ASPO Australia

Australian Association for the Study of Peak Oil and Gas

PEAK OIL AND AUSTRALIA'S NATIONAL INFRASTRUCTURE

SUBMISSION TO INFRASTRUCTURE AUSTRALIA

Australian Association for the Study of Peak Oil and Gas

October 2008

We need to leave oil before it leaves us.

Dr Fatih Birol, Chief Economist, International Energy Agency, 2008

The era of procrastination, of half-measures, of soothing and baffling expedients, of delays, is coming to its close. In its place we are entering a period of consequences.

Winston Churchill, 1936

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About ASPO-Australia

ASPO-Australia is a non-partisan network of professionals working to reduce Australia's oil vulnerability, by bringing the probabilities, risks and opportunities presented by peak oil to the attention of decision-makers. Our membership includes scientists, geologists, engineers, transport and urban planners and a wide range of other professionals, comprising working groups focusing on the implications of peak oil on different sections of the community and the economy. ASPO-Australia's patron is the Honourable Andrew McNamara MP, Queensland Minister for Climate Change, Sustainability and Innovation.

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Executive Summary

World oil production is at or near its historic peak and will most likely begin to decline within several years. Net exports of oil available on the world market have probably entered a decline that will continue more steeply than the declining rate of production. Compounded by the impact of geopolitical circumstances, extreme weather events and other economic trends, the decline in oil availability will see dramatically increasing and highly volatile oil and fuel prices, oil supply shocks and impacts on economic growth, employment, demographics and transport patterns.

Australia's economy, particularly its transport system, is highly dependent on growing supplies of affordable petroleum fuel, however domestic oil production peaked in 2000 and is now in decline. Almost one half of the oil consumed in Australia is imported and the petroleum trade deficit already exceeds $12 billion per annum. Based on official production and demand forecasts Australia will need to import approximately two thirds of its oil by 2015, in a setting of rapidly declining availability and increasing prices in international markets.

The nature of Australia's infrastructure is a key determinant of its oil vulnerability. Much infrastructure investment in recent years has exacerbated the country's oil dependence. Despite growing awareness of peak oil, infrastructure planners have either ignored the phenomenon altogether or explicitly rejected the likely impacts. Many projects are already at risk of failure as their planning assumptions become invalidated by the combined impact of peak oil, the world financial crisis and related economic factors.

More appropriate investment facilitated by Infrastructure Australia will be crucial in mitigating the impact of peak oil. The need to reduce Australia's oil vulnerability should be included in Infrastructure Australia's goals and strategic priorities. Oil vulnerability assessment should be included in the feasibility studies for significant infrastructure projects.

The resilience of existing energy infrastructure needs to be improved, while a longer term transition to sustainable energy is facilitated. Australia needs to establish a strategic petroleum reserve equivalent to 90 days of oil imports. Direct investment needs to be made in renewable, distributed energy infrastructure to minimise the impact of systemic shocks and alleviate the socio-economic impact of peak oil.

Serious flaws in existing transport planning processes have resulted in a high dependence on cars and road freight, which are both highly vulnerable to the impact of peak oil. Infrastructure Australia should commission an independent study into the implications of peak oil for transport planning, in order to determine realistic planning assumptions. Urgent investment in sustainable transport systems is required, including world class public transport and freight rail. Investment in expanding urban motorways should be discontinued, as should airport expansions. The feasibility of high speed passenger rail should be investigated as a long term alternative to air travel.

Introduction

The imminent peak and subsequent decline in world oil production, or 'peak oil', will be a defining feature of the 21st century. Although Prime Minister Kevin Rudd and others have described recent oil price increases as a "third great oil shock", few appear to grasp the full extent of the problem, even as the present world financial crisis shatters much conventional economic wisdom. Australian policy makers must now accept that we have entered a "period of consequences" and adapt to the new realities of the peak oil era.

ASPO-Australia welcomes the opportunity provided by Infrastructure Australia to inform the prioritisation of Australia's national infrastructure development. This submission provides an overview of the peak oil phenomenon, its likely global and domestic socio-economic consequences, and implications for infrastructure planning. Shortcomings with existing plans are identified, as are opportunities for developing transport and energy infrastructure to mitigate the impact of peak oil. This is an enormous problem that needs to be foremost in Infrastructure Australia's deliberations.

The Peak in World Oil Production

Peak oil is a term that refers to the maximum rate, i.e. 'peak' of production in a given oil well, oil field, oil producing country or region, beyond which it goes into irreversible decline. World oil production is already at or near its historic peak. Oil discoveries peaked in the 1960s and the oil production rate has exceeded the discovery rate since the 1980s. In 2007 the production rate was four times the discovery rate (see Figure 1), i.e. only one barrel of oil is being discovered for every four that are currently being used, even before the long lead-times for bringing new oil fields into production are considered.

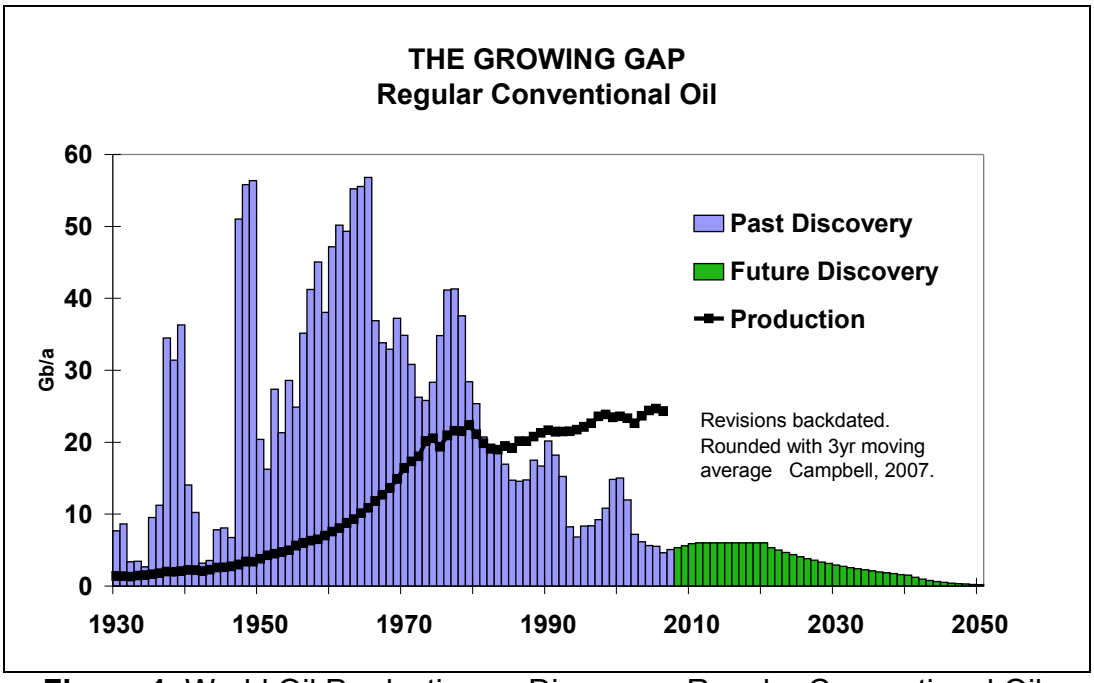

Figure 1. World Oil Production vs Discovery, Regular Conventional Oil, 1930-2050.

