

Integrating our Mega-Regions: Implications for Sydney-Newcastle High-Speed Rail.

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Summary

- Over 60% of Australia's population live in three "Mega Regions", based on Sydney, Melbourne, and Brisbane. Fast rail links from the three capitals to their surrounding cities are now seen as crucial.
- High Speed Rail between Melbourne and Brisbane is also now back on the agenda.
- Fast Rail and High-Speed Rail can and should be integrated. This will:
 - **improve connectivity** both within each mega region and between them
 - minimize costs, by utilizing rail infrastructure efficiently and reducing need for more highways and airports
 - **maximize benefits**, by upgrading freight as well as passenger movement, improving long-distance travel as well as commuting, and shifting transport to the most energy efficient and carbon neutral mode.
- Achieving this will require a National Perspective, rather than disparate State-based approaches which have dogged the rail industry in Australia for the last 170 years. We also need an Integrated Network Design suitable for Australian conditions, learning from overseas experience.
- The Federal Government has indicated its first priority for HSR is the **Sydney Newcastle corridor**. This provides a **case study** of how to design HSR to maximize benefits both in the short and longer term by careful integration and staging of construction and operations.

Australia's "mega regions" are too dominant



- Our three mega-regions had 15 million people in 2022, and are dominating population growth
- All are experiencing
 - high housing costs,
 - rising congestion and
 - high costs of infrastructure.
- These problems are already spreading from the capitals to Newcastle, the Sunshine Coast and Geelong.
- State Governments are improving rail links within each mega region.
- But this won't be enough...

Source: https://www.abs.gov.au/statistics/people/population/regional-population/latest-release

Only High-Speed Rail can break this pattern.



The map shows the impact which high-speed rail would have on accessibility for the wider corridor, reducing once and for all the "Tyranny of Distance" which has led to the over-dominance of our capital cities.

<u>Airlines and highways cannot achieve this spread of accessibility</u>

Airlines further reinforce the capitals Highways are too slow

We Need To Integrate Fast and High-Speed Rail



This will Minimize Costs and Maximize Benefits

- Reduces costs by sharing tracks appropriately
- Brings forward benefits by makes it easier to stage improvements to infrastructure and services.
- Combines benefits of high-speed rail and fast rail

Benefits	Stand-Alone HSR	Fast Rail Only	Integrated National Network
Long Distance Passengers	\checkmark		\checkmark
Commuter Passengers		\checkmark	\checkmark
Freight Efficiency	\checkmark	\checkmark	
Decentralisation		\checkmark	\checkmark
Regional Development	\checkmark		\checkmark
Emissions Reduction	\checkmark	\checkmark	 ✓
Housing Choice and Affordability	\checkmark	\checkmark	



It makes obvious sense – but how do we do it? We need:

- A long-term integrated plan, with bipartisan support
- State and Local Govts for infrastructure and housing
- Staging of both infrastructure and services to allow incremental benefits
- A National Passenger Rail Operator and National Infrastructure Manager
- Land Value Sharing to minimise speculation and to help fund the project.
- And finally, the first stage project to be successful!

How did other Countries achieve HSR?

Japan started the move to High-Speed Rail in 1964.

Its existing narrow-gauge lines were congested and incapable of higher speeds in any event.

So, a stand-alone, fully separated Shinkansen system was introduced, electrified and standard gauge, to increase both speeds and capacity between Tokyo and Osaka.

Even then, "Mini-Shinkansen" trains were introduced to run on both high-speed and older tracks (the latter widened to standard gauge).

This has now grown to a 3,000 km long network. But it has taken 60 years!

Japanese streamlined narrowgauge train of the 1950's

MYWWWWWWW

Lineup of seven generations of Shinkansen trains operated by JR East

The European Approach

In Europe high-speed trains often utilise both high-speed lines and slower speed lines because:

- of an existing standard gauge network; and
- because not all HS lines have high density traffic.

All countries have long-term plans focused on economic development.



