High speed rail in Australia
- much studied and slow to start

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Abstract: High Speed Rail or HSR with electric passenger trains operating at speeds of 250km/h or more is now operational in 11 countries and has been under recent consideration in Australia for future operation between Melbourne, Canberra, Sydney and Brisbane. The paper outlines HSR studies in Australia and conditionally quantifies the potential reduction of aviation fuel use at up to 0.5m litres per annum from the introduction of HSR by 2020 in Australia with a reduction of external costs at $540m per annum by 2020. In addition, HSR in Eastern Australia by 2020 could allow for some 300 slots to be released at Sydney Airport.

The paper also notes the option of major upgrades to the existing East Coast interstate mainline track with rail deviations to facilitate Fairly Fast Passenger Trains at speeds of up to 200 km/h.

Keywords: High Speed Rail, Australia, Sydney airport

1. INTRODUCTION

The International Union of Railways (UIC, 2008) notes that High Speed Rail (HSR) involves electric passenger trains using steel wheels on steel rails; also HSR requires dedicated track, special trains, and in-cab signalling as per the Tokaido Shinkansen that commenced operations in 1964.

A UIC (2011) paper (p9) notes that there is "no single standard definition of HSR"; however, if HSR is taken as being able to offer train journeys with speeds of more than 250 km/h, then 11 countries then had HSR. These comprised Japan, France, Italy, Spain, Germany and Belgium by the year 2000 followed by South Korea, Taiwan, China, Britain and Turkey to mid 2009, all with speeds with maximum operating speeds of 250km/h or more (Railway Gazette International - RGI, 2009). If HSR is taken to include trains operating at speeds from 220 to 250 km/h, then the United States (Acela), The Netherlands and Switzerland are included; also, the total length of HSR in the above 14 countries was an estimated 15,231 km (UIC, 2011). Proposals made in early 2010 to extend HSR in Britain, following a House of Common Committee inquiry in 2011, were confirmed in 2012.

UIC (2008, p6) notes that the use of HSR to promote faster transit times (from a city centre to another city centre) coupled with higher frequency of service, comfort, reliability, price and safety are benefits to customers. Environmental benefits include higher energy efficiency than air or car (with less greenhouse gas emissions) and “less overall external costs” (the costs borne by society for road accidents, pollution, climate change and noise. A further environmental benefit is “efficient use of land”. Along with freeing up capacity of existing railway lines for more freight trains and local passenger trains, HSR can lead to important indirect and long term benefits. These include (RGI, 2009, p2) “regeneration of towns and cities plus access to jobs over a wider area.”

HSR has been under close examination in the United States since January 2010 when the Obama Administration announced an allocation of $8 billion of federal funds to various corridor investments plus improvement projects and planning. In Canada, HSR has been the subject of ongoing government supported studies in Canada on two corridors. The most recent study, released in late 2011, examined trains operating at either 200 km/h or 300 km/h on the Quebec-Windsor Corridor and the shorter Montreal Toronto corridor.

2. AUSTRALIAN HSR STUDIES

In 1984, the Commonwealth Scientific and Industrial Research Organisation (Wild et al, 1984) outlined the concept of a Very Fast Train (VFT) linking Sydney, Canberra and Melbourne through a coastal route. It included a then ambitious Sydney Melbourne transit time of three hours using French technology. The proposal was developed by the private sector and later augmented to include an 859 km inland option by a VFT Joint Venture (1989). This is some 101km shorter than the existing railway between Melbourne and Sydney. The VFT Joint Venture (1989) noted that a VFT would have benefits including a reduced demand for imported aircraft and fuel imports, stimulation of inbound tourism, improved road safety and increasing Australia’s technological capacity (see also Black, 1989).

Both coastal and inland options were subject to extensive investigation around 1990 by the Victorian government and by a Senate Committee (1991). After a somewhat negative approach by government to the concept of a VFT concerning key questions, taxation concessions and land development, the proposal lapsed in 1991.