Oil production has already peaked in as many as 60 countries and most regions. For example, US production peaked in 1970, North America & Mexico production peaked in 1997, OECD production peaked in 1997, North Sea (UK/Norway/Denmark) production peaked in 2000, Australian production peaked in 2000, non-OPEC, non-FSU production peaked in 2002, and production in Russia and China has probably peaked. Prospects for increasing production of crude oil are found in ever more remote, technically difficult, politically unstable or even hostile locations. Unconventional oil resources such as shale oil and tar sands, while the potential reserves are large, are not able to be produced at sufficient rates to meet the growing gap. Attempts to rapidly scale up the production of alternative fuels such as biofuels and synthetic fuels are encountering serious cost, thermodynamic and environmental constraints.

The 2006 Senate Rural and Regional Affairs and Transport Committee inquiry into peak oil[1] examined a broad range of world oil production forecasts. These were loosely grouped into 'early peak' forecasts envisaging the peak in the 2005-2015 timeframe and 'late peak' forecasts placing the peak beyond 2020. Since then most of the 'late peak' forecasts have been revised by their authors into the 'early peak' timeframe or discredited. Notably, the Senate Inquiry concluded in February last year: "In view of the enormous changes that will be needed to move to a less oil dependent future, Australia should be planning for [peak oil] now."[2] However, the Government is yet to reply to the inquiry report, much less commence planning for this increasingly urgent problem.

The International Energy Agency (IEA) and other official agencies such as the US Energy Information Administration (EIA) and Australian Bureau of Agriculture and Resource Economics (ABARE) have traditionally produced *demand based* forecasts of oil production and simply assumed that reserves and production capacity would meet demand. Typically these have forecast world oil production continuing to increase until at least the 2030 timeframe at rates of up to 120 million barrels per day, compared with the current 87 million barrels per day. Notably, there is already a gap of 1.5 million barrels per day between the *WEO 2006* forecast and actual production, i.e. production growth has fallen 50 per cent short of forecast growth over the last two years. Price forecasts based on these production forecasts have been similarly discredited in recent years, even over the short term.

Since the Senate inquiry, a number of independent *resource based* and *project based* studies of world oil production have concluded that production is likely to peak in the 2007-2018 timeframe, at rates in the range of around 87-95 million barrels per day, before declining at around two to three per cent

[1] See Senate Standing Committee on Rural and Regional Affairs and Transport, *Australia's Future Oil Supply and Alternative Transport Fuels: Final Report*, Parliament of Australia, Canberra, 7 February 2007, at http://www.aph.gov.au/senate/committee/rrat_ctte/oil_supply/report/index.htm.
[2] *Ibid.*, Recommendation 1, paragraph 3.137.

per annum or more steeply. Typical of these is the Colin Campbell/ASPO Oil and Gas Depletion Model[3] shown at Figure 2.[4]

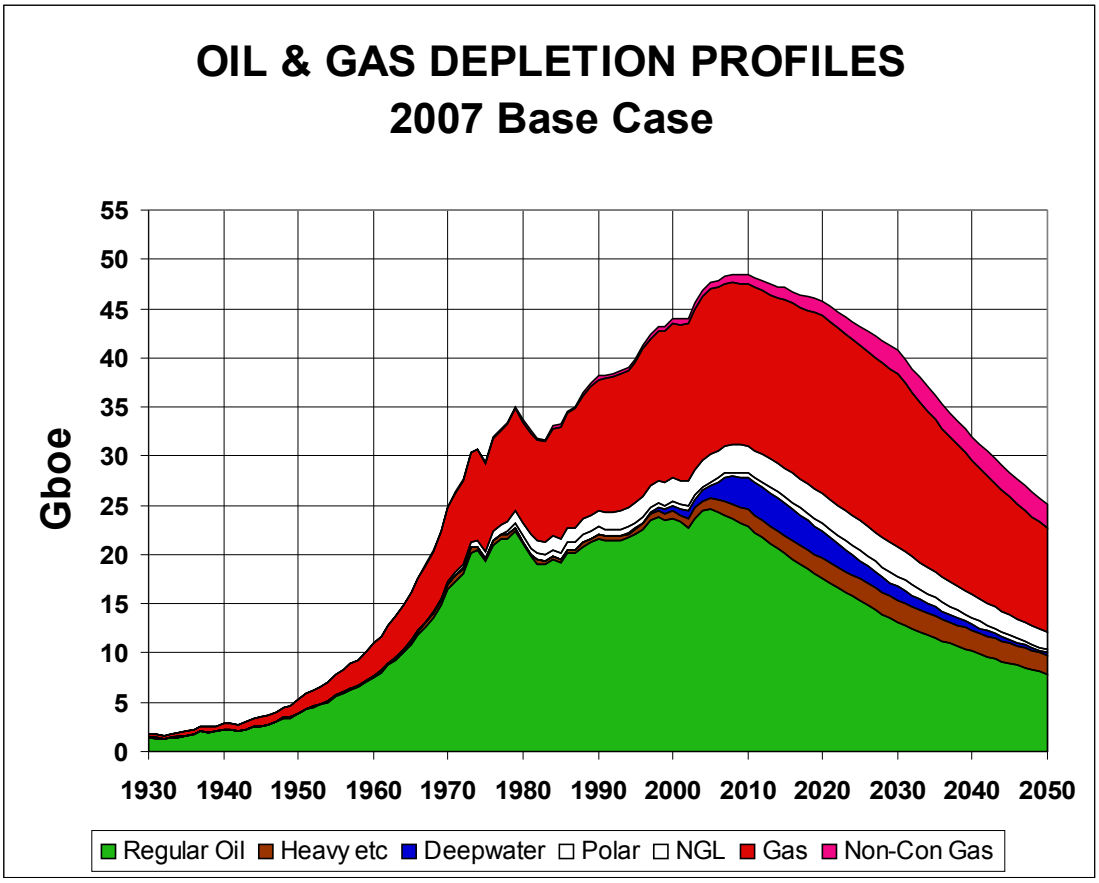

Figure 2. World Oil & Gas Depletion Profiles, ASPO 2007 Base Case.

