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Australian Rail Industry Research Report

FINAL REPORT – CONFIDENTIAL
5 March 2021

Deloitte Access Economics

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5 March 2021

Mr Jin Qiansheng
Corporate Culture Department
CRRC Corporation Limited
16-5 Xisihuan Mid-road, Haidian District
Beijing, PRC

Dear Mr Jin

Re: Australian Rail Industry Research Report

In accordance with our signed offer letter dated 15 December 2020, we have pleasure in providing this *FINAL Report* which outlines findings of economic, strategic and industry analysis of the current and future state of the Australian rail industry. These findings include analysis of the current size and scope of the Australian passenger rail sector, the future of passenger rail in Australia, the size, scope and future of freight rail in Australia and opportunities for suppliers of rolling stock in both the passenger rail and freight rail sectors.

Restrictions on report use

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Basis of our work

We have based this work on our economic research and analysis of publicly available data as well as our own economic analysis and data. To the extent that these key information and data change, the results of the economic analysis are likely to change.

For all enquiries on this report please contact Steve Kanowski - skanowski@deloitte.com.au or +61 477 727 754.

Yours sincerely

Steve Kanowski

Partner, Deloitte Access Economics

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EXECUTIVE SUMMARY

Key findings 'at a glance'

Overview

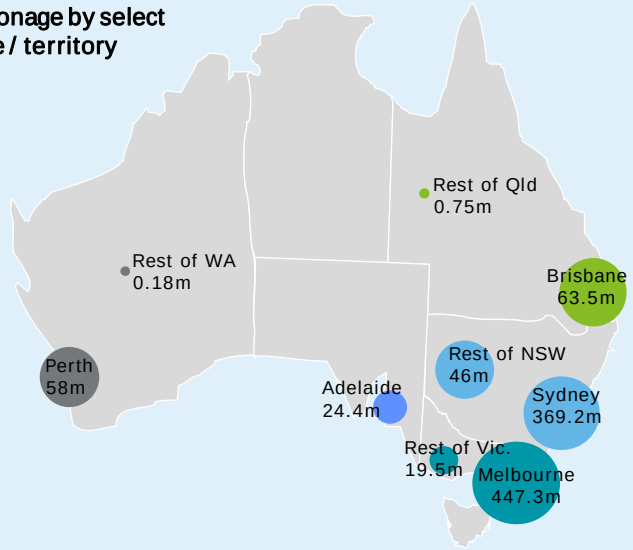
Australia's rail network is an assortment of intrastate networks (typically managed by state government owned / operated and private entities) and interstate networks (typically managed by the Australian Rail Track Corporation – a Federal government corporation). Australian rail networks are a combination of narrow gauge, standard gauge, broad gauge and dual gauge networks with the 'type' of network varying by state and / or region.

Passenger rail

Passenger rail patronage

Since 2001-02, Perth's metropolitan network has seen the largest percentage growth in heavy rail patronage. From 2011-12 to 2015-16 train patronage in Perth was more than 100% higher than it was in 2001-02. However, patronage has since fallen slightly to remain 88% higher in 2017-18 than it was in 2001-02. Brisbane had the smallest growth over this same period, with train patronage being only 18% higher in 2017-18 than it was in 2001-02.

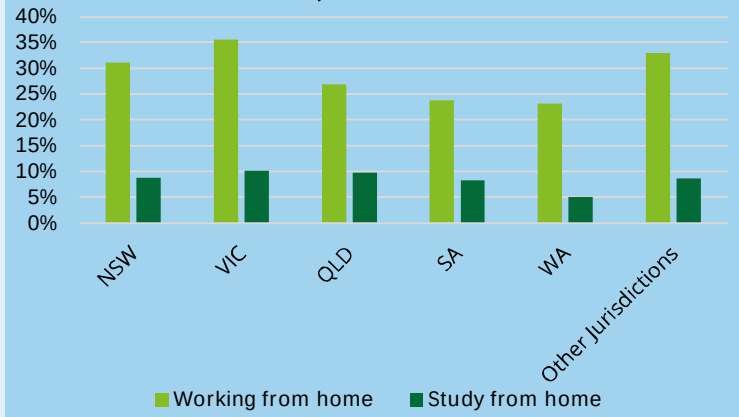
Patronage by select state / territory



Impacts of COVID-19

- Capital city rail patronage in Australia hit its lowest point in April 2020 and has since been on the rise, though even in November 2020 patronage was significantly below pre-COVID-19 levels for that month.
- Melbourne, in particular, was affected for a prolonged period. The 'second wave' brought about a -83% decline in public transport usage.
- Domestic trends including increased rates of employees 'working from home' are likely to persist and affect rail patronage on urban networks in the next few years.
- Trends such as low migration rates to Australia are expected to persist and result in lower population growth rates and lower than pre-COVID expected urban rail patronage levels and growth.

Survey results indicate a prevalence of 'working from home', November 2020



Source: ABS Household Impacts of COVID-19 survey, November 2020

The current size of Australia's rail sector

In 2019, the rail industry contributed more than $29.8 billion to the Australian economy. Of this contribution, 31% came from passenger rail and 4% from rolling stock production – where 51% of this rolling stock production is for passenger rail purposes. In total, the passenger rail and passenger rolling stock production sectors are expected to comprise 33%, or approximately $10 billion, of the rail industry's contribution to the Australian economy.

The economic contribution to the rail industry is comprised of employee wages and gross operating surplus (refer ribbon).

The Australian rail industry is a major contributor to the economy.

$29.8b contribution to GDP

The rail industry is a major employer for Australians

$16.1b wages and over 160,000 (direct and indirect) FTE

Gross Operating Surplus (GOS) comprises approximately 46% of the industry's contribution to GDP

$13.7b (direct and indirect) GOS

Operators of passenger rail rolling stock

The passenger rail transport industry is characterised by a significant market concentration, with the three largest players in the market accounting for 84% of industry revenue. The largest players in the market are state-owned entities that either directly operate passenger rail services or procure them via franchising:

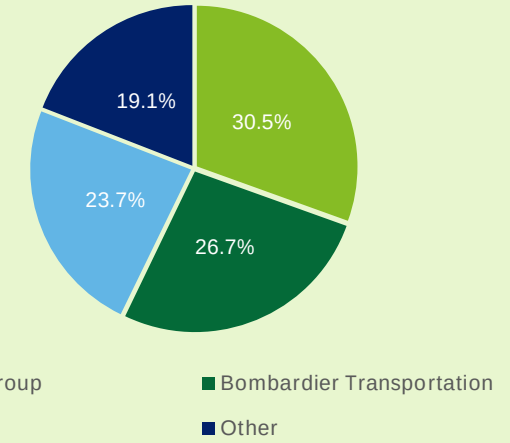
- Department of Transport NSW (e.g. Sydney Trains, NSW TrainLink etc) with franchised light rail operations.
- Victoria's Public Transport Development Authority (e.g. V/Line and - via a franchise - MTM)
- Queensland Rail (a wholly-owned vertically integrated entity) and light rail services operated privately on the Gold Coast.

Other states with commuter passenger rail services are Western Australia (Perth) and South Australia (Adelaide). The ACT has a privately operated light rail system.

Key suppliers of railway equipment manufacturing and repair in Australia

The rail manufacturing and repair industry in Australia is dominated primarily by three suppliers: CIMIC Group, Bombardier Transportation and Downer. Of these operators, CIMIC Group (via it's subsidiary UGL Limited) is the market leader in terms of revenues with 30.5% of the market, closely followed by Bombardier Inc. with 26.7% and Downer with 23.7% (refer chart below).

Market share by revenue, 2020 financial year



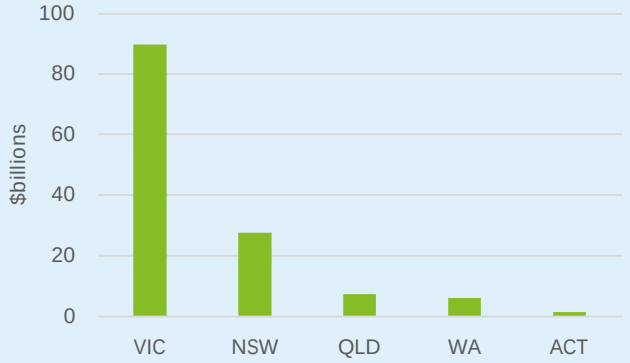
Source: IBISWorld, 2020

Passenger rail investment pipeline

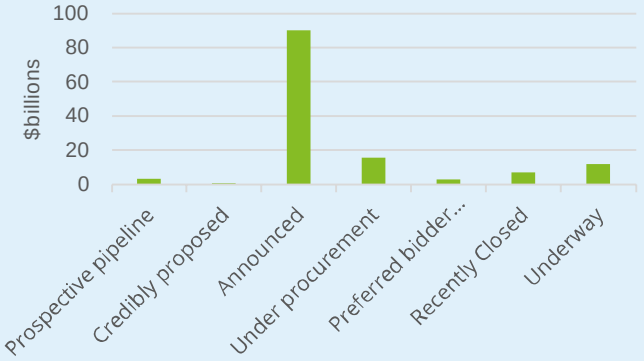
Investment in new rail infrastructure and rolling stock improves the capacity and efficiency of Australia's rail network and helps to reduce congestion in cities and regional areas. Victoria, NSW, QLD, WA and the ACT all have multi-billion dollar rail project pipelines that will enhance urban and regional networks (refer top chart below).

The majority of the rail investment pipeline in Australia has been announced, but is not yet under procurement or underway. There are several projects that have also been credibly proposed, are in the prospective pipeline, or are even at earlier stages that do not yet have costing data (refer bottom chart below).

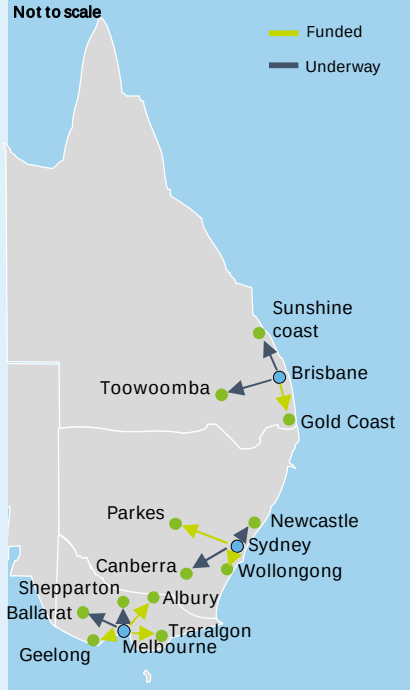
Passenger rail investment pipeline, by jurisdiction



Passenger rail investment pipeline, by stage of investment



Source: Deloitte analysis Informed by various sources
Note: Top chart excludes projects in prospective pipeline and those credibly proposed



National faster rail program

The National Faster Rail Program is a 20-year rail investment plan, centred on generating increased efficiency between major capital cities and surrounding regional centres. The faster rail plan will utilise the increasingly populated and pressurised capital cities – Sydney, Melbourne and Brisbane - to shape future growth via faster, more efficient and reliable journey times to regional centres. The three general connections, Sydney to Newcastle, Melbourne to Greater Shepparton and Brisbane to the regions of Moreton Bay and the Sunshine Coast, had an initial $20 million government investment. The subsequent business case included $2 billion of both Federal Government and State Government funding into the Melbourne to Geelong rail link.

Forecast rail patronage growth rates (per annum)

2.0% National	2.7% in WA	2.0% in QLD
2.0% in VIC	1.7% in SA	1.3% in NSW

Source: Australasian Railway Association, 2020, *Value of Rail 2020*

The future size of Australia's rail sector

In 2030, the rail industry is estimated to contribute more than $44.9 billion to the Australian economy, reflective of an estimated year-on-year growth rate of 3.8%. Of this contribution, the passenger rail and passenger rolling stock production sectors are expected to comprise roughly 33% or $14.8 billion of the rail industry's total contribution the Australian economy.

Further, Australia's **passenger rail** sector in 2030 is estimated to employ over 20,000 people nationally. New South Wales, Victoria and Queensland are expected to remain the largest hubs for employment.

The economic contribution to the rail industry is comprised of employee wages and gross operating surplus (refer ribbon, right).

The Australian rail industry will remain a major contributor to the economy.

$44.9b contribution to GDP

The rail industry will remain a major employer for Australians

$23.5b wages and over 215,000 (direct and indirect) FTE

Gross Operating Surplus (GOS) comprises approximately 46% of the industry's contribution to GDP

$21.4b (direct and indirect) GOS

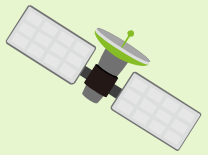
"Investment in light rail networks are becoming more prevalent in Australia's smaller cities."