Source: Study from Polytechnic University of Madrid (UPM)

(left), inter-urban trains (right) as well as freight trains (mostly at night)

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French High-Speed Services showing routes and density of traffic.

A Solution for Australian Conditions...

Different countries used different approaches for HSR. Some countries use a combination of approaches, depending on the corridor. There is no "one size fits all".

Country/Region	Size	Pop Density	Rail Traffic Density	Existing Rail Gauge	HSR Solution
Japan	Small	Very High	Very High	Narrow	Stand-Alone
France	Medium	Medium	Medium	Standard	Integrated
Italy	Medium	High	High	Standard	Integrated
Germany	Medium	High	High	Standard	Integrated
Spain	Medium	Med - Low	Low	Broad	Combination
Turkey	Large	Med - Low	Low	Standard	Integrated
Indonesia	Medium	Very High	Low	Narrow	Stand-Alone
India	Medium	Very High	Med – Very High	Narrow/ Broad	Stand-Alone
SE Australia	Large	Med-Low	Low - Medium	Mostly Standard	Integrated

Australia needs a carefully-designed, integrated network, taking into account current and future demand for a variety of both passenger and freight movement in a variety of corridors.

Integrated Network Design

Type of Infrastructure	High-Speed Lines	Existing Lines	Inland and Transcon Lines
Electrification	25 KV AC	Generally not, except suburban	No
Axle Loads	22 tonnes	19 – 30 tonnes	25-30 tonnes
Permitted Speeds	Up to 350 km/hr	Up to 160 km/hr	Up to 120 km/hr
Curvature	Low	Often very significant	Varies
Trains running mostly on High-Speed Lines	Trains running both on high speed and on existing lines	Trains running on existing lines	Trains running on Inland and Transcontinental Lines
Alstom DD High Speed Train	Talgo Dual Electric (Hydrogen Train) Hallow Hallow	Bulk Freight Train	Double-Stack Container Train
Stadler Dual voltage Commuter	Cargobeamer fast freight train.	Vlocity Regional Train	Long Distance Tourist Train

HSR Routes through the Sydney Mega Region

- This is the <u>most challenging</u> part of the whole HSR corridor between Melbourne and Brisbane because of topography, land use and traffic density.
- The <u>existing rail links (shown in red)</u> in the Sydney Mega Region do service the historic CBD's. However, poor alignments due to topography mean they cannot support fast, let alone high-speed services (right).



HSR Routes through the Sydney Mega Region

• <u>Any realistic high-speed alignment will</u> need to be routed away from the main CBD's but linked to them and to other centres via existing heavy rail and metro lines.



HSR Routes through Sydney

- The shortest route through Sydney would be via Epping, Parramatta and Liverpool (figure 1). Some trains would join the high-speed line at Wilton from a future link to the Illawarra. There would also be interchanges at Glenfield, Liverpool, Parramatta/Rosehill and Epping for connections to other rail services.
- HSR could potentially serve SSA instead of Liverpool, with high-speed links from Parramatta and Menangle (figure 2). This would be longer, but potentially simpler and nearly as fast given the higher speeds possible.
- A link to Central from a triangular junction south of Epping could add fast East-West as well as North-South links through Sydney at a later date. This would also allow some HS trains to bypass Central, minimising the number of tracks and platforms needed to access the CBD (figure 3).



The Sydney – Newcastle Corridor



Section of the "Short North" through the Central Coast, showing the excessively winding route built 130 years ago.

- Existing rail is slow and congested due to 19th century alignments, and the volume of commuter, freight and long-distance passenger traffic.
- HSR between Sydney and Newcastle could **treble total rail capacity**, and allow **faster travel**, facilitating
 - Population growth
 - Mode shift from road as rail services are accelerated
 - Additional freight and longdistance passenger trains
- Requires both the existing and the new line.
- But how best to achieve this?