By 1994, a Speedrail Consortium including Alstom and Leightons had been formed to promote a Sydney-Canberra high speed rail proposal. In 1996, the Australian, NSW and ACT governments invited expressions of interest from the private sector to provide an improved Sydney-Canberra train service. Subsequently, four detailed proposals were made (an electric tilt train, a diesel-electric tilt train, Speedrail and a Maglev - see Laird et al, 2001). In August 1998, Speedrail was invited to prepare and submit a conditional “proved up bid” that would be at “no net cost to the tax payer.” This bid was submitted on a commercial in confidence basis.

In December 2000, the Australian government announced that it would not proceed further with the proposal, and instead commissioned an East Coast Very High Speed Train (VHST) Scoping Study for Melbourne-Sydney-Brisbane corridors. This study (Department of Transport and Regional Services - DOTARS, 2001) considered user benefits and public benefits (including airport decongestion, road decongestion, accident costs, noise and local air pollution costs) along with revenue benefit found that although public benefits were small in comparison with user benefits and fare revenue, on a 'central evaluation' case with a 7 per cent discount rate, the total benefits exceeded the total costs. However, HSR did not proceed.

An Auslink White Paper (DOTARS, 2004a) did not mention high speed rail, but placed emphasis on improving rail freight and noted (page 7) that "handling growth in airport activity is also a critical infrastructure concern in capital cities." In respect of rail, the Australian Government stated that rather than developing HSR, preference would be given to rail freight and set “rail the challenge of increasing its share of the freight market in the crucial Melbourne to Brisbane corridor to 30 per cent” (DOTARS, 2004b).

In Australia, a HSR strategic information report prepared for the CRC for Rail Innovation (von der Heidt et al, 2010) concluded that the time is right to carry out an in-depth concept study of High Speed Rail in Australia. This report identified extensive benefits as to consumers, the environment, and society in general. The CRC report found that even if HSR doesn’t go ahead in the immediate future, there should be a move towards corridor preservation to reserve future options. This view was supported by Infrastructure Partnerships Australia (2010) which also urged an incremental approach to HSR in Australia.

2.1 Recent Australian HSR studies

In August 2010, the Australian Government announced that it would proceed to a two phase study of HSR options for Australia with a focus on Sydney-Newcastle. This received bipartisan support. In August 2011 the Australian Department of Infrastructure and Transport (2011) released a Phase I report on HSR. In brief, cost estimates were given between $61 billion and $108 billion to build and involve laying more than 1,600 kilometres of new HSR track with four options between Brisbane and Newcastle and two options between Sydney and Canberra. Attention was also given to station locations and patronage projections including a total of 54 million per annum by 2036 (an indicative operational year), and approximately 15 million trips between Newcastle and Sydney (estimated to take between 40 and 50 minutes).

The Phase 2 report, released April 2013, was to examine "the financial feasibility of HSR, identify an optimum route alignment, refine patronage and cost estimates and investigate potential financing options." This report settled on a route of some 1748 km between Melbourne, Sydney and Brisbane, with a spur line to Canberra, with higher cost estimates of $50 billion between Sydney, Melbourne and Canberra, and $64 billion between Sydney and Brisbane. Four phases in a future HSR program are noted, the first being the preparation and corridor protection phase, requiring a Memorandum of Understanding (MoU) between the Australian, ACT and state governments and (page 40) "a publicly-owned HSR development authority (HSRDA) would be created to develop, procure and integrate the HSR system, including procuring and owning the required land."

The reaction to the release of the Phase 2 report, and concurrent announcements by the Minister for Infrastructure and Transport, and Shadow Treasurer, has included disappointment that neither the present government or the main opposition party will quickly deliver the start of a HSR network.

In addition, Edwards (2012) in a report commissioned by a minority party (The Greens who had called in May 2010 for an in-depth study into HSR), found an estimated $48 billion of benefits from HSR. These included time savings ($31 billion), congestion savings (airports and roads - $11 billion), accident savings ($4 billion) and less greenhouse gas emissions ($2 billion).

Questions relating to the financing of major projects were addressed by Infrastructure Australia (2011) who observed, inter alia, that Australia as a country and a community is reluctant to increase government debt or raise taxes to pay for better infrastructure and services, and is are uncomfortable with the ‘user pays’ concept. It is also of note (see for example Laird et al, 2001) that Australia has a long standing culture of extensive use of cars, trucks, and planes.