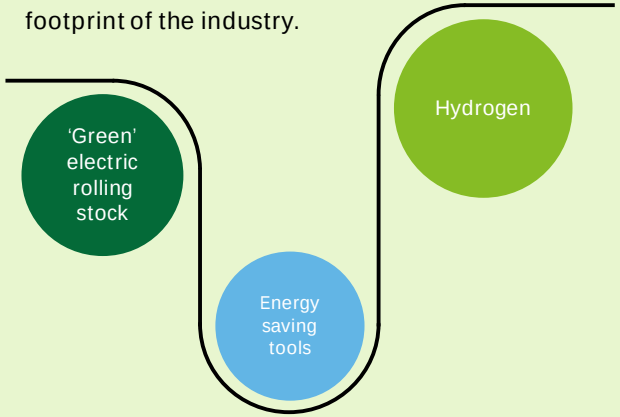
Investment in light rail networks

Several light rail projects have been developed in recent years, including those in the Gold Coast, Canberra and Newcastle. Furthermore, there is the possibility of developing a light rail on the Sunshine Coast, which is currently being assessed along with other transport options.
With the additional of several hundred thousand new residents expected to live in the Gold Coast, Sunshine Coast and Canberra over the next 20 years, the light rail networks will play key roles in reducing road congestion and improving urban mobility in these cities.

Emerging technology

Developments in renewable energy traction rolling stock technology provides opportunities for Australia to increase efficiency in its rail network and reduce the carbon footprint of the industry.





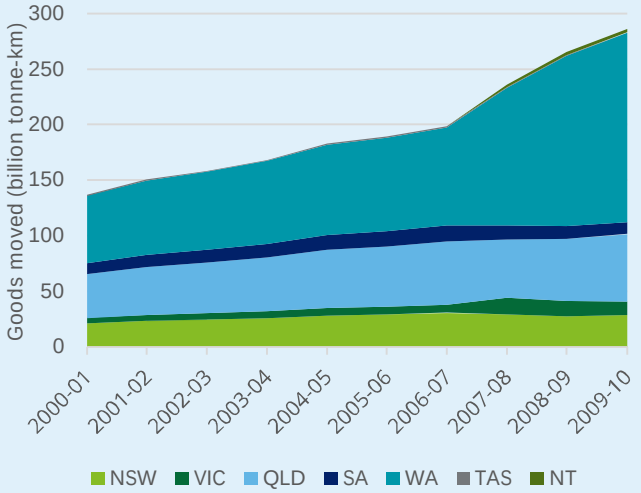
Freight rail

Freight rail in Australia

Rail is the most commonly used method of moving freight within Australia and has experienced high growth since the post-GFC mining boom. In 2015-16, 413.5 billion tonne-kilometres of goods were transported via rail, more than double the tonne-kilometres of any other transport mode. From 2000-01 to 2015-16 there has been approximately 200% growth in freight rail, at an average annual rate of 13.4%.

WA is the biggest user of freight rail in Australia, at 170.9 billion tonne-kilometres in 2009-10. This tonnage is nearly three times higher than any other jurisdiction in Australia. Queensland is the second largest user of freight rail in Australia, at 60.7 billion tonne-kilometres in 2009-10. NSW, Victoria, SA, Tasmania and NT each transported 28.2, 12.6, 10.5, 0.1 and 3.2 billion tonne-kilometres of freight via rail networks in 2009-10 (refer chart below).

Total domestic rail freight (bulk and non-bulk), by jurisdiction



Source: BITRE, 2019
Note: More recent data is not available on a State-by-State basis from BITRE.

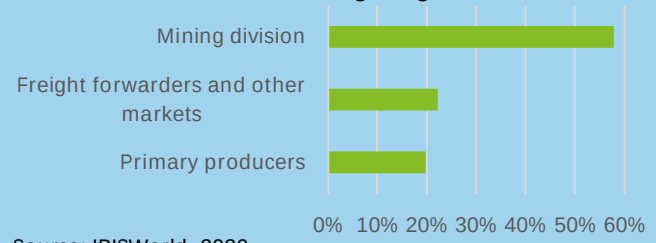
Major players, users and future outlook for freight rail

Coal and mineral freight transport comprises the majority of Australia's rail freight task. Mining is the largest market for rail freight transport at 57.9% of the total task. Freight forwarding and other markets comprise an additional 22.3% of the demand for freight rail, while primary producers comprise the remaining 19.8% (refer chart).

Australia's general cargo rail freight industry (including containerised intermodal traffic) is highly concentrated. Pacific National and Aurizon have almost 35% and 40% market shares, respectively (this does not include private rail operations such as Rio Tinto, FMG etc.). Other players in containerised cargo, bulk agriculture and specialised cargo haulage (e.g. steel) include Qube, One Rail Australia, SCT Logistics, SSR and Fletcher International.

Demand for rail freight is set to increase in the future, albeit at a slower pace than in recent years; growth approximately 40% on 2016 volumes over the period to 2030.

Sectors demanding freight rail



Source: IBISWorld, 2020

Supplier opportunities

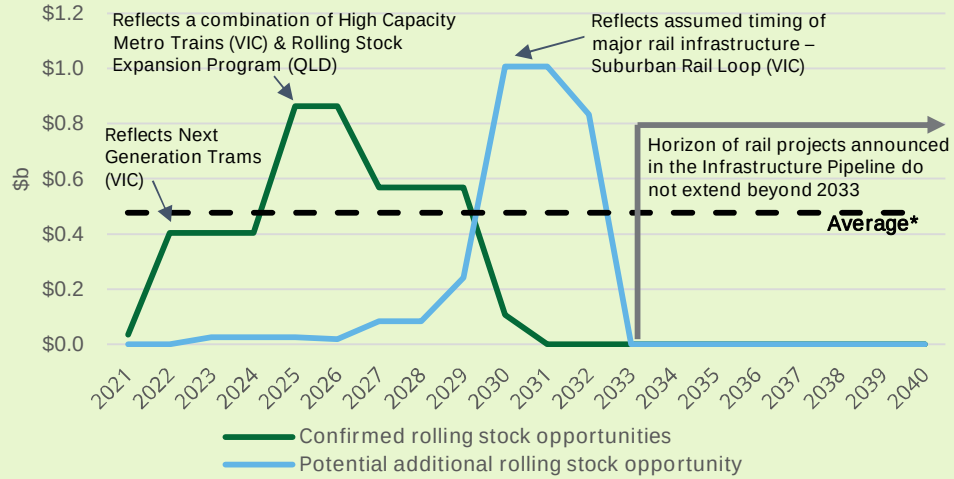
Opportunities for suppliers

There are several opportunities for suppliers in both passenger and freight rail. These opportunities arise in the current context of government investment in passenger and freight rail projects, favourable conditions for future growth in both patronage and freight volumes (including for key CRRC customers such as Rio Tinto, BHP, FMG, Qube and SCT Logistics) and an ageing domestic rolling stock fleet. These opportunities include repairs and maintenance or asset replacement or the design and supply of additional rolling stock to support expansion and/or new projects.

Passenger rail

Analysis indicates the existence of notable supplier opportunities across the next decade; most notably, the Next Generation Trams, High-Capacity Metro Trains and Rolling Stock Expansion Program. The indicative annualised supplier opportunity over this period for these projects is approximately $0.4 billion increasing to approximately $0.9 billion between 2025 and 2026. On average, confirmed rolling stock opportunities for suppliers averages approximately $0.5 billion per year across the period 2021 to 2030.

Indicative annual estimates of passenger rolling stock supplier opportunity, 2021 - 2040



Source: Deloitte analysis using various sources, primarily Australia and New Zealand Infrastructure Pipeline
Note: Confirmed rolling stock opportunities are announced but are yet to be tendered. Potential additional opportunities are those projects that are infrastructure focused but have the potential to result in rolling stock opportunities for manufacturers.
*Average of 'annual confirmed rolling stock opportunities' between 2021 and 2040

Freight rail

Despite the recent slow-down in the growth of the rail freight industry since the peak of the mining boom in the early 2010s', volumes are expected to grow over the period to 2030. Overall, the industry is expected to grow by around 41% on 2016 levels over the period to 2030. This is equivalent to a CAGR of 2.5%. With bulk freight assumed to comprise roughly 92% of this expected growth in volumes, growth in the industry to 2030 could require as much as 3000 additional wagons and 80 locomotives on average per year to service this freight (depending on a range of variables).*

*see chapter 6

CHAPTER 1

Background

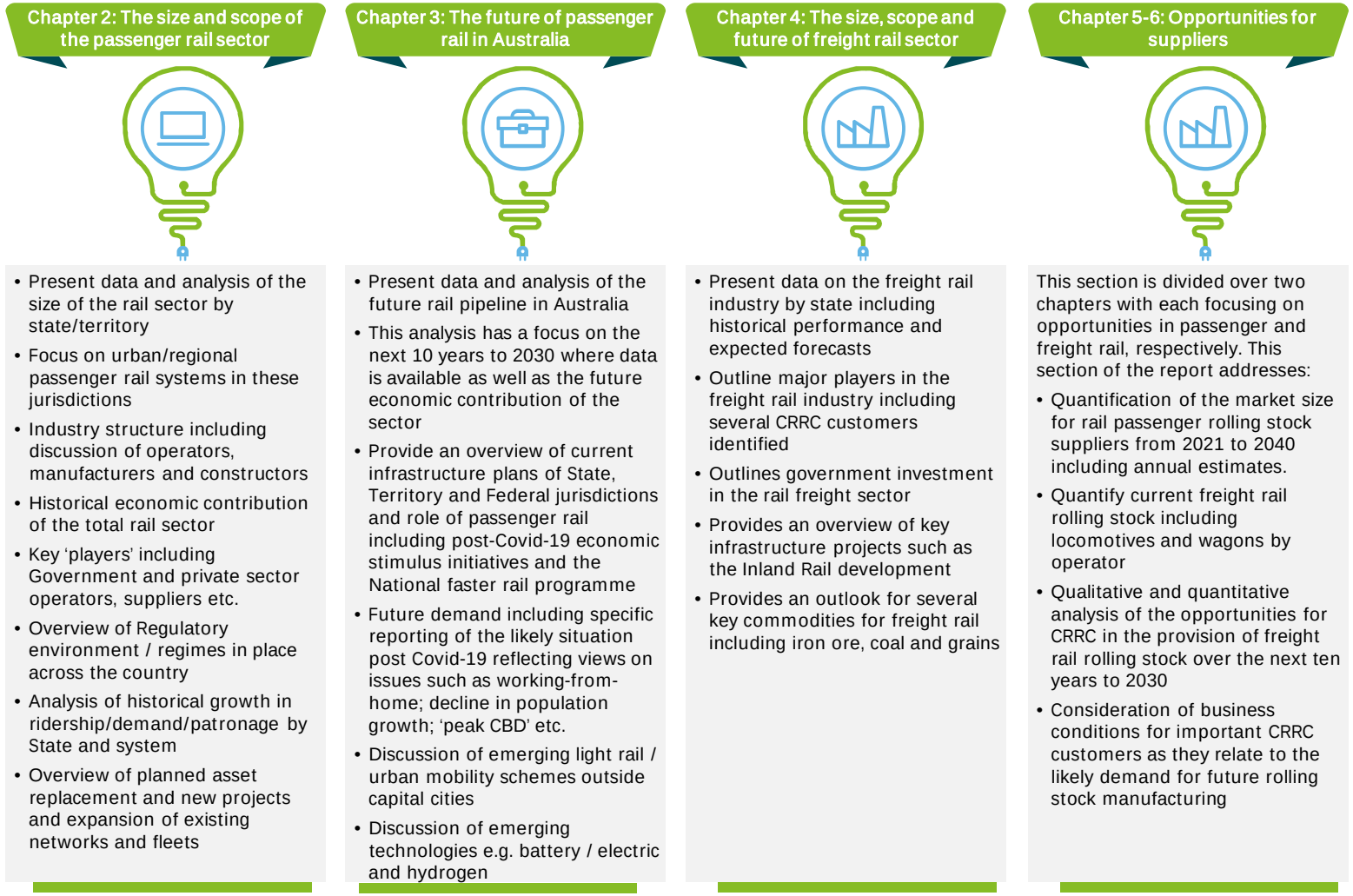
This research report has a focus on presenting key data and analysis of the size and scope of the passenger rail sector and future outlook with consideration for the freight rail sector and rail rolling stock supplier opportunities

Deloitte Access Economics was engaged by CRRC Corporation Limited to prepare a research report on the Australian rail industry with a particular focus on passenger rail rolling stock. The aim of the report is to provide research and analysis on the following key areas as part of the scope of this engagement:

- **The size and scope of the Australian passenger rail sector** with this draft report having a focus on the economic and employment contribution of the passenger rail sector to the Australian economy. This also provides an overview of the existing urban and regional rail networks in each Australian state and territory including a discussion of the structure of the industry and key 'players' including operators and ownership aspects. This also provides analysis of historical trends in the rail passenger sector and an overview of the patronage levels and trends on urban and regional networks and discussion of the age and characteristics of Australia's rolling stock.
- **The future of passenger rail in Australia** with a focus on the future plans for passenger rail by state, territory and federal jurisdictions including the Faster Rail Plan. This chapter also has a focus on presenting data and analysis of the passenger rail investment pipeline and with regard to the future outlook for the sector in the nation.
- **The size, scope and future of the Australian freight rail sector** with a focus on the freight rail sector generally including the key players and users of rail freight services, government investment in the sector, current and future volumes and outlook for key commodities.
- **Opportunities for suppliers** are split into two separate chapters with a focus on quantifying where possible the opportunity for suppliers in both passenger and freight rail. This includes consideration of key long-term customers for CRRC including Rio Tinto, BHP, FMG, Qube and SCT Logistics.

