# Rail Links and Sydney's Airports Key Success Factors

by **Peter Thornton** www.transportationassociates.com.au/downloads **Transportation Associates Pty Ltd** Updated 18 March 2020

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Presentation for CIVL4815

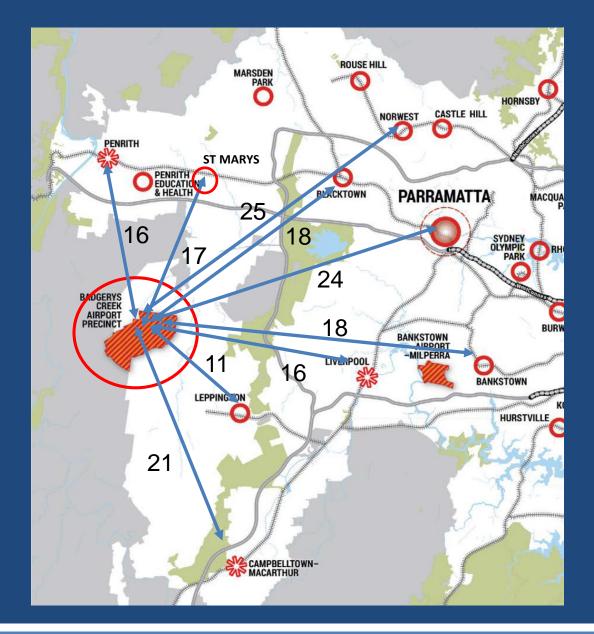
Rail Links and Sydney's Airports © Transportation Associates

- What type of rail link(s) does WSA need to be successful as an airport?
- Is the existing rail link at Sydney airport a good model for WSA?
- What proportion of passengers can be or should be expected to use rail?
- To what markets or centres of population or economic activity should a WSA airport rail link?
- What service parameters are needed to create a successful airport rail ?
- Are current proposals the answer?

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A few key questions (2)





Source: http://www.planning.nsw.gov.au/~/media/Files/DPE/Plans-and-policies/a-plan-for-growing-sydney-2014-12.ashx

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## Sydney's Airports and Land Transport System (3)

- Major transport corridor for road and rail into the terminal precinct and continues in tunnel across site for rail
- Provision for 2 pairs of railway tracks in the rail corridor
- Possibility of two stations

   one to serve the passenger terminal and one to serve the internal business park precinct.

Source: WSA-EIS-Volume-1-Chapter-5-Stage-1-Western-Sydney-Airport.pdf

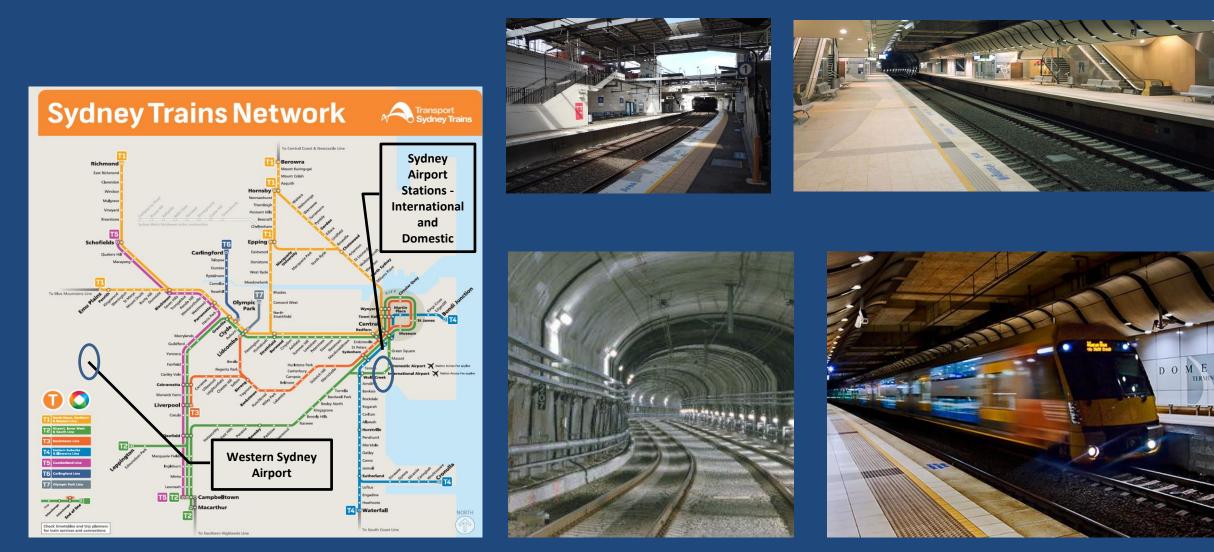
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What is the provision for Rail within the WSA Airport Plan?



