is slowly spreading towards the poles. Violent cyclones, floods, drought, tornadoes and violent storm surges will increase in frequency and intensity. This will destroy crops, plantations, terrace agriculture and other irrigation systems that have taken decades to be productive. In low-lying coastal areas sea level rises will flood farmland. In the longer term, sea water will permeate through the ground and waterways further inland destroying even more productive farmland. The interaction of hunger and of sea-level rises in vulnerable low lying areas in the developing world could produce up to 800 million refugees fleeing from starvation (Brown 2003).

Oil shortages and global warming will increase the number of the world's hungry by reducing the area of land, and the amount of fertilizer and pesticides available for farming in developing countries. Oil to power-assist labour intensive agriculture in the developing world will not be affordable. Wealthy OECD countries will buy all the high cost oil to keep their car dependent transport systems going and for their oil intensive agricultural practices. For example, US food production consumes ten times more fossil fuel energy than it produces in food energy.

Four litres of oil are expended each day to feed each American and, because power "comes from the barrel of a gun", they and other rich allies will get priority in accessing oil supplies. This will deprive the poor countries of the oil needed to power assist their labour intensive food production with small tractors and light agricultural machinery and to transport their food to regional markets (Murrey 2005).

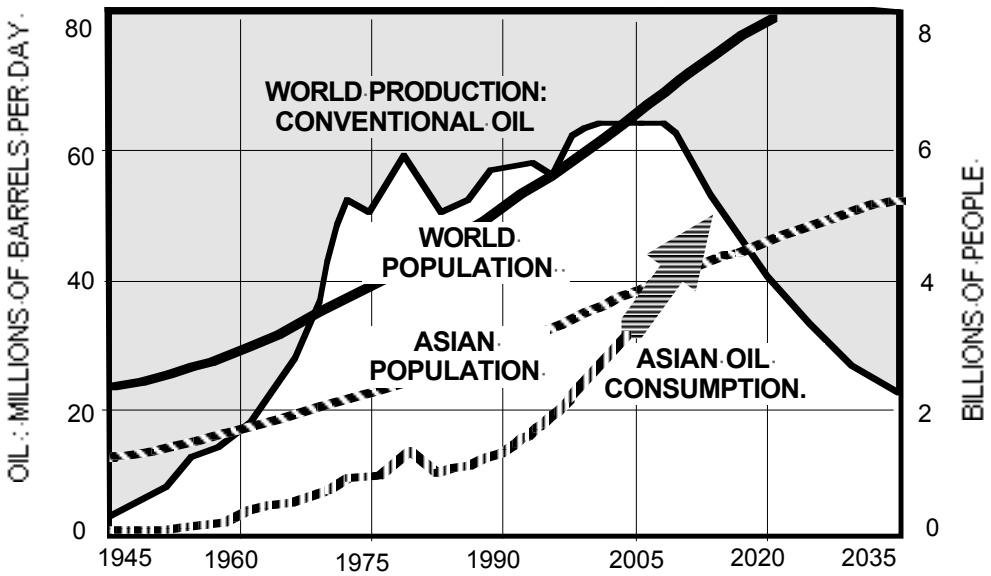
Sixty-five developing countries, home to half the developing world's population, risk losing about 280 million tons of potential cereal production as a result of this synergetic interaction of environmental factors which is made worse if the price of oil increases. This loss of food production capacity will drastically increase the number of undernourished people, severely hindering progress in combating poverty and food insecurity (FAO 2005)

In the longer term perhaps there will be a Malthusian die-off from starvation in populous countries. In the worst case scenario a billion people could die (Parker 2004 B) (Brown 2003).

The new consensus on the need for quality data on oil reserves

In the western world, in the decade before the invasion of Iraq, there was an insider debate on peak oil between an articulate group of veteran geologists in the Association for the Study of Peak Oil (ASPO) and some neo-conservative economists. which surfaced in oil industry and science journals but did not surface in the mainstream world media till mid 2004.

Figure 1 the growth of Conventional oil production, world population and Asian oil consumption.



Source: Campbell, C. J. 1997. Better understanding urged for rapidly depleting oil reserves,Oil and Gas journal. Journal April 7 1997.

The veteran geologists argued that by around 2008 half the world's conventional oil reserves would have been used and oil production would peak.

By 2001 the veteran geologists had formed ASPO and held their first international conference and gained the support of many environmentalists. They argued that if enough non-conventional oil was produced to satisfy the predicted growth in the demand for oil without carbon sequestration it would produce so much more CO2 that there would be a risk of destabilizing the climate. To assess that risk they wanted a system of energy accounting introduced, based on "energy return on energy invested" (EROI), and to measure the impact of non-conventional oil production.

ASPO argued that peak oil is only dangerous because there is no international agreement in place to reduce the flow from the tap on the global oil tank and proposed a "depletion protocol " to overcome the problem. Many ASPO members wanted a depletion protocol in place because they recognized the potential threat to world food production (Campbell 2005).

Up until 2004 the counter view was held by some economists, many of whom held senior positions in academia, in national governments and international agencies. These economists were deceived by the limited data about oil production and reserves put out by Saudi Arabia and other OPEC countries which does not include details about how much oil is extracted from each reservoir and what methods are used to extract that oil; nor do they permit audits by outsiders. Indeed, the condition of the Saudi and other OPEC oil fields is a closely guarded secret. The neo-conservative economists never showed any concern over what oil shortages would do to world food production

In Australia peak oil did not surface in the mainstream media till mid 2005. Most Commonwealth Government energy reports before 2005 were a reflection of the wildly optimistic assumptions of neo-conservative economists (BTRE 2005).

The attitude of the Commonwealth Government in 2005 still reflects the assumptions of the same group of neo-conservative economists and their willingness to support the use of carbon intensive heavy oil and non-conventional oil which will greatly increase CO**2** emissions in a few years time.

The consequence of this often heated debate which surfaced in confrontations at ASPO conferences - which were not attended by any Victorian or Australian government representatives - was that ASPO geologists and many senior economists found a common cause for agreement. The 2003, 2004 and 2005 ASPO conferences on peak oil included both groups. In 2004 there emerged a consensus that the estimates of conventional oil reserves were inaccurate and that there was no international accepted standard for measuring when the peak oil would take place.

The waves of dissent with economic orthodoxy emanating from ASPO surfaced in Australia at some transport and oil industry conferences in 2004. A recent report from the economists' side in that debate finished up them stating the need for reliable data:

"Since Shell announced that it had significantly overstated its reserves, its market capitalization immediately fell by almost £3 billion. However, the greater impact was probably on the doubt thrown on international reserve estimates. As one commentator put it, 'if Shell doesn't know how much oil it has got then it is likely that the world doesn't know how much oil it has got.' Confidence in the world oil market was further undermined by the record high prices (nominal) reached in October 2004"... "Some steps have been taken since then, although major benefits are yet to be realized. The Joint Oil Data Initiative, the UN Framework Classification for Energy and Mineral Resources and moves by regulators in the U.S. and the U.K. to incorporate external auditing procedures should all serve to improve reserves reporting and strengthen confidence in oil forecasts" (BTRE 2005).

Both the Iraq invasion of Kuwait and the US invasion of Iraq highlighted the importance of oil in the affairs of nations and their willingness to fight over it. There is nothing new in that, decades earlier the US and UK engineered the overthrow of Mossadec in Iran and replaced him with a monarch. The US would like to remove Iran's leaders today if they could and in the 1930s Churchill wanted to use poison gas bombs on the Kurds in the oil producing areas of Iraq and Iran so that oil supplies for the Royal Navy could be guaranteed. Protecting national interest is the reason for peak oil being on the political agenda of world leaders. On 4-5th February 2005, the G7 Finance Ministers and Central Bank Governors met in London and the following statement confirmed their need for reliable data.

"We discussed medium-term energy issues and the risks of current oil prices. Market transparency and data integrity is key to the smooth operation of markets. We welcomed concrete actions in improving data provision to oil markets and encouraged further work, including on oil reserves data, by relevant international organisations" (Aleklett 2005).

In 2005 ASPO's concern was about how much time would be required for a stable transition to less oil dependent economic growth. This concern was addressed by the US Department of Energy (DoE), which called for an investigation entitled the Mitigation of the Peaking of World Oil Production. The report to the US DoE states that action must start 20 years before peak oil to adapt to declining oil supplies and stated that:-

"Prudent risk management requires the planning and implementation of mitigation well before peaking. Early mitigation will almost certainly be less expensive and less damaging to the world's economies than delayed mitigation" (Hirsch 2005).

Without early mitigation the rapid development of China, India and Asia generally will quickly come to an end if they continue to create transport systems that are even one third as dependent on oil as those of the US and Australia (Pang et al 2005).

The Energy Research Centre (ECN) in the Netherlands takes peak oil seriously. In a 72 page report dealing with four possible scenarios of energy futures in Europe it devoted 10 pages to the global peak oil problem and why the timing of peak oil is uncertain. It states that ASPOs arguments have a lot of validity as the modelling of two of their four scenarios showed oil production peaking between 2010 and 2020 and demonstrated that there are major uncertainties regarding the feasibility of keeping oil supplies in line with continuing increases in oil demand. They support the hypothesis that an oil peak somewhere in the period 2010-2020 is far from impossible and that:-

" While there are many events that could postpone an oil peak to after the year 2020, there are equally many events that could lead to an oil peak before the year 2020.....an oil peak in the near future is indeed plausible and

that it would be useful to consider the possible consequences for global energy markets and the resulting drive for system innovations..... we are referring to the period up to 2020 rather than any one particular year... scenarios with limited availability of oil and sharply rising prices deserve serious attention in terms of the consequences for European energy transitions and related energy research, demonstration and development strategies"
(Brugglink 2005).

Chevron, the US's second-largest energy group with a good environmental record set up a web site, warning of the pressures of high demand and fewer fields and offering a forum of discussion and stated that :-
"One thing is clear: The era of easy oil is over. We call upon scientists and educators, politicians and policy-makers, environmentalists, leaders of industry and each one of you to be part of reshaping the next era of energy. Inaction is not an option" www.willyoujoinus.com .

According to a report published in New York Times (Maass 2005) Sadad Al-Husseini who retired in 2004 as a director of Saudi Aramco, the giant state-owned oil company, revealed that the Saudi Government is seriously overstating its reserves. Husseini earned a Ph.D. in geological sciences from Brown University in 1973 and went to work in Aramco's exploration department, eventually rising to the highest position. He is one of the most respected and accomplished oilmen in the world. Husseini told Maass that

"You look at the globe and ask, 'Where are the big increments?' and there's hardly anything but Saudi Arabia,'....The kingdom and Ghawar field are not the problem. That misses the whole point. The problem is that you go from 79 million barrels a day in 2002 to 82.5 in 2003 to 84.5 in 2004. You're leaping by two million to three million a year, and if you have to cover declines, that's another four to five million." In other words, if demand and depletion patterns continue, every year the world will need to open enough fields or wells to pump an additional six to eight million barrels a day -- at least two million new barrels a day to meet the rising demand and at least four million to compensate for the declining production of existing fields. "That's like a whole new Saudi Arabia every couple of years," Husseini said. "It can't be done indefinitely. It's not sustainable" (Maass 2005).

His message, like ASPO, is that the world is heading for a devastating oil shortage. This contradicts the calming speeches of the Saudi Oil Minister, and predictions by the US Energy Information Administration (E.I.A.) who in 2004 provided a false forecast based on demand that by 2020 Saudi Arabia would produce 18.2 million barrels of oil a day, and that by 2025 it would produce 22.5 million barrels a day (Maass 2005). Those estimates were not based on real data about oil production and oil reserves, because no US intelligence agency is privy to the closely guarded oil data of the main OPEC producers; they merely assumed that if demand went up so would production. Husseini, said the forecast was:-

"unrealistic..... The expectations are beyond what is achievable. This is a global problem .....that is not going to be solved by tinkering with the Saudi industry."

Unreliable estimates and advice to member countries of the IEA and OPEC

The uncertainty in reserve estimates is not helped by innacurate short term and long term predictions by the International Energy Agency (IEA 2004 p.259) and OPEC which are quoted by Australian neo-conservative agencies such as the Productivity Commission (PC 2005 p 249) The faster growth of oil demand in 2003 and 2004 has already resulted in far higher crude oil prices. The EIA, the statistical unit of the US Department of Energy, sees crude costing US$64 to US $65 next year -- up from US $58 in 2005 and US $32.5 in January 2004.

A prediction in 2004 of US $19.3 a barrel by OPEC for 2010 and 2020 is not credible. Indeed, On Monday 31 October 2005 OPEC president Sheik Ahmad al-Fahd al-Sabah said. *"The current oil price of about US$60 a barrel was about right."* The Sheik, who is also Kuwait's Oil Minister, said the current level was a balance *'acceptable to both consumers and producers'.* The Sheik said the growth in demand had slowed, which showed up in the easing price. But he did not expect the price to ease much further.

The IEA prediction in 2004 that there will only be gradual increases in the marginal cost of production and that by 2010 a barrel of oil will cost only US $22, a barrel is not credible either. The IEA prediction of US $29 a barrel in 2030 is based on the assumption that refined oil products can be produced from shale oil, tar sands and very heavy oils without huge increases in GHGs and far less energy returns on the energy invested to extract and refine them. This prediction is based on mostly unproven technology and low cost techniques for geo-sequestration of carbon that are still to be invented and proven in practice. (IEA 2004 p.259)

IEA executive director Claude Mandel said that non-conventional oil resources can solve all our problems if there is a major investment in geo sequestration and other new technologies of US$ 6,500 billion in the next decade or so (Weekend Australian 2005).

The latest annual World Energy Outlook report from the IEA states that Global greenhouse gas emissions will rise by 52% by 2030, unless the world takes action to reduce energy consumption. It says that under current consumption trends, energy demand will also rise by more than 50% over the next 25 years and that oil prices will "substantially" rise unless there is extra investment in oil facilities because the world has seen *"years of under-investment"* in both oil production and the refinery sector and it estimates that the global oil industry now needs to invest US $20,000 billion in fresh facilities by 2030, or else the wider global economy could suffer (IEA Nov 2005).

How realistic is this IEA proposal for such increase in funding when we know there are no multi-billion dollar investments planned for Australia, the USA, India and China?. Australia's partners in the new agreement to reduce CO2 emissions have no plans to spend money at a fast enough rate to deal with the decline in the production of conventional oil.

The governments of Australia and the USA are in league with the coal, and oil industries and they not going to commit funding on that scale. Indeed, the Bush and the Howard governments transport policies will not slow the growth in the demand for oil in their transport sectors. China has said it will spend US$180 billion on renewable energy but there is no sign of big spending on the sequestration of CO2.

IEA chief economist Fatih Birol says *"We must change these outcomes and get the planet onto a sustainable energy path."* (IEA Nov 2005) but until the IEA stops stating what may or may not be theoretically possible from a technical perspective, with coal to oil conversion and tar sands etc, which they know to be currently politically impossible, little will happen.

The IEA also warned consuming countries could no longer rely on major oil-

producing countries to invest enough to meet long-term oil demand. Indeed, why should the Muslim oil producers and their not so fortunate Muslim allies who will have a total population of over one billion in 2020 squander the oil will be needed for basic essentials of survival in the next 50 years.

The problem is that the IEA is not like the United nations; it has no brief to represent the interest of the poorer and developing nations. The IEA represents the 26 main industrialized nations who are the major oil consumers. The IEA needs to start telling the truth to power and spell out why we are on a fast track to mass unemployment and economic chaos and may be creating the precondition for future wars to gain control over the remaining conventional oil reserves

Unless IEA members make a serious effort to conserve oil and reduce the demand for oil starting as soon as possible the world will remain on an unsustainable energy path putting the global economy, the world climate and world food production at risk.