The structure of the rest of this draft report and the scope is provided in Figure 1.

Figure 1: Report structure and scope of works



CHAPTER 2

The size and scope of the Australian passenger rail sector

Australia's passenger rail sector is important to the Australian economy as it contributes approximately $30 billion to Australian GDP and employs more than 16,000 Australians, nationally.

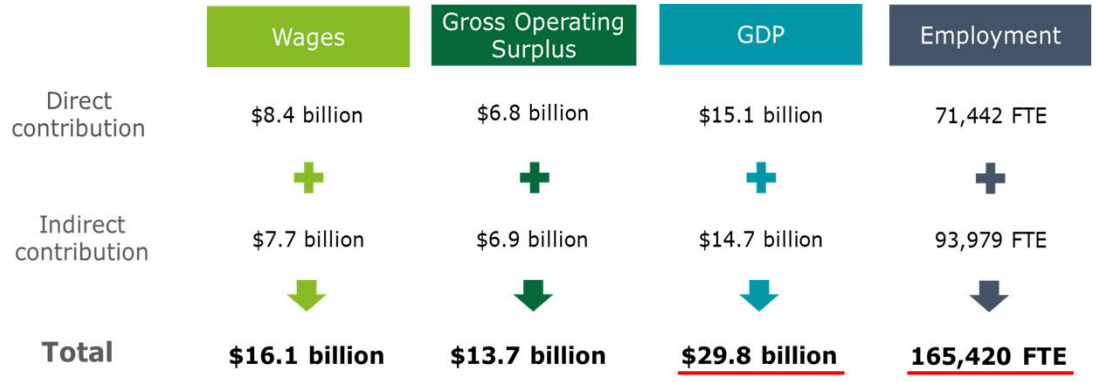
The size of Australia's passenger rail sector

In 2019, the rail industry contributed more than $29.8 billion to the Australian economy. Of this contribution, 31% came from passenger rail and 4% from rolling stock production[1] – where 51% of this rolling stock production is for passenger rail purposes[2]. In total, the passenger rail and passenger rolling stock production sectors are expected to comprise 33%, or approximately $10 billion, of the rail industry's contribution to the Australian economy.

The economic contribution to the rail industry is comprised of employees' wages and gross operating surplus (GOP), which is effectively industry profits. Across the entire rail industry in Australia (not just passenger rail), wages had a direct contribution of $8.4 billion to the Australian economy, plus an additional indirect contribution of $7.7 billion.

Industry profits directly contributed $6.8 billion to Australia's economy, plus a further $6.9 billion of indirect contribution. Indirect contribution stems from activities in related industries that are supported by the Australian rail sector. The overall contribution to GDP is comprised of $15.1 billion of direct contribution and $14.7 billion of indirect contribution, to have an overall contribution of $29.8 billion. This breakdown is presented in Figure 2.

Figure 2: Economic contribution of the rail industry to Australia's economy



Note: FTE = Full Time Equivalent job

Source: Australasian Railway Association, 2020, *Value of Rail 2020.*

1. Australasian Railway Association, (2020), *Value of Rail 2020.*
2. IBISWorld, (2020), *Rail equipment manufacturing and repair in Australia C2393.*

Employment in passenger rail in Australia

Australia's passenger rail sector employs over 16,000 people nationally (refer Table 1). NSW, Victoria and Queensland are the largest hubs for employment in the passenger rail industry. These three locations account for approximately 84% of the total passenger rail market in Australia[2], largely through their extensive urban networks – though they each have large regional networks as well.

NSW has the largest number of people employed in railway rolling stock manufacturing and repair, followed by Victoria and Queensland respectively (refer Table 1). Western Australia has the largest number of people employed in this sector relative to the amount of employment in the rail passenger transport sector; however this is expected to be reflective of the larger employment in freight transport in the state, as the ANZSIC industry data published by the ABS does not distinguish between railway rolling stock manufacturing and repair for freight and passenger services. See Appendix A for wider rail industry employment.

Table 1: Direct employment in passenger rail in Australia by state and territory

State or Territory	Rail passenger transport			Railway Rolling Stock Manufacturing and Repair		
	Full time	Part time	Other	Full time	Part time	Other
NSW	4,664	407	315	1,207	82	42
Victoria	4,532	477	332	793	45	23
Queensland	4,273	360	249	636	39	21
SA	459	68	55	129	6	9
WA	426	48	32	171	12	10
Tasmania	124	11	5	6	3	-
NT	7	10	3	-	-	3
ACT	4	-	1	-	-	-

Source: ABS Census of Population and Housing, 2016.

Note: Other captures people who are employed but may be away from work or those who did not state their hours. This data does not capture passenger rail employment where the specific rail sector was not fully disclosed.

Passenger rail patronage is highest is Melbourne, followed by Sydney. Since 2001-02, strong growth in patronage has been evident in Melbourne, Perth and Adelaide, but less so in Brisbane and Sydney.

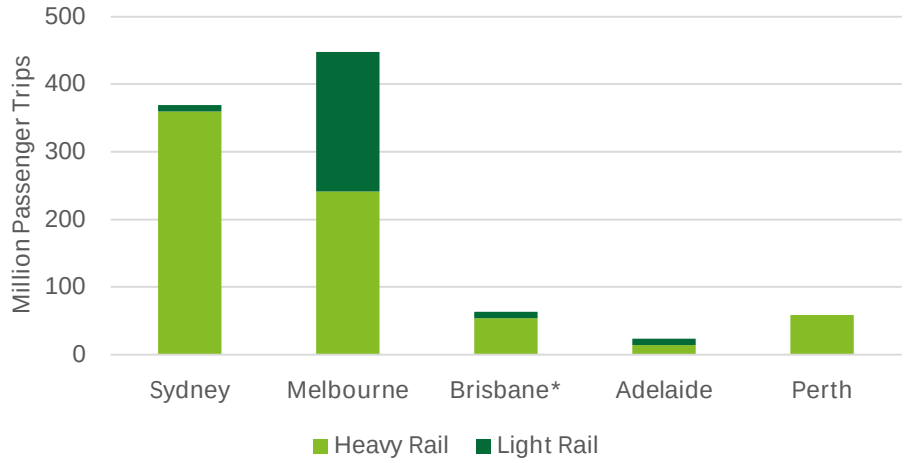
Patronage on Urban Networks

Presently, five Australians states operate urban heavy rail networks, five states and territories operate light rail networks (including two networks in NSW), and all states and territories except Tasmania are connected to a regional network.

Victoria is home to Australia's largest urban rail network, comprised of a 413km heavy rail network and a 250km light rail network. The light rail network in particular is significantly larger than any other light rail network in Australia. Melbourne's urban network had the highest patronage in Australia is 2017-18, with a total of approximately 450 million passenger trips on the network (refer Chart 1). Victoria's regional rail network is smaller than both NSW and QLD's regional networks, though this is largely reflective of the smaller land area in the state and the smaller distances between regional centres.

Sydney had the next largest number of passenger trips on its urban networks, at approximately 370 million trips in 2017-18. The vast majority of these trips were made on its urban heavy rail network, which is much more extensive than its light rail network. Sydney was followed by Brisbane, Perth and Adelaide respectively for the number of passenger trips made in 2017-18 (refer Chart 1).

Chart 1: Patronage on urban networks in 2017-18



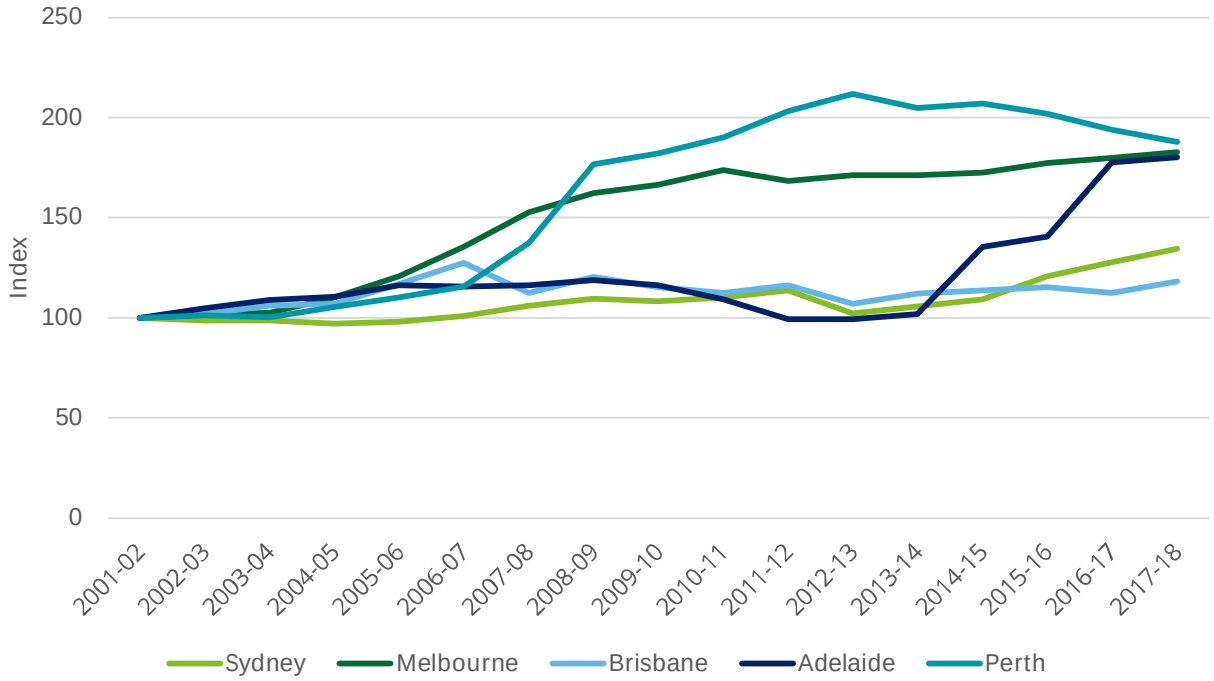
*Brisbane figures include the South-east Queensland TransLink network and light rail trips on the Gold Coast
Source: BITRE

Patronage Growth

Since 2001-02, Perth's metropolitan network has seen the largest percentage growth in heavy rail patronage (refer Chart 2). From 2011-12 to 2015-16 train patronage in Perth was more than 100% higher than it was in 2001-02; however patronage has since fallen slightly to remain 88% higher in 2017-18 than it was in 2001-02. Brisbane had the smallest growth over this same period, with train patronage being only 18% higher in 2017-18 than it was in 2001-02.

It is worth noting that patronage growth is reflective of new investment in rail lines, rolling stock and the construction of new networks. Investment across Australia's cities has varied over the years.

Chart 2: Growth in Urban Patronage from 2001-02 to 2017-18



Source: BITRE Statistics Yearbook, 2020; Deloitte Analysis

The pandemic caused a sharp decline in public transport patronage when its impacts manifest, but recovery is evident in Australia's major cities. There is some concern that the downturn could remain 'sticky' as travel behaviour has shifted.

The pandemic downturn

The COVID-19 pandemic brought a halt to the way cities operate, and rail operations were no exception. High-density locations such as CBDs that are typically accessed through rail or other modes of transportation were found to be much emptier as Australians began to work remotely and no tourists were around.