2.2 Sydney airport issues

Sydney Airport is Australia's busiest airport, with ongoing studies for a second major airport for Sydney, and the view that an East Coast HSR network in Australia would eliminate the need for a second Sydney Airport has received both support and opposition. Accordingly, some comment on this airport is relevant to consideration of HSR in Australia.

During 2008-09 (Bureau of Infrastructure, Transport and Regional Economics - BITRE, 2010), Sydney Airport had some 32.3 million passengers (20.1m domestic, 1.9m regional and 10.3m international). This is a more than three fold growth from 9.5m passenger numbers in 1985-86. An airport passenger is regarded as a person who arrives in departs from an airport, or one who transfers through an airport in a given day.

In 2009, Sydney was the world's 28th busiest airport on passenger numbers with 33.45m total passengers (Airports Council International at http://www.aci.aero). Sydney's main airport is subject to both a curfew (from 11:00 pm to 6:00 am restricting takeoffs and landings) and a “maximum movement limit” or “cap” of no more than 80 aircraft scheduled movements per hour (with ‘slot’ management and compliance schemes).

As noted by Sydney Airport (2009, section 14.2) guaranteed access for regional services is required, and noise is clearly an issue requiring runway modes of operation for noise sharing and respite. Noise near Sydney airport has long been an issue, leading to much effort over many years in locating a potential second Sydney Airport site, and much controversy in building a third runway at Mascot.

Sydney Airport (2009) briefly addresses future projections to 2029 as 78.9m passenger movements. This assumes both a decline in general aviation traffic and ‘a progressive upscaling in aircraft size across the fleet’ (citing a standard airbus A380 with 525 seats).

In noting approval for the Sydney Airport 2009 Master Plan, although supportive of aviation, an Aviation White Paper (2009) did not accept that this airport “can, nor should, handle proposed long-term growth for the region.”

Part of the cost of operating Sydney Airport includes ongoing improvement in road capacity. Despite the upgrading of main roads serving Sydney airport, road congestion near the airport continues to be an issue. In late 2012, plans were released by NSW Infrastructure (2012) for major road upgrades called WestConnex, which is proposed to link Sydney's west with the CBD and the airport, at a cost in the order of $10 billion.

Following a detailed study, the Australian and NSW Governments (2012) attempted to develop a joint aviation strategic plan for the Sydney region. However, a second Sydney airport at several proposed sites, including a formerly selected site at Badgerys Creek in Western Sydney, has met strong opposition on the one hand whilst receiving some support (NSW Infrastructure, 2012).

2.3 Release of slots at Sydney airport

In common with other larger airports around the world with strong demand for runway access, Sydney airport uses a “slot” system. Here a slot is “most commonly known as a landing or take-off right at airports during a specified period of time” (Czerny et al, 2008, p41). Indeed, Sydney is “the only slot controlled airport in Australia.”

During 2009, between Sydney and Melbourne there were about 45,000 airport movements (BITRE, 2010). This is an average of 123 plane trips per day. If HSR was in place and, on the basis of European and Japanese experience for a corridor of length about 800km, then HSR could attract 50 per cent of air traffic (see, for example, Van der Heidt et al, 2010), then on 2009 traffic it would allow for the release of about 61 airport slots per day.

Further analysis (2011a) shows that the diversion of passengers from regular domestic air services to HSR could lead to a total reduction of 198 slots at Sydney Airport. With projected increases in aviation as noted above, and without adjustment for increases in size of aircraft, by 2020, HSR could then release an average of 300 slots each day at Sydney airport.

2.4 Aviation fuel use

For further information on energy use and external costs, see a CRC for Rail Innovation project R1.114 internal report and a conference paper (Laird, 2010, 2011a). The estimates presented should be regarded as broad ones requiring further research.

One source of estimated fuel use for various flight sectors is given by the International Civil Aviation Organisation (ICAO) with a Carbon Calculator (at www.icao.int). One example is a one way passenger in economy on a Sydney Melbourne (SYD-MEL) flight will release about 89.13kg of CO_2. With various assumptions, this gives fuel use of about 4.4 litres per 100 passenger km (pkm).