ASPO like the IEA, is not like the United Nation's and does not represent all or any nation's national interests , but at least it tries to speak truth to power and spell out the consequences of peak oil to all nations. President of ASPO Kjell Aleklett said,

"We in ASPO know that the World does not have 20 years, we must act now"

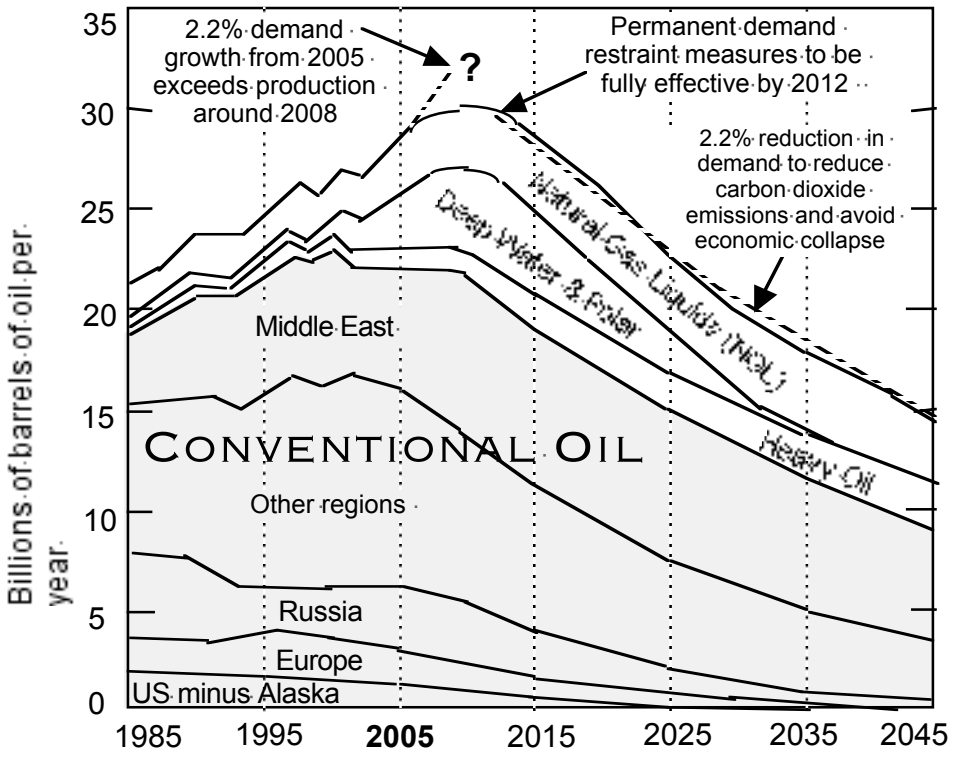
ASPO argued that the light, clean and once affordable conventional oil is going to peak much earlier if current growth rates continue for much longer. Peak oil is only dangerous because there is no international agreement in place to reduce the flow from the tap on the global oil tank. ASPO called for such an international agreement and proposed a "depletion protocol " to overcome the problem, which achieves the following: -

"In outline, such a protocol would require producers to limit production to their current depletion rate, namely annual production as a percentage of what remains, which is a small burden insofar than few can exceed this limit anyway. More important, it would require importers to limit their imports to match world depletion rate. This would have the effect of moderating world prices so as to put them in better relationship with actual cost preventing profiteering and the massive destabilizing financial flows that threaten the financial system.

In humanitarian terms, moderating world prices would allow poor countries to afford their minimal needs" (Campbell 2005 B). (ASPO 2004).

ASPO data, shown on Figure 2 shows why action is needed now.

Figure 2 World oil and gas liquid production from 1985 to 2045: 2.2% demand restraint to cope with declining production



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RESERVES OF AFFORDABLE AND NOT SO AFFORDABLE CONVENTIONAL OIL

Figure 2 shows world oil production increasing by 2.2% per year, which is the rate at which it increased in 2004 according the IEA, and then peaking between 2008 to 2012 followed by a 2.2% per annum decline in production to 2045 (ASPO 2005). That means that oil demand should be reduced to balance it with reduced oil production of 2.2% per year as follows:

2009 to 2020: reduction of 660 million barrels a year,

2005 to 2008: reduction of 715 million barrels a year,

2021 to 2030: reduction of 616 million barrels a year,

2031 to 2040: reduction of 515 million barrels a year,

Figure 2 shows the increasing proportion of heavy oil that is extractable from oil wells after they peak and the reserves of an increasing proportion of natural gas liquids (NGL).

The known reserves of oil in deep water and in Polar Regions are also shown. It is expected that the cost of extracting oil from deep water (< 500 metres) will require more energy to extract and will produce more CO2 but the technology is certainly improving (Bruhn 2005). as it is in the Polar Regions (Ronning and Haarr 2005).

Note the shaded area on figure 2 showing the changing regional mix of conventional oil production from 1985 to 2003 and the increasing proportion of non-conventional oil from 2004 to 2045. Figure 2 does not show any non-conventional oil from tar sands, shale or oil substitutes synthesized from brown and black coal, because these will greatly increase CO2 emissions without carbon sequestration.

More CO2 intensive non-conventional oil will be produced

By the time conventional oil production begins to peak most of the light sweet crude has been extracted and the remaining conventional oil gets heavier and more sour with more sulfur reducing the energy return on the energy invested and producing more greenhouse gas emissions. Even if there are large new discoveries of conventional oil in the Gulf of Mexico, the Artic Circle, Australia or any where else they will mostly be in deep water or hazardous areas requiring far more energy to extract, transport and refine.

Once conventional oil production has peaked more CO2 intensive non-conventional oil will be produced. Once all the light sweet conventional oil has gone and non-conventional oil production greatly increases there will be huge increases in CO2 emissions. This change is already underway in Canada which has huge reserves of tar sands and is planning, a 1160 km oil pipeline from the tar sand refining plants to the pacific coast to satisfy the need for crude oil in China and Japan. (Simon 2005)

One third of the energy in a barrel of synthetic crude oil made from, tar sands is required to produce it, making it a major emitter of greenhouse gases. A lot more research and development is going to be required to reduce the level of CO2 (Gielen and Unander, 2005). Indeed the French oil giant Total SA, amid rising oil and natural-gas prices, is considering building a nuclear power plant to extract ultra heavy oil from the vast oil-sand fields of western Canada. This comes as high oil prices are removing lingering doubts about the long-term profitability of extracting the molasses like form of oil from sand. At the same time, prices of natural gas -- which oil-sands producers have relied on to produce the steam and electricity needed to push the viscous oil out of the ground -- have risen 45% in the past year and the US faces serious shortages of gas within a few years.

This is prompting Total Oil, which holds permits on large fields in Alberta that contain oil sands, to consider building its own nuclear plant and using the energy produced to get the job done. This is interesting because it shows the staggering investments which will be required to produce oil products from the Canadian oil sands.

Producing oil from shale also creates a large increase in CO**2**, according to the World Energy Council, it requires hydrogen to be added to it and large inputs of energy to produce a useful oil product: -

"The term "oil shale" is a misnomer. It does not contain oil nor is it commonly shale. The organic material is chiefly kerogen, which can be converted into a substance somewhat similar to petroleum. However, it has not gone through the "oil window" of heat (nature's way of producing oil) and therefore, to be changed into an oil-like substance, it must be heated to a high temperature. By this process the organic material is converted into a liquid, which must be further processed to produce an oil.
www.worldenergy.org/wec-geis/global/downloads

The US has the largest oil shale reserves but large scale commercial production was not expected for 20 to 30 years. In 2005 that expectation changed as the price of conventional oil increased. With further price increases there will be a market for some high quality non-conventional sources of oil from tar sands and shale oil in Canada the US and Venezuela. The synthesis of oil from gas, brown and black coal will become marginally economic in many countries. Even so, in time all the low hanging fruit will be picked. There are limits to the amount of high quality coal, shale or tar sands that is available from which to make oil.

In Australia, a company called APEL is planning to build an "oil from coal plant" in the Latrobe Valley to produce low-sulphur diesel fuel from brown coal from the Flynn field near the Loy Yang power station. However, it is a condition of their mining license that they sequester at least part of the carbon dioxide emissions because it would otherwise result in a substantial increase in Victoria's greenhouse emissions. This is likely to be one of the first applications of "clean coal" and geosequestration (underground storage of CO2) technologies in Australia, but the feasibility of sequestration in Gippsland and the cost of pumping the CO2 deep underground are not yet established. The APEL oil from coal plant may be operating by 2009, but it will only produce about 50,000 bbl/day diesel fuel.

No one doubts the unrealised potential to make oil products from shale, tar sands, very heavy oils or to make oil from coal. What is unsound and very much in doubt is the the assumption that unproved greenhouse friendly technology can and will be developed in time to cope with the peaking and then decline of conventional oil production. Most of that new technology is 20 years away.

According to the Oxford Institute of Energy Studies *"unconventional oil is unlikely to exceed 10% of the world supply before 2020*" (Skinner 2005).

Another researcher in the non-conventional oil industry points out:

"While non-conventional oil is emerging as a new major source of oil, even an aggressive world-wide development scenario can only capture some 10 –15% of the required new oil supply in the next 20 years. In addition, non-conventional oil by itself cannot make up for the decline in world conventional oil production" (Isaacs 2005).

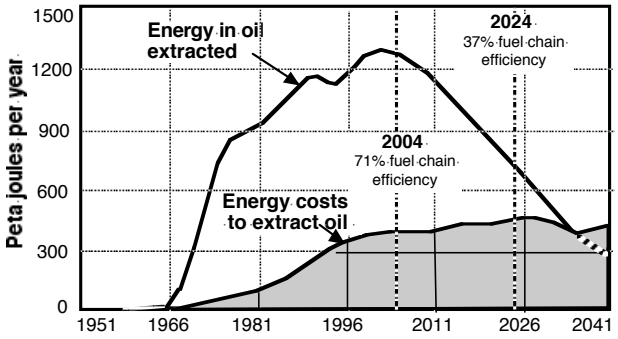
CSIRO modelling of the energy costs of conventional and non conventional oil in the long term in Australia found that:

"the energy return on energy invested (EROI)" in finding, extracting, transporting and refining oil will decrease. The reality is that the energy costs and benefits of oil extraction do change for the worse over time, as shown on Figure 3, and CSIRO scientists, recommend that physical energy profit accounting procedures should complement monetary accounting procedures for all important energy companies and national accounts (Foran and Poldy 2002).

Economists often fail to understand the importance of energy use in keeping our economic system functioning and becoming more ecologically sustainable or the need for a science based measure of energy efficiency:-

The critical importance of energy use to the maintenance and growth of our economic system is not properly acknowledged in most national analysis (that have a short term focus). Long run analysis suggests that energy use is responsible for 50% of production in a modern economy but represents only 5-10% of the cost. This tension between physical and economic realities effectively blocks the transition to a physical economy with low carbon energy sources", p 28 (Foran and Poldy 2002).

Figure 3 Energy costs and benefits of oil ex traction 1951 to 2041



Source: Foran and Poldy (2002) Chapter 5 "The future of Energy" from "Future dilemmas: options to 2050 for Australia's population, technology, resources and the environment", by CSIRO Sustainable Ecosystems, Working paper series 02/01

Achieving energy efficiency in all sectors of the economy requires that many actions be taken by individuals, companies and by governments who can encourage and discourage energy efficiency in many ways. Achieving energy efficiency is a change process that can be very costly and the resources available for doing it are limited. So it is necessary to identify those improvements to energy efficiency,, which are crucial to the energy security of the nation. Then it is necessary to consider the options available that also allow a reduction in CO**2** emissions and then to determine what should be done.

The need is to prioritise the energy efficiency change process in a way that will guarantee Australia's energy security by reducing the transport sector's over dependence on oil. It does not matter that there is uncertainty about when peak oil will occur, what matters is the consensus that peak oil will occur and the commitment by international agencies to accurately predict the timing and then take appropriate action.

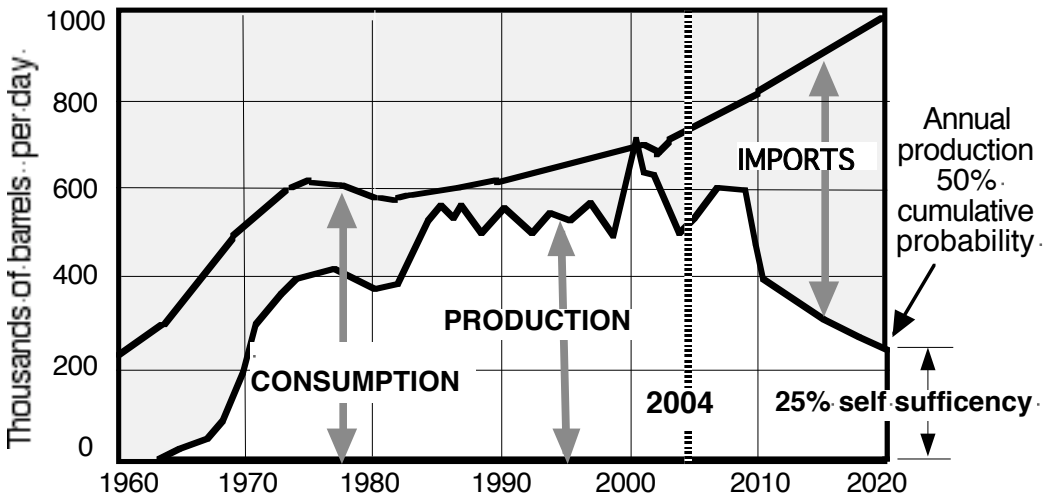
The IEA Executive Director Claude Mandel has no brief to spell out the climate change implications of extracting and processing non-conventional oil and CO2 emissions that would be considered acceptable. His proposal to throw US$ 6,500 billion at carbon sequestration and other unproved technology problems is not his responsibility (Weekend Australian 2005).

The IEA has not produced any reliable evidence to show that the abundance of non-conventional oil can be reliably produced without destabilizing the climate. Indeed, there has been no consultation with the Intergovernmental Panel on Climate Change (IPCC) which is the international agency with the responsibility to make the final judgement on that issue.

Most neo-conservative economists and politicians will of course ignore the need for the IPCC to have the last word on this issue because many of them will not accept the reality of climate change or the need to consider inter-generational equity or the use of the" precautionary principle. I am not suggesting that Claude Mandel takes this approach but many of the senior US republicans that refuse to take the sound IEA advice, to conserve oil and reduce the demand for oil, do take this approach.

In conclusion it would appear that ASPOs advice for the major oil users to collectively take action to conserve oil is sound advice. Hopefully the IEA will be doing more than suggesting that oil be conserved and will be giving out the advice that collective action is necessary to its members in a year or so.

Figure 4 Australian crude & condensate: imports, production, consumption and self sufficiency from 1960 to 2020.



Source: "Oil and Gas Resources of Australia 2002" Geoscience Australia, March 2002.

Australians will become the world's worst per capita CO2 emitters

The IEA predicts, that without reducing the demand for oil, global emissions of greenhouse gases will increase by 52% by 2030. In an earlier report they stated that emissions would only reduce by 33% even under a scenario in which governments impose tougher environmental policies to reduce emissions (IEA 2005). Without carbon taxes in Australia, Canada, the US and Venezuela there will be no incentives for industry to develop carbon sequestration technology and far more CO**2** will be produced from non-conventional oil use and coal fired power stations.