Three approaches to serving regional centres



2013 High-Speed Options

The 2013 HSR study proposed a **<u>stand-alone HSR line</u>**, for HS passenger trains only. As a result:

- <u>Stops were limited</u> to Newcastle West (Park and Ride only) and Ourimbah West (Interchange with existing line)
- Existing NSW Intercity and Regional trains would not be able to operate on the line as it was 25 KVAC only. Thus, all passengers other than park and ride <u>passengers would</u> <u>need to inter-change</u> from conventional inter-city or regional trains at either Ourimbah or Hornsby.
- **Gosford or Woy Woy passengers** would have had to travel north to interchange with the HS station, before travelling south.
- Longer distance passengers from Brisbane, North Coast, Hunter Valley or beyond would also have to interchange at Ourimbah, since the Newcastle HSR station is well off the existing rail corridor,

As a consequence, benefits to Central Coast and Newcastle passengers would have been limited.



More Recent Rail Options

TNSW examined HSR and faster rail options in the Sydney – Newcastle corridor. It is believed that these were considering:

- Sydney's HSR station at Olympic Park or Parramatta, rather than the CBD
- The Sydney North HSR station at Hornsby to be moved to Epping
- A HSR station at **Gosford**, possibly underground, below the existing station.
- Potential sharing north of Ourimbah with the proposed **Freight Bypass Line**, with a link with the existing line in the vicinity of Hexham/Tarro.

Since then. a potential metro station at **Rosehill** opens up the possibilities of a Sydney HSR station to be co-located at Rosehill, with the metro on an East-West alignment and the HSR station on a North-South alignment.

In addition, Newcastle City Council has called for any HSR station for Newcastle to be located at **Broadmeadow**,

Having HSR stations at Gosford and Broadmeadow would require **additional tunnels, add costs, and slow down** long-distance services to the North Coast, Brisbane, the Gold Coast, the Upper Hunter or New England..



Integrated Options

Fastrack proposes

- Construction of the Sydney Newcastle HSR line in 4 stages.
- "Interlined" stations at Hawkesbury River and Tuggerah to avoid expensive new stations at Gosford and Broadmeadow.
- Interchange station near **Hexham**, where longdistance regional trains from the Hunter and the North-West could join the high-speed line from the conventional line.







High-Speed Rail.

Family and

Restriction.

Manuk 2004

Proposed Staging (Infrastructure)

Rose Parra	hill/ matta	Epping Hawkesbury River		Tuggerah	Hexham Tarro		
	Stage 3	Stage 1	V. ,	Stage 2	Stage 4		
Stage	N3	N1		N2	N4		
From	Rosehill/Parra	Epping (W I	Ryde)	Hawkesbury R	Tuggerah		
То	Epping	Hawkesbu	ıry R	Tuggerah	Newcastle West		
Civil	Tunnel	Tunnel		Bridge + Tunnel	Mostly Surface		
Station(s)	Rosehill / Parramatta	Epping (Underground) Hawkesbury R (surface)		Tuggerah (surface)	Newcastle West (Surface)		
Power	25 KVAC	25 KVAC 25 KVAC		25 KVAC	25 KVAC		
Max Speed	200 kph	250 kph		250 kph	320 kph		



Proposed Staging (Services)

Southbound trains in morning peak hour (Interurban Commuter services only shown)



Newcastle Interchange

Trains starting /hour

Trains terminating /hour

Trains / hour

using HS segment



Alternatively, it could be built over a longer time period, allowing more time to evaluate options, construction experience and operations. This would enable simultaneous progress on other corridors – e.g. Sydney – Canberra, within the same funding envelope. This would accelerate the phasing in of infrastructure, rollingstock, and services.



SN1: Epping – Hawks R; SN2: Hawks R – Tuggerah; SN3: Epping – Roesehill; SN4: Tuggerah – Hexham; SC1: Canberra – Goulb/Yass; SC2: Macarthur – Mittagong; SC3: Mittagong – Goulburn; SC4: Macarthur - Rosehill

Conclusion

Building a new rail line makes no sense unless it facilitates more and better services. The proposed integrated upgrade of the Sydney – Newcastle Corridor would enable (See appendix).