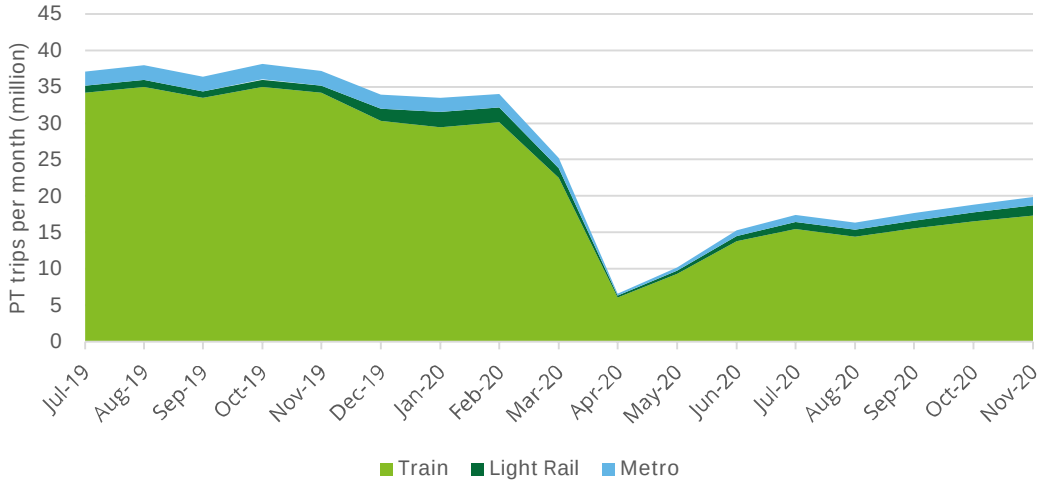
The aftermath of COVID-19 is yet to be fully explored, but it is more than possible that some COVID-19 behaviours such as remote working will remain for some time into the future, which could impact demand for rail transport for an indefinite time period. While some recovery is already evident from the initial COVID-19 shutdown period, public transport usage is not yet close to the patronage levels that were observed pre-COVID-19.

The impact that COVID-19 has on public transport usage was instant and severe, and it is unlikely that recovery will follow the same pattern. Monthly data published by Transport for NSW shows the sharp decline that followed Australia's first wave of the COVID-19 outbreak in April (refer Chart 3). Patronage hit its lowest point in April and has since been on the rise, though even in November 2020 patronage was significantly below pre-COVID-19 levels.

The impact of the COVID-19 downturn on rail patronage was also evident across other capital cities in Australia (refer Chart 4). Melbourne in particular was badly affected for a prolonged period, as their second wave brought a decline in public transport usage to a low of -83%, exceeding the downturn seen in the first wave where the low was -79%. While Melbourne was experiencing its second wave of COVID-19, Australia's other capital cities were experiencing a gradual return to normal, in which rail patronage slowly increased. Perth's patronage has recovered the most, where there have coincidentally been the least COVID-19 cases. Across all cities patronage remains approximately 15-30% lower than pre-COVID levels, though Australia is not yet beyond the risk of further outbreaks.

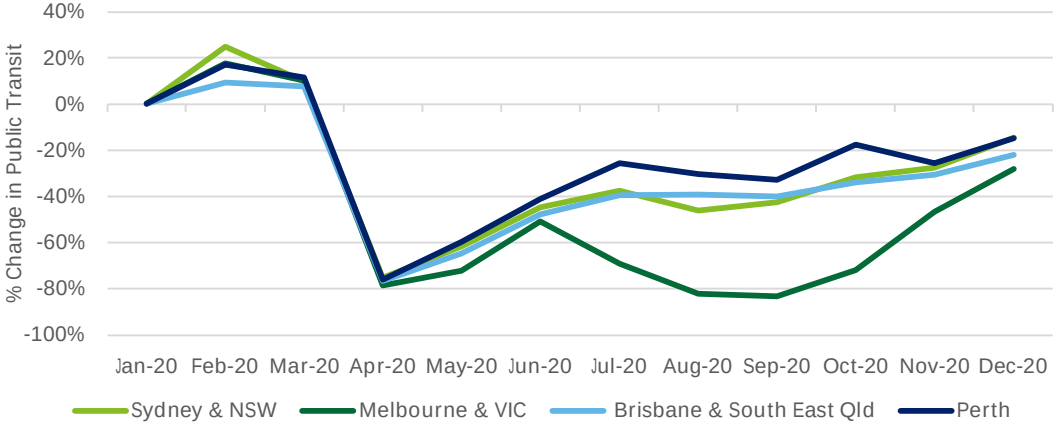
As more Australians are able to work from home, and as long as COVID-19 remains a threat, public transport patronage is not likely to experience full recovery. Some of the new travel behaviours that Australians have adopted due to the looming threat of COVID-19 may also remain 'sticky' post-COVID-19, which may impact future demand and investment for rail in Australian cities.

Chart 3: Sydney public transport trips* per month on rail services – COVID-19 Impact



Source: Transport for NSW Open Data Hub

Chart 4: COVID-19 impacts on public transport usage in capital cities



Source: Moovit Public Transit Index

*Trips refers to a single movement on one mode of public transport from the point of embarking and disembarking. It does not account for longer journeys that may include multiple changes in public transport mode.

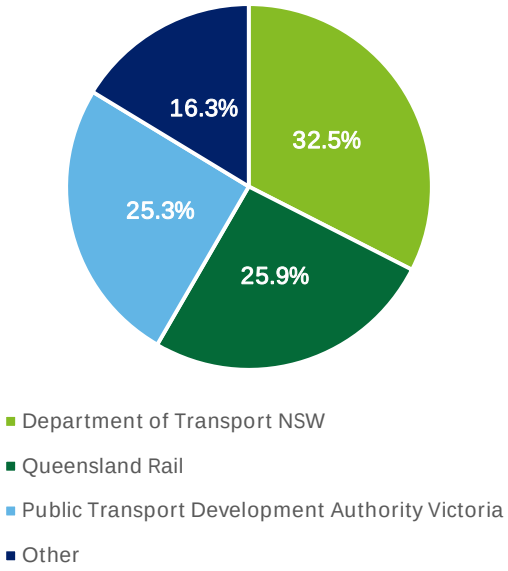
The passenger rail sector is largely characterised by major players that have a high market concentration. The major players in the market are state government operators, with the sector being mostly publicly-owned.

Operators

The passenger rail transport industry is characterised by a high level of market share concentration, with the three largest players in the market accounting for 84% of industry revenue (refer Chart 5).[1] The largest players in the market are comprised of the state-wide corporations or authorities that operate passenger rail services in their respective states, notably the Department of Transport NSW, Victoria's Public Transport Development Authority (albeit via a franchise) and Queensland Rail. The only other states offering commuter passenger services are Western Australia and South Australia, however with smaller populations and rail networks, they are smaller players in the passenger rail industry.

There are a number of minor players in the passenger rail transport industry, including long distance and tourist services operating in all Australian states and territories. Among these services are the famous Ghan Railway that operates between Darwin and Adelaide (via Alice Springs) and the Indian Pacific that operates between Sydney and Perth (via Adelaide).

Chart 5: Major Players in Passenger Rail



Source: IBISWorld

Ownership

The major players in Australia's passenger rail industry are predominantly government agencies or government-owned corporations. Industry operators largely depend on government subsidies to cover operating costs due to a combination of modest fare yields, high maintenance and labour costs that the industry faces. Without subsidies the industry is largely unprofitable.

Some exceptions to government ownership include Metro Trains Melbourne (MTM), which is a private consortium operating under a franchise arrangement. MTM is a joint venture between MTR Corporation (which is majority owned by the Hong Kong Government), John Holland Group, and UGL Rail. MTR Corporation is currently one of the only foreign entities operating passenger rail services in Australia.[1]

Several tourism services are privately owned, including Great Southern Rail, which operates the Ghan, the Indian Pacific and the Overland (Melbourne-Adelaide). Great Southern Rail is currently owned by Australian private equity firm Allegro, though it was previously foreign-owned by a UK-based company.[1]

Opportunities exist to work with state-owned operations where private capital can be used in rolling stock ownership or provision, terminal operations and the provision of communication technology. There is potential for partnerships and leasing arrangements with passenger rail operators for the provision of these assets/services. For example, Metro Trains Melbourne leases all of its rolling stock.[1]

Regulations

Australia's passenger rail network is heavily regulated, and this is largely reflective of the high level of public ownership and operation of the networks. To gain access to the rail networks, operators must adhere to government regulation. Any person operating a train must be accredited by the relevant body in a state or territory where the activities will take place, giving state governments control over who operates on their networks.[1]

Pricing regulation is also very prevalent in the passenger rail sector. The market is largely subsidised by the governments, as they have the dual function of providing public transport to the community at a reasonable prices and funding the operations of the public transport provider (which is usually a public entity). Due to the high level of subsidisation in the market, there is very little opportunity for private entities to competitively provide new rail transport offerings in the market without significant public sector involvement.

1. IBISWorld, (2020), *Rail equipment manufacturing and repair in Australia C2393.*

The manufacturing and repair of railway locomotives and rolling stock (including rail carriages, trams and cable cars) in Australia is dominated by a few major operators.

Railway Equipment Manufacturing and Repair in Australia[1]

The rail manufacturing and repair industry* in Australia is dominated primarily by three suppliers: CIMIC Group, Bombardier Transportation and Downer. Of these operators, CIMIC Group (via it's subsidiary UGL Limited) is the market leader in terms of revenues with 30.5% of the market, closely followed by Bombardier Inc. with 26.7% and Downer with 23.7% (refer Chart 6).

CIMIC Group

CIMIC Group Limited is one of the largest construction, engineering and project mining companies in Australia. CIMIC Group operates in this industry via the subsidiary UGL Limited (UGL) – a transportation and infrastructure company. UGL is one of Australia's leading freight locomotive manufacturers and maintains fleets across the country.[2] UGL is also a major passenger rolling stock maintenance provider with contracts in New South Wales and Victoria in partnership with MTR Corporation Limited, a Hong Kong-based rail operator.

Bombardier Incorporated

Bombardier Inc. operates via the wholly-owned subsidiary Bombardier Transportation Australia Pty Ltd (BTA). Bombardier Inc. is a Canada-based multinational corporation that is publicly-traded on the Toronto Stock Exchange. BTA manufactures and maintains railway rolling stock, including light rail vehicles and is headquartered at its manufacturing hub in Dandenong, Melbourne.

Downer EDI Limited

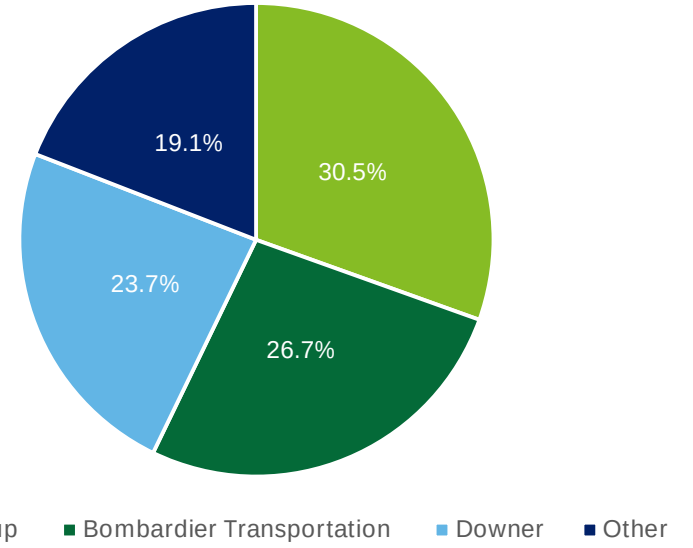
Downer EDI Limited is an multinational ASX-listed company that provides engineering and infrastructure management services to public and private rail, road, power, telecommunications, mining and resource companies. Downer designs, manufactures, refurbishes and maintains locomotives and wagons exclusively for passenger transport rail. This follows the sale of Downer's freight rail manufacturing and maintenance division to Progress Rail in early 2018.

*This industry as discussed in this section of the report encompasses those entities whose primary activities include: locomotive manufacturing, railway rolling stock manufacturing, repair of locomotives and rolling stock, tram manufacturing, cable car manufacturing and rail carriage manufacturing. The major products and services produced by this industry include repair and maintenance services, passenger trains and carriages, freight trains and wagons and passenger light rail and trams.

Other suppliers

- Bradken Pty Limited – Bradken Pty Limited is a subsidiary of Hitachi Construction Machinery Co. Limited. Bradken P/L manufactures different consumables and capital products for mining, energy, transport and other industrial markets. Bradken Pty Limited designs, manufactures and supplies freight rolling stock.
- Engenco Limited – Engenco Limited is a publicly-owned company listed on the ASX. Engenco provides repair, refurbishment and maintenance services for locomotives, wagons and other rail products through its operating arm Gemco Rail. Gemco Rail also sells a range of spare parts for rolling stock, and other rail equipment and consumables.

Chart 6: Market share by revenue, 2020FY



Source: IBISWorld, 2020

1. IBISWorld, 2020, Rail equipment manufacturing and repair in Australia C2393.
2. UGL, 2020, 'How UGL keeps Australia moving' - https://www.ugllimited.com/en/news/2020/how-ugl-keeps-australia-moving

Sydney captures the largest proportion of journey-to-work trips via its rail network, and has the largest ridership on its urban heavy rail network in Australia. Rail patronage is expected to grow with expansion of light rail and metro systems

NSW Rail Networks

The NSW passenger rail network is comprised of an urban heavy rail network in Sydney, two small light rail networks located in Sydney and Newcastle, and the regional heavy rail network that links to regional hubs and interstate. The network is largely administered by public entities such as Transport for NSW, though the light rail networks in Sydney and Newcastle are privately operated by Transdev and Newcastle Transport (a subsidiary of Keolis Downer) respectively.