Transport predictions to the year 2010 in Australia for single occupant car commuting, car travel generally, air passenger travel, inter city road freight and intra-city commercial vehicle traffic all show unsustainable growth of oil dependency. Over the last forty years Australia has become addicted to cheap oil, especially for transport which uses almost 80% of Australia's petroleum; 55% of road transport fuel is petrol, 39% diesel and 6% is LPG. The oil dependent transport sector is responsible for 76% of oil consumption and that has to be reduced as it poses a very serious threat to Australia's future economy (Parker 2004 B). Even the supposed abundance of natural gas will not get us far if we sell it all off as LNG for export instead as using it as a transitional fuel in Australia. The NW Shelf partners expect production to begin falling from 2025!

The Commonwealth does not recognize this growing threat to national security but the decline of Australia's oil production has been documented and is shown in Figure 4. The disparity between the growth in oil consumption and oil imports and the decline in indigenous oil production predicts a serious loss of self-sufficiency between 2006 and 2020. The Commonwealth's policy on energy ignored oil for transport (Parer 2004).

The Department of Environment and Heritage has released figures that show that Australia's transport greenhouse emissions have galloped ahead in leaps and bounds. A 29% increase has occurred from 1990 to 2003 but Commonwealth agencies have no policies to reduce further increases. With current policies, carbon intensive non-conventional oil will be used and carbon dioxide emissions from the oil dependent transport sector will greatly increase (Karvelas 2005).

The absence of carbon tax in Australia, uncontrolled oil dependence and the use of coal to generate electricity will drive up per capita CO2 emissions. The use of brown coal in Victoria to generate electricity: Hazelwood power station will produce 445 million tons of CO**2** over the next 25 years and ensure that Victoria will become the world's worst per capita CO**2** emitter.

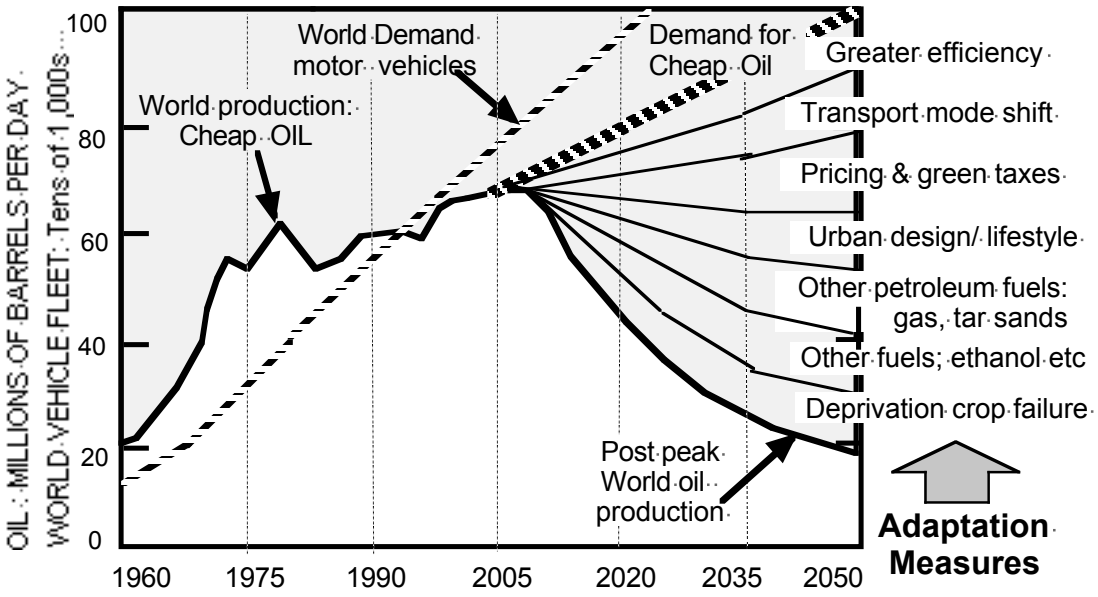
THE NEED FOR A STRATEGIC OIL RESERVE AND OTHER MEASURES TO CONSERVE OIL

Australia in few years will have a high level of import dependence and remote geographic location, but does not have an oil security stock holding above that which is commercially optimal. That puts Australian energy security at risk. There is need for a strategic oil reserve of 6 months diesel and petrol to provide a buffer to keep the economy going with a rationing plan to ensure that these reserves are used for essential purposes.

The Commonwealth government is ignoring the need for a strategic reserve of oil and diesel and many of the measures needed to reduce oil dependence shown on figure 5. Its current policy does not even reflect the draft oil emergency measures of the IEA .

Figure 5 illustrates most of what needs to be done to allow world transport/ energy policy to evolve in a way that will lead to a reduced demand for oil that keeps pace with reducing oil production. Space does not permit a detailed discussion of the global implications of the seven 'adaptation measures shown. However, some of these measures can be easily implemented by Australian Local, State or Commonwealth governments given responsible leadership. They are outlined in the following six recommendations and other recommendations in Appendix B

Figure 5 Adaptation measures to reduce world oil consumption



Source: Post peak scenario outlined by Ron (Swenson 1998)
Motor vehicle demand added by Alan Parker June 2004

1) Transport mode shift and lifestyle change in outer suburbia.
The adaptation measures of 'transport mode shift' and 'lifestyle change' can best be made at local government level by the promotion of Travel Smart programs or 'Individualized Marketing' which have already made very significant reductions in car travel rates.. Western Australia has the most successful programs. Travel Smart programs supplemented by the provision safe bicycle route networks that provide safe and secure access to public transport need to be applied in the outer suburbs of the capital cities where most single occupant car commutes originate. These and other measures to increase walking, cycling car sharing and the use of public transport are detailed in Appendix B

2). Transport mode shift; the use of electric bicycles
From a strategic transport planning perspective investing in bikeway networks would be cost effective in Australian cities if they enabled bicycles and electric bicycles (E-Bikes) to be more safely used instead of cars (Parker 2001). Figure 6 shows that the E-Bike is very energy efficient using between one twentieth and one sixtieth of the energy used by cars per km. E-Bikes have great potential as access modes to public transport in the low-density areas of cities.

The best E-Bikes are designed and made in Japan and weigh only a few kilograms more than bicycles. They have electronically controlled power assistance via sensors in the cranks linked to a computer chip. There is no clutch to worry about after switching on with a key. The power assistance operates automatically on starting, going uphill and combatting headwinds. Power cuts out at 24 km per hour so they can be safely used on shared footways (Parker 2004 A).

In 2005 the production of E-Bikes in Japan will be around 210,000. In China, the production of electric bikes, mostly with throttle controlled power assistance and higher power outputs of 300 to 400 watts, is expected to reach ten million. Chinese consumers will have a wide choice of models to pick from now that petrol powered bicycles, mopeds, and light motorcycles with polluting two stroke engines are being banned in their major cities.

Electric bicycles are now mass produced and could be safely used in Australian cities to reduce air and traffic congestion if the measures in appendix B to encourage walking and cycling are implemented.

However the Australian Road Rules need to be revised to allow E-Bikes of 300 watts power output to be classed as bicycles as they are in NZ. Nearly all of the safest Japanese E-Bikes cannot be purchased in Australia as they would be classified as motor cycles. Disabled people should be allowed to use 600 watt power output as they are in NZ. and the U.S.

Figure 6 Petrol, diesel, ethanol & electricity energy use of vehicles

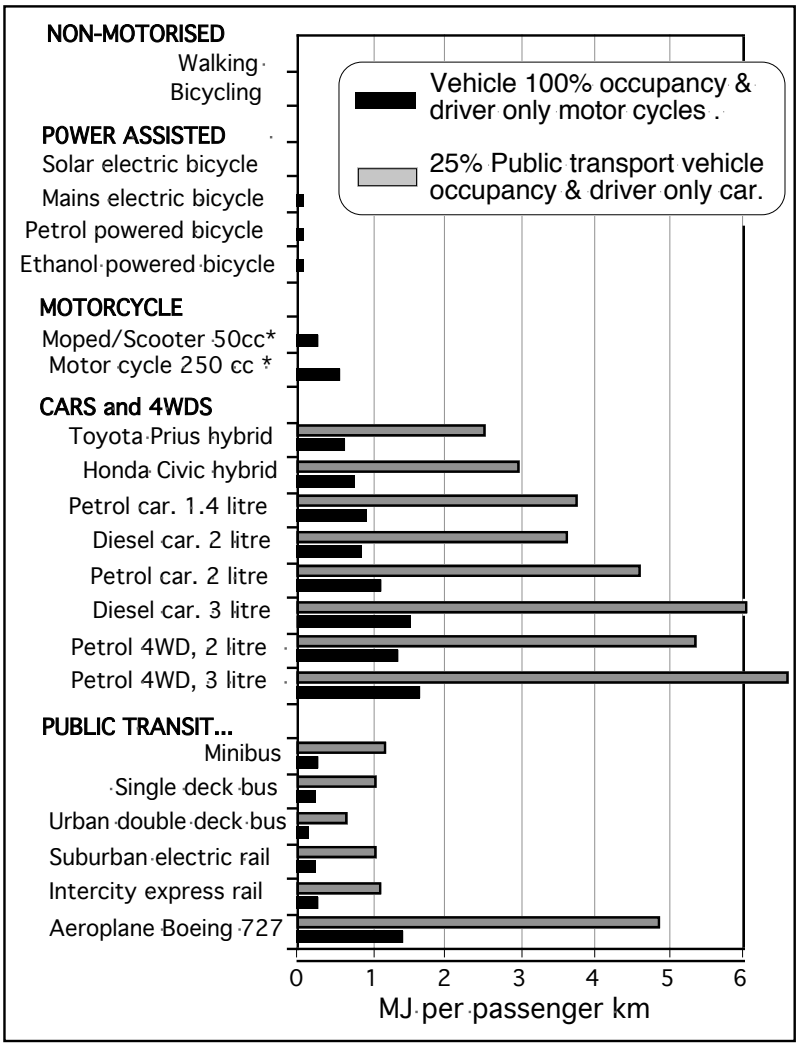


Figure 6 shows petrol, diesel, ethanol & electricity energy use of passenger vehicles and aircraft. Conserving oil should have priority over other forms of energy saving. Note ,that Japanese electric bicycles with batteries charged by roof top solar PV panels are the most energy efficient motorised vehicles ever invented.

3). Mandating standards for fuel efficient cars.

The average car in the Australian car fleet is bigger and consumes more fuel in 2005 than a decade ago, despite the fact that engine efficiency has improved. Meanwhile, the world's best car designers in Germany and Japan have created vehicles that could slowly create more energy efficient car fleets that use far less oil and, in the long term, could mostly rely on off-peak main electric charging as their energy source.

The energy efficiency of the Japanese petrol electric hybrid cars indicates the importance of using hybrids and putting in place fuel efficiency standards to ensure the mass market take up of this technology. For essential long distance travel by car on rural freeways new diesel powered vehicles maybe more appropriate

Sound and effective fuel efficiency standards have been mandated in the past and this could be done again. Former US President Jimmy Carter introduced the Energy Policy and Conservation Act of 1975, which improved the energy efficiency of the US car fleet directly and required US car companies to double the fuel efficiency of their cars over phased periods of years. It improved the energy efficiency indirectly of the world's car fleets by providing an incentive to overseas car companies to produce more energy efficient cars for export to the USA.

The direct incentive of the US CAFE standards (as they are now known) was very effective when introduced in 1975 when the average car in the fleet consumed 18 litres /100 km. By 1987 the average fuel efficiency of the car fleet improved to 9 litres/100 km. Then the average fuel efficiency of the car and SUV fleet reduced to 9 5 litres/100 km in 2004 because of the failure to upgrade the CAFE standards (Bezdek and Wendling 2005).

Bezdek and Wendling have recommended that for new US cars a new standard be phased in to ensure that by 2015 average fuel consumption of the car fleet will be 5.7 litres/100 km and for the SUV and light truck fleet to be 7.6 litres/100 km, giving an overall 50% increase in fuel efficiency.

An Australian car fuel efficiency standard is needed to ensure that by 2015 average fuel consumption of the car fleet including 4WDs will be 5 litres/100 km and for the SUV and light truck fleet to be 6.5 litres/100 km. giving an overall 50% increase in fuel efficiency.

The Australian government needs to intervene now to ensure that the car industry co-operatively produces petrol electric hybrid vehicles. Tax and other incentives should be apply to the ten imported cars that are recommended by the Department of Transport and Regional Services as the top environmental performers with the best greenhouse and air pollution ratings (Easdown 2005)

If hybrid petrol/electric and gas /electric cars and LCVs are built in Australia then fuel economy improvements of 40% or more are possible (Hirsch 2005).

4). Green taxes to decouple the growth in oil consumption from the growth of GDP

The national peer review of the Netherlands transport system by the OECD (European Conference of Transport Ministers) identified the Netherlands as having the best passenger transport practice for the EU (ECMT 2001). The Dutch have been moving slowly towards ecologically sustainable development with their National Environment and Policy Plan (N.E.P.P) by:-

"Decoupling economic growth from the growth in fuel consumption. (N.E.P.P. 3. 1998)
As this plan evolved the Dutch greened their tax system as well as providing the infrastructure to improve the performance of their transport system.

NEPP 3 states why non-motorised travel is considered to be so important and why the car, which in the 1960s to 1990s was regarded as a sacred cow is now subject to many regulatory constraints. The transport objectives of the NEPP are:-

- Vehicles must be as clean, quiet, safe and economical as possible.
- The choice of mode for passenger transport must result in the lowest possible energy consumption and least possible pollution.
- The locations where people live shop, work and relax will be co-ordinated in such a way that the need to travel is minimized.

Without the NEPP it was expected that car km's would increase by 72% over the period 1986 to 2010. With the NEPP this increase will be lowered to 48%, a positive step towards ESD. Dutch experience with implementing the NEPP suggests that there is the potential for a shift of at least 10% of all "drive alone" commuter trips to multiple occupant trips. (Parker 2001)

This is in addition to using bicycles to substitute for short, highly polluting car trips (Wellemen 1999).

Dutch experience shows that greening the tax system could provide incentives and constraints to use cars less so that tax reform results in the conservation of oil reserves and the use of more energy efficient vehicles which will reduce in greenhouse gas emissions. It would be based on the principle that the polluter must pay in the following ways:-

- The internalization of environmental costs. The future costs of oil depletion need to be built into the price of diesel, petrol and aviation fuel so as to encourage fuel conservation, the purchase of more fuel-efficient cars, LCVs, trucks and aircraft.
- Reduce the long lead times in adapting to oil depletion by increasing fuel taxes every year to pay for the introduction of alternative fuels, particularly gas, and to build the infrastructure needed to encourage walking cycling and public transport.
- For those who cannot do without cars for essential purpose in business, or are disabled, provide tax incentives for the ownership of more energy efficient cars and disincentives to the ownership of large cars and 4WDs in urban areas.
- Provide incentives for telecommuting; informal and formal sharing of cars; and innovative forms of car leasing such as the Dutch "Call-a-Car" scheme.
- Eliminate subsidized car parking and provide incentives for commuting by bicycle.
- Establish the general principle that car travel to and from work is a personal expense.
- Salary packaging for commuting, or for vehicles owned by other family members, will not be subsidised. Season tickets on public transport and the provision of bicycles for commuting and/or work business should be salary packaged instead.

The achievement of the 'big picture' planning and transport outcomes induced by the Australian Commonwealth "Greening" of the tax system-would be dependent on state funding and investment being radically changed so that they reinforce and complement these tax reforms.

5. Abundant natural gas should be used as the transitional fuel

Australia is well endowed with natural gas, which can be used as a transitional fuel to replace petrol and diesel and to give Australia a competitive advantage in starting to be less dependent on oil. Many IEA members, like the US, do not have enough indigenous gas reserves to use it as transitional fuel prior to oil peaking and subsequent oil shortages .