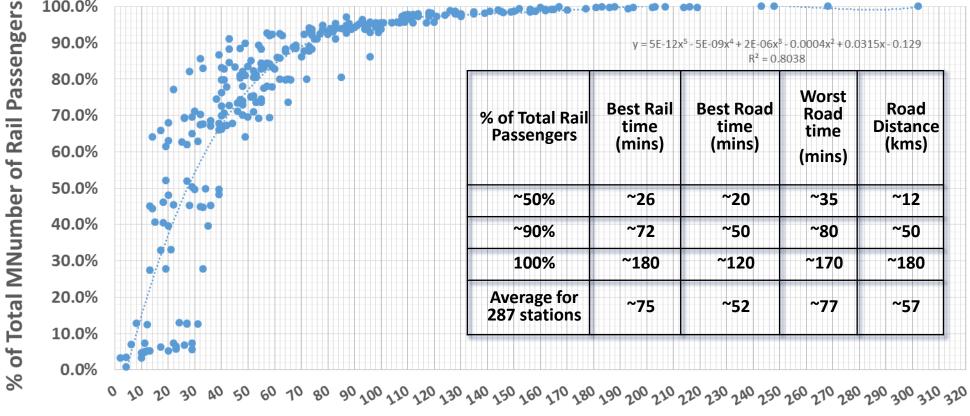
https://www.airportlink.com.au/trip-information/locations/

http://www.bouygues-construction.com.au/project/sydney-airport-link/

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## Sydney Airport Rail Link

## Total Rail Passengers in November 2016 through Sydney Airport Stations



#### **Rail Travel Time in Minutes**

- Total Rail Passengers in November through Sydney Airport Stations
- Poly. (Total Rail Passengers in November through Sydney Airport Stations)

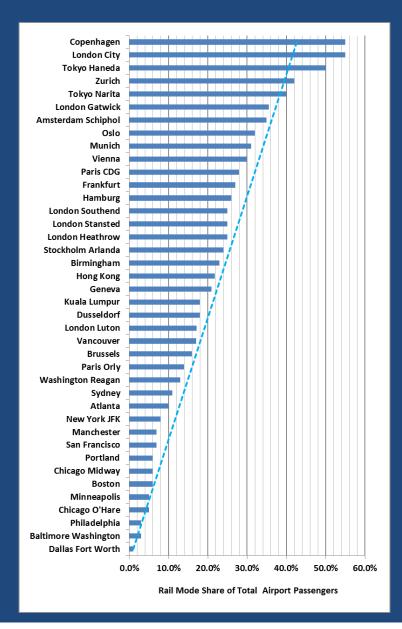
Graph shows % of total rail passengers passing through Airport Stations by rail travel time

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Analysis of Opal Card O - D Data for Sydney Airport Stations (6)



- <u>Africa</u> OR Tambo;
- <u>Australia</u> Brisbane; Sydney
- <u>Asia</u> Seoul; Bangkok; Singapore; Shanghai Maglev; Beijing; Delhi; Kuala Lumpur; Hong Kong; Shanghai Metro; Tokyo Narita; Tokyo Haneda; Osaka Kansai;
- <u>Europe</u> Manchester; Rome; Paris Orly; Brussels; London Luton; Dusseldorf; Moscow; Birmingham; Stockholm Arlanda; London Heathrow; London Stansted; London Southend; Hamburg; Frankfurt; Paris CDG; Vienna; Munich; Oslo; Amsterdam Schiphol; London Gatwick; Zurich; London City; Copenhagen;
- <u>North America</u> Dallas Fort Worth; Baltimore -Washington; Philadelphia; Chicago O'Hare; Minneapolis; Boston; Chicago Midway; Portland; San Francisco; New York JFK; Atlanta; Washington Reagan; Vancouver