Sydney's heavy rail network is operated by Sydney Trains, and in the case of the new driverless metro lines, Sydney Metro. The network spans a total of 400km, with 364km operated by Sydney Trains and 36km operated by Sydney Metro. In 2017-18 approximately 360 million trips were made on the Sydney heavy rail network, up from approximately 270 million in 2001-02 (refer Chart 7). The network currently serves as the mode of transport for 19.1% of journeys to work in Sydney.

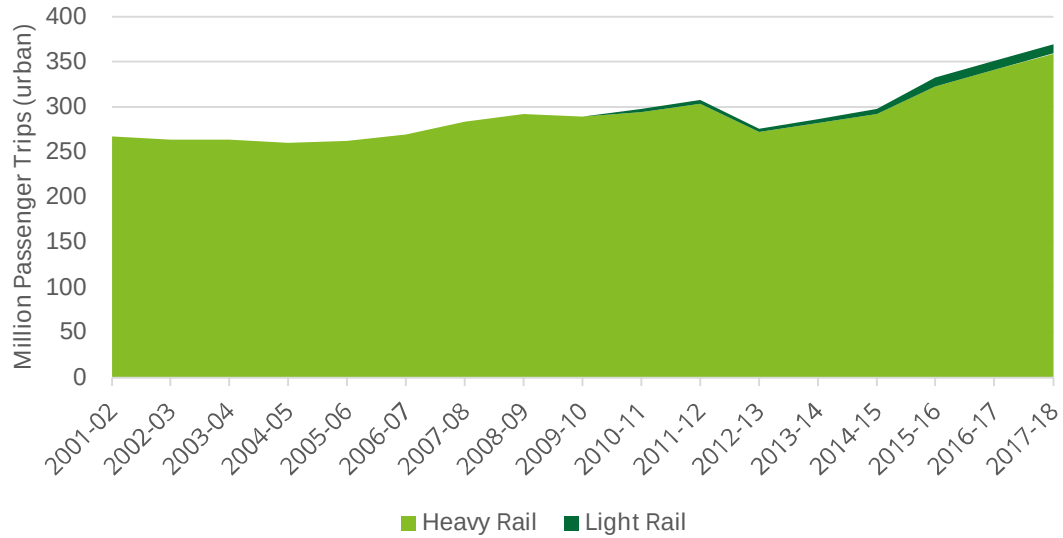
The NSW urban rail network had experienced growth of approximately 34% from 2001-02 to 2017-18. Growth in patronage was particularly strong from 2013-14 to 2017-18, where patronage grew from 286 million trips annually in 2013-14 to 369 million trips annually in 2017-18 (refer Chart 7). The majority of this growth was in the heavy rail sector, though the construction of the light rail has added to these figures and is expected to grow as the network is expanded. This growth period followed an approximately10% year-on-year decline in rail patronage in 2012-13 (refer Chart 8).

NSW is home to two light rail networks, a 24.7km network in Sydney and a 2.7km network in Newcastle. The Newcastle network is newly completed and began operating in 2019 and is therefore not reflected in Chart 7; however the Sydney network was used for close to 10 million trips in 2017-18, with this set to grow as the network expands. Both the Sydney and Newcastle light rail networks are relatively new and are set to undergo further stages of construction in coming years that will increase their usage and convenience for passengers.

The NSW regional rail network is operated by NSW TrainLink and spans 4,261km. It is the highest patronage regional network in Australia, with approximately 46 million trips in 2017-18. The majority of these trips were intercity trips – Sydney to Newcastle being among the most popular routes – at 44.7 million, while approximately 1.3 million trips were made to regional locations.[1]

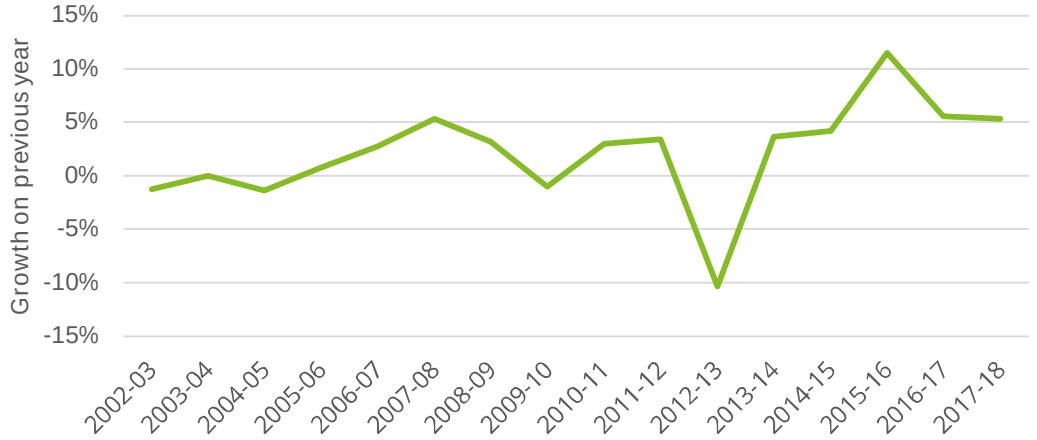
Maps of the NSW rail networks are provided in Appendix B.

Chart 7: Urban Rail Patronage - Sydney



Source: BITRE

Chart 8: Growth in Urban Rail Patronage - Sydney



Source: BITRE and Deloitte Analysis

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Victoria has experienced steady growth in rail patronage on its urban network and its regional network. By improving the rail links between Melbourne and nearby regional hubs, Victoria has defied the downward trend in regional travel.

Victoria's Network

Victoria is home to Australia's largest urban public transport network, with over 650km of network coverage comprised of 413km of urban heavy rail and 250km of urban light rail. Victoria's regional network is somewhat smaller than other states owing to its smaller size, though the non-urban network still spans 1,737km of rail network coverage.

Melbourne's heavy passenger rail network spans 413km across the city of Melbourne. It is privately operated by Metro Trains Melbourne (MTM), which is a joint venture between Hong Kong's MTR Corporation and Australia's John Holland Group and UGL Rail. It serves as the mode of transport to work for 13.7% of Melburnians. Heavy rail travel in Melbourne has grown steadily, with trips increasing from 132 million in 2001-02 to 241 million in 2017-18. This represents growth of approximately 83% over the period (refer Chart 9).

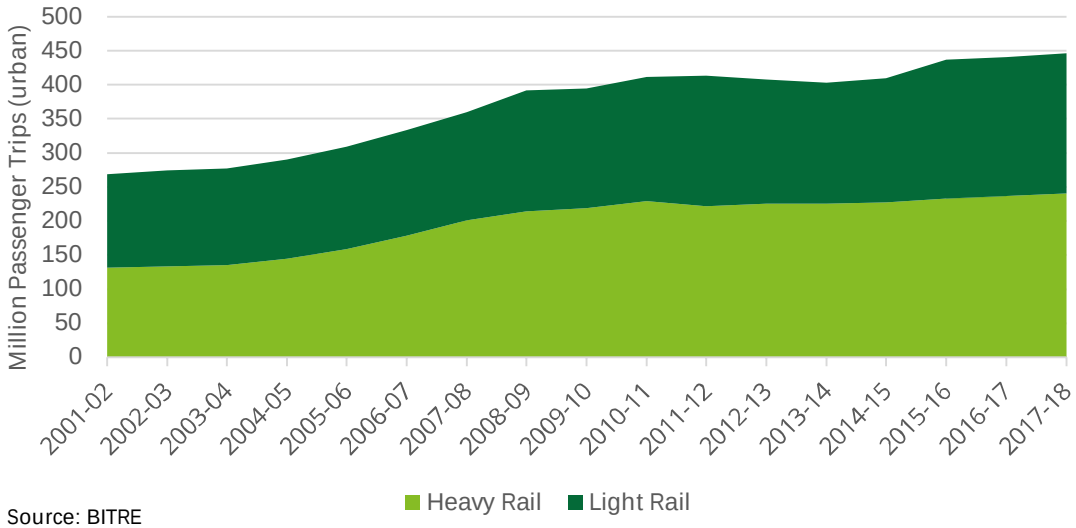
Melbourne is home to Australia's largest light rail network of 250km. The light rail network is operated by Keolis Downer, operating as Yarra Trams. It provides a method of travel to work for 3.9% of Melburnians. Light rail usage has also grown steadily in recent years, increasing from 137 million trips in 2001-02 to 206 million trips in 2017-18 (refer Chart 9). This represents growth of approximately 50% over the period.

Aside from slight declines in 2012-13 and 2013-14, Victoria experienced positive growth over the observed period. This includes three consecutive years where growth was roughly 8-9% between 2006-07 and 2008-09 (refer Chart 10).

Victoria's regional network is operated by V/Line and spans 1,737km across the network. Victoria's regional network is growing at a faster pace than regional networks in other states, largely due to growth in Geelong and other regional locations within commuting proximity of Melbourne. Non-urban rail patronage has grown by over 200% in Victoria since 2004-05, significantly outpacing growth in NSW and counteracting the downward trends in regional rail that Queensland and WA are experiencing.[1] Victorian regional rail is in a somewhat unique position to their counterparts due to the close proximity of regional hubs to Melbourne that aren't part of the urban network (Queensland's TransLink urban network spans Brisbane, the Gold Coast and Sunshine Coast, for example). This resulted in a total of 19.5 million trips on the regional network in 2017-18. The Geelong corridor alone had 13.8% growth on V/Line patronage in 2017-18, which contributed to the overall growth of 8.8% in that year.[1]

Maps of the Victorian rail networks are provided in Appendix B.

Chart 9: Urban Rail Patronage - Melbourne



Source: BITRE

Chart 10: Growth in Urban Rail Patronage - Melbourne

Source: BITRE and Deloitte Analysis

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Queensland has experienced small growth in the use of its urban heavy rail network, though overall rail patronage has increased due to the construction of the Gold Coast Light Rail system.

Queensland is home to an urban heavy rail network spanning Brisbane, the Gold Coast and Sunshine Coast, the Gold Coast light rail and a regional network. The urban network is amalgamated under the TransLink banner, though the heavy rail and light rail networks are operated by separate entities. Queensland's regional network is the largest in Australia and it connects several regional and rural hubs.

Queensland's heavy rail network is operated by Queensland Rail and it spans 396km. Queensland Rail operates the heavy rail network across Brisbane, the Gold Coast and Sunshine Coast, and is the preferred transport mode for 7.3% of commuters. Queensland's heavy rail network has seen the least growth of all capital cities' urban heavy rail networks, with growth of approximately 18% from 2001-02 to 2017-18. In 2017-18 approximately 54 million trips were made on the network (refer Chart 11).

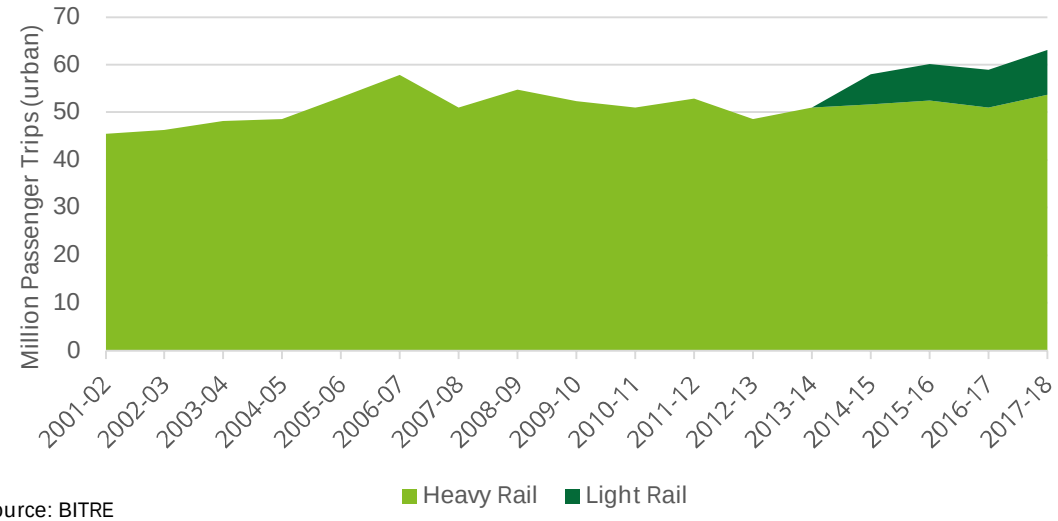
The Gold Coast Light rail is the only light rail service currently operating in Queensland, operated by Keolis Downer. The route spans 20.3km from Helensvale (where it connects to the Queensland Rail network) to Broadbeach South, though it is set to be expanded to Burleigh Heads and then eventually to the Gold Coast Airport. There is also proposed investment in light rail systems in Cairns and on the Sunshine Coast, which would expand Queensland's light rail network. In 2017-18 there were approximately 10 million trips taken on the light rail network (refer Chart 11).