There is also a need to retain a significant part of our natural gas resources as bridging fuel for the transition from fossil fuels to renewable energy.

As the CSIRO identified in 'Future Dilemmas', a large amount of gas will be needed for power generation and transport fuel during this transition, even if a 'Factor-4' type economic development and low population growth strategy were adopted to reduce the growth in energy use (Foran and Poldy 2002). Australia needs an energy security plan in place to competently use this resource.

The sustainable transport coalition in WA has produced a booklet advocating that the Commonwealth encourage the use of LPG, CNG and LNG in the motor vehicle fleet. This should include preferencing gas for government fleets; providing financial incentives for vehicle conversions, or purchase for dedicated gas vehicles; and financial support for provision or conversion of fuel storage and distribution infrastructure (STC 2004).The use of gas as a transitional fuel in all government, company cars and salary packaged vehicles needs to be considered

Given a reduced growth in transport and a growing proportion of fuel efficient vehicles in the car fleet and LCV fleet over ten years, the demand for oil could be greatly reduced. During this period short-term dual-fuel conversions would work for many older vehicles, but this is not a long-term solution.

Ethanol may have limited use in some rural areas for cars and LCVs, but is not a solution for urban fuel supplies because of the low energy return on energy invested. However, ethanol used as a fuel additive to petrol can reduce air pollution and improve engine efficiency. Ethanol used to power assist bicycles has a lot of potential because these vehicles would use less than one litre per 100 km. and if the engines were designed by the Orbital Engineering Co there would be hardly any pollution. With such a fuel efficient application the low energy return on energy invested in ethanol production would be insignificant especially if the electric bike is used instead of a car.

6). National energy security plan needed to Implement the adaptation measures

Japan provides a good example of a national energy security plan (the Dutch NEPP produces similar results) This was developed in response to the oil crisis of 1973 when several oil dependent industries were closed for several months. They formulated the view that national security was about enabling Japan to survive oil shortages; that oil conservation is just as important as having a military capacity and that oil dependence was a serious threat to their way of life. Japan's energy security policy has reduced oil dependence in the transport sector from 80% in 1973 to 50% in 2004 thus reversing a negative trend (Hook, W. 1994) (Alford 2005).

They reduced their dependence on oil by creating the finest rail system in the world for urban commuting and intercity transportation, which is sustainable because it is reliant mainly on hydroelectric and nuclear energy sources. Inter modal passenger transport is highly developed with 6 million bicycles being used to access rail stations, with very efficient modal interchanges which link buses and trains and provide secure bicycle parking (Parker 1993).

In 2005 Japan has zero population growth and has transport infrastructure in place that will reduce the impact of future oil shortages. The government recently introduced a national campaign urging the Japanese to replace their older appliances and buy hybrid vehicles, as part of a patriotic effort to save energy and fight global warming. Competition did not create their hybrid vehicle technology but sensible energy security planning (Hook, W. 1994).

To achieve what the Japanese have done there is also a need to reduce oil demand for freight transport in Australia. There are two measures that need to be implemented together to reduce the consumption of diesel oil as there are synergetic benefits.

Firstly, the big engines made overseas and used by the growing number of B-doubles are very efficient and the engines that run efficiently on bio-diesel are available. Also the big HINO 700 series diesel /electric hybrid trucks are reducing diesel consumption by 10%; and the use of such vehicles needs to be encouraged.

All diesel trucks have to use Australia's poor quality fuel, which reduces their engine efficiency by 10% to 12 % and the fuel needs to be cleaned up. There are commercially available trucks with very efficient engines designed to run on natural gas and their use needs to be encouraged.

Secondly, there is a need to build up the interstate rail infrastructure, which many government inquiries have revealed to be in a run down condition, so that it can take a lot more freight and do so safely. The inland rail freight route from Melbourne to Newcastle should be a top priority that would reduce the predicted increases in road congestion from trucks in all cities.

The short term goal is to stop freighting goods that are in the category of 'taking coals to Newcastle', which has been done overseas, and to steadily increase the price of diesel so as to deter unnecessary freight movement. A Energy Security Policy must be produced with both demand and supply side measures for both passenger and freight transport .

5). IEA oil emergency demand restraint measures

Mention must be made of work done by the IEA on oil emergency demand restraint measures as a result of some IEA member countries, looking for ways to improve their capability to handle oil market volatility and possible supply disruptions in the future. The IEA prepared a report to show how short term disruptions in world oil supplies could be dealt with.

Table 1 shows the opportunities to achieve substantial reductions in transportation oil demand quickly and cheaply – if national leaders are prepared to act and sell politically unpopular demand constraint measures to their people. In the event that Peak Oil is proved to be be less than 10 years away these measures could be applied almost immediately.

The IEA has recommended technical solutions for the restraint of mostly urban road transport that could reduce oil demand on their own without any restraint of intercity freight and air travel of fixed sources of oil use.

Some measures may make sense under any circumstances; others are primarily useful in emergency situations. All can be implemented on short notice – if governments are prepared (IEA 2005 C).

Table 1. Summary of oil saving effects of demand constraint policies for passenger transport summed across all IEA countries

Potential oil saving	IEA proposed MEASURE
VERY LARGE 370 million barrels a year	**Car pooling:** large program to designate emergency car pool lanes along all motorways, designate park-and-ride lots, inform public and match riders signals.
	Driving Ban: odd even license plate scheme. Provide police enforcement, appropriate information and signage.
	Speed limits: reduce highway speed limits to 90 km/hr. Provide police enforcement or speed cameras appropriate information and signals.
LARGE 185 million barrels a year	**Transit:** free public transport (set fares to zero)
	Telecommuting: large program, includes active participation of businesses, public information of benefits of tele commuting, minor investment in infrastructure to facilitate.
	Compressed work week: Program with employer participation and public information campaign
	Driving Ban: 1 in 10 days based on license plate, with police enforcement and signal.
MODERATE More than 36 million barrels a year	**Transit:** 50% reduction in public transport fares.
	Transit: increase week end an off peak service and increase peak service business hours 10%.
	Car pooling: small program to inform public and match riders.
	Tyre pressure: large public information programme.
SMALL Less than 36 million barrels a year	**Bus Priority:** bus priority usage and convert some other lanes to bus only lanes convert all existing car pools & bus lanes to 24 hour

The IEA report examines potential approaches for rapid uptake of telecommuting, "eco-driving", free public transport and car-pooling, among other measures. It also provides methodologies and data that policy makers can use to decide which measures would be best adapted to their national circumstances. It may be prudent to introduce these restraints unilaterally before the timing of peak is known or if provisional estimates indicate that peak oil is less than 10 years away.

CONCLUSION AND SUMMARY OF RECOMMENDATIONS

There is a significant risk of world oil Peaking before 2010. This is the worst case scenario, that would induce a world wide depression, wreck the Australian economy and produce mass unemployment. Outer suburbanites would be terribly disadvantaged as would be the poor in rural areas. The Commonwealth and state government need to develop a prudent risk management strategy to cope with that.

"Prudent risk management requires the planning and implementation of mitigation well before peaking. Early mitigation will almost certainly be less expensive and less damaging to the world's economies than delayed mitigation" (Hirsch 2005).

If oil peaks between 2015 and 2025 a far less a painful adaptation is possible, Indeed if most of the harsh measures in the following recommendations are implemented, and the transport research community takes a strong advocacy role in persuading governments to actually reduce oil dependence. There will be far less pain.

Recommendations

1. Develop car fuel efficiency standard to ensure that by 2015 average fuel consumption of the car fleet including most 4WDs be 5 litres/100 km and for the SUV and light truck fleet to be 6.5 litres/100 km. giving an overall 50% increase in fuel efficiency.

2. Conserve oil reserves by the use of natural gas as a transition fuel; the manufacture of energy efficient hybrid electric cars and LCVs in Australia and the building up a strategic reserve of 6 months diesel and petrol

3. Embody the costs of oil depletion into the price of diesel, petrol and aviation fuel and other green taxes designed to decouple the growth in oil consumption from the growth of GDP. Use the green taxes to rebuild and enhance rail infrastructure into all urban areas.

4. Promote and fund the uptake of telecommuting, eco-driving, car-pooling and Travel Smart programs in all urban areas.

5. Change current land use planning practice to eliminate urban sprawl and provide public transport services in new residential and industrial areas.

6. Change the constitution of road planning and building agencies to make it their responsibility to reduce the demand for road space and travel.

7. Build urban bikeway networks for bicycles and electric bicycles and provide secure bicycle parking at all modal interchanges and railway stations.

8. Encourage the use of electric bicycles with solar electric and/or over night battery charging.

9. Support in principle ASPO's call for a new plan on the scale of the Marshall Plan to cope with coming end of the age of affordable oil (ASPO 2004).

10. Produce an Australian Energy Security Policy to mitigate oil dependency with both demand and supply side measures.

11. Fund research to prioritize the most effective mitigation measures.

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Appendix B *Submission to the Senate Inquiry into Australia's fuel supply.*

The census data for urban commutes reveal the growth of oil dependence since 1976

Submission to the Senate Rural and Regional Affairs and Transport Inquiry into Australia's future oil supply and alternative transport fuels

By Alan A. Parker 12-2-06

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INTRODUCTION

This submission (appendix B) focuses on commuting because commuter trips have been responsible for generating most of the growth of oil dependent passenger transport in Metropolitan Melbourne and in other capital cities over the last 25 years. Oil dependence has been generated by the growth of low density urban sprawl in the outer suburbs, particularly those with no fixed rail access or regular trunk bus services, that lock households into multiple car ownership and longer car commutes.

Increasing congestion costs are the most useful indicator of increasing household oil dependence Data produced by VicRoads for metropolitan Melbourne provides us with a simple formula for estimating the high congestion costs of the 13% of all car trips that are commuter trips and why it is such a useful indicator of the growth in oil dependence. This formula, plus or minus a percentage or two, applies to the other capital cities.

Car commutes in 2001 =
= 13% of all car trips
= 33% of distance travelled on main roads
= 40% or more of the cost of congestion.

This appendix uses the census data on urban commutes because it has 97% sample size and provides accurate data for all transport modes from 1976 to 2001 even at local government level. Analysis of this data reveals an unsustainable growth in oil dependence which will be confirmed by the 2006 census which will be available in 2007. Indeed, oil dependence is growing rapidly and *"around 640 km of Melbourne's arterial road network is currently congested at peak times and this could more than double to 1300 km of roads by 2021 and the total costs of congestion could be as high as $2.7 million per annum".*(Business Council of Australia 2005) It is argued that this is likely to be a conservative estimate after world oil production peaks and then reduces as oil prices will be in the $200 a barrel region. The unsustainable growth of car dependent outer suburbia in the capital cities needs to be replaced by a process of ecologically sustainable development.(ESD) well before the oil crunch comes.

Melbourne commutes are analysed in depth in 2001 for all the 16 regions of Melbourne with a focus on the inner/outer urban trends. The high level of car dependency in the major provincial Victorian cities is also documented. Census data spanning 25 years for journeys to work (commutes) show that the market share of walking, bicycling, car sharing and public transport has declined, and that long single occupant car commutes are steadily growing, where most residents now live.

All commute modes, household car ownership and household density are analysed for the sixteen regions of metropolitan Melbourne in 2001. The proportion of walking and cycling trips was very low in the six outermost suburbs and nearly all bicycle commutes were made by men, but in the inner suburbs there are nearly as many female bicycle commutes. Walking, cycling and public transport commutes resulted in higher, and healthier levels of incidental exercise in the inner suburbs, less in the middle suburbs and very little in the outer suburbs. It is concluded that the strategy "Melbourne 2030" is not based on a sound understanding of ecologically sustainable development (ESD *) and that the Metropolitan Transport Plan will not create ecologically sustainable transport (EST #) and that is the underlying reason why road congestion costs will continue to increase. Similar trends in Sydney, Brisbane, Perth and Adelaide are graphed and correlated with total Australian congestion costs.

To reduce oil dependence it is necessary to tackle the underlying cause rather than the symptoms. The cause of unsustainable transport congestion is ecologically unsustainable development of cities that result in transport behaviours which will continue to increase per capita oil consumption, air pollution, greenhouse gas emissions and road congestion costs in the next 30 years. Current outer urban growth and the lack of public transport orientated land use planning are not ecologically sustainable. ESD and EST also require effective oil demand management measures to cope with the peaking of world oil production and greatly reduced Australian oil production. This is the only way to eliminate high congestion costs, reduce greenhouse gas emissions and encourage healthy and sustainable transport behaviours.

For the capital cities to become ecologically sustainable an integrated overall plan which includes the following is required:

1. The per capita uses of fertile land, fresh water and fossil fuels are incrementally reduced by an integrated planning effort by all levels of government and the private sector with supportive Commonwealth policies.
2. Modal substitution for most "single occupant car commutes" by sharing cars, using public transport, walking and cycling or choosing to use small cars and petrol electric hybrids, all of which consume less oil and are sustainable transport behaviours.
3. Using bicycles, solar PV charged electric bicycles, or walking to substitute for many short urban car trips and as means of access to public transport in low density outer urban areas to replace long urban car trips.
4. Supportive national/state energy security policies with effective oil demand management measures to cope with the peaking of world oil production and its subsequent decline before oil shortages become a serious threat to the economy and national security.

*** ESD =** de-coupling the demand for fertile land, fresh water and fossil fuels from the growth of the quality of life in Australian cities

 # EST = de-coupling oil demand from the growth of passenger and freight transport in Australian cities = decongestion

CHANGES IN THE WORKING LIVES OF AUSTRALIANS SINCE 1960

Since the 1960s there have been changes in the kind of jobs available, the location of workplaces and the location of households that have impacted on commuter travel patterns in major cities, where an increasing proportion of people live and work. However, in Australia there has been little change in the proportion of the population employed: a small increase from 41% in 1976 to 43% in 2001. There are now proportionally more jobs in the cities than the rural areas and many of these new jobs are following new outer urban housing developments.

In Victoria and Australia the proportion of persons employed in the population has not changed significantly; the ratio of males to females has decreased and more women are now employed and fewer men (See Table 1). The changing role of women in society, the decline in manufacturing industry and the growth of service industries have had a significant effect. There are now fewer secure full time male jobs, more part time work and more casual employment.

Table 1 The proportion of persons aged 15 and over employed in Australia

Year	1973	1983	1993	2003
Males	81	70	65	68
Females	39	40	46	53
Persons	60	55	55	60

Source ABS surveys 1973 to 2003

Commuting to work in metropolitan Melbourne

While Melbourne's residential population increased by 850,000 from 2.64 million in 1976 to 3.49 million in 2001, the increase in commuters is far less than that, being only 190,000 or 22% of the population increase. Figure 1 (column 1) shows that since 1976, the Melbourne work force has become far more car-dependent and car commutes (drivers and passengers) have increased from 620,000 in 1976 to 1,033,000 in 2001.