- A tripling of total passenger services from 63 per day to over 190 per day (in each direction)
- A major increase in fast freight and intermodal container trains

This will cater for a dramatic increase in long-distance high-speed services in the long term, as well as a doubling of commuter services, with key economic, social and environmental benefits.



Thank you....For Further Information

To download the detailed reports below and for presentations, database and other information on high-speed rail, see **WWW.fastrackaustralia.net**



										Corridor
Author	Glazebrook	Glazebrook	R Lowrey	Glazebrook & Lowrey	R Lowrey	Glazebrook	Lowrey	Glazebrook	Glazebrook	Glazebrook
Data	2021	2021	2021	2023	2023	2023	2023	2023	2024	2024
Key Focus	Overall Concept	Population & Decentalisation	Regional Growth	Staging Plan	Canberra HSR	Freight	Governance	Routes & Alignments	Operation 2	Integration

Appendix: Potential Service Enhancements

Passenger

As shown below, there are approximately 63 southbound passenger trains per day currently in the existing corridor. The addition of the HS line integrated with the existing line would allow this to be tripled, with a ten-fold increase in long distance trains, a 150% increase in the number of intercity trains, and a tripling of local services. Freight traffic increases could also be handled, as discussed earlier.

ТҮРЕ	FROM	то	VIA	CURRENT	N1	N2	N3	N4	LATER
Inter-capital	Brisbane	Sydney (Central)	Strathfield	1	2	2			
Inter-Regional	Gold Coast / Lismore	Sydney (Central)	Strathfield	1	2	2			
Regional	Coffs Harbour	Sydney (Central)	Strathfield	1	2	2			
Regional	Upper Hunter / NW	Sydney (Central)	Strathfield	1	2	4			
Sleeper	Brisbane	Sydney (HS Station)	Epping HS Station				1	1	2
Sleeper	Gold Coast	Sydney (HS Station)	Epping HS Station						1
Intercapital XP	Brisbane	Sydney (HS Station)	Epping HS Station				2	4	12
Fast Regional	Gold Coast	Sydney (HS Station)	Epping HS Station						6
Fast Regional	Mid-North Coast	Sydney (HS Station)	Epping HS Station				4	4	6
Fast Regional	Upper Hunter / NW	Sydney (HS Station)	Epping HS Station				8	8	12
TOTAL LONG DIST				4	8	10	15	17	39
Intercity	Newcastle Interchange	Sydney (Central)	Strathfield	36	18	18	18	18	18
Intercity	Wyong/Central	Sydney (Central)	Strathfield	7	18	18	18	18	18
Intercity	Wyong / Gosford	Sydney (Central)	Chatswood	6	8	8	8	8	8
Fast Intercity	Hunter HS Station	Sydney (HS Station)	HS Line					14	24
Fast Intercity	Newcastle IC Station	Sydney (HS Station)	Tuggerah HS Station		24	24	24	24	24
Fast Intercity	Tuggerah / Gosford	Sydney (HS Station)	H River HS Station				24	32	32
TOTAL INTERCITY				49	68	68	92	114	124
Suburban	Newcastle Interchange	Tuggerah / Wyong	Existing Line	3	10	20	30	30	30
Suurban	Wyong/Tuggerah	Gosford	Existing Line	7	10	10			
TOTAL SUBURBAN				10	20	30	30	30	30
TOTAL PASSENGER				63	96	108	137	161	193

Freight

Fastrack's report on "Freight and High-Speed Rail" examined the potential for a major shift from road freight to rail freight in the Sydney – Melbourne corridor, utilizing the latest developments in terminals, rollingstock and high-speed rail infrastructure

While coal traffic to Newcastle is anticipated to decline over coming decades, intermodal, fast freight and industrial traffic could increase, especially if Newcastle develops aa a significant container port and if high-speed freight trains are successful.

The diagram below shows potential freight services on completion of the Sydney – Newcastle HSR route and the Newcastle Freight Bypass.