Year-on-year growth in patronage on South-East Queensland's urban rail network was very volatile between 2002-03 and 2017-18, with years of growth in patronage often following years of decline. The year-on-year growth rate saw a low of around -12% in 2007-08 and a high of around 14% in 2014-15 (refer Chart 12).

Queensland has Australia's largest regional passenger rail network operated by Queensland Rail, spanning 4,380km across the network. The regional network excludes the South-East Queensland network that spans Brisbane, the Gold Coast and Sunshine Coast which are Queensland's three largest population centres, and as a result, patronage on the regional network is substantially smaller in Queensland than in NSW and Victoria. In 2017-18 there were approximately 750,000 trips made on Queensland's regional network. This represents a decline of less than 2% on the previous year.[1] The service is heavily tourism focussed, with the distances travelled and the price of the service making flying more economical in many cases.

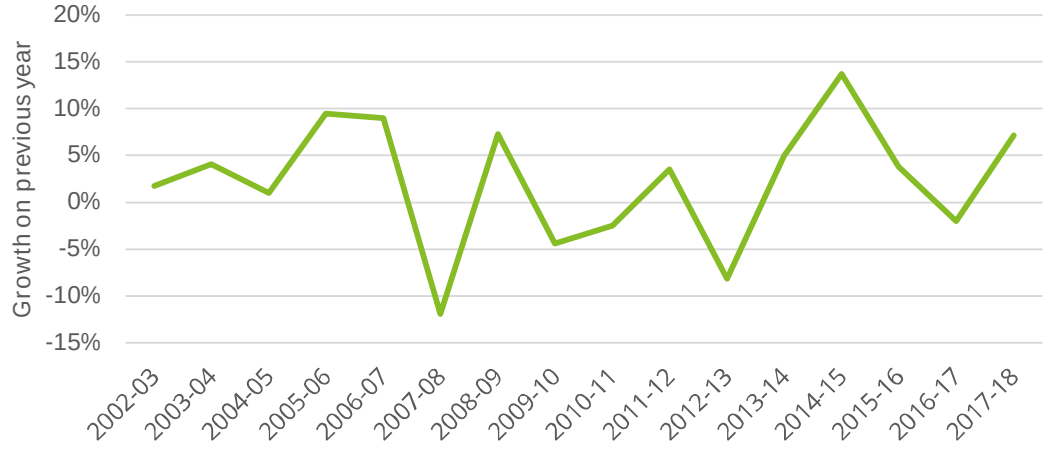
Maps of the Queensland rail networks are provided in Appendix B.

Chart 11: Urban Rail Patronage – South-East Queensland



Source: BITRE

Chart 12: Growth in Urban Rail Patronage – South-East Queensland



Source: BITRE and Deloitte Analysis

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Perth's urban heavy rail network has seen the most growth of all urban networks in Australia's capital cities. By increasing rail supply in areas with growing population (and hence demand) ridership growth has been impressive.

Western Australia is home to an urban heavy rail network and a regional rail network. There are no light rail operations currently in the state. All rail operations in the state are publicly managed, with the urban network operated by Transperth, and the regional network operated by Transwa. Great Southern Rail also operates its Indian Pacific service that connects Perth to Sydney via Adelaide.

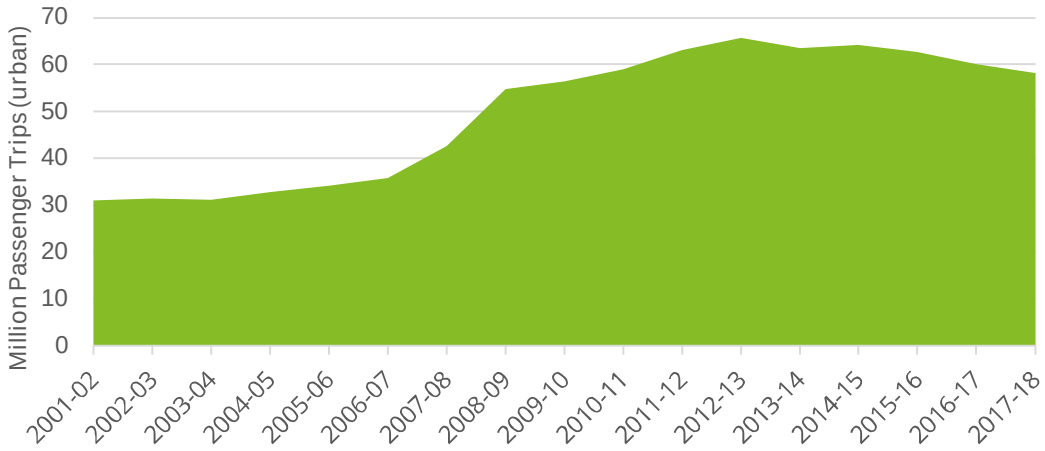
Perth's heavy rail network spans 181km and serves as the mode of transport to work for 7.5% of the population. It connects more regional hubs such as Mandurah to the city centre as well as providing convenient connections in the inner city. Perth's urban network has seen the most growth since 2001-02, with approximately 88% more patronage as at 2017-18. In 2001-02 approximately 31 million trips were made on Perth's urban network, while in 2017-18 there were 58 million trips. Despite strong overall growth over the 16-year period, ridership has been on the decline since 2012-13 (refer Chart 13).

Perth saw significant year-on-year growth in its urban rail patronage of nearly 30% in 2008-09. This is likely to be from increased patronage on the Perth-Mandurah line, which began operating in 2007. Growth has slowed since 2008-09 and has been on the decline since 2015-16 (refer Chart 14).

Transwa operates several passenger rail services in southern WA. The services operate from Perth to Kalgoorlie and Perth to Bunbury. In 2017-18 there was an estimated 180,000 passengers on WA's regional services, down approximately 4% from the previous year.[1]

Maps of the WA rail networks are provided in Appendix B.

Chart 13: Urban Rail Patronage - Perth



Source: BITRE

Chart 14: Growth in Urban Rail Patronage - Perth

Source: BITRE and Deloitte Analysis

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Passenger rail patronage in South Australia has grown with the introduction of light rail into the city of Adelaide and further investment into the city's heavy rail network.

The South Australian passenger rail network is comprised of an urban heavy rail network and an urban light rail network. South Australia does not have any regional networks operating; however Great Southern Rail operates several interstate long distance services that pass through Adelaide.

Adelaide's urban heavy rail network spans 126km and is operated by Adelaide Metro. The network saw little growth in patronage from 2001-02 to 2013-14, but has since invested in rail expansion, upgrades and new rolling stock, which has driven growth in patronage. From remaining stagnant at roughly 8-9 million passenger trips until 2013-14, there were approximately 15 million passenger trips in 2017-18. This represents growth of approximately 80% from 2001-02 to 2017-18 (refer Chart 15).

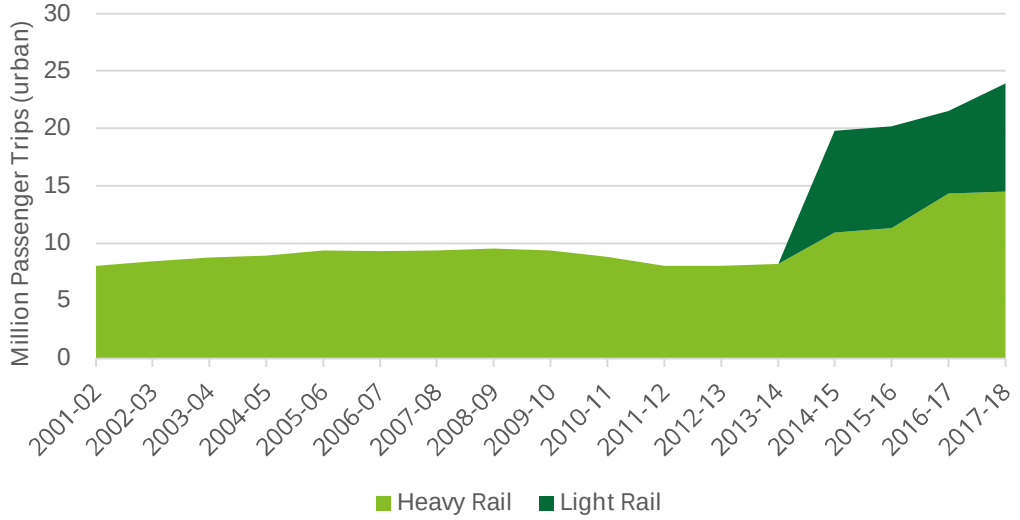
Adelaide's light rail network begun operating in 2014-15 and has quickly become a popular form of transportation. The network spans 16.5km and is privately operated by Torrens Connect. Approximately 9 million passenger trips were made using Adelaide's light rail network in 2017-18 (refer Chart 15).

The opening of Adelaide's light rail network in 2014-15 spurred huge growth in overall rail usage in Adelaide. The year-on year growth in rail usage was 141% in 2014-15, vastly driven by the opening of the light rail service, though the heavy rail network also experienced a boost to patronage in this year (refer Chart 16).

While South Australia does not have a regional network, Great Southern Rail does operate several services that transit via Adelaide. Great Southern Rail operates the Ghan Railway that operates between Adelaide and Darwin (via Alice Springs), the Indian Pacific route that operates between Sydney and Perth (via Adelaide), and a service that links Melbourne and Adelaide. While these services primarily operate for tourism purposes, they do provide additional modes of travel between Adelaide and other capital cities in Australia.

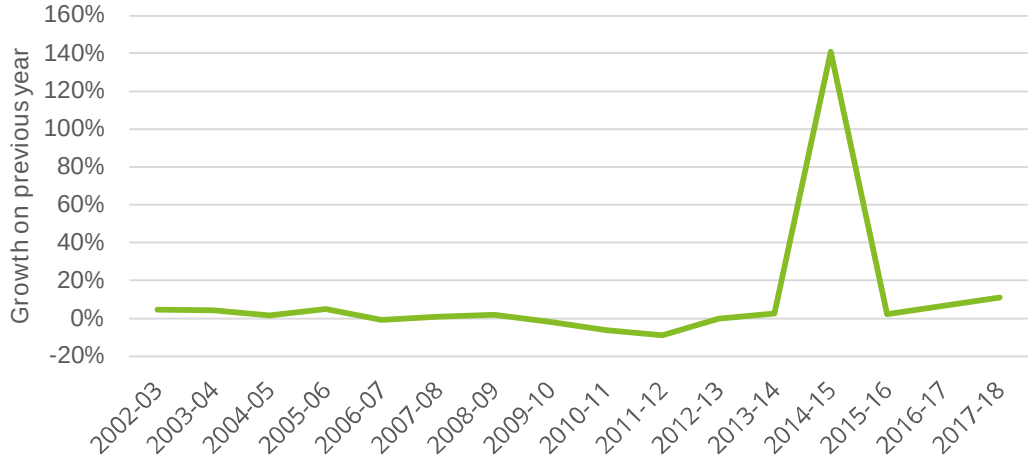
Maps of the SA rail networks are provided in Appendix B.

Chart 15: Urban Rail Patronage - Adelaide



Source: BITRE

Chart 16: Growth in Urban Rail Patronage - Adelaide



Source: BITRE and Deloitte Analysis

Regional and long distance services offer alternative modes of transport between Australia's capital cities and regional hubs. Patronage on longer journeys is largely for tourism, as alternative modes of transport provide faster journeys.

Regional Services

Four out of the five states offering urban heavy rail services also operate regional and long distance services within their states. Regional services are operated by NSW TrainLink in NSW, V/Line in Victoria, Queensland Rail in Queensland, and Transwa in WA. These services provide links between regional centres, capital cities and interstate locations.

The patronage on these regional and long distance services is presented in Table 2.