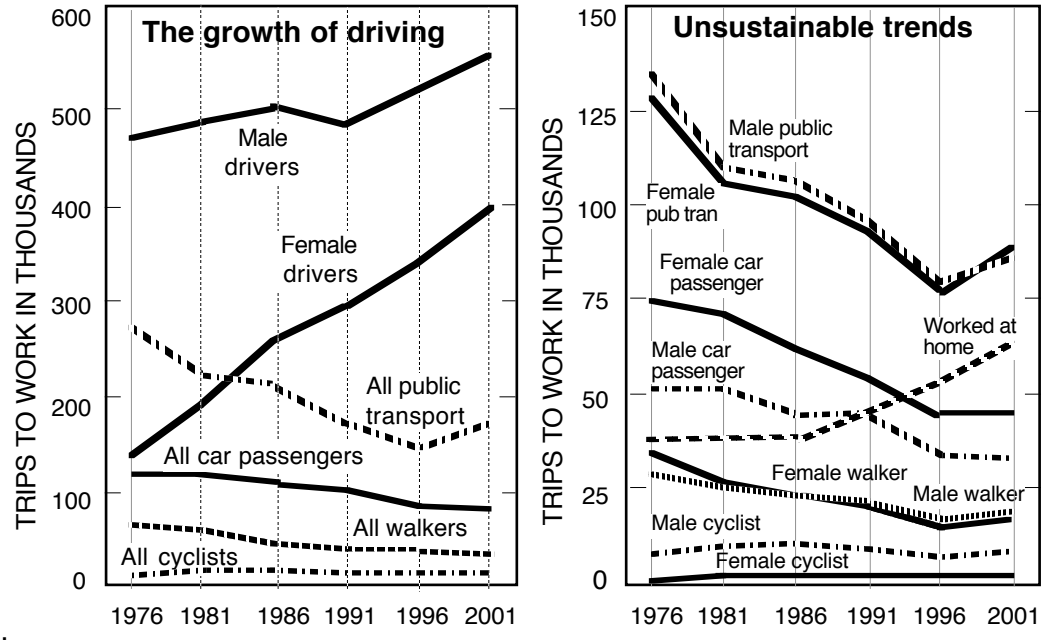


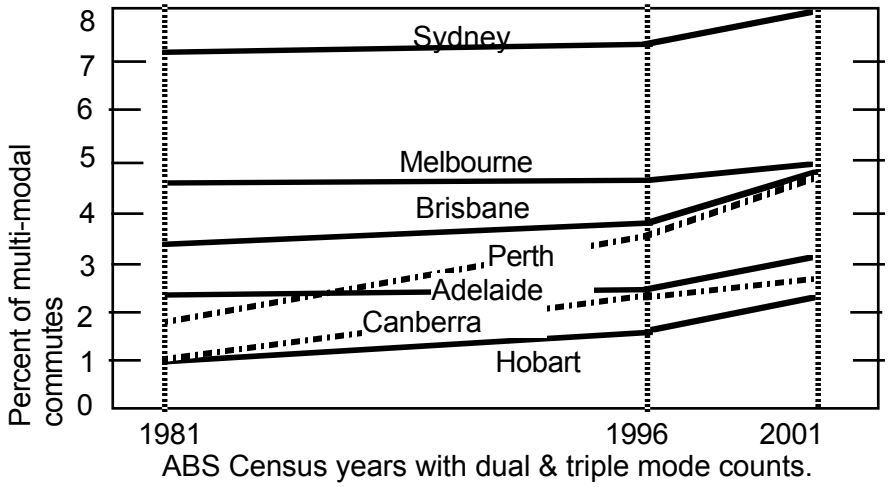
Figure 1 Melbourne journey to work ABS Census 1976 to 2001

By 2001 there were 953,000 commutes by car drivers. Column 2 on figure 1 shows that there has been a decline in the number of public transport users, walkers and car passengers but that cycling stayed much the same. In 2001 80% commutes were made by car; walking and cycling combined only accounted for 3.9% of all commutes. These robust trends (shown on Figures 1) are not sustainable; they also apply generally to other capital cities. All the capital cities have an overall modal split that is similar to that of Melbourne, with the growth of female car commutes being the dominant trend (Parker 2004 B).

Other sources show that car commutes have become longer than most other weekday journeys; in 2001 they accounted for 32% of the total distance travelled by car. Car commutes are concentrated in the congested rush hours and are subject to stop-start driving conditions and 'cold starts' (VicRoads 2003) Peak hour car commutes are responsible for around 40% of peak hour emissions, fuel consumption and road congestion. Similar trends for all the other capital cities show increased congestion costs and vehicle fuel consumption to the year 2010 (Parker 2004 B)

Figure 2 Dual and triple mode commutes in the Capital Cities.

Source ABS Census "Classification counts" 2001



ABS Census years with dual & triple mode counts.

The growth of dual mode travel in metropolitan Melbourne

A study of intermodal access to stations in Melbourne suggests that most car access trips to stations are less than 3 km and within easy cycling distance but that the potential of the bicycle/train dual mode is constrained by very high levels of bicycle theft and vandalism in all the capital cities. (Parker 2002). In marked contrast 2000 bicycle lockers have been installed at Brisbane rail stations but little progress has been made with encouraging dual mode bicycle travel Melbourne. However, $2 million of Commonwealth funds will be spent on providing bicycle lockers at stations throughout Australia in 2005 and 2006 and 400 more bicycle lockers will be provided in Melbourne.

In the Netherlands, 25% of all commutes are by bicycle or bike/train and there are 250,000 bicycles parked at rail stations (Welleman 1999). In Australia there were 62,000 car/train dual mode commutes on Census day but only 3,200 bike/train commutes.

Figure 2 shows the growth of dual or triple mode travel in the Australian capital cities since 1981 and indicates that by 2010 there will be an even higher percentage. In 2001 4.3 % of all commutes were dual mode or triple mode, up from 3.3% of all trips in 1981. The larger the capital city the higher is the proportion of these commutes ranging from 8% of all commutes in Sydney to 2.5% in Hobart and only 1% in Victorian cities of less than 100,000 population.

Once cities get beyond 500,000 population there is a need for an increasing proportion of dual mode travel, particularly bike/rail travel and bicycle/express bus travel and to access shared cars. The distribution of multi-modal trips in all the capital cities with a suburban rail system is still car dominated and not sustainable if drive alone cars are coming from within easy cycling distance.

The diverse range of dual and triple mode trips involving more than 750 persons in Melbourne (shown in Table 2) is not so different from other cities with suburban rail systems. Melbourne also has a 300 km tram network and there are 11,650 multi mode commutes involving trams. Since 1976 the use of cars to access Melbourne trains has increased to 25,400. There are 17,810 commutes involving buses used with other modes. Only 1,032 bicycles were used by commuters to access stations.

Encouraging the use of bicycles to access trains is world best practice, according to an European Union study which indicates the potential for more bicycles to be parked at stations in Australia than cars (ECMT 2001). In the Netherlands bicycle access and bus access are the dominant access modes for intermodal travel and there is less road congestion and less oil is used in the passenger transport sector as a consequence. Using bicycles to access existing and new rail stations in outer urban areas and provincial cities is a sound means of reducing oil dependence.

Table 2 Melbourne dual and triple mode commutes
Source ABS Census "Classification counts" 2001

Dual mode only	Number	%	Dual and triple mode	Number	%
Car driver / train.	18616	1.4	Train / bus / tram	2737	0.2
Bus / train	9425	0.7	Train / bus / car pass	1165	0.1
Tram / train	8919	0.7	Train / bicycle	1032	0.1
Car passenger / train	5623	0.4	Bus / car driver	993	
Car driver/car passenger	2617	0.2	Truck / car driver	831	
Bus / train	2091	0.2	Bicycle / car driver	786	
Bus / car passenger	1401	0.1	TOTAL Dual/triple mode	62060	4.3

SINGLE OCCUPANT CAR COMMUTES GENERATE ROAD CONGESTION

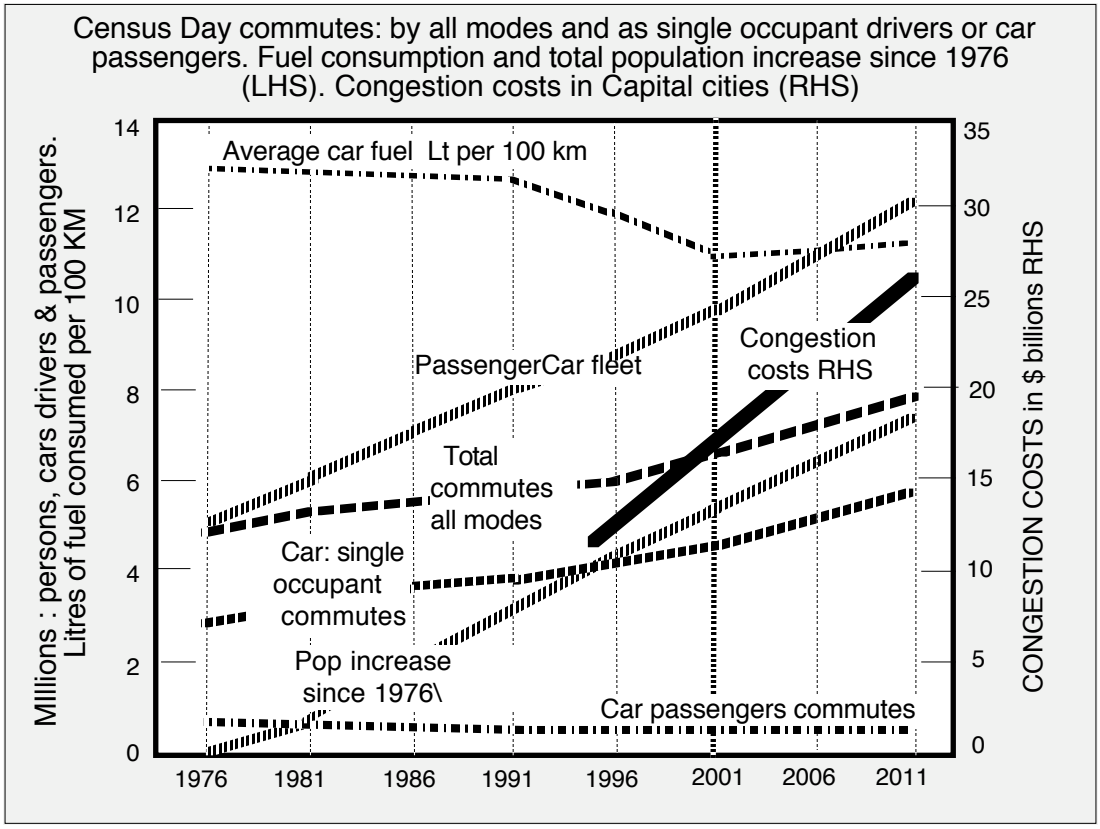
Congestion in Australian cities was generated many years before it was studied. In the early 1980s, it was caused by the growth in the population, which spread into sprawling outer suburbs, where the employed have to commute long distances and have no alternative to the car. As a consequence, the car population doubled between 1976 and 2001, an increase of 5 million cars that parallels the 5.4 million increase in the population.

The costs of congestion in Australian cities, particularly Sydney, Brisbane and Melbourne are increasing. The congestion cost in A$ billions (right axis on Figure 3) starting in 1995 when it had already become a serious problem and projected to 2011. The projected growth of congestion costs from 1995 to 2011 is higher than the actual and projected growth in the car and human population and is even higher than the number of commutes by all modes. The increase in commutes by all modes would be far less costly if the number of single occupant car commutes could be cut back to what it was in 1991, instead of increasing to 2011.

Figure 3 includes estimates by the CSIRO of car fleet fuel efficiency; that is litres of petrol consumed per 100 km. Fuel efficiency improved from 1976 to 2001 but is projected to get worse from 2001 to 2011 due to the growing proportion of large cars with more luxury

features and four wheel drives (Foran & Poldy 2002). This would effectively wipe out the benefits of improved fuel consumption in some new cars to at least 2011.

Figure 3 Unsustainable Australian commutes 1976 to 2011



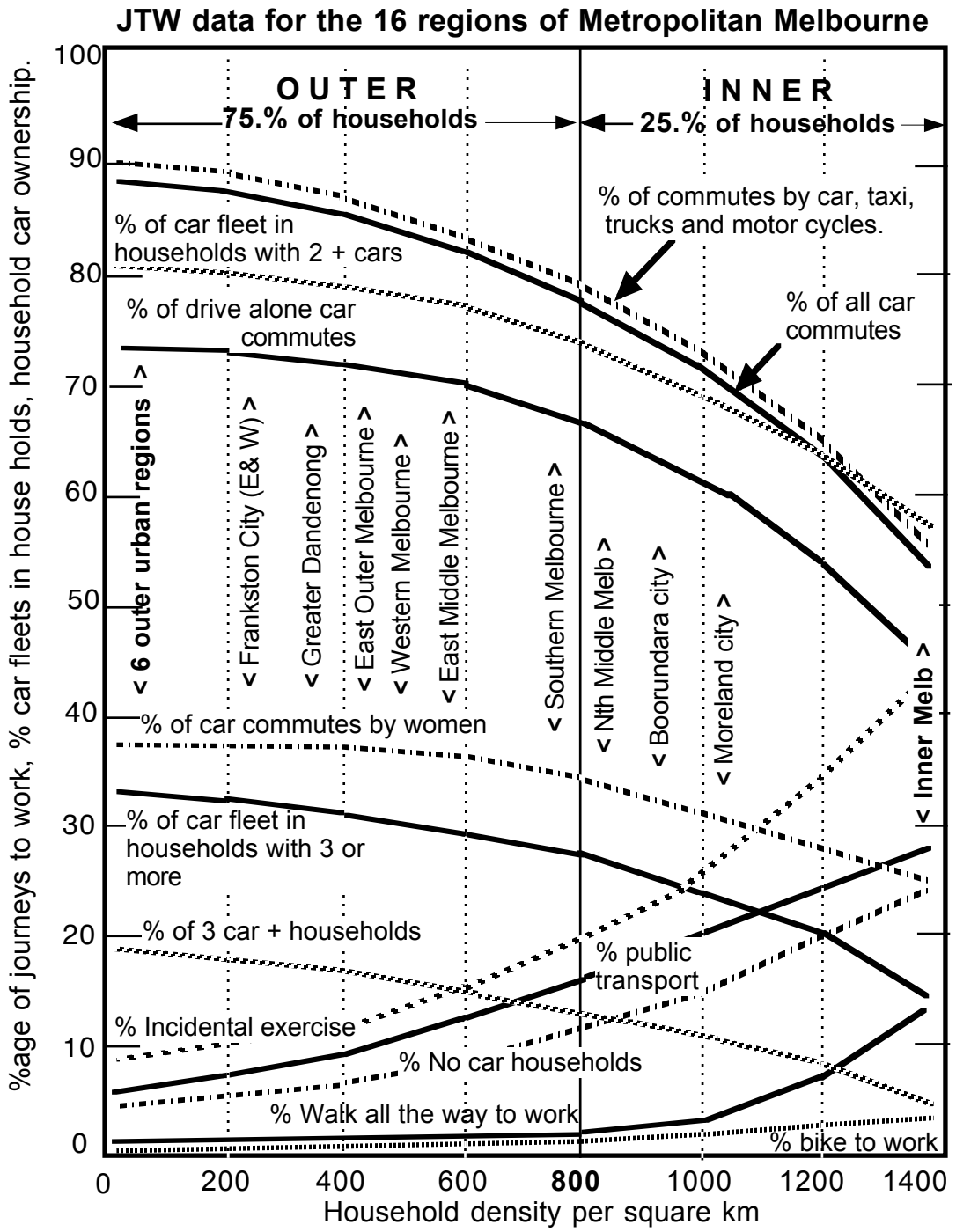
The long life of the average car in Australia, of 9.5 years in 2002, means that half the cars on the roads today will still be on the roads in 2014. It will make the Australian car fleet less energy efficient per passenger km to at least 2011 despite the availability of energy efficient hybrid cars unless a large increase in petrol prices and other incentives are introduced to increase the sale of small cars or petrol/electric hybrids.

Single occupant car commuters were encouraged to create more road congestion by the introduction of the GST in 2000 which reduced the cost of cars. Furthermore, the absence of import duty on 4WDs is another concession to buy and drive larger vehicles.