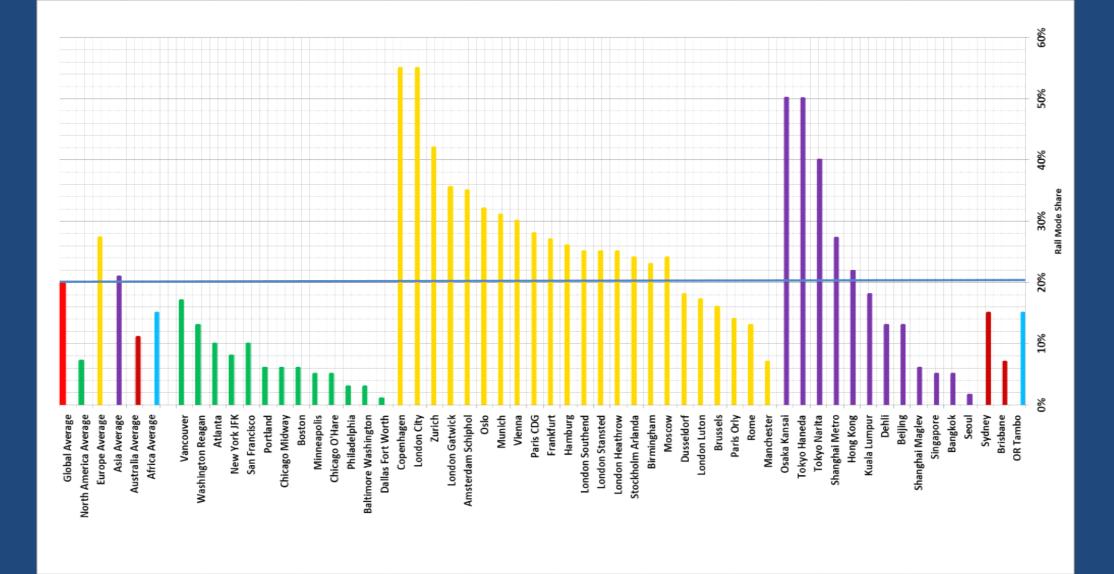


## • Source: IARO (IARO Report 18.13) and others;

- Why is the airport rail mode share of ground access so different around the world?
- What makes Copenhagen so different from Dallas Worth?
- What factors bear on mode choice?
- Can it be reliably predicted from those factors?
- What models work? And how well?
- Issues getting up to date mode share data; excluding transit passengers from those requiring ground access; comparing like with like (parity pricing); getting consistent data on travel times and costs; multi-airport cities; multiple rail links to one airport (e.g. Heathrow);

Predicting Rail's Share of Airport Passenger Movements Starting Point 40 Airport Rail Links (IARO Report 18.13 Author Paul Le Blond) Transportation Associates

**Kev Points** 



Sources Transportation Associates analysis based on data originally assembled by IARO (IARO Report 18.13: Forecasting Air-Rail Author: Paul Le Blond), GARA and internet research

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Mode Share to Rail for 51 Airport Rail links on 5 Continents (8)

## **Multi-Factor Linear Regression Factors**

Selected as likely to be influential and data available:

- Road distance to Common Downtown location (kms);
- Best Road Time to Common Downtown Location (mins);
- Worst Road Time to Common Downtown Location (mins);
- Rail Time to a Common Downtown location (mins);
- Rail Headway (mins);

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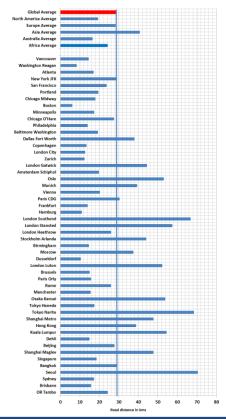
- Taxi Fare Parity Price in 2014 USD;
- Airport Parking (best available price for parking for 24 hours short stay at airport) in USD 2014 parity currency;
- Rail Fare Parity Cost in 2014 USD.