Table 2: Long Distance and Regional Service Patronage[1]

Operator	Patronage (thousand trips)
NSW TrainLink	1,280 regional and 44,700 intercity
V/Line (Victoria)	19,500
Queensland Rail	750*
Transwa (WA)	180

*Excludes services between Brisbane and the Gold Coast or Sunshine Coast via TransLink

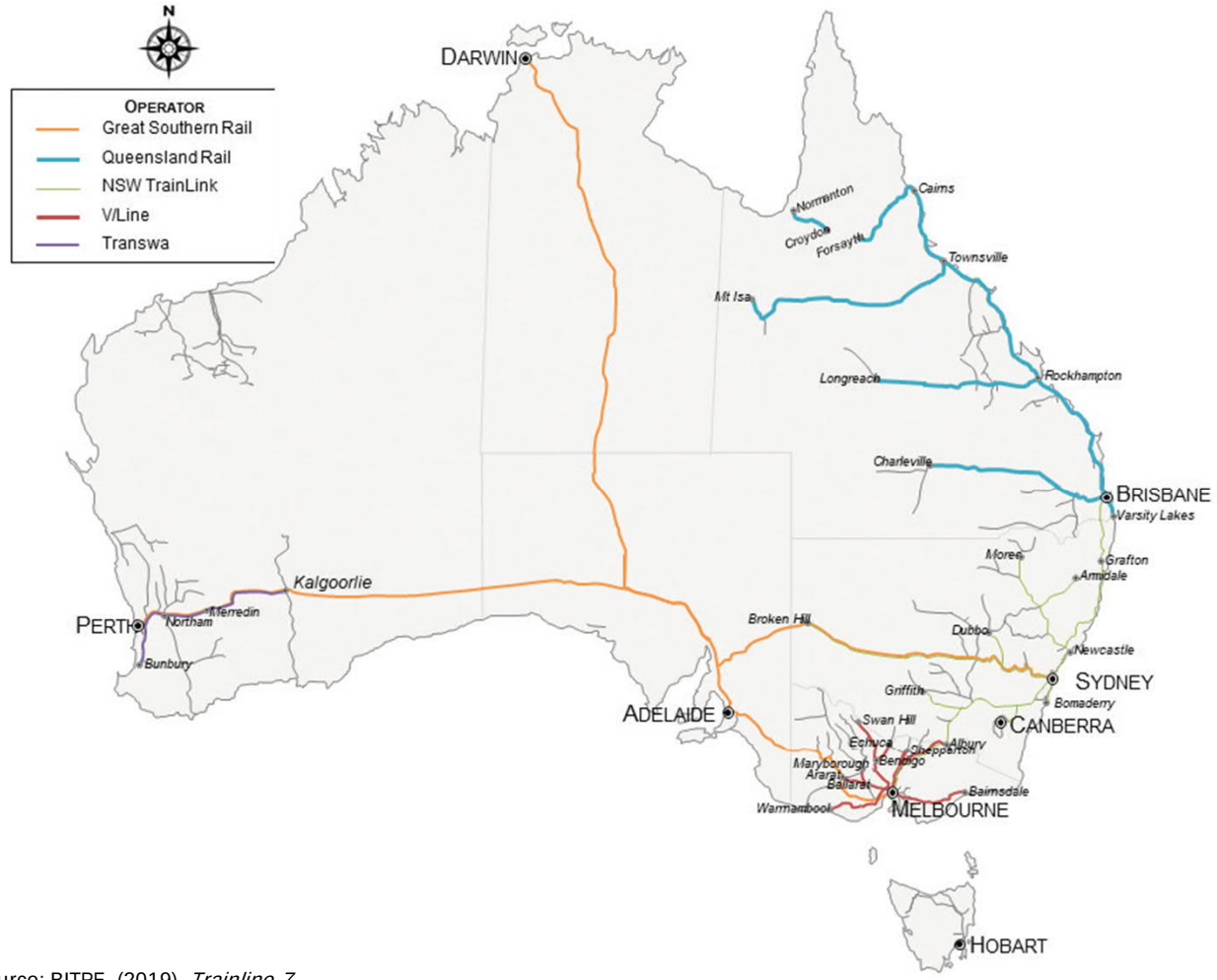
Source: BITRE Statistical Report, 2019

Long distance tourist-focused services

Great Southern Rail operates several long distance services that largely operate for tourism purposes. Among the most famous of these is the Ghan Railway that operates between Adelaide and Darwin (via Alice Springs), though they also offer the Indian Pacific route that operates between Sydney and Perth (via Adelaide) and a service that links Melbourne and Adelaide (refer Figure 3).

Several additional tourism services operate across the country, though many are of a smaller scale than the routes operated by Great Southern Rail. These include heritage railway services such as the SteamRanger Heritage railway in South Australia and the Kuranda Scenic Railway in Queensland.

Figure 3: Regional and Long Distance Services



Source: BITRE, (2019), *Trainline 7*

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

NSW operates its passenger rolling stock on a standard gauge network. Much of the rolling stock on the urban heavy rail and regional rail networks is decades old, though there are projects in place to modernise (and expand) the fleet.

NSW Urban Heavy Rail Network

The NSW urban heavy rail network operates on a standard 1,435mm gauge network. The network operates an electrified (1500V DC) system across a 400km route, of which 364km is operated by Sydney Trains and 36km is operated by Sydney Metro. The urban heavy rail network has a fleet of 400 rolling stock that entered service between 1981 and now. Detail on the rolling stock is available in Table 3.

NSW Light Rail Networks

NSW currently has two light rail networks operating – a 24.7km route in Sydney and a newly constructed 2.7km line in Newcastle. Both of these networks operate on a standard 1,435mm gauge and are either segregated or largely segregated. Both of these networks have publicly owned tracks, but are operated by private entities (Transdev in Sydney and Newcastle transport, a subsidiary of Keolis Downer, in Newcastle).

Across the two light rail networks there are a total of 78 rolling stock. More detail on this rolling stock is available in Table 3.

NSW Regional Network

The NSW regional rail network operates on a standard 1,435mm gauge. The route spans a total of 4,261km, with approximately 445km of this being powered by electricity. The network currently has 102 rolling stock in service that began operating between 1981 and 1994 (see Table 3 for more detail), though it is set to be replaced by 117 new rolling stock from 2023 onwards.

Table 3: NSW Passenger Rolling Stock Fleet

Operator	Rolling Stock Fleet	Number in Fleet	Year entered service
Sydney Trains1	K-Set 4-car units	40	1981-1985
	C-Set 4-car units	14	1986-1987
	T-Set "Tangara" 4-car units	111	1988-1995
	M-Set "Millennium" 4-car units	35	2002-2005
	H-Set "Oscar" 4-car units	55	2006-2012
	A-Set "Waratah" series 1, 8-car units	74	2011-2014
	B-Set "Waratah" series 2, 8-car units	26	2018-2019
Sydney Metro[2]	6-car fully automated Metropolis trains	45	2019-present/ongoing
Transdev[3]	Alstom Citadis	60	-
	CAF Urbos 3	12	-
Newcastle Transport[4]	CAF Urbos 3 100 trams	6	-
NSW TrainLink[1]	Xplorer DMUs – 2 or 4 cars set up	23	1993-1995
	XPT – various formations	79	1981-1994
	New rolling stock in 3-car and 6-car formations to replace Xplorer and XPTs	117	From 2023

Source: Transport for NSW

1. Transport for NSW, (2020), *Sydney and intercity train fleet*.
2. Sydney Metro, (2020), *23 metro trains on the way for Sydney's Southwest* [media release].
3. Sydney Light Rail, (2016), *Sydney Light Rail: News – March 2016*.
4. CAF, (2020), *Newcastle Tram*.

Victoria and Queensland operates rolling stock on broad, standard and narrow gauge networks. Both states have a variety of older and newer rolling stock in operation (on heavy and light systems) with upgrades in the pipeline.

Victoria's Urban Heavy Rail Network

Victoria's urban heavy rail network operates on a standard 1,435mm gauge network. The route spans 413km, of which 382km is powered by electricity. The network is operated by Metro Trains Melbourne, who have 291 rolling stock on the network. Details on the rolling stock are available in Table 4.

Victoria's Light Rail Network

Victoria operates the most extensive light rail network in Australia, with 250km of 1,435mm gauge tracks. The network is largely integrated with the road network, with only 24% of the network being segregated. There are 501 rolling stock operating on Victoria's light rail network (detail on this rolling stock is available in Table 4).

Victoria's Regional Network

Victoria's regional network comprises over 1,700km of tracks, comprised of broad (1,600mm) and standard (1,435mm) gauge tracks. Over 350 rolling stock operate of Victoria's regional network – the details of which are available in Table 4.

Table 4: Victoria's Passenger Rolling Stock Fleet

Operator	Rolling Stock Fleet	Number in Fleet	Year entered service
Metro Trains Melbourne[1]	6-car units	226	2009-present
	7-car HCMT units	65	Late 2020-ongoing
Yarra Trams[1]	Various classes including Bombardier Flexity Swift, Siemens, Combino, Alstom Citadis.	501	-
V/Line[1]	Vlocity units	228	2003-present
	Sprinter Units	21	1993-1995
	Various carriages and vans	120	1957-1990

Source: Yarra Trams, V/Line, Metro Trains Melbourne

Queensland's Urban Heavy Rail Network

Queensland's urban heavy rail network operates on a narrow 1,067mm gauge. The network spans 396km and is entirely electrified. The network is operated by Queensland Rail, who operate 212 rolling stock on the urban heavy rail network. Details on the rolling stock are available in Table 5.

Queensland's Light Rail Network

Queensland's light rail network operates on a standard 1,435mm gauge and spans 20.3km in length. The network is privately operated by Keolis Downer. There are 18 rolling stock on the network that entered service as the light rail's operations began in 2018. This is Queensland's newest public transport network.

Queensland's Regional Network

Queensland's regional network operates on a narrow 1,067mm gauge and spans 4,380km. It is the largest regional network of any jurisdiction in Australia. The network is operated by Queensland rail, who utilise a fleet of 18 rolling stock on the regional network.

Table 5: Queensland's Passenger Rolling Stock Fleet

Operator	Rolling Stock Fleet	Number in Fleet	Year entered service
Queensland Rail[2]	SMU 200 3-car units	12	1994-1995
	SMU 220 3-car units	29	1999-2001
	SMU 260 3-car units	35	2008-2011
	EMU 3-car units	88	1979-1987
	IMU 3-car units	10	1996-1997
	IMU 120 3-car units	4	2001-2002
	IMU 160 3-car units	27	2004-2011
	ICE 3-car units	7	1988-1989
Keolis Downer[2]	Bombardier Flexity 2 trams	18	2018
Queensland Rail[2]	L-class cars across 3 services	18	-

Source: Queensland Rail; Gold Coast Light Rail

1. Transport for Victoria, (2015), *Trains, Trains and Jobs – Rolling Stock Strategy*.
2. Queensland Rail, (2020), *Annual Reports*.

Renewal of the rolling stock fleet in Adelaide saw an increase in patronage on its urban heavy rail services. Most of the smaller jurisdictions with older fleets have been or are planning to modernise rolling stock (or even add new systems).

WA's Rail Network

WA's urban network operates on a narrow 1,067mm gauge over 181km, while the regional network operates on a combination of narrow 1,067mm and standard 1,435mm gauges. The urban and regional networks are operated by Transperth and Transwa respectively. Transperth recently invested in 47 new rolling stock for its urban network, while Transwa has 6 new rolling stock due in 2022 (refer Table 6).

SA's Urban Heavy Rail Network

SA's urban network operates on a broad 1,600mm gauge and is operated by Adelaide Metro. The route spans 126km and is electrified for 44km of this route. Adelaide's urban heavy rail network largely has older rolling stock that entered service between 1987 and 1996, though recent efforts to revamp the network have involved the introduction of newer, more modern rolling stock. This program has also seen a rise in patronage on the network.

SA's Light Rail Network

Adelaide's light rail network is privately operated by Torrens Connect and runs on a standard 1,435mm gauge network. The network is currently 16.5km in length. As the light rail only began operating in 2014-15, the fleet is relatively newer. Opportunities for new rolling stock are more likely to arise from expansion of the network, which has not yet been announced.

ACT's Light Rail Network

ACT's light rail network is the first rail network in the territory and began operating in 2019. It operates on a standard 1,435mm gauge over a 12km route, privately operated by Canberra Metro Operations. There are 14 rolling stock on the network that entered service in 2019, when the light rail began its operations.

Table 6: Passenger Rolling Stock Fleet in Other Jurisdictions

Operator	Rolling Stock Fleet	Number in Fleet	Year entered service
Transperth[1]	2-car A-Series units	48	1992
	3-car B Series units	31	2004-2006
	3-car B Series units	47	2009-2019
Transwa[1]	Australind - 3 / 4 car sets – DMUs	-	1987
	Prospector - diesel railcars - 3-car sets	-	2004
	AvonLink and Merredin links - 2 or 3 car sets - diesel railcars	-	2005
	New railcars for Australind – Alstom	6	Due 2022
Adelaide Metro[2]	3000/3100 class diesel railcars	70	1987-1996
	3-car 4000 class EMUs	22	2014-present
Torrens Connect[2]	Bombardier Flexity Classic	15	-
	Alstom Citadis trams	12	-
Canberra Metro Operations[3]	CAF Urbos 3 trams	14	2019

Source: Public Transport Association WA; Adelaide Metro; Torrens Connect; Transport Canberra.

1. Public Transport Authority of Western Australia, (2020), *Our fleet*.
2. Government of South Australia, (2015), *Building a stronger South Australia: Public Transport*.
3. Transport Canberra, (2020), *Light Rail*.