In 2009, there were 7.09 million journeys by regular scheduled air services between Sydney and Melbourne (BITRE, 2010) which has a great circle distance of 705km. Using this data plus the ICAO factor of 100km, at 4.4 litres per 100km, approximately 250 million litres of aviation fuel was used on this sector for 2009.

Flights in 2009 on the busy Sydney - Brisbane, and Sydney - Coolangatta sectors used an estimated 235 million litres of aviation fuel. Scheduled flights in 2009 with smaller number of passengers on the Melbourne - Canberra, Sydney - Canberra, Sydney - Wagga Wagga, Sydney Albury, Sydney Coffs Harbour, Newcastle Brisbane and Newcastle Coolangatta sectors used an estimated total of 87m litres. On the top 10 origin-destination 'top routes' for the Sydney-Melbourne corridor and the Sydney-Brisbane corridor, an estimated total of 571 million litres of aviation fuel was used (with carbon dioxide emissions amounting to about 1.44 million tonnes) for about 17 million passenger journeys.

2.5 Potential reduction of energy use

Based on the assumption above if HSR was now operational between Sydney and Melbourne and could attract 50 per cent of air traffic, and, from the data above, the reduction of use of aviation turbine fuel would be 125 million litres. Further analysis shows (Laird, 2011a) that if HSR was operational between Melbourne, Canberra, Sydney, Newcastle and Sydney, if HSR took 90 per cent of Sydney-Canberra and 70 per cent of Melbourne-Canberra, and 50 per cent of other traffic on the other routes notes above, there would be about 11 million passengers, on 2009 air traffic volumes, diverted from regular domestic air services to HSR on the 10 top routes between Sydney and Melbourne, and, between Sydney and Brisbane. This would lead to a total reduction of use of aviation fuel by 307 million litres per year on 2009 passenger numbers. This would result in a net reduction of carbon dioxide levels of at least 400,000 tonnes per annum.

From the Sydney Airport Master Plan (2009) an average growth rate of 3.9 per cent per annum is projected from 2007 to the year 2029 for domestic passengers. At this compound growth rate, domestic passenger numbers through Sydney Airport would increase from 2009 to 2020 by a factor of 1.523. Although energy efficiency of aircraft is expected to increase over the next two decades, this could to some extent be offset by increased congestion at airports. Assuming these growth factors, and diversion as above of some passengers from aviation to HSR as above, there could be a total reduction of use of aviation fuel by 468 million litres per annum by 2020.

A further factor reducing aviation fuel use is the ability of HSR to carry high value freight in the way the domestic planes carry freight. Liquid fuel savings would also result from the transfer of some intercity car travellers to any operational HSR. Here, it should be noted that the dominant method of transport between Sydney and Canberra is by car.

2.6 External costs

Aviation, like other modes of transport, gives rise to external costs. For aviation, these include aircraft noise, accidents, air pollution and climate change. Large airports such as Sydney act as significant road traffic generators, thus giving rise to further external costs.

In Australia, apart from accidents, there has been little qualitative information provided about estimated external costs of aviation. More information is to be had in Australia on external costs of land transport (see, for example, Laird, 2005, 2011a).

Although reducing carbon emissions and minimising the impact of aircraft noise is covered in the Aviation White Paper (2009), other external costs of aviation are not mentioned at all. Some attention is given to these costs by Nero and Black (2009).

It is recognised that HSR can give rise to external costs, including noise. European based estimates given by UIC (2008, p9) include 22.9 Euros per 1000 passenger kilometres (pkm) for HSR and 52.5 Euros per 1000 pkm for planes. Using an assumed exchange rate of $A1 = 0.7 Euros gives 3.3 Australian cents per pkm for rail and 7.5 cents per pkm for planes.

For a Sydney-Melbourne one way journey, external costs amount to $60.37 for plane and $29.63 for rail. On this basis, for the 2009 traffic between Sydney and Melbourne and diversion of 50 per cent of this traffic to HSR, there would be a reduction of external costs of about $109 million.

Further analysis (Laird, 2011a) shows that for the Sydney-Melbourne and Sydney-Brisbane corridors, the diversion of passengers from regular domestic air services on the 10 top routes to HSR could lead to a total reduction of external costs of $256 million on 2009 passenger numbers. By 2020, assuming aviation traffic growth at 3.9 per cent per annum and an average inflation rate of 3 per cent per annum, the potential reduction of external costs would be $540m per annum.