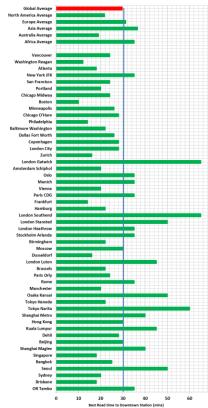
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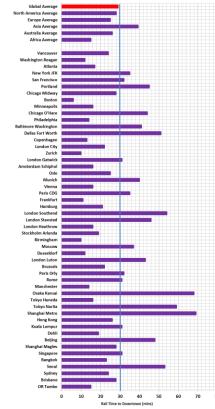
Global Analysis of 51 Airport Rail Links (7)

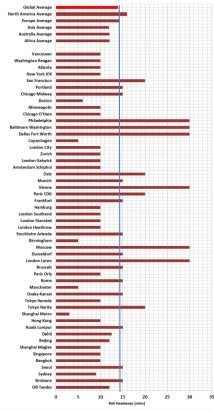
## Key Points

- All factors highly variable in all continents;
- US airports closer to downtown on average than European or Asian;
- US Airport Rail links competitive on average with Global Averages for Rail Time and Service Headway.









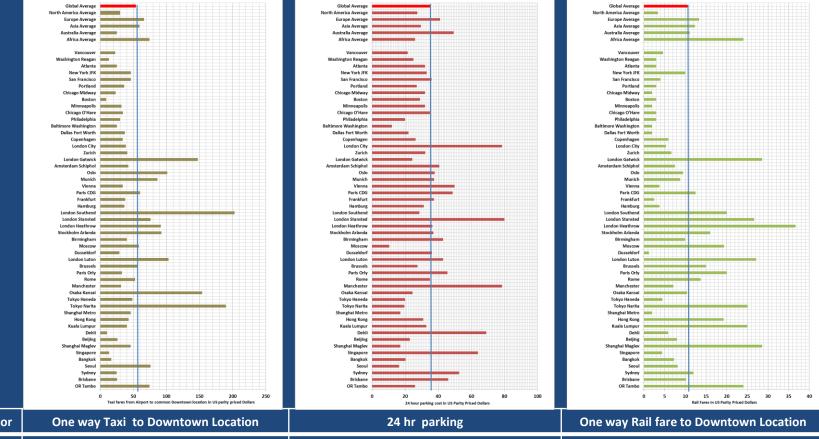
	Road distance in kms	Best road time to downtown station (nims)	Kail Time to Downtown (mins)	America Contraction of the Contraction	
Factor	Road Distance (kms)	Best road time (mins)	Rail Time (Mins)	Rail Service Headway (mins)	
Africa	24.3	35.0 15.0		12.0	
Australia Average	16.5	19.0 26.0		12.0	
Asia Average	40.7	36.5	39.3	11.9	
Europe Average	28.3	31.2	25.0	14.1	
Nth America Average	19.4	21.8	28.1	15.8	
Global average	28.4	29.6	29.0	13.9	

Predicting Rail's Share of Airport Passenger Movements

Road Distance and Travel Time; Rail Travel Times and Headways

#### Key Points

- All costs US\$2014 Parity Priced)
- Highly variable on all dimensions on all continents;



Factor	One way Taxi to Downtown Location	24 hr parking	One way Rail fare to Downtown Location
Africa	USD 74.4	USD 25.9	USD 24.1
Australia Average	USD 25.0	USD 49.3	USD 11.1
Asia Average	USD 59.0	USD 29.5	USD 12.4
Europe Average	USD 66.2	USD 41.1	USD 13.4
Nth America Average	USD 29.1	USD 27.4	USD 3.4
Global average	USD 53.6	USD 34.9	USD 10.7