The project based studies are particularly important as the peak in world oil production makes its transition from theoretical projection to observed phenomenon. Given the five to seven year start-up time for a typical major oil project, and reasonable estimates of depletion rates in existing oil fields, the project based studies provide a good indication of actual production capacities during the period to about 2018, beyond which time underlying depletion in the ageing supergiant oil fields will be the main determinant in overall production rates. Although new oil discoveries continue to be made, the

[3] Regularly updated at http://www.aspo-ireland.org/index.cfm/page/newsletter.

[4] Other recent studies include Werner Zittel and Jörg Schindler, *Crude Oil: The Supply Outlook*, Energy Watch Group, October 2007, at http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Oilreport_10-2007.pdf; Kjell Aleklett, *Peak Oil and the Evolving Strategies of Oil Importing and Exporting Countries: Facing the Hard Truth About an Import Decline for the OECD Countries*, OECD Joint Transport Research Centre, December 2007, at http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DiscussionPaper17.pdf; Fredrik Robelius, *Giant Oil Fields - The Highway to Oil: Giant Oil Fields and their Importance for Future Oil Production*, Uppsala University, September 2007, at http://publications.uu.se/abstract.xsql?dbid=7625; Chris Skrebowski, *Megaprojects Update: Just How Close to Peak Oil are We?*, presentation to the ASPO-USA 2007 World Oil Conference, 18 October 2007, at http://www.aspousa.org/proceedings/houston/presentations/Chris%20Skrebowski%20megaprojects.pdf; and the collaborative, open-source *The Oil Drum/Wikipedia Oil Megaprojects Database*, at http://en.wikipedia.org/wiki/Oil_megaprojects.

inexorable downwards trend in conventional crude oil discoveries has continued since reaching a maximum *four decades ago*.

Despite the evidence, sceptics of the proposition of a near-term oil production peak have tended to resort to a faith-based argument that increasing oil prices would ensure increasing discoveries and production. World demand for oil has continued to surge largely as a result of rapid economic growth in developing countries such as China and India. Oil industry profits and spending on infrastructure and exploration have been at record levels. However observed data shows that the rate of world liquid fuel production has been on a plateau at approximately 85 million barrels per day since 2005 (see Figure 3). The theory of increasing prices bringing about concomitant increases in oil production has been discredited. There is little or no evidence that world oil production can continue to grow beyond the next decade, indeed the evidence strongly indicates the opposite – a high probability that world oil production will be declining within several years.

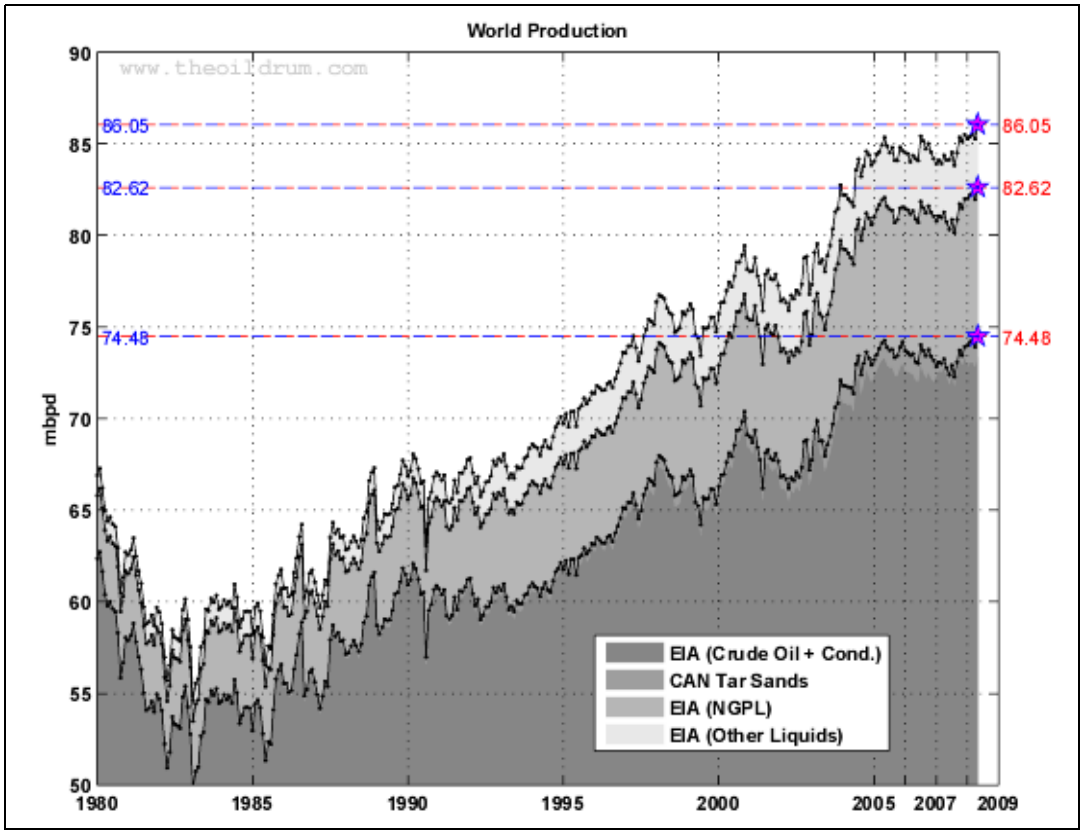

Figure 3. World Oil Production, 1980-2008 (EIA monthly data).

While many economists are currently predicting that the current world financial crisis will see oil demand decline and prices ease substantially, the paradox is that this will likely hasten the onset of peak oil. The enormous capital investment needed to complete the large new oil projects that would marginally increase production over the next several years (see Figure 4) will likely fall victim to the combined impact of easing prices and the credit crunch. Delays in these projects, coupled with underlying depletion in the existing super-giant oil fields, may herald the arrival of peak oil.

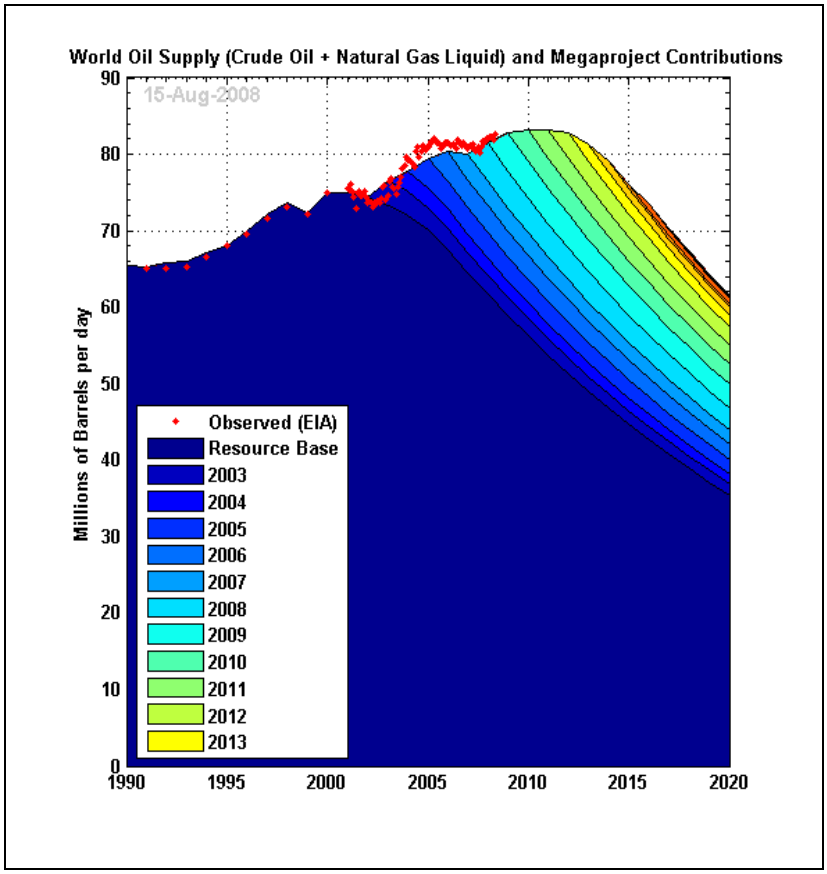

Figure 4. The Oil Drum/Wikipedia Oil Megaprojects Database, Moderate Decline Rate (4.5% per annum) Scenario, world oil supply and megaproject contributions, compared to observed EIA production data.

Peak oil is gradually being accepted by the IEA and other agencies. The IEA has undertaken a major review of world oil and gas supply prospects for its forthcoming *World Energy Outlook 2008*, including resource based and projects based methodologies similar to those cited above. This included a detailed field-by-field analysis of trends and prospects for production and decline rates at more than 400 of the world's largest fields, and a full review of reserves and resources.[5] IEA Chief Economist Fatih Birol Birol alluded to the outcomes in a recent interview: "when we present the *WEO 2008* this November, I think it possible that *the sirens will shrill even louder*."[6] [7] Birol earlier wrote in *The Independent*: "we need to leave oil before it leaves us."[8]

[5] See Fatih Birol, *World Energy Outlook 2008: The Road to Copenhagen*, OECD/IEA, 17 April 2008, at http://www.iea.org/Textbase/work/2008/weocopenhagen/Birol_Copenhagen.pdf.

[6] Interview by Astrid Schneider, "Die Sirenen Shrillen", *Internationale Politik*, April 2008, at http://www.internationalepolitik.de/archiv/jahrgang-2008/april/--die-sirenen-schrillen--.html (English translation at http://transitionculture.org/2008/06/12/fatih-birol-offers-the-world-an-oil-health-check/).

[7] The IEA was established by the OECD to counter-balance OPEC and represent the interests of major oil-consuming nations. Unlike the IPCC it is not a broad-based international organisation and in the past there have been serious grounds for doubting the objectivity and reliability of IEA oil forecasts. Although recently the IEA has become more open to oil depletion methodology, Australia should not rely on IEA information alone while neglecting other more independent assessments such as those of Energy Watch Group and ASPO.

[8] Fatih Birol, "We Can't Cling to Crude: We should Leave Oil Before it Leaves Us", *The Independent*, 2 March 2008, at http://www.independent.co.uk/news/business/comment/outside-view-we-cant-cling-to-crude-

Peak oil is being compounded by growing domestic consumption in the key oil producing and exporting countries, resulting in declining net exports available on the market for net importers. Total net exports from the world's top 20 exporting countries have been trending downwards since mid-2005 (see Figure 5). A recent independent study produced a 'middle case' scenario in which exports from the world's top five oil exporters decline by 6.2 per cent per year from the present rate of approximately 24 million barrels per day to approximately 12.5 million barrels per day by 2015,[9] i.e. *a decline equivalent to one quarter of the world's internationally traded oil over the next seven years*. This analysis is reinforced by Jeff Rubin from CIBC World Markets, who recently estimated that world exports will decline by 2.5 million barrels per day over the next three years.[10]

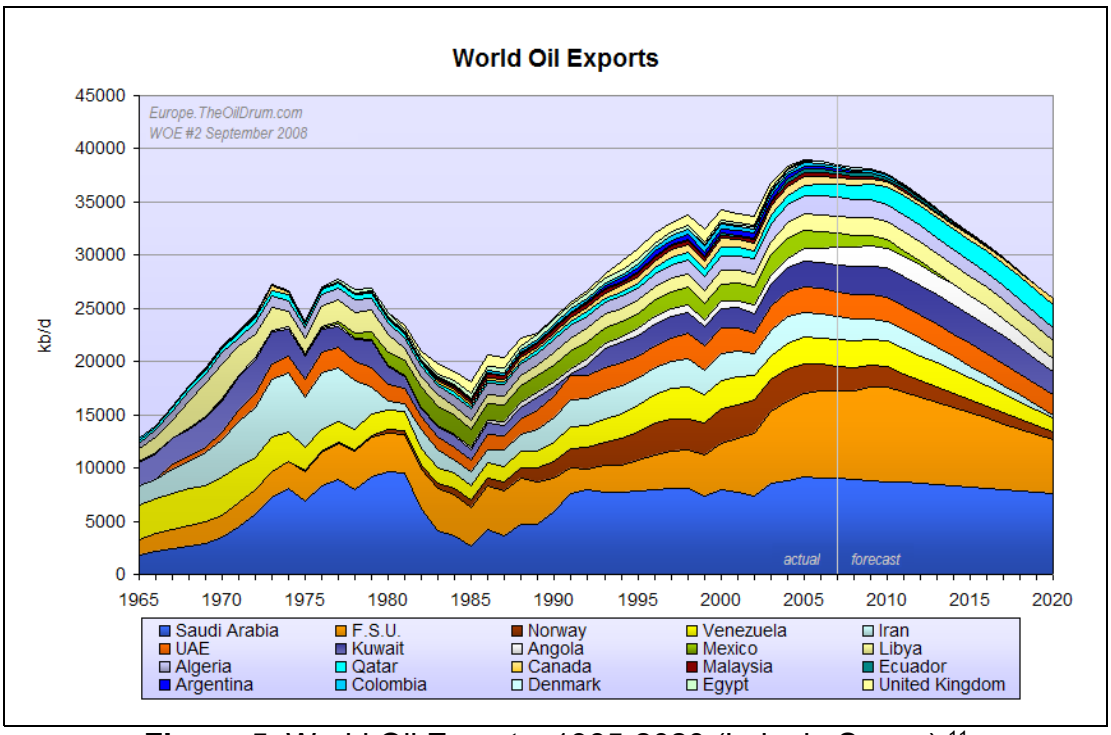

Figure 5. World Oil Exports, 1965-2020 (Luis de Sousa).[11]

The peak oil phenomenon will be a major historical disjuncture, between the era of increasing supplies of cheap, abundant energy and an era of declining supplies of scarce, expensive energy. The fact that few countries have begun to make any preparations means that the onset of peak oil will bring major, world-wide socio-economic upheaval.

Implications for the World Economy

we-should-leave-oil-before-it-leaves-us-790178.html.

[9] "A Quantitative Assessment of Future Net Oil Exports by the Top Five Net Oil Exporters", *Energy Bulletin*, 8 January 2008, at http://www.energybulletin.net/38948.html.

[10] Jeff Rubin, "OPEC's Growing Call on Itself", presentation to the *6th Annual International ASPO Conference*, Ireland, September 2007, at http://www.aspo-ireland.org/contentfiles/ASPO6/2-3_ASPO6_JRubin.pdf.

[11] Luis de Sousa, "World Oil Exports No. 2", *The Oil Drum*, 19 September 2008, at http://europe.theoildrum.com/node/4513.

Even among those who accept the fact that world oil production is peaking, many tend to dismiss the problem on the faith-based assumptions that "the market will sort it out" or that there will be a seamless transition to "something else." Such views ignore the importance of oil in the world economy, the enormity of the transition to alternative fuels and/or technologies, the impact that high oil prices are already having, and the compounding impacts of peak oil with other global sustainability and economic shocks.

Oil is the world's most important primary energy source, providing more than one third of all energy. 80-95 per cent of all transport is fuelled by petroleum. All petrochemicals are produced from oil. 95 per cent of goods arrive at the point of sale using oil. 99 per cent of our food involves the use of oil and/or gas for fertiliser, pesticides, ploughing, cultivation, processing and transport. For the last half century there has been a close correlation between world economic growth and growth in world oil production. Robert Hirsch estimates that a one per cent decline in world oil supply would roughly equate to a one per cent decline in world GDP, in order of magnitude.[12] The recessions that followed the 1970s oil shocks provide an indication of the impact of *temporary* oil production declines. In a seminal 2005 report commissioned by the US Department of Energy (the 'Hirsch Report'),[13] Hirsch *et. al.* concluded:

> *The long-run impact of sustained, significantly increased oil prices associated with oil peaking will be severe. Virtually certain are increases in inflation and unemployment, declines in the output of goods and services, and a degradation of living standards. Without timely mitigation, the long-run impact on the developed economies will almost certainly be extremely damaging, while many developing nations will likely be even worse off.*[14]

Much of the Hirsch Report was devoted to scenarios for mitigating the liquid fuel shortfall following peak oil, with each scenario assuming the implementation of 'crash programs' in fuel efficiency and alternative fuel production. A crash program to produce substitute fuel equivalent to of one per cent of world oil production would cost at least $US100 billion and take more than a decade. The scenario in which crash programs were implemented 20 years before world oil production peaked offered "the possibility of avoiding a world liquid fuels shortfall", whereas "waiting until world oil production peaks before taking crash program action leaves the world with a significant liquid fuel deficit for more than two decades", resulting in the "world supply/demand balance [being] achieved through massive demand destruction (shortages), which would translate to significant economic hardship."[15] Given that no such crash programs have yet been

[12] Robert L. Hirsch, *World Oil Shortage: Scenarios for Mitigation Planning*, presentation to ASPO-USA World Oil Conference, Houston, October 2007, p. 3, at http://www.aspousa.org/proceedings/houston/presentations/HIRSCH%20HOUSTON-ASPO-USA.pdf.
[13] *Peaking of World Oil Production: Impacts, Mitigation and Risk Management*, February 2005, pp., 27-28, at http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf.
[14] *Ibid.*, p 30.
[15] *Ibid.*, p. 59.

implemented and declines of several per cent per year are imminent, the most likely scenario now is one of "significant economic hardship."

With the world oil production trend merely on a plateau rather than in decline, i.e. even before there is conclusive evidence of it having peaked, the IEA has already observed "devastating" demand destruction in the US and other OECD countries, contributing substantially to a slowdown in the global economy,[16] while Jeff Rubin has calculated that the impact of rising oil prices on global transport costs in recent years has effectively offset all of the trade liberalisation efforts of the past three decades.[17] More than 100 developing countries are currently experiencing fuel and/or energy shortages, while demand for biofuel feedstock is contributing to a prolonged world food crisis.

Most importantly, peak oil is merely one of several serious, compounding problems bearing down on society. Thomas Homer-Dixon, among others, identifies five converging "tectonic stresses" that are increasingly likely to trigger "synchronous failure" in modern civilisation over the coming decades. These include population stress, energy stress (including peak oil), environmental stress, climate stress and economic stress (for example the current global financial crisis).[18] Energy stress is the most serious:

> *… energy is society's critical* master resource*: when it's scarce and costly, everything we try to do, including growing our own food, obtaining other resources like fresh water, transmitting and processing information, and defending ourselves, becomes far harder.*[19]

Bearing these factors in mind, it is likely that the next decade will feature not only a transition to declining world oil production but periodic oil shocks, i.e. sudden, serious disruptions to oil supplies. These may be triggered by geopolitical events, such as the 1979 Iranian Revolution which caused a sudden decline equivalent to six per cent of current world oil production, or natural disasters such as Hurricane Katrina in 2005, which shut in the equivalent of on quarter of annual Gulf of Mexico production and contributed to substantial oil price increases. Events such as these will have severe impacts upon the global, regional and domestic economies.

Socio-economic Implications for Australia

The current resources boom has given rise to the notion of Australia as an emerging "energy superpower."[20] Australia does indeed have large fossil fuel

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[16] See IEA, *Medium Term Oil Market Report*, July 2008, at http://omrpublic.iea.org/mtomr.htm.
[17] Jeff Rubin and Benjamin Tal, "Will Soaring Transport Costs Reverse Globalization?", *StratagEcon*, CIBC World Markets, 27 May 2008, at http://research.cibcwm.com/economic_public/download/smay08.pdf.
[18] Thomas Homer-Dixon, *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilisation*, Text Publishing, Melbourne, 2006, pp. 9-30.
[19] *Ibid.*, p. 12.
[20] See for example former Prime Minister John Howard, *Australia's National Challenges: Energy and Water*, speech to the Committee for Economic Development of Australia (CEDA), 17 July 2006, transcript at http://ceda.com.au/public/package/howard_200607/howard_200607_speech.html.

and mineral reserves, and is an important exporter of these commodities in world terms, particularly uranium and coal. In the case of oil and gas, however, the situation is very different. Domestic oil production is already in decline and most of our natural gas is being exported very cheaply while we lack the wherewithal for it to be utilised as a mainstream transport fuel. Given Australia's geography and the nature of its existing transport systems, oil dependence is becoming somewhat of an economic Achilles heel.

In the coming years Australia will experience serious difficulty in securing affordable supplies of petroleum fuels at present or forecast consumption rates. With its domestic oil production having peaked in 2000, Australia is already about 50 per cent import dependent. Based on current Geoscience Australia (GA) production forecasts and ABARE demand forecasts, Australia will be two thirds dependent on petroleum imports by 2015 (see Figure 6). Depending on oil prices, exchange rates and other variables, the petroleum trade deficit alone could climb from its current level of $12 billion per annum to the $40-80 billion range in that same timeframe. This is clearly unsustainable.

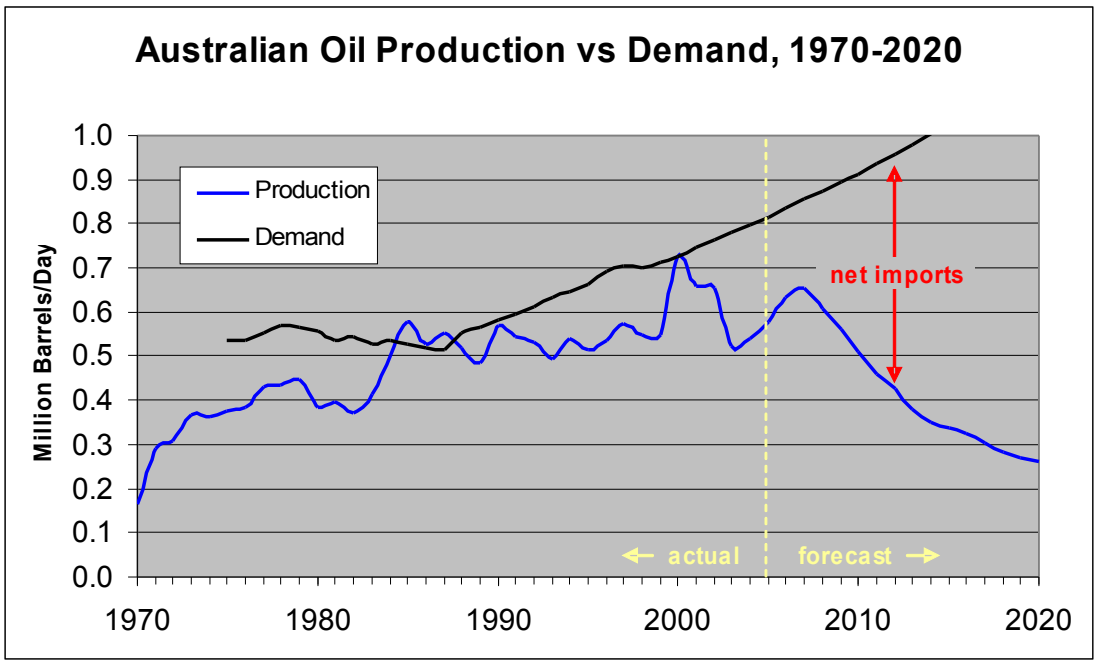

Figure 6. Australian Oil Production (Geoscience Australia, actual and P50 forecast) vs Demand (ABARE), 1970-2030.

While there are contingency plans in place to address *short-term* supply disruptions through cooperation with other OECD nations and various emergency mechanisms for controlling domestic demand,[21] these will not address the sort of *long-term* supply disruptions and highly volatile prices that will result from the *permanent decline* in world production. Australia is unique among OECD nations for not maintaining a 90-day strategic petroleum reserve, contrary to the fact that it is party to the IEA agreement that mandates such a reserve, instead relying on the petroleum already coming through the supply chain to provide a buffer for short-term shocks. This is a

[21] See for example Commonwealth of Australia, *Liquid Fuel Emergency Act 1984*, Canberra, at http://www.austlii.edu.au/au/legis/cth/consol_act/lfea1984213/.

very serious shortcoming, among many others, that will leave the country's economy highly vulnerable to the whims of market forces during the oil supply shocks that will likely characterise the peak oil era.

The domestic socio-economic implications arising from peak oil will likely be severe. Recent economic modelling on the impact of a near-term peak in world oil production by the CSIRO indicated fuel prices as high as $8 per litre by 2018, a reduction in passenger and freight travel of up to 40 per cent and a decline in GDP of at least three per cent.[22] At the micro-economic level the combined impact of rising oil prices and high debt levels has been the subject of extensive ongoing research by Jago Dodson, and Neil Sipe of Griffith University, among others. In *Unsettling Suburbia*, the most recent in a series of papers on the subject, Dodson and Sipe find that the car dependent residents of outer suburbs that are poorly serviced by public transport are highly vulnerable to the combination of high fuel prices and mortgage debt. Notably, a disproportionate impact is being experienced by already disadvantaged socio-economic groups.[23] These impacts will likely be compounded by the flow-on effects of the world financial crisis and other systemic shocks, including climate change impacts.

Infrastructure Australia's Goals and Strategic Priorities

The nature of Australia's infrastructure is a key determinant of its oil vulnerability. Although much infrastructure investment in recent years has exacerbated the country's oil dependence, more appropriate investment facilitated by Infrastructure Australia should play a leading role in the national peak oil mitigation effort.

ASPO-Australia welcomes the principled approach articulated in Infrastructure Australia's draft goals and strategic priorities. The imperative of reducing oil dependence is consistent with the existing goals, namely: increased economic standard of living for Australians; environmental sustainability and reduced greenhouse gas emissions; and better social outcomes, quality of life, and reduced social disadvantage in cities and regions. However this objective needs to be made more explicit to provide clear policy direction.

Given that oil is a non-renewable resource, peak oil is by definition a 'sustainability' problem. Unlike environmental sustainability issues such as climate change, the manner in which Australia comes to terms with declining world and domestic oil production is fundamentally an economic problem. Unfortunately the Federal Government is yet to even acknowledge peak oil much less formulate a plan for how to sustain the economy in the face of oil decline. Where peak oil relates to climate change and the broader environmental sustainability debate is that urgent action is needed while petroleum fuels are still sufficiently abundant and affordable. This factor is

[22] CSIRO Future Fuels Forum, *Fuel for Thought: The Future of Transport Fuels*, June 2008, at http://www.csiro.au/resources/FuelForThoughtReport.html.
[23] Jago Dodson and Neil Sipe, *Unsettling Suburbia: The New Landscape of Oil and Mortgage Vulnerability in Australian Cities*, Griffith University, August 2008, at http://www.griffith.edu.au/__data/assets/pdf_file/0003/88851/urp-rp17-dodson-sipe-2008.pdf.

sadly absent from the public debate, to the detriment of policy formulation. The market-based response implied in the emissions trading scheme proposed by the Federal Government, for example, is unlikely to trigger sufficiently urgent investment in alternative energy and transport infrastructure before the economic impacts of peak oil, such as steeply rising construction costs, render many options prohibitively expensive.[24] Conversely, timely public investment in such infrastructure would facilitate the transition to a post-carbon economy and provide a buffer against the economic downturn.

Recommendation 1. Include the need to "reduce Australia's oil vulnerability" in Infrastructure Australia's goals and strategic priorities.

ASPO-Australia has previously highlighted serious flaws in the planning for major infrastructure projects.[25] Despite growing awareness of peak oil by decision-makers, planners have either ignored the phenomenon altogether or explicitly rejected the likely impacts. Many projects are already at risk of failure as their planning assumptions become invalidated by the combined impact of peak oil, the world financial crisis and related economic factors. One example of this is the disastrous $1.2 billion initial public offering by Brisconnections, owner/operator of Brisbane's proposed Airport Link tunnel, the largest infrastructure project in the country. The value of $1 initial instalments has already collapsed to below 3c as a result of declining market confidence in the project's over-inflated traffic forecasts. The financial model upon which this project was based has been described as the "dead-parrot model."[26] Infrastructure Australia should mandate the conduct of oil vulnerability assessments as part of the feasibility studies for all significant projects.

Recommendation 2. Mandate the conduct of oil vulnerability assessments in the feasibility studies for significant infrastructure.

Energy Infrastructure

Australia's energy policies have to date revolved around maximising energy commodity exports, increasing the capacity of centralised infrastructure to meet growing energy demand and, more recently, the need to reduce carbon emissions. Policy makers and infrastructure planners need to adapt to the new context of Australia's oil vulnerability. The resilience of the existing

[24] See Stuart McCarthy, *Implications of Oil Production Decline Forecasts for Copenhagen 2009*, letter to Garnaut Review, 22 September 2008, at http://www.aspo-australia.org.au/References/Bruce/Letter-Garnaut-Sep-2008.doc.
[25] See for example Stuart McCarthy, *Oil Depletion and the New Parallel Runway: Submission to the Brisbane Airport Corporation*, February 2007, at http://www.aspo-australia.org.au/References/ASPO-Qld/McCarthy-Brisbane-Airport.doc; and *Peak Oil and the Northern Link EIS: Submission to the Queensland Coordinator-General*, January 2008, at http://www.aspo-australia.org.au/References/ASPO-Brisbane/Northern-Link-EIS-28Jan-2008-v2.doc.
[26] Michael West, "Macquarie's Dead-Parrot Model", *Sydney Morning Herald*, 31 July 2008, at http://business.smh.com.au/business/macquaries-deadparrot-model-20080731-3nwt.html.

energy market to near term external shocks needs to be improved, while a longer term transition to sustainable energy is facilitated.

Australia needs to establish a strategic petroleum reserve equivalent to 90 days of oil imports. One solution might be to establish crude oil reserves adjacent to existing refineries in Sydney and Brisbane, with capacities equivalent to 90 days' production at those facilities. At present Eastern Australia is mainly dependent on imported oil, whereas domestic production in Southern and Western Australia provides a higher degree of self-sufficiency in those areas, at least in the short term. Further reserves would need to be established in Southern and Western Australia as domestic production continues to decline and import dependence increases.

Recommendation 3. Establish a strategic petroleum reserve.

The climate change mitigation debate in Australia has focused largely on costs and potential job losses in the mining and energy sector, while several important considerations have bee overlooked. The first is that centralised energy infrastructure is vulnerable to systemic shocks arising from peak oil. A second consideration is that peak oil will likely exacerbate increasing stationary energy costs due to the centralised nature of the infrastructure and the dependence of mining and transport on petroleum fuels. One method of alleviating the costs for consumers would be to develop de-centralised, or 'distributed' renewable energy networks, for example grid-connected solar PV systems. The added benefit would be to strengthen the resilience of energy systems and improve the self-sufficiency of local communities. A well managed transition to renewable energy also offers the prospect of increased employment and other socio-economic benefits, particularly in regional areas. One recent study found that a shift to a renewable energy economy in the Hunter region would create a net gain of between 3,900 to 10,700 jobs.[27] This could alleviate the socio-economic impact of peak oil as well as reducing carbon emissions.

Recommendation 4. The Federal Government should invest directly in renewable, distributed energy infrastructure.

Transport Infrastructure

With approximately two-thirds of overall petroleum consumption attributable to the transport sector, appropriate investment in transport infrastructure is crucial to alleviating Australia's oil vulnerability. Serious flaws in existing transport planning processes have resulted in over-investment in urban motorway and airport expansions and under-investment in public transport and rail infrastructure. Remedying this imbalance is probably Infrastructure Australia's most important task.

[27]Anthea Bill, *et. al.*, *A Just Transition to a Renewable Energy Economy in the Hunter Region, Australia*, Centre of Full Employment and Equity, June 2008, at http://www.greenpeace.org/australia/resources/reports/climate-change/just-transition-report.

Existing shortcomings in transport infrastructure planning are largely attributable to discredited oil price forecasts and flawed transport projections by official government agencies, which ignore the onset of peak oil and its various socio-economic impacts. ABARE invariably forecasts falling oil prices despite the tightening world oil supply situation, believing that high prices will trigger increased supply. When challenged about these forecasts during the 2006 Senate inquiry into peak oil, a former head of ABARE stated "if the price of eggs is high enough, even the roosters will start to lay."[28] BITRE is currently forecasting average metropolitan traffic growth of 37 per cent between 2005 and 2020[29] and four per cent annual growth in passenger movements through capital city airports for the next 20 years.[30] These projections either ignore oil prices as an 'externality' or make unsupportable assumptions about alternative fuels and propulsion systems, in terms of scale, time, cost and the laws of physics. Underlying assumptions about perpetual economic, employment and population growth are also highly questionable. No detailed studies into the nature and magnitude of peak oil mitigation have been undertaken in Australia to support these assumptions.

The absence of an Australian equivalent of the Hirsch Report, coupled with widespread ignorance and/or denial of peak oil, has resulted in the predominance of wishful thinking rather than rigorous, objective analysis. Given the significance of peak oil for transport infrastructure planning, Infrastructure Australia should commission an independent study to develop a set of realistic planning assumptions which take into account the socio-economic implications of peak oil. The study would consider realistic forecasts of world oil production and trade, domestic oil production, oil prices, related economic implications, short to medium term impacts on various transport modes, and prospects for a medium to long term transition of those modes to alternative fuels and propulsion systems.

Recommendation 5. Commission an independent study into the implications of peak oil for transport planning, in order to determine realistic planning assumptions.

Arguments for expanding urban road networks are usually based on the need to alleviate traffic congestion, while the underlying problem of car dependence is ignored. Peter Newman and others have written extensively about the enormous socio-economic costs associated with high levels of car dependence in Australia's cities. In direct dollar terms, car dependence costs local economies literally tens of billions of dollars per year. Despite this body of literature, 'transport' is synonymous with 'roads' in the minds of most policy-makers, while sustainable transport proponents are dismissed as 'anti-car' ideologues. The combination of steeply increasing construction costs, the lack of available surface space necessitating tunnelling road network expansions

[28] Jonathan Holmes (rep.), "Peak Oil?", *Four Corners*, ABC Television, 10 July 2006, transcript available at http://www.abc.net.au/4corners/content/2006/s1683060.htm.
[29] BITRE, *Working Paper 71: Estimating Urban Traffic and Congestion Cost Trends for Australian Cities*, April 2007, at http://www.bitre.gov.au/publications/49/Files/wp71.pdf.
[30] BITRE, *Working Paper 72: Air Passenger Movements Through Capital City Airports to 2025-26*, May 2008, at http://www.bitre.gov.au/publications/37/Files/WP72.pdf.

and failed PPP financial models means that most motorway expansions are now well beyond the point of diminishing return. Decades of urban planning and transport policy failures, for example the $5 billion annual road user deficit,[31] are now exacerbated by the onset declining oil production.

Several state and local governments are at various stages of planning for peak oil. Parliamentary inquiries are currently underway in New South Wales and South Australia. The Queensland Government has begun to develop an Oil Resilience Strategy.[32] Brisbane City Council recently commissioned a detailed investigation into the combined impacts of peak oil and climate change, although many of the findings and recommendations were subsequently repudiated.[33] In Western Australia, while the state government has not undertaken a parliamentary inquiry, expansion of public transport is well underway partly in response to concern about peak oil.

Despite these efforts, literally tens of billions of dollars continue to be committed to motorway expansions based on seriously flawed traffic modelling and forecasting, with disastrous financial results. Flawed traffic forecasts have already resulted in the financial collapse of Sydney's $1 billion Cross City Tunnel, write-offs of investments in the $1.1 billion Lane Cove tunnel and the collapse of share prices for Brisbane's $3.2 billion North South Bypass Tunnel and $4.2 billion Airport Link, among others. Brisbane City Council has committed more than $500 million in public funds to the NSBT. Notwithstanding the outcomes of the above recommendation, Infrastructure Australia should allocate a low priority for urban motorway expansions.

Recommendation 6. Allocate a low priority for urban motorway expansions.

There is already a serious deficit of high quality public transport in Australia's capital cities, due to chronic underfunding by federal and state governments over many decades. Around 10 per cent of all urban trips are taken on public transport. Despite existing inadequacies, patronage has surged in recent years largely in response to rising fuel prices, even before the onset of peak oil. Over the last decade Brisbane has seen an increase of 41 per cent and Melbourne an increase of 33 per cent, with patrons often left waiting at bus stops and railway stations due to overcrowding. Urgent investment is needed to upgrade and expand Australia's urban public transport networks to world class standard, incorporating fast, high frequency, integrated services. Such improvements would also be a more cost-effective solution to alleviating traffic congestion.

Freight rail infrastructure has suffered similar neglect and requires equally urgent investment to facilitate the transfer of freight from road to rail. This

[31] Chris Riedy, *Energy and Transport Subsidies in Australia: 2007 Update*, Institute for Sustainable Futures, April 2007, at http://www.isf.uts.edu.au/publications/riedy2007subsidies.pdf.
[32] See http://www.epa.qld.gov.au/environmental_management/sustainability/.
[33] Maunsell Australia and Brisbane City Council, *A Call for Action: Climate Change and Energy Taskforce Final Report*, Brisbane, 12 March 2007, at http://www.brisbane.qld.gov.au/.

would involve track re-alignments and duplications, improved freight hubs and intermodal infrastructure, and extending railway lines to regional centres.

Recommendation 7. Allocate a high priority for world class public transport and enhanced freight rail infrastructure.

Proposals for expanding Australia's airport infrastructure are based on the flawed assumption of perpetual growth in passenger movements. This assumption ignores the direct impact of peak oil, namely rising and volatile fuel prices, and the indirect socio-economic impact, namely declining discretionary spending and hence decreasing demand for air travel. Roger Bezdek estimates that demand for air travel will decline at approximately the same rate as GDP and oil production, i.e. several per cent per annum.[34] The world airline industry is already experiencing a period of unprecedented contraction and consolidation consistent with this and other forecasts.

Recommendation 8. Allocate a low priority for airport expansions.

A viable alternative to air travel between Australia's capital cities and regional centres, particularly along the east coast, would be high speed passenger rail. Indeed, airline companies in Europe are involved in the operation of high speed passenger trains. The development of a high speed rail system would be an economic boon to many regional centres, providing alternative employment for former airline employees and reducing carbon emissions, in addition to alleviating oil dependence. The Federal Government commissioned a scoping study for an East Coast high speed train in 2001.[35] Travel times trips between Sydney, Melbourne, Canberra and regional centres in South Eastern Australia would be comparable to, and in some cases faster than, 'short-haul' air travel times. Infrastructure Australia should re-visit the proposal to develop a high speed passenger rail system.

Recommendation 9. Investigate the feasibility of high speed passenger rail to connect capital cities and regional centres.

Conclusion

Peak oil presents enormous threats and opportunities for Australia's infrastructure and the broader economy. Without urgent action to alleviate oil vulnerability the domestic economy will continue to experience systemic shocks akin to the present financial crisis, while many existing infrastructure projects fail. The current review by Infrastructure Australia provides a timely opportunity to develop valuable transport and energy infrastructure that will serve the nation through a period of unprecedented socio-economic upheaval.

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[34] *Aviation and Peak Oil: Why the Conventional Wisdom is Wrong*, presentation to the ASPO-USA World Oil Conference, October 2007, at http://www.aspousa.org/proceedings/houston/presentations/Roger_Bezdek_Houston_Slides_10-19-07.pdf.

[35] ARUP-TMG, *East Coast Very High Speed Train Scoping Study: Final Report*, November 2001, at http://www.infrastructure.gov.au/rail/trains/high_speed/index.aspx.