The practice of subsidising car use as part of salary packaging has grown to such an extent that it significantly discourages public transport use and encourages the purchase of vehicles that are larger than they would be if not part of a salary package. New cars in 2003 will have fuel efficiency labels for buyers but there are no fiscal carrots in the form of 'green' tax incentives to buy small energy efficient cars. Until the tax system is "greened" as it is the Netherlands the current tax system will generate increased road congestion.

Freeways are merely short term de-congestants which in a few years generate more congestion, by increasing the journey length of single occupant car commuters from the outer suburbs. This has the unsustainable the side effect of discouraging the use of public transport, walking and cycling thereby contributing to the national obesity epidemic. There are no Commonwealth or Victorian actions in the pipeline that will decongest urban main roads or reduce the unsustainable and unhealthy side effects of increased car dependence before the peaking of world oil production.

Figure 4. Melbourne Commutes: 16 urban regions and household density



Notes. The %age of incidental exercise = The total % age of all public transport, cycling and walking journeys. The %age of drive alone car commutes = car driver commutes minus car pass commutes. Curves in outer regions have been statistically smoothed.

Most long car commutes originate in Melbourne's outer suburbs

Commutes by all modes are plotted against household density per square kilometre for the 16 statistical regions in Melbourne in 2001 on Figure 4. This shows the dominance of single occupant car commutes and high car ownership levels in outer suburbia. The percentage of walking, cycling and public transport commutes all decline with household density.

Most of the congestion creating commutes originate in the sprawling outer suburbs which have between 20 and 800 households per square kilometre and where 75% of the population now reside. In these areas 80% of households own 2 or more cars; around 85% of those who are employed commute by car and they are responsible for 85% of the distance travelled by all commuters and for 70% of the drive alone commutes in the metropolis.

Furthermore, 78% of the car fleet resides in households with 2 or more cars. Walking, cycling and public transport account for only 13% of all commutes. In a few years when petrol many far less affordable than now Many city dwellers are likely to suffer considerable hardship because 90% of their journeys to work are made by car, truck or motorcycle and there is no easy way of continuing to do that without cheap oil.

Figure 4 shows that there here is a most significant difference between the Inner Melbourne Region, and the six outermost regions. The Inner Melbourne Region has a density of 1,300 households per square km, commuting is far less car dependent and 43% of commuters benefit from "incidental exercise" incurred in walking, riding a bike or walking to and from public transport. When petrol becomes expensive most households in this region will be able to dispense with their cars and survive without petrol, as people did from the beginning of World War 2 to around 1950. However, Melbourne was a more compact city in 1950.

With current government policies the growth of the oil dependent transport system will inevitably retard urban economic growth not only in the outer suburbs of the capital cities, but also in provincial cities many of which have the same level of car dependence. It is concluded that congestion is not created by the minority of commuters who share cars, use public transport, ride a bike or walk to work.

If reduced greenhouse gas emissions are taken into account for both fuel consumption and the embodied fuel used and emissions involved in the manufacture of cars we can see the following benefits of higher density in the inner suburbs. (Perkins and Hamnet 2005)

• Travelling fewer kms with less fuel consumption.
• Having more fuel efficient cars
• Having smaller cars requiring less energy to manufacture them..
• Having a lower household car ownership with far fewer households with 2 , 3, or 4 cars and requiring far less energy to manufacture cars per household.

The Census data show on figure 3 show that the cost of congestion in Australian capital cities is primarily created by commuters who use vehicles, designed to efficiently carry three, four or five people, to drive alone to work. The problem is not the modern car but i planners and their politicians who have failed to make best use of it and to encourage the purchase of new fuel efficient vehicles and cars sharing schemes for the larger cars in the existing car fleet.

The most recent study of "Oil vulnerability in the Australian city"(Dodson and Sipe 2005) confirms the trends in figure 4 but takes the analysis further by the development of an oil vulnerability index for all municipalities in Melbourne, Sydney and Brisbane metropolitan areas , which are mapped and clearly show the most vulnerable outer suburbs. The maps highlight the areas that will suffer the most from the interaction of increased petrol prices, urban transport systems and social geography. It states the need to comprehend the impact of costlier fuel and to effectively plan well in advance to mitigate inevitable impact of world oil production peaking.

In 2005 the Victorian Government showed some recognition oft need for a car fleet with

smaller and more fuel efficient vehicles. Minister for Manufacturing Andre Haermeyer had discussions with Toyota of the need to produce petrol electric hybrid vehicles in Victoria. Toyota has no plans to build hybrids in Australia but they are building them in China and the USA.

Table 3 Percentage of 2001 Sustainable Commutes in all the capital cities and selected Victorian cities ranked by the total level of incidental exercise

Sustainable commutes: Australia, Capital Cities, selected City Regions & 4 Victorian provincial cities	% Incid- -ental exer- -cise	House- -holds per sq.km	% of house- -holds with No cars	% cycle trips all the way to work	Ratio of male to female cyclists	% of walk trips all the way to work	%of all Public transit. 1,2 & 3 modes	% of car passe- -ngers
Inner Melbourne Region #	43.2	1351	24.4	3.4	1.7	12.4	27.5	4.4
Metropolitan Sydney	26.6.	118	14.2	0.6	3.8	4.5	21.4	6.6
Moreland City region	26.1	1027	16.2	2.6	1.6	2.6	21	6
Boorundara City Region	23.3	956	9.8	1.3	3.4	3	19	4.5
Metropolitan Brisbane	17.4	129	10.4	1.1	4.2	3	13.1	8
Metropolitan Melbourne	17.2	161	10.2	1	2.5	2.9	13.2	6.1
Australia: all urban & rural	16.8	1.1	10.7	1.2	3.2	4.7	11	7.6
Greater Hobart	14.2	56	11.8	1	3.5	7.1	6.1	9.3
Canberra	13.3	142	7.7	2.3	2.5	4.2	6.8	9.4
Darwin	13.2	12	9.9	3.7	2.1	5.7	3.8	9.9
Metropolitan Perth	13.1	95	8.3	1.1	3.5	2.2	9.8	6.9
Metropolitan Adelaide	12.9	235	11.4	1.2	3.7	2.6	9.1	7.1
Greater Dandenong Reg	12	336	11.8	0.6	7.9	1.9	9.5	8.7
Greater Geelong (Victoria)	10.7	152	10.4	1.5	5.3	3.4	5.8	7.8
Melton & Wyndam Region	10.2	42	**5**	0.3	4.3	1.6	8.2	7.8
Mildura Rural City (Victoria)	9.4	34	9.1	1.2	3	6.3	1.9	8.5
Frankston City Region	9.1	323	9.2	0.5	2.8	1.6	7	7.2
Greater Bendigo City (Vic)	8.5	59	10	1.8	5.3	4.9	2	8.6
Ballarat City (Victoria)	8.4	41	10	1.5	7.5	4.5	2.5	7.5
Mornington Penninsula Rg	8	68	7.1	0.6	4	3.9	3.6	6.7
Sth East Outer Melb Reg	7.8	43	4.5	0.3	4.9	1.6	6	7

Notes: # Inner Melb. Region = City's of Melbourne, Yarra, Port Phillip & West Stonningham. Male to female ratio = % of male bicycle commutes divided by % female bicycle commutes

The underlying cause of the growth in oil dependence is the absence of a plan for ecologically sustainable transportthat guarantees the growth of market share for the more sustainable modes of transport in the existing and new urban areas. Indeed, the issue of oil depletion and a reduction in future oil supplies was deliberately excluded from the planning process in Melbourne (Robinson 2002) and in Sydney and Brisbane.

Table 3 is focussed on sustainable commuting modes in the capital cities, including Darwin and Canberra, selected Melbourne metropolitan regions and four Victorian provincial cities. The commuter market share of public transport, walking, bicycling and car passenger commutes are all ranked by the level of incidental exercise involved in commuting. The level of incidental exercise which is conservatively estimated by adding the percentages of walking and cycling commutes (all the way to work) to the percentage of public transport commutes. When accounting for the costs of oil dependence it would be wise take into account the health costs of decreasing levels of incidental exercise.

Incidental exercise has greatly declined since petrol ceased to be rationed in Australia. Using commuter data for the year 1951 (Manning 1984), incidental exercise was estimated to be 50.3 % of all commutes in Melbourne. By 1981, incidental exercise had dropped to 27.1% and dropped again to 17.2% by 2001. In the 1950s it is likely that high levels of incidental exercise were the norm in all Australia cities.

Metropolitan Sydney has a much higher level of incidental exercise (26.6% of commutes) than the other capital cities but much less than the 43.2% in the Inner Melbourne Region (ie the municipalities of Melbourne, Port Phillip, Yarra and the west part of Stonnington). When the commutes for Sydney, Perth, Brisbane and Adelaide are broken down by metropolitan regions (as they are on Figure 4 for Melbourne) these are likely show a similar level of incidental exercise in the inner regions.

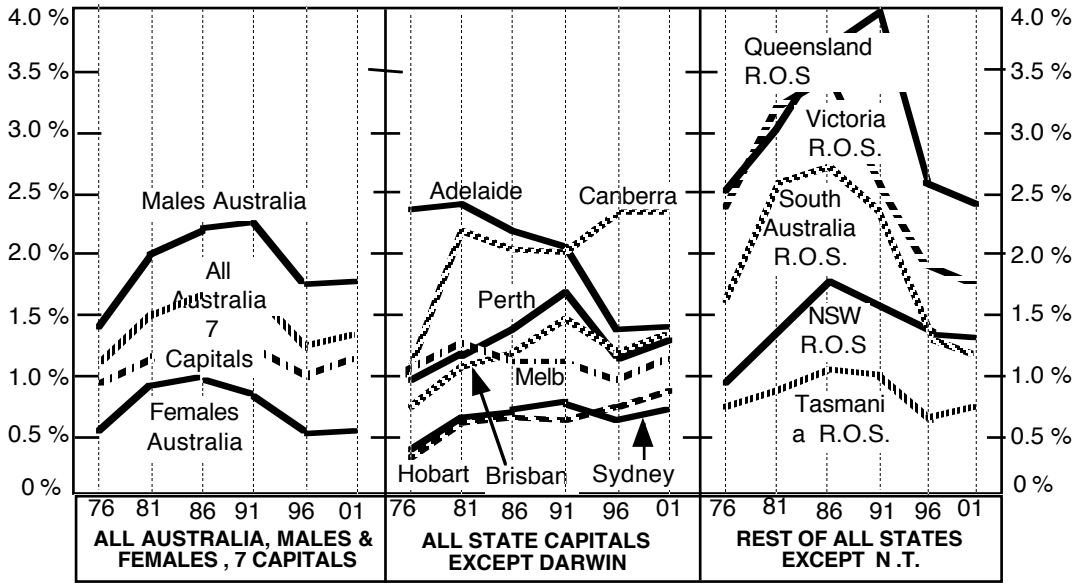
Male and female bicycle commuting trends in most Australian and NZ cities.

In Australia there has been only a small increase in bicycle commutes all the way to work from 1.11% of all commutes in 1976 to 1.15% in 2001, of which 81% were by males.

There are four male dominated commuting modes: powered two wheelers, taxis, trucks and bicycles but only bicycling is considered here because it is a healthy and sustainable form of commuting which needs special consideration in planning to increase its use. The ratio of male to female commutes is shown on Tables 3 and 4 and on the left hand graphs on Figures 5.

The "ratio of male to female commutes" is the ratio of the percentages of male bicyclists in the total of all male commutes, divided by the percentage of female bicyclists in the total of all female commutes. The ratio of the number of male to female bicyclists would not be a fair comparison because female labour force is less than the male labour force.

Figure 5. Australia: percentage of bicycle journeys to work 1976-2001

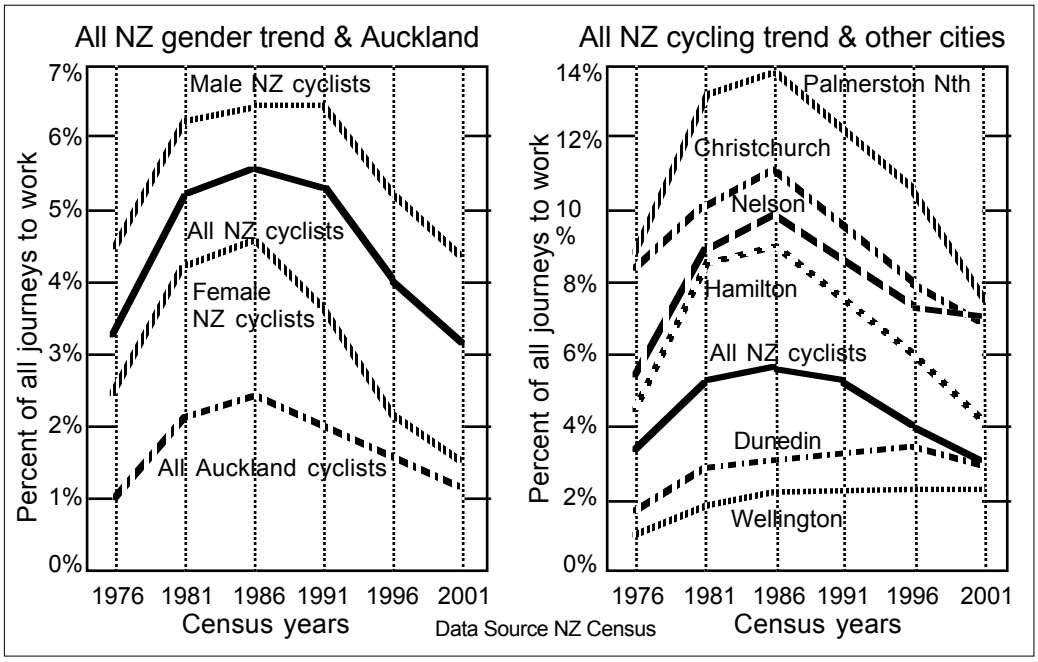


In the six outermost regions of Melbourne the male to female ratio is 4.9 compared to 1.7 in inner Melbourne. In the inner Melbourne Region 8 times as many men per 1000 population

choose to cycle than in the six outer regions and 24 times as many women choose to cycle. This huge difference is due to low density urban sprawl in outer areas which are poorly serviced by public transport, thus generating single occupant car commutes and multiple household car ownership. Work locations are much further apart. The main road network is far less bicycle friendly with multilane roundabouts, few low traffic back routes and very few off road bicycle facilities. For most outer urban commuters using a bicycle is not a safe or convenient choice.

These gender statistics suggest the need for a more secure cycling environment for women in outer suburbia and the need to stop creating more low density urban sprawl. In most Dutch cities cycling is much safer which is why the male to female ratio is between 0.9 or 1.0, compared to a ratio of 2.5 for Melbourne, and 2.7 in NZ. Australian and NZ cities lack the Dutch close knit bikeway networks on which it is much safer to ride (Welleman,1999). Dutch women choose to cycle on local roads with 30 kph speed limits, on bikelanes on roads with a maximum 50 kph limit and on separate one-way bikepaths alongside high speed main roads and freeways because it is safe to do so (Parker 2001) (ECMT 2001).

Figure 6 New Zealand percentage of bicycle journeys to work 1976-2001



New Zealand cities are similar in many ways to Australian cities but some of them have far higher percentages of bicycle commutes. Auckland with 1.4 million inhabitants can be compared to Brisbane, Adelaide or Perth and has similar low % of bicycle commutes. However Christchurch and other NZ provincial cities have much higher levels of bicycle and provide a model for Australian provincial cities .(see the right hand graph on figure 6).