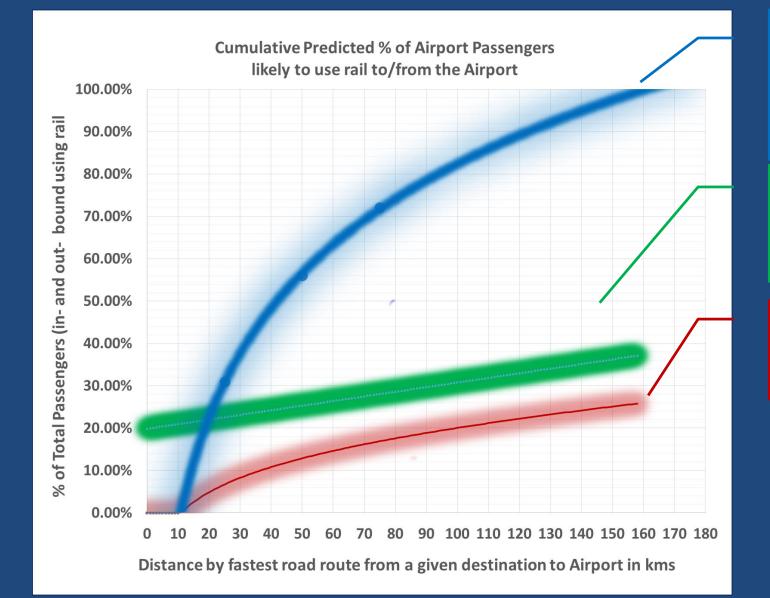
Predicting Rail's Share of Airport Passenger Movements

Taxi, Parking and Rail Costs

	Global Average	Copenhagen	Dallas Fort Worth (2014)	
Rail Mode Share	19.8%	55%	1%	
Road Distance (kms)	28.4	13.4	37.9	
Best Road Time (Mins)	29.7	28	24.0	
Worst Road Time (mins)	51.3	40	45.0	
Rail Travel Time (mins)	29.0	13	51.0	
Headway Mins	13.9	5	30.0	
Taxi Fare (USD Parity)	\$53.70	\$33.9	\$43.0	
Parking 24 hrs (USD Parity)	\$34.93	\$26.3	\$22.0	
One Way Rail Fare (USD Parity)	\$10.81	\$5.9	\$4.0	

Predicting Rail's Share of Airport Passenger Movements

......What does make Copenhagen different to Dallas Forth Worth?



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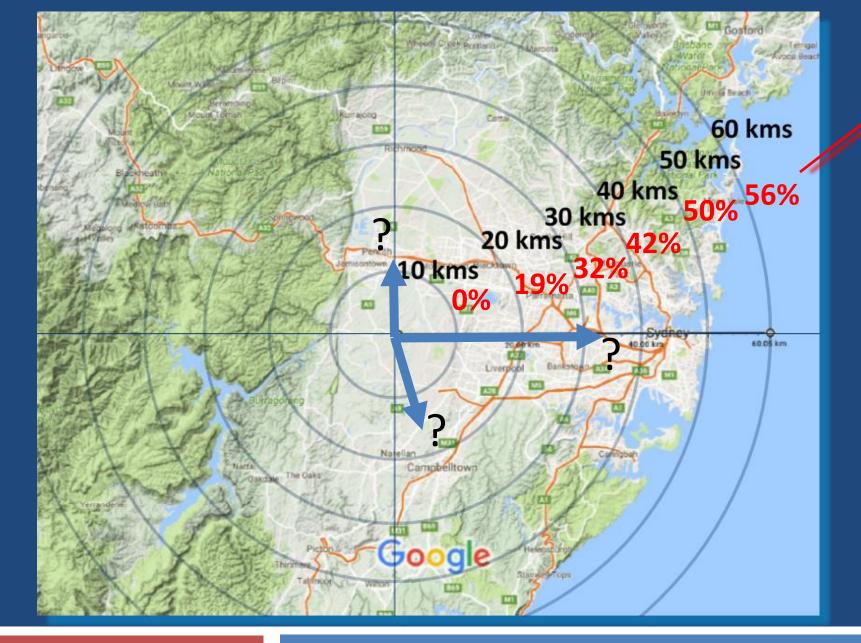
Cumulative % of passengers passing through airport by distance from airport (difficult to estimate in two airport city and for a new airport)

% of total passengers likely to use rail by distance from airport( estimated by multifactor linear regression analysis from 51 airports data)

% of passengers likely to use rail by distance from airport (product of two above curves)

Model Predicts ~18% for Sydney airport – actual about 17 % and growing;

Predicting the usage of Rail to access/egress at a Airport (9)

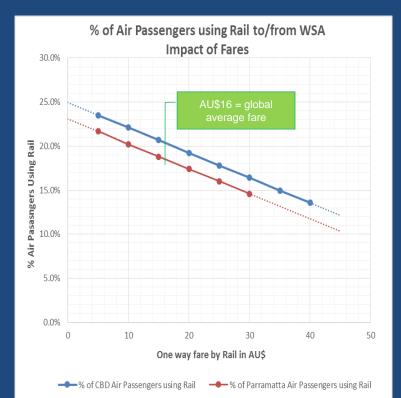


% of total rail passengers inside this distance from WSA

Model predicts: rail ridership of ~26% of total inbound and outbound passengers at WSA

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Which way should rail link(s) point to maximum users? (10)

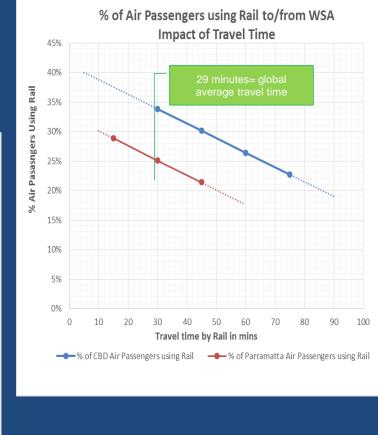


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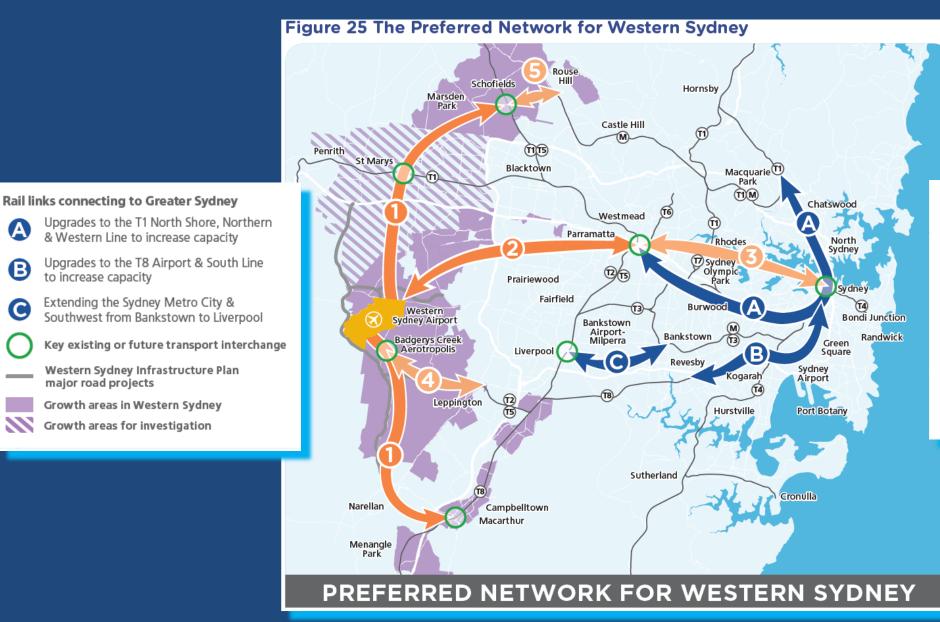
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Factor sensitivity for predicting Rail travel to/from WSA (11)



#### Rail links connecting Western Sydney and the airport

North-South Link via Western Sydney Airport

East-West Link via Western Sydney Airport

#### Rail links supporting growth and the airport

- Sydney Metro West 6
- (detailed planning has commenced)
- South West Link from Leppington to 4
- the Badgerys Creek Aerotropolis
- Extending the Sydney Metro Northwest from Cudgegong Road to Schofields

Source: Western Sydney Rail **Needs Scoping Study OUTCOMES REPORT Department of Infrastructure Regional Development and** Cities March 2018

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B

C

to increase capacity

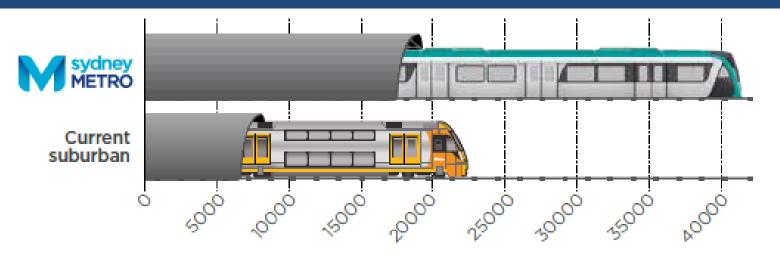
major road projects

## Western Sydney Rail Needs Scoping Study (12)



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Sydney Metro West and Western Sydney Airport (13)



#### Maximum Sydney train customers per hour per line

	Headway (mins)	seats per train	standees per train	total pax	Seats per hour	Standees per hour	Total Pax per hour	% standees
Sydney Metro at Start-up	4.0	346	806	1,152	5,184	12,096	17,280	70%
Sydney Metro NW Capacity	2.4	346	806	1,152	8,640	20,160	28,800	70%
Safeguarded Capacity (12 car trains)	2.0	461	979	1,440	13,824	29,376	43,200	68%
Waratah DDs	4.0	894	418	1,312	13,410	6,270	19, <del>580</del>	32%
Waratah DDs – ERTMS	2.4	894	418	1,312	22,350	10,450	32,800	32%
Waratah DDs (12 car trains) & ERTMS	2.0	894	418	1,312	26,820	12,540	39,360	32%

"Metro rail moves more than 40,000 people an hour in each direction - significantly more than a current suburban line"

But 70% standees, so is this the right configuration for people to travel 50kms and up to 1 hour to from CBD?

# Equally are DD's suitable as airport trains?

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Sydney Metro West – Is it right as an airport rail link? (14)



#### **Sydney Metro if extended**

- Mixed travellers
- No dedicated CBD
- Average speed 60km/h



#### **Stockholm Arlanda Express**

- SD 2+2 seating
- No stops 20 mins, 10 mins headway
- Airport travellers only
- Dedicated CBD Terminus
- Suburban Service as well









#### **Helsinki Airport Railway**

- SD 2+2 seating
- 5-7 stops 27 mins, 10 mins headway
- Airport and suburban travellers







#### **Copenhagen Airport Railways**

- SD 2+2 seating
- Mainline 13 mins, 10 mins h'way Metro 13 mins, 4 mins h'way
- International, Airport and suburban travellers
- Dedicated CBD Platform Dedicated Mainline Platform; Metro Station in CBD

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## Comparison of Airport Rail Links to Major CBDs (15)











Source: Wikipedia; Veloasia; MTR;

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Hong Kong Airport Rail Link – 20 years old but still one of the best (16)

- High passenger generation capability and growth potential locations – e.g. Parramatta and Sydney CBDs;
- A CBD to WSA time of 30-35 minutes; Competitive fares;
- Clearly identifiable CBD point of "low friction" access;
- Similarly, an airport station that is more findable than a taxi rank;
- Focus on a few key interchanging locations;
- Fully seated, not commuter standing and crowded, airport style rolling stock;
- Less than 15 minute headways;
- Future North-of-harbour link to tap into Sydney's "Golden Arc of Employment"?

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So what's needed to help made WSA successful? (17)

- Focus the service parameters travel time, fares, comfort;
- North South Link more about urban development than making airport successful per se;
- As currently presented, Sydney West Metro not suitable;
- <u>BUT</u> there are some positives so it could become so!

In Conclusion (18)

- Hong Kong's Tung Chung Line is good model fast airport overlaid on slower stopping suburban services;
- Unique opportunity to link the three GSC designated cities;
- Keep on encouraging the Governments to plan and deliver a rail link which can help make the Airport successful.

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If you are interested in the original data or analyses then go to www.transportationassociates.com.au/downloads or http://www.transportationassociates.com.au/files/IARO%20P resentation%20WashingtonV5.pdf

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**Background Analyses**