3. SOME UNITED KINGDOM PERSPECTIVES

There are three broad approaches to expanding High Speed Rail in the United Kingdom; strong support, opposition on various grounds, and that more examination is required. All three approaches are apparent in over 200 submissions to a House of Commons Committee inquiry (2011) that, in principle, endorsed High Speed 2 or HS2.

The first approach, as also expressed in 2009 by Lord Adonis, the former Secretary for Transport, is that there should be more HSR in Britain (RGI, 2009). This is in addition to the London St Pancras-Channel Tunnel 108km route completed in 2007 for Eurostar trains, and includes proposals announced on 11 March 2010 for a full 335-mile High Speed Two (HS2) network. In January 2012, the UK Government invited expressions of interest for a $32 billion first stage between London and Birmingham for completion by 2026.

The second approach, as expressed by Ryanair’s (a low cost airline) CEO Mr Michael O'Leary (2009) that investing billions in high-speed rail in the UK to replace short-haul flights would be "insane" with other airlines including British Airways echoing this view, albeit in a more diplomatic manner. Opposition is also provided on the grounds in effect, that HSR is an expensive distraction from the need to upgrade the existing intercity and urban passenger rail systems.

The approach that each proposal needs separate and detailed examination is outlined by Professor Chris Nash (2009) who also notes that certain HSR projects in France have delivered more cost effective benefits than projects such as Madrid-Seville in Spain.

The conclusions are of interest (Nash, 2009, p 16,17) and include "at least 9m passengers per annum will be needed" in many cases to include viability, also: "Most successful applications of high speed rail seem to arise when there is both a need for more rail capacity and a commercial need for higher speeds. It seems difficult to justify building a new line solely for purposes of increased speed unless traffic volumes are very large, but when a new line is to be built, the marginal cost of higher speed may be justified; conversely the benefits of higher speed may help to make the case for more capacity. It follows from the above that appraisal of HSR will need to include assessment of the released capacity benefits for freight, local and regional passenger services and the changes in service levels on the conventional lines."

4. FAIRLY FAST TRAINS

A case can be made that the alignment of the existing Sydney-Melbourne-Brisbane track needs significant improvement to Fast Freight Train (FFT) standards (Laird, 2009, 2011b). The issues in an HSR context were examined by the Senate Committee (1991) examining the VFT which recommended … *"that the economic and technical feasibility of a fast freight train sharing part or all of the VFT alignment should be examined as a matter of urgency in the context of the overall proposals for an FFT. The economics of government paying for the cost of reducing gradients to levels acceptable to the FFT should be considered of it proves impractical to have the FFT and VFT gradients."*

The FFT concept between Sydney and Melbourne was then examined by the NSW and Victorian rail authorities, but the necessary deviations did not proceed. Various deviations were examined as part of a major Track Audit released by the Australian Rail Track Corporation (ARTC - 2001) with more details given by this writer (Laird, 2009) along with potential Sydney-Brisbane rail deviations. The ARTC Melbourne has undertaken an upgrade of most (but not all) of the existing Melbourne-Sydney-Brisbane track, on the existing alignment, at a cost of over $2 billion. However, as seen by the ARTC (2008, p20) *For rail to move to the next step in competitiveness, or even in fact to maintain competitiveness against a constantly improving road network, there is no alternative but to start to consider deviations of the current poorly aligned sections of the network."*

As also noted (Laird, 2009, 2011b), the construction of about 196 km of new track at five locations between Menangle and Junee would remove some 256 km of "steam age" alignment. The cost of upgrading the most of existing Sydney Melbourne railway to FFT standards, that could allow the operation of Fairly Fast Rail (FFR) trains for passengers (with a maximum speed of say 200 km per hour) is unknown. However, it would be appreciably less than estimates (Department of Infrastructure and Transport, 2011) of Sydney-Melbourne routes costs in a range of $30.4 to $50.1 billion.