Figure 6 shows that the percentage of bicycle trips in the smaller NZ cities was very high between 1981 and 1991 compared to, Auckland and Wellington. Figure 5 (right graph) shows that in 1991 the rural cities in Queensland also had a much higher % of bicycle commutes but nothing to compare with Palmerston North, Christchurch or Nelson in 1986. In these three cities between 7% and 8% of commutes were by bicycle in 2001 and that is a very good performance compared to any Australian city. However, the greatest change in transport behaviour in both Australia and NZ relates to more women choosing to drive to work from 1976 to 2001, that is reflected in the overall decline in bicycle use in both Australia and NZ from around 1990.

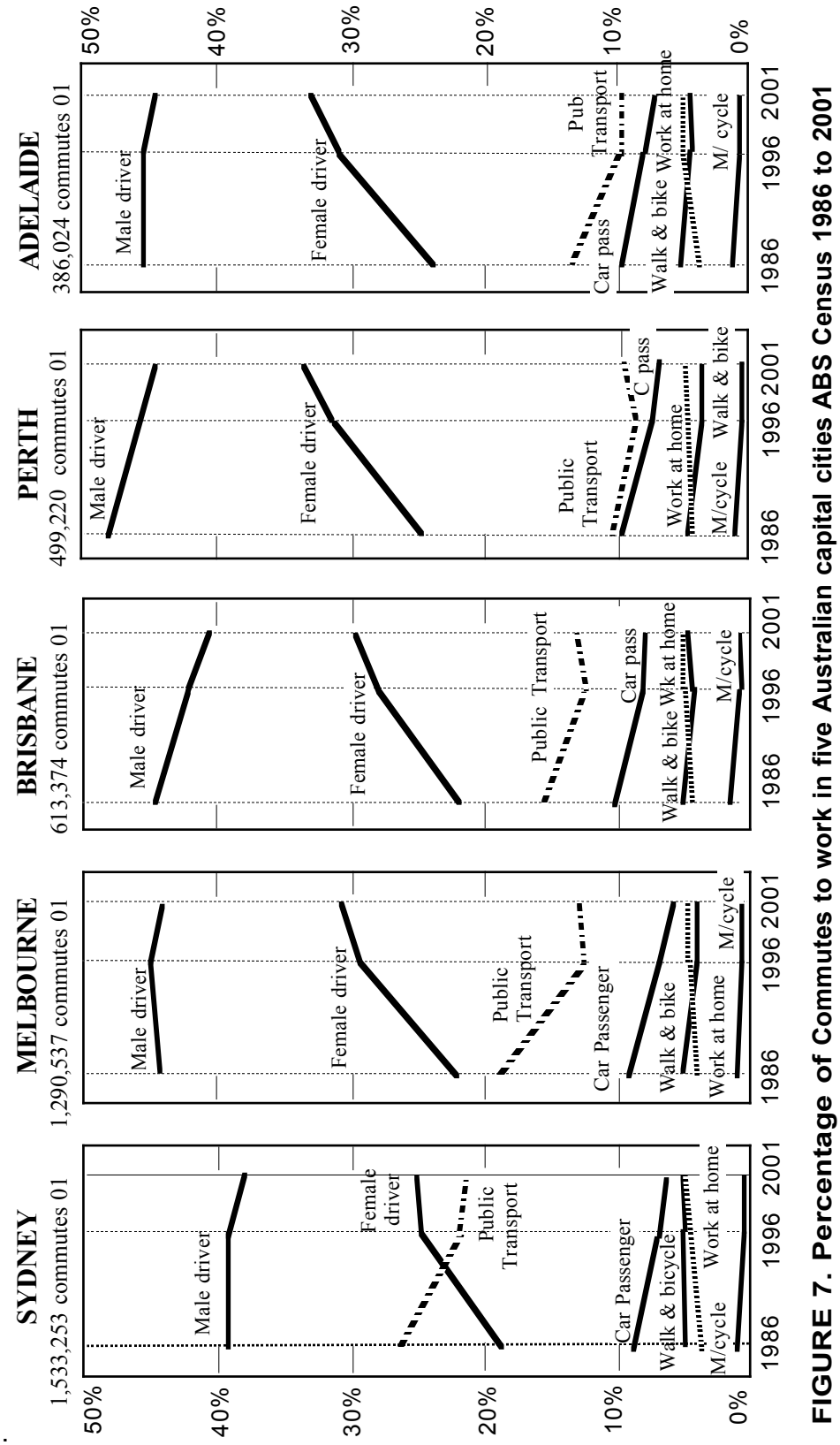


FIGURE 7. Percentage of Commutes to work in five Australian capital cities ABS Census 1986 to 2001

Unsustainable trends in five major Australian cities from 1986 to 2001

The transport trends in five Australian cities from 1986 to 2001 are examined to see which

cities, if any, are making progress in encouraging the more sustainable commuting behaviours that reduce congestion .

Figure 7 compares the five largest Australian capital cities ranked from right to left in terms of population size and showing modal share of single occupant car commutes. Sydney has a significantly lower percentage of male and female driving commutes and a higher proportion of public transport commutes. Perth has the highest proportion of single occupant car commutes and the lowest proportion of commutes by public transport. However the percentages of non-motorised, car passenger and motorcycle commutes and the proportion of those who work at home is similar in all five Australian cities between 1996 and 2001. The percentage of non-motorised commutes (walking plus cycling) in 2001 in Australian cities is very low being only 3.4% of all commutes in Perth and 5.2% of all commutes in Sydney.

Local, state and the Commonwealth governments need to understand the health and welfare implications of both increasing road congestion and decrease in the level of incidental exercise that is a major contribution growing obesity levels in the Australian population. Their is need encourage the use of more smaller and more energy efficient roads vehicles as is being done today in japan and Europe. Extensions of the rail network are needed into the outer suburbs. Clearly some national initiatives are needed to support any plan to reduce road congestion costs and oil dependence in any state and without national policy initiatives actions taken by the Victorian government will have limited impact.

RECOMMENDATION S TO REDUCE Oil DEPENDENCE IN AUSTRALIA

The Australian Census data suggest the need for “urban design/lifestyle” changes, transport mode shifts and urban design (land use) changes to accommodate population growth in the capital cities. To implement these changes across the transport sector will require “road pricing and green taxes”, the use of “other fuels”, particular gas, in the first ten years . A 20 year transition period will be needed in moving from the “age of oil” to the “solar age” and that is mostly a Commonwealth responsibility. The Commonwealths responsibilities for reducing road congestion by reducing oil dependence are set out in the appendix to this submission. What follows are state and local government initiatives

1. Travel Smart programs for the able bodied in outer suburbia

Clearly positive action is needed to reduce road congestion by the state government at the grass roots level, to motivate households to reduce personal car use generally and particularly for commuting. Travel Smart programs for the able bodied need to be applied in the outer suburbs of the capital cities where most single occupant car commutes and driving generally originate. The average reduction in car-kms travelled in the completed WA projects is 13% at a benefit: cost ratio of 30:1, far higher than that of most transport projects. Similar results have been obtained in Europe and the US (Robinson 2005).

The following specific commuter behaviours are proposed for targeting, measuring and evaluation by local government every five years using the Census data:-

1. Reduction in drive alone car commutes by women,
2. Reduction in drive alone car commutes by men,
3. Increased use of public transport,
4. Increase in walk and bicycle commutes all the way to work,
5. Increased intermodal access to the public transport system,
6. Reduced household car ownership via car-pooling, informal car sharing or the development of car clubs.

In Victoria there is a need for the Commonwealth to upgrade the funding of Travel Smart programs to at least $10 million a year or little will be be achieved. To reinforce Travel Smart programs adequate funding for public transport and bikeway networks in outer urban areas is also needed. The Melbourne "Metropolitan Transport Plan" not only fails to recommend rail extension into outer suburbia, it also suggests that Travel Smart programs have little potential in outer suburbia. (See figure 10 on page 33 of the "Metropolitan Transport Plan") That is not the way to go because labour intensive programs are a most effective way to reduce increasingly costly oil dependent transport behaviour in a few years.

Its obvious that Travel Smart programs will be much more effective in outer urban areas if new rail and express bus services are introduced. In the short term both secure bicycle and car parking needs to be provided at modal interchanges that link new radial rail lines with cross suburban express bus services and trunk bus routes. In the longer term bicycles, electric bicycles, shared cars and mini vans can replace single occupant cars as access modes to new public transport services. These services once provided need to be used a quickly as possible to ensure high occupancy levels and Travel Smart programs are one of the best way of marketing them.

2. The need for an "all of government" approach to reduce oil dependency

The need to cooperate with other states and the Commonwealth was ignored in Melbourne 2030 and oil dependence is not even recognised as a serious energy security threat that needs an "all of government approach". What is happened in Victoria is typical of long term strategic planning in other states. The long term strategic plan "Melbourne 2030'" institutionalised the practice of ensuring that public transport and cycling were neglected by allowing VicRoads to determine what the Department of Infrastructure (DOI) did with state transport funds. The DOI was responsible for the conduct of "Melbourne 2030'" but failed to recommend that the State Government change the Transport Act to redefine VicRoads role in reducing the demand for more roads, encouraging walking, cycling and public transport and enabling bicycles to substitute for short drive alone car trips.

Three years after initiating "Melbourne 2030'" Professor Peter Newman recommended, that there needs to be a powerful public transport group created to plan the changes that are needed to the public transport system and be an effective counter weight to VicRoads. It is apparent that DOI and other government agencies, particularly VicRoads did not recognise that increasing oil use is clearly unsupportable in the long term. There was no recognition that world production of light, sweet, crude had already peaked in 2002 and that world production of the remaining light sweet crude, plus the increasing proportion of heavy sour, oil will peak around 2010. This will make car based transport increasingly expensive resulting in a declining in standard of living and a dying economy, if action is not taken now to "decouple economic growth from the growth in oil consumption"

VicRoads has not generated an increase in bicycle commuting since they took planning for bicycles away from the Ministry for Transport as dem onstrated on Figures 1 and 5 and Table 2. If we link bike lanes with local bicycle routes it will encourage bicycle use. Providing that the two networks are developed together in a co-ordinated way into one arterial bicycle network. There is also a need to redefine VicRoads role in creating a close knit arterial bicycle network that links VicRoads bike lanes, local government residential street routes and shared footways provided by local government several other agencies. There are similar problems in other states.

The Australian National Bicycle Strategy has the objectives of substituting bicycle trips for short car trips especially when made on a cold engines; such trips are very polluting,

contribute to increasing fuel consumption, have negative public health effects and greatly increase congestion costs. VicRoads directors in 2001 were totally opposed to the trip substitution concept and while they made "mother hood" statements about support for the National Bicycle Strategy, which also supported trip substitution, VicRoads intention was to ignore them.. (see recommendation 5 for more detail)

A review of the proposed VicRoads bikelane network on main roads, revealed that if it was completed would create a network of 1.5 km x 1.5 km or rectangular equivalent) with huge gaps where the certain freeways, sections of truck routes, the Westgate Bridge and the Bolte Bridges provide short cuts for motorists with no alternative routes for cyclist and pedestrians. Dutch and Danish experience shows that such a course mesh bikelane network will not make it quicker to make a short trip by bicycle than by car, because it will not provide the shortcuts to the arterial road system for cyclists. High speed limits on roads with bikelanes is another serious deterrent to cyclists.(Wellemen 1999)(Parker 2001A)

There no recognition in Melbourne 2030 that bicycle and pedestrian planning is a very labour intensive and requires proper staffing. Bikeway networks are not capital intensive like freeway networks which cost $ billions. The cost of construction is very low in comparison but there is a lot of complex detail to plan, design and construct as well as tiny property acquisitions and endless consultations with interested parties. Bicycle planning is very labour intensive. It does not cost much to provide bicycle facilities on new roads but to retrofit existing roads is sometimes impossible and, if feasible, often a time consuming exercise that involves a number of organisations. (Parker 2001A) VicRoads should a have properly constituted pedestrian/bicycle planning unit with a budget of around $36 million a year for ten years to create a fine mesh bicycle arterial route network in Metropolitan Melbourne (Parker 2001A). The same applies to other road agencies particularly the Road Traffic Authority of NSW

The competent provision of bicycle facilities and programs needs a bicycle/pedestrian planner in every LGA and the state and commonwealth governments needs to recognise the labour intensity and importance of this task. Until that happens new graduates will avoid this kind of work; and will not take bicycle planning seriously as a career option if government persist in providing token measures particularly in integrating bicycle access to public transport in the new outer urban areas which are so spread out that walking is not a convenient means of access.

3. Melbourne 2030 strategy and the 2020 transport plan need a rewrite

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The Melbourne 2030 strategy and the 2020 transport plan should be comprehensive with the following transport objectives :-

- Vehicles must be as clean, quiet, safe and economical as possible.
- The choice of mode for passenger transport must result in the lowest possible energy consumption, reduced road congestion and least possible pollution.
- The locations where people live shop, work and spend their leisure time will be co-ordinated in such a way that the need to travel is minimised.

Dutch experience with implementing the above objectives suggests that there is the potential for a shift of at least 10% of all "drive alone" commuter trips to multiple occupant trips.(Parker 2001) This would seriously reduce congestion and create a more energy efficient car fleet. This is in addition to using bicycles to substitute for short, highly polluting car trips. (Wellemen 1999).

Melbourne 2030 was deficient and failed to do anything about vehicles being as clean, quiet, safe and economical as possible. Indeed, the Victorian government made a major

investment in a plan to produce “gas guzzling” 4WDs and SUVs instead of producing small cars and petrol electric hybrid vehicles. The unsound brief it gave to DOI for Melbourne 2030 reflects this.

Japan’s experience with implementing its energy security policy has reduced oil dependence in the transport sector from 80% in 1973 to 50% in 2004 thus reversing a negative trend (Hook, W. 1994) (Alford 2005). Japan provides a good example of a national energy security plan which was developed in response to the oil crisis of 1973 when several oil dependent industries were closed for several months. Japan formulated the view that national security was about enabling Japan to survive oil shortages; The latest Japanese plan for sustainable development greatly encourages the use of more efficient small cars petrol electric hybrids, vans, trucks, buses and electric bicycles. For details of the use of electric bicycles and the need to upgrade the legislation to enable Victorians to buy them was totaly ignored in the 2020 transport plan. (see recommendation 6)

Dutch experience shows that “greening” the tax system could also provide incentives and constraints to use cars less, so that tax reform results in the conservation of oil reserves and the use of more energy efficient vehicles. The achievement of the ‘big picture’ planning and transport outcomes induced by the Australian Commonwealth “greening” of the tax system, would be dependent on state funding and investment being radically changed so that they reinforce and complement these tax reforms. The Victorian government will fail to reduce road congestion unless it can persuade the Commonwealth to “green the tax system in this way. It must seek support from other state governments to do that.(see Appendix) (Parker 2001B)

4. Prevent new housing developments that lock people into car dependence

Some measures to reduce congestion can be taken at state or local government level without Commonwealth involvement . For example discouraging low density housing and gated communities is the way to enable people to walk, cycle, use public transport or share cars. Some of Melbourne's outer urban areas have so many unoccupied investment properties that it effectively reduces the population density which is already low. This creates the perception of being isolated and vulnerable which discourages walking and cycling. Local and state governments have a role in removing the physical and perceived barriers to non-motorised travel which they approved in the past.