CHAPTER 3

The future of passenger rail in Australia

Australia's major cities are investing in new rail infrastructure to reduce congestion in cities and commuter travel times. Larger cities like Melbourne and Sydney are also working to better connect regional hubs and capital cities via rail.

Investment in new rail infrastructure and rolling stock improves the capacity and efficiency of Australia's rail network and helps to reduce congestion in cities and regional areas. Victoria, NSW, Queensland, WA and the ACT all have multi-billion dollar rail project pipelines that will enhance their urban and regional networks.

Victoria's passenger rail investment pipeline is significantly larger than any other jurisdiction in Australia. More than half of their expenditure is expected to be on the Suburban Rail Loop – a 26km underground rail tunnel that will connect several rail lines without entering the city – that is expected to cost a minimum of $50 billion.[1] Also among the more expensive projects are the Melbourne Metro Tunnel and the Melbourne Airport Rail Link, which are each estimated to cost close to or upwards of $10 billion.[2]

Victoria's total pipeline of rail projects is conservatively estimated to be worth approximately $90 million (refer Chart 17) – noting that this figure uses the lower cost estimates of projects where the cost is provided in a range, and some projects are in their early stages and have not yet been costed. While this cost will be spread out over several years – likely more than a decade for some of the largest projects – this still represents are huge investment from the Victorian government.

NSW has the second largest passenger rail investment pipeline, at an estimated $27.5 billion. This is also considered to be a conservative estimate, as the cost of some projects – particularly the Sydney Metro projects are either estimated or unknown. The investment pipelines in QLD, WA and ACT are conservatively estimated to be worth $7.3 billion, $6 billion and $1.3 billion respectively (refer Chart 17).

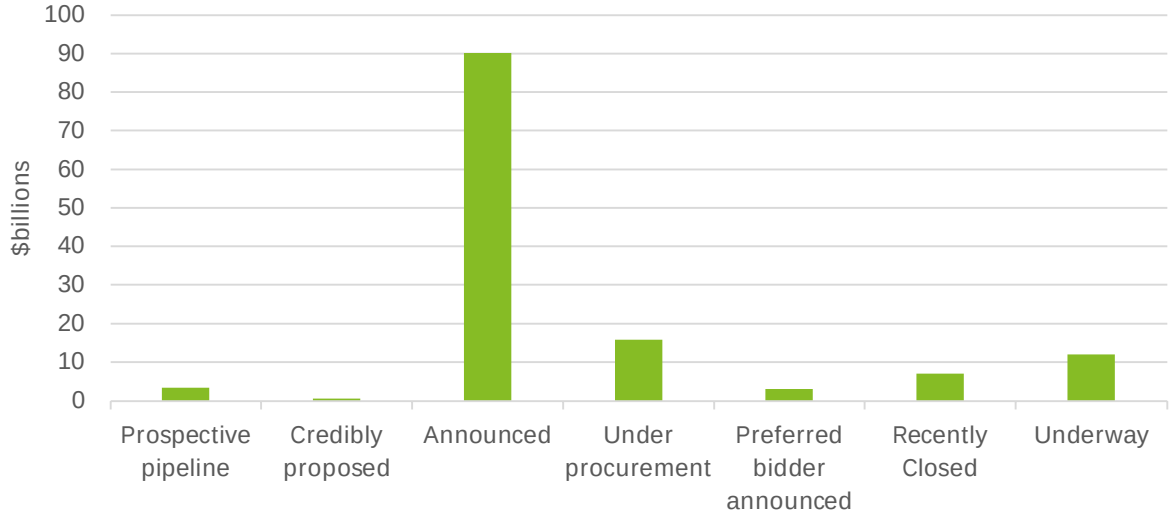
The majority of the passenger rail investment pipeline in Australia has been announced, but is not yet under procurement or underway. There are several projects that have also been credibly proposed, are in the prospective pipeline, or are even at earlier stages that do not yet have costing data available, so they are therefore not included in Chart 18. Among the estimated $90 billion investment pipeline that has been announced, many of the projects are not yet funded or only partially funded by state and federal governments, or private entities.

Definitions for each stage of the infrastructure pipeline are provided in Appendix C.

Chart 17: Passenger rail investment pipeline, by main land State or Territory

Source: Deloitte analysis Informed by various sources

Chart 18: Passenger rail investment pipeline, by stage of investment



Source: Deloitte analysis Informed by various sources

1. ABC, (2018), *Melbourne suburban train loop, including 12 new stations, promised by Victorian Labor.*
2. ABC, (2018), *Melbourne Metro Tunnel project: Design unveiled for five new underground train stations*.

Victoria has the largest rail investment pipeline of any Australian state. The pipeline includes major projects such as the Suburban Rail Loop and the Melbourne Metro tunnel.

Victoria is set to deliver several major projects over the next few years. These projects include high profile projects such as the Suburban Rail Loop, Melbourne Metro Tunnel and Melbourne Airport Rail Link, as well as line upgrades to several urban and regional rail lines. The Suburban Rail Loop is set to remove pressure from transport hubs in the CBD by acting as an underground rail 'ring road' that connects several train lines without entering the CBD (refer Table 7).

Most of Victoria's regional rail upgrades are focused on delivering more efficient services between Melbourne and regional hubs. The Fast Rail to Geelong project in particular is expected to be a major commuter route, as it lowers the travel time between Geelong and Melbourne to 50 minutes. Geelong is already the fastest growing regional hub in Victoria, so this project will only enhance the appeal of living in this regional town.

Several projects such as the Next Generation Trams and high capacity Metro Trains 2 projects will enhance and modernise Victoria's rolling stock. These projects will improve the efficiency on Melbourne's urban network while also improving the network capacity through a method that does not require adding additional services.

The Melbourne Airport Rail Link is the key missing link in Melbourne's current public transport network. Melbourne is currently home to Australia's largest public transport network, yet there is no rail link to Melbourne's Tullamarine airport. This link is expected to relieve traffic on the Tullamarine Freeway and create a more reliable mode of transport to and from the airport.

A detailed summary of major projects is available in Appendix C.

Table 7: Passenger Rail Investment Pipeline for Victoria

Project	Status	Indicative Capital Cost	Timeline
North East Rail Line Upgrade	Recently Closed	$235 million	Completion in mid-2021
Level Crossing Removal project	Ongoing	>$6.6 billion*	Completed by 2025
Cranbourne Line Upgrade	Under Procurement	$750 million	Construction to start in 2020
Gippsland and Bendigo Package	Under Procurement	$689 million	Construction to start in 2021
Next Generation Trams	Announced	$1.48 billion	New trams to start rolling out in 2025
Warrnambool Line Upgrade	Announced	$512 million	Stage 1 construction expected to be completed in 2021
Suburban Rail Loop	Announced	$50 billion**	-
Shepparton Line Upgrade	Announced	>$300 million	-
Melbourne Airport Rail Link	Announced	$8 billion to $13 billion	Construction expected to begin in 2022
Melbourne Metro Tunnel	Announced	$11 billion**	-
Sunbury Line Upgrade	Announced	$2.1 billion	Expected completion by end of 2023
Fast Rail to Geelong	Announced	$4 billion	Expected commencement of construction in 2023
Hurtsbridge Line Upgrade Stage 2	Credibly Proposed	$530 million	-
High Capacity Metro Trains 2	Prospective Pipeline	$2.3 billion	-
Waurn ponds duplication project	Prospective Pipeline	$1.06 billion	-
Fishermans Bend tram link	Prospective Pipeline	-	-
Caulfield to Rowville rail line	Prospective Pipeline	-	-

Source: Various sources, primarily Australia and New Zealand Infrastructure Pipeline[18]

*Costs are expected to exceed $6.6 billion as the business case that reported this figure was for the removal of 50 level crossings, while the project has been expanded to remove 75. Some of the level crossing removals may also be included in rail line upgrade projects.

**Reported costs are indicative only, based on prior government announcements. There is indication that these projects will cost more than originally reported.

18. Australia & New Zealand Infrastructure Pipeline, (2020), *Project search results – rail*.

NSW is set to continue to invest in a 'driverless' metro system and its rolling stock over the next few years. The investment is largely targeted at the growing Western Sydney corridor (and new airport) and regional NSW links.

Rail investment in NSW is largely focused on its new driverless metro system, the regional network and upgrading their rolling stock. These measures are aimed at reducing congestion on their current services and providing more efficiency in the NSW rail network (refer Table 8).

The Sydney Metro projects form the majority of NSW's rail investment. The construction of each new metro line is estimated to cost upwards of $10 billion, and there are currently three new metro lines in the pipeline. The City and South West metro line has already begun the early stages of its construction, while the other lines are in earlier stages. The West and Western Sydney lines will provide more transport options for the fast growing Western Sydney corridor, and provide a key transport connection to the new Western Sydney Airport.

NSW is also investing in new and upgraded rolling stock to improve the efficiency and capacity of its network. This include the XPT fleet replacement on the regional network, the new Intercity trains on the regional network, and the More Trains, More Services program on the urban network.

Additional projects include the Parramatta Light Rail – Stage 2 project and the Improved Sydney-Canberra Passenger Rail. Both of these projects are in their earlier stages and do not yet have timelines, however they are both focused on relieving pressure on other transport services by providing alternative and more efficient modes of transport.

A detailed summary of major projects is available in Appendix C.

Table 8: Passenger Rail Investment Pipeline for NSW

Project	Status	Indicative Capital Cost	Timeline
XPT Fleet Replacement	Recently Closed	$2.8 billion	First new trains are expected to be running from 2021
New Intercity Trains	Ongoing	-	Roll out in early 2021
More Trains, More Services – Stage 2	Preferred bidder announced	$2.233 billion	Delivered over the next ten years
Sydney Metro – City and South West	Under Procurement	$11.5 billion to $12.5 billion	To be completed in 2024
Sydney Metro – West	Announced	Not disclosed	Construction to begin before end of 2022
Sydney Metro – Western Sydney Airport	Announced	~$11 billion	To be completed for airport opening in 2026
Parramatta Light Rail – Stage 2	Credibly Proposed	-	-
Improved Sydney-Canberra Passenger Rail	Proposed Pipeline	-	-

Source: Various sources, primarily Australia and New Zealand Infrastructure Pipeline

Despite smaller overall investments, Australia's other jurisdictions are looking to improve rail services. Both the ACT and QLD are expanding their light rail networks, while WA's Metronet project delivers a suite of heavy rail investment.

With the exception of the Cross River Rail Project, Queensland's investment is predominantly outside of Brisbane in the outer urban network. The Queensland urban network sprawls across SEQ as far as the Gold Coast and the Sunshine Coast, where much of Queensland's rail investment is occurring. The Gold Coast Light Rail project will create a rail link to the Gold Coast Airport, also allowing people to travel all the way from the Gold Coast Airport to Brisbane and the Sunshine Coast all via rail. There is also early stage planning to develop a light rail network on the Sunshine Coast (refer Table 9).

WA is planning several upgrades to its heavy rail network through the Metronet project. There are several parts to this project, comprising of rail line upgrades, rail line extensions, level crossing removals, rolling stock procurement and operational improvements that will all improve the efficiency of Perth's heavy rail network.

The ACT is set to see their new light rail network expand over the next two years, as the second stage of the project connects the City with Woden via the parliamentary triangle. This will provide a second public transport mode for southern Canberra, where busses were previously the only mode of public transport available.

A detailed summary of major projects is available in Appendix C.

Table 9: Passenger Rail Investment Pipeline for Queensland, WA and the ACT

State	Project	Status	Indicative Capital Cost	Timeline
QLD	Cross River Rail	Underway	$5.4 billion[19]	Completion in 2024
QLD	Gold Coast Light Rail – Stage 3	Preferred bidder announced	$719 million	Construction commencement in 2021
QLD	Queensland rolling stock expansion program	Under Procurement	$600 million	-
QLD	Beerburrum to Nambour rail upgrade – Stage 1	Announced	$550.8 million	Construction to be complete in late 2024
QLD	Beerburrum to Nambour rail upgrade – Stage 2	Credibly Proposed	-	-
QLD	Gold Coast Light Rail – Stage 4	Credibly Proposed	-	Indicative construction commencement in 2023
QLD	Sunshine Coast Light Rail	Early Stages	-	-
QLD	Standard Gauge Mt Isa-Townsville	Early Stages	-	-
QLD/NT	Mt Isa-Tennant Creek Rail Link	Early Stages	-	-
WA	Metronet – Morley to Ellenbrook Line	Recently Closed	$1.352 billion	Construction to be complete in 2023-24
WA	Metronet – Rolling stock procurement	Recently Closed	$1.3 billion	Construction to be complete in 2024
WA	Metronet – Thornlie to Cockburn Link and Yanchep Rail Extension	