An upgrade of the part of existing Sydney-Melbourne track to FFR standards, coupled with use of an upgraded Sydney to Macarthur track (now under way) with an improved connection to Canberra, could allow for the operation of a Sydney- Canberra train 2h 15m service at an appreciably lower cost than HSR.

For the Sydney-Brisbane corridor, an ambitious Pacific Highway upgrading programme is now underway. However, there are issues to address regarding the improvement of rail capacity for freight and passenger trains on the Strathfield-Hornsby-Gosford-Broadmeadow section of track, and one solution would be to construct either a new High Speed Line, or new track to Fairly Fast Rail (FFR) standards (suitable for trains operating in a maximum speed range from 160 to 250 km/h for passenger use.

By way of comparison with the potential of HSR to reduce aviation fuel use of some 300 million litres and net CO_2 emissions by 400,000 tonnes per annum, on 2009 traffic data, the upgrading of the Sydney-Melbourne-Brisbane existing track to FFT standards with rail winning 50 per cent of intercapital intermodal freight by 2014 was estimated (Laird, 2009) to save 134 million litres of diesel per annum and reduce CO_2 emissions by over 340,000 tonnes per annum.

Whether or not HSR proceeds in Australia, there is a need to address the cost and benefits of FFT for freight movements between Melbourne, Sydney and Brisbane. This is opposed on ongoing reliance on heavy trucks for line haul of non-bulk freight. There is also a need to upgrade urban rail networks.

4.1 Oil vulnerability

Oil vulnerability received attention from the Garnaut Climate Change review (2008, Chapter 21 'Transforming transport') that noted, inter alia, "Governments have a major role in lowering the economic costs of adjustment to higher oil prices, an emissions price and population growth, through planning for more compact urban forms and rail and urban public transport. Mode shift may account for a quarter of emissions reductions in urban public transport, lowering the cost of transition and delivering multiple benefits to the community."

Further information on oil vulnerability (or peak oil) in a transport context may be found in books by Gilbert and Perl (2010) and Rubin (2009) who has projected higher oil prices. On the other hand, Gargett (2010), after detailed analysis, has found "that petrol prices are likely to be restrained in this decade."

In a recent book, former Australian Deputy Prime Minister Tim Fischer (2011) addresses topics including HSR and peak oil.

In one sense inter-capital city passenger movements in Eastern Australia face two broad scenarios. These are:

1. business as usual with reliance on planes and cars for passengers; and
2. development of HSR for intercity passengers.

The first scenario of 'business as usual' has already been questioned on various grounds including Sydney airport congestion. However, given Australia's liking for cars, trucks and planes, and wariness of 'user pays' etc, 'business as usual' is a resilient scenario.

The second scenario is more likely to result if international oil prices move to, and remain at, high levels. This scenario cannot be eliminated. Accordingly, future studies should consider the costs and benefits of HSR under a range of future oil prices.

5. CONCLUSIONS

In 1984, when Australia first examined the concept of a Very Fast Train, only Japan and France had High Speed Rail (HSR). Further examination of HSR took place during the 1990s with a further study released in 2001. By 2010, when Australia commenced its fourth major examination of HSR leading to two detailed reports, a total of 11 countries had trains capable of operations at 250 km/h or more.

The paper finds that if HSR with trains capable of 250 km/h or more was in place in Eastern Australia by 2020, HSR could reduce the use of aviation fuel by over 450 million litres each year on the 10 top routes of the Melbourne-Sydney and Sydney-Brisbane corridors.

Based on European estimates, the potential reduction of external costs resulting from diversion from planes to HSR in Eastern Australia could be $540m per annum by 2020. On 2009 data, if HSR had been operational between Melbourne, Canberra, Sydney and Brisbane, and attracting at least 50 per cent of 2009 aviation passenger numbers, then 198 slots would be released at Sydney Airport.

Australia may or may not commit before 2020 to construction of HSR. However, future HSR corridors in Eastern Australia should be identified and preserved and there is a case for upgrading mainlines for faster and heavier freight trains along with faster passenger trains and for the upgrading of urban rail networks.

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REFERENCES

Australian Rail Track Corporation (ARTC at www.artc.com.au)
- (2001) Track Audit
- (2008) Submission to Infrastructure Australia

Australian and NSW Governments (2012) Meeting the Future Aviation Needs of Sydney

Aviation White Paper (2009) Department of Infrastructure, Transport, Regional Development and Local Government

Bureau of Infrastructure, Transport and Regional Economics
- (2009) Airport Traffic Data 1985-86 to 2008-09
- (2010) Australian Domestic Airline Activity - time series

Black, J., A., (1989) Very Fast Trains: Developments overseas and the proposal for Australia, NSW Parliamentary Library.

Czerny, A., Forsyth, P., Gillen, D and Niemeien H-M (2008), Airport Slots, Ashgate, Aldershot

Department of Infrastructure and Transport at www.infrastructure.gov.au
- (2011) High Speed Rail study Phase 1
- (2013) High Speed Rail study Phase 2

Department of Transport and Regional Services (DOTARS)
- (2001) East Coast Very High Speed Train (VHST) Scoping Study by ARUP-TMG
- (2004a) Auslink White Paper, Building our National Transport Future
- (2004b) Paper to International HSR Conference 2004 Tokyo

Edwards, N., (2012) High Speed Rail-benefits that add up. Accessed http://apo.org.au/research/high-speed-rail-benefits-add

Fischer, T., (2011) Trains Unlimited in the 21 st Century, ABC Books

Gargett, D., (2010) Petrol prices in Australia, Australasian Transport Research Forum (www.patrec.org)

Garnaut Climate Change Review (2008) Final Report at http://www.garnautreview.org.au/

Gilbert R and Perl A (2010) Transport Revolutions: Moving People and Freight without Oil, New Society Publishers, Gabriola Island, BC Canada

House of Commons Select Committee on Transport (2011) Inquiry into the strategic case for High Speed Rail at http://www.parliament.uk/business/committees

International Union of Railways (UIC)
- (2008) High speed rail: Fast track to sustainable mobility
- (2011) High Speed Rail and Sustainability

Infrastructure Australia (2011) Report to COAG Communicating the Imperative for Action http://www.infrastructureaustralia.gov.au

Laird, P.,
- (2005) External land freight costs in Australia, Australasian Transport Research Forum (www.patrec.org)
- (2009) Australian freight railways and commodity exports, Canadian Transportation Research Forum Proceedings, pp 641 -655
- (2010) High Speed Rail - Quantification of Non Commercial Benefits Internal Project Report for the CRC for Rail Innovation
- (2011a) Potential reduction in energy use from a High Speed Rail network in Australia, Australasian Transport Research Forum (www.patrec.org)
- (2011b) Australia's biggest cities deserve better, International Railway Journal, May 2011 p36-40
- (2011c) Some benefits of an Australian High Speed Rail network, AusRail Plus Conference, Brisbane

Laird, P., Newman, P., Bachels, M., and Kenworthy, J. (2001) Back on Track: Rethinking Transport Policy in Australia and New Zealand, UNSW Press, Sydney

Nash, C., (2009) When to invest in high-speed rail links and networks ? At http://www.internationaltransportforum.org/Proceedings

Nero, G., and Black, J.A., (2000). A critical examination of an airport noise mitigation scheme and an airport noise charge: The case of capacity expansion and externalities at Sydney (Kingsford Smith) airport. Transportation Research Part D 5, 433-461.

NSW Infrastructure (2012) First things first; The State Infrastructure Strategy 2012 – 2032

O'Leary, M., (2009) As quoted guardian.co.uk, 5 August 2009

Railway Gazette International (2009) High speed rail fact file

Rubin, J., (2009) Why Your World is about to get a Whole Lot Smaller, Random House, New York

Sydney Airport (2009) Master Plan

VFT Joint Venture (October 1989) VFT Focus for the Future

von der Heidt, T., Gillett, P., Hale, C., Laird, P., Wardrop, A., Weatherby, R., Charles, M., Coleman, D., Ramasokeran, B., Waingold, C., Zito R., Taylor M., and Pollock, P. (2010) High Speed Rail: Strategic information for the Australian context http://www.railcrc.net.au

Wild, J.P., Brotchie, J.F. and Nicolson, A.J., (1984) A proposal for a fast railway between Sydney, Canberra and Melbourne, CSIRO