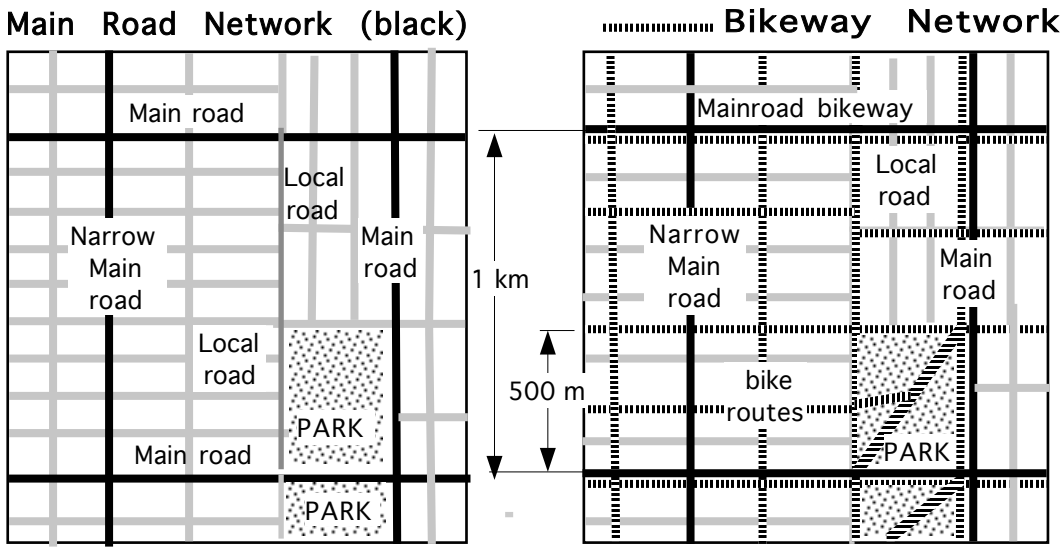
Recently the law was changed so that children aged 11 years or younger are legally allowed to ride bicycles on footpaths alongside pedestrians of all ages. The problem is that in many outer suburban areas the roads have no footpaths. It is necessary to make the urban fabric of the capital and provincial cities more permeable for walkers and cyclists so as to provide safer and more convenient access to an enhanced public transport system.

Studies to identify the existing and future constraints to walking and cycling in the urban fabric are needed in all local government areas (DOI 2002). The fabric of the outer urban areas is not permeable because there are long waterway barriers of rivers and creeks, intermingled with large man made barriers of railways and freeways, many of which are more than one km long and divide communities. Many main roads do not have enough signalised crossings for pedestrians and cyclists to cross in safety.

The residential street and access road network is very important because it connects with off-road ‘shared footways’ used by walkers, the disabled and by cyclists of all ages. More mid block crossings and refuges are needed to link up residential streets, and create walking and cycling routes across main roads. The provision of a safe bicycle route network will require hundreds of safer main road crossings to link footpaths, residential streets, shared footways and back street bypass routes in a co-ordinated route network.

this is illustrated on figure 8.

Figure 8. A Bicycle arterial network should be a recognised part of the hierarchy of roads and have a finer mesh than the main road network



Typical Melbourne middle suburb on rectangular road grid.

Main arterial road networks have a coarse mesh as shown on the left map above. The arterial bikeway network has to be a much finer mesh so that for most short car trips it is more direct and quicker to get from A to B by bicycle as the map on the right map shows in red. The proposed "principal bicycle network" in Melbourne is far too coarse, with too many breaks in the network and too few shortcuts to encourage bicycle use. What is needed are arterial bicycle networks to provide short cuts for cyclists and pedestrians over and under freeways, railway lines, rivers and other barriers to motor vehicle travel. Bikeways on or alongside main roads need to be linked up with traffic calmed local streets and off-road shared footways. Also most one way streets for cars should be two way for bicycles and roads with bikelanes should have a speed limit of 50kph.

Drawn; Alan A Parker 1995

The introduction of a 50 kph limit on local roads in January 2002 and the reduction of the legal leeway given to violators to 3 kph, have made these roads safer for cycling and walking. It makes sense to use them to bypass sections of dangerous main roads. In the longer term a 40 km per limit on all residential streets is required.

As an adaptation measure to reduce oil consumption a close knit bicycle arterial network is needed for Melbourne and all the provincial cities. The mesh of the bike way network would be around 500m x 500m in the inner areas and 750m x 750m in the outer areas, or the rectangular equivalent of these sizes. In Melbourne such a bicycle arterial network would have around 7,500 km of bicycle routes, with proportionally more or less in other cities based on population and urban density. (Parker 2001 A)

4. Put in public transport with safe bicycle access when providing new housing

The absence of public transport is a problem but it can be dealt with relatively easily. Developer contributions for roads and footpaths and for major infrastructure works, such as water reticulation, are fairly common in Australia. State governments should ensure that this development charge is extended to public transport infrastructure and services. Indeed a recent report prepared for the Melbourne Transportation forum states that:-

> *"Public transport services are expensive to operate to an adequate standard in newly developed areas. It is reasonable to expect that some of the funding could be provided by beneficiaries of the development in these areas. In this respect, development levies are a legitimate funding mechanism to consider. If the intention is to increase public transport usage (as it is in Melbourne) it may be appropriate to extend the pre-set schedule of "off the shelf" levies to public transport. In outer Greenfield areas, the greatest need is likely to be for public transport services, whereas in inner areas the need is likely to be infrastructure improvements to improve capacity and priority for buses and trams".(Richardson 2004)*

Such schemes, with a variable charge per square metre for small and large, residential and commercial lots, would encourage urban designers and architects to make more efficient use of available land. As a lesser charge would apply to the more sustainable smaller lots, it would also provide a more equitable outcome.

Table 4 Station catchment area data for walking & cycling with the same physical effort of 75 watts for 7.6 minutes, within a rectangular street grid

	Walking	Mountain bike	Racing bike
Effort advantage	1	3.1	3.8
Speed km/hour	6.1	20	23
Distance km.	0.8	2.5	3
Catchment area sq km	1.3	12.4	19

Table 4 shows that, within a rectangular street network, bicycle access uses the ergonomic advantage of pedalling over walking to go 3.5 times as far and to access an area ten times as large as the pedestrian catchment. Cycling 2 to 3 kms will increase the rail corridor catchment area 4 to 10 times compared to walking; four times for closely spaced stations and 10 times for widely spaced stations. Only 12 % of the population of Metropolitan Melbourne is within easy walking distance of a station but around 70% are within easy cycling distance (Parker 2002). The bicycle and the power assisted electric bicycle will be most important for the elderly to access stations as they reduce the effort required to cycle by 50%.

In most low density outer suburbs stations and express bus stops are too far away to walk to, too time consuming to access by local bus, or not accessible at all by public transport. It is important to provide more safe bike routes, more public transport and to provide secure thief and vandal proof storage for bicycles at rail stations and at express bus stops (Gardiner 1993).

If there was secure bicycle parking and if the rail system was extended into outer urban areas the potential of the the existing rail system would be around 50,000 bike rail commuters. With new express bus services running around the extended radiating rail

routes the potential for bike/rail travel would be well over 100,000 commutes per day. In Brisbane a good start has been made with 1,800 bicycles lockers in use at stations in 2003 and several hundred more lockers being installed in 2004 and 2005. Several hundred bicycle lockers are being provided in 2004 and 2005 on rail systems in Perth, Adelaide, Sydney and Melbourne.(Parker 2002)

If a bicycle is used at both ends of a rail trip, as happens with 25% of the bike/rail commutes in the Netherlands, the rail system not only provides convenient access to the CBD but to most of the inner suburbs within 10 km of the CBD and to suburbs within to two to three km of the radiating rail lines. (ECMT 2001). Japan has the most developed and sophisticated rail system in the world with around 5,500,000 cyclists parking their bicycles at rail and bus stations on their journey to work school or university (Replogle 1992). In Metropolitan there is a planning opportunity to greatly increase the volume of intermodal travel by having a bicycle arterial network that ultimately connects with all rail stations and a new express bus network.(Austroads 2002).

It is recommended that the state government and local government work together to plan new trunk and express bus routes on outer urban main roads and that priority be given to buses using these roads so that they can replace a large proportion of long urban car journeys. Use the ergonomic advantage of cycling over walking to increase the catchment area of these new routes and by providing safe access routes and theft and vandal proof bicycle parking at bus stops.

5. Planning for bicycles to substitute for short car trips

The Dutch have been successful in achieving the trip substitution objective by the integration of demand management strategies, spatial planning strategies (C.R.O.W. 10 1993), the restriction of car parking (C.R.O.W. 11 1994) and an innovative range of bicycle programs (Wellemen 1999).

If, at some future date, oil were to be rationed, as it was in 1940s and as it might be in the not too distant future, bicycle transportation would have obvious advantages. Most of the population in outer urban areas who could no longer use their cars, could use bicycles for journeys up to 7 km, on relatively safe roads used by very few motor vehicles. For longer urban journeys, bicycles could be used to access rail stations and bus stations and if electric bicycles were available it would be a lot easier to cope with longer trips.

Unfortunately metropolitan Melbourne lacks the Dutch close knit bikeway networks on which it is safe to ride. Around one in four Dutch women choose to cycle to work on local roads with 30 kph speed limits, on bikelanes on roads with a maximum 50 kph limit and on separate bikepaths alongside high speed main roads and freeways because it is safe to do so (Welleman, 1999)(Parker 2001). In the outer suburbs of Melbourne around 5 Australian women in a 1000 choose to ride a bicycle to work. 50 times as many women choose to cycle to work in Dutch cities than in Australian outer suburbia. Similar safe riding conditions and high levels of female and male bicycle use exist in many Danish, Swedish and German cities.

The scope for trip substitution is very high in Melbourne. The data in Table 5 are from the Victorian Activity Travel Survey and show that there are 11.8 million trips made everyday in Melbourne for all purposes and that 7.9 million of these trips are made by car. When we consider the current estimates of how far cyclists ride bicycles for all purposes in Melbourne there is a huge potential for bicycles to be used for many of the 5 million cars trips of less than 5 km.

Table 5 Car trips: Melbourne all days, all purposes. Source (VATS 1994 to 1999.

Distance.....	Drivers	Passengers	Total cars	% of trips.
0 to 1 km	624,.246	373,658	997,904	12.6%
1 to 2 km	847,561	521,992	1,369,553	17.3%
0 to 2 km	1,471,807	895,650	2,367,457	30%
0 to 5 km	From VATS 1996		4,977,000	63%

6. Encouraging the use of electric bicycles in Victoria

When we consider the current estimates of how far cyclist ride bicycle for all purposes in Melbourne on table 6 below there is huge potential for bicycles being used by the able bodied instead of cars for trips of 8 km or less and electric bicycles for 16 km or less.

Table 6 How far do cyclists ride In Melbourne

Distance.....	% of trips
0 to 1 km	33%
1 to 2 km	22%
2 to 4 km	19%
4 to 8 km	13%
8 to 16 km	11%
More than 16 km	1%

This applies to the relatively flat areas. For the able bodied in the hilly suburbs of cities E-Bikes are a practical substitute for many urban car trips of less than 10 km. For partially disabled or elderly people many trips are less than 5 km and the use of bicycle, shopping tricycles and electric bicycles would be a great asset. E-Bikes could significantly increase bike lane usage on main roads and make them safer as a consequence. However the Australian Road Rules need to be revised to allow E-Bikes of 300 watts power output to be classed as bicycles as they are in NZ. The best E-Bikes are designed made in Japan and weigh only a few kilograms more than bicycles. They have electronically controlled power assistance via sensors in the cranks linked to a computer chip. Nearly all of the safest Japanese E-Bikes cannot be purchased in Victoria as they would be classified as motor cycles. VicRoads should upgrade its road regulations in line the NZ regulations.

The E-Bike, coupled with roof mounted solar electric panels for over night recharging, has been proven to be practical in Japan and is the most energy efficient motorised road vehicle ever made (see Figure 9). (Parker 2004 A) The Victorian Department of Sustainability and Environment could commission a study to develop a prototype solar PV battery recharging installation for E-Bikes, test the recharging installation over a period of one year and produce a feasibility study for companies willing to market the E-Bike PV battery charging units as a package.

Introducing congestion pricing inner Melbourne, Sydney and Brisbane

Introducing congestion pricing for access to the inner Melbourne, Sydney and Brisbane has a lot of potential. A rash of cities round the globe are set to travel the same road as London, after the apparent success of the first year of the groundbreaking London scheme. Since 1999 car travel has reduced by 400,000 trips daily (4%) and increased bicycle, moped and motorcycle use by 20% with 50,000 fewer vehicles entering the central zone every day thanks to a package of measures introduced by Mayor Ken

Livingstone.

These measures included better bus services, bus lanes, electronic ticketing, slower traffic lights, and the controversial Congestion charging scheme; which will raised A$170 million in its first year and was used to further improve public transport . Note that petrol/electric hybrid cars were exempt from congestion charging.(Clark, A. 2004)

A feasibility study by the UK Department of Transport in 2004 concluded that charging for all motorists could cut traffic by 4%- enough to cut the time drivers spent in traffic jams by as much as 46 %. However other experts said that charging motorists would be pointless unless it raised extra funding for public transport.(Clark, A. 2004)

CONCLUSIONS

It is necessary to tackle the underlying cause of oil dependence rather than the symptoms. The cause of the growth in the demand for oil is that existing policies will result in transport behaviour that increases per capita oil consumption, greenhouse gas emissions in the next 10 years. The reality is that ecologically sustainable development and the evolution of a ecologically sustainable transport system will not take place without de-coupling the oil consumption from economic growth.

The Census Data show very clearly that oil dependence in Metropolitan Melbourne is mostly caused by car dependent commuters who use a vehicle designed to carry three or four people to drive alone to work. Commuting trends are unsustainable and the Census Data for 2006 and 2011 will clearly show this to be the case unless their is a serious attempt to reduce single occupant car commutes. Excessive oil consumption due to car dependence is not caused by the minority of commuters who share cars, use public transport, ride a bike, walk to work or work at home.

Furthermore, most of these unsustainable commutes originate from the sprawling outer suburbs with between 20 and 800 households per square kilometre; where around three quarters of all residents live. In 80% of these households there 2 or more cars and around 85% of the employed household occupants commute by car and are responsible for around 85% of the distance travelled by all capital city commuters. Plans are needed to crack the commuter transport problems and change commuter behaviour. Do that and transport behaviours will change for other motor vehicle trips as well.

The disparity between the growth in oil consumption and oil imports and the decline in indigenous oil production predicts a serious loss of self-sufficiency between 2006 and 2020 (see figure 4 appendix A) If peak oil occurs early it will be disastrous for the world economy. Even if occurs late there is a proven need to act now because research shows that a painless adaptation to peak oil by the developed nations will take 20 years. (see Appendix A)

As far as taxi and truck traffic in cities is concerned the introduction of gas powered or gas/electric hybrid vehicles would reduce pollution and greenhouse gas emissions. Eliminating light commercial vehicle traffic and truck traffic that is in the category of “carrying coals to Newcastle” would also help a great deal. The building of the inland rail freight route from Melbourne to Brisbane and improving the freight rail system in Melbourne would reduce the number of long distance trucks and B-double trucks on Melbourne's and Brisbanes roads.

The need to cooperate with other states and the commonwealth is not recognised as a serious national energy security problem that needs an “all of government approach to reduce oil consumption. The current tax system is a joke that encourages the overuse of

large cars and 4WDs and as detailed in Apppedix A the tax system needs to have a Dutch style greening job done on it to de-couple oil consumption from economic growth. State Governments need to change their Transport Acts to redefine their Road agencies role in reducing the demand for more roads, encouraging walking, cycling and public transport and enabling bicycles to substitute for short, drive alone, car trips.

The commonwealth needs recognise that adequate funding for the sustainable modes of transport ' will contribute towards the national failure to deal with "Peak Oil" which is arguably the greatest threat to Australian national security since federation. The Commonwealth and the states need a Energy Security Policy to reduce and oil dependency with both demand and supply side measures. A strategic oil reserve needs to be created and the use gas as transitional fuel needs to be promoted. It must fund research to prioritise the most effective mitigation measures taken in conjunction with what has yet to recommended by the IEA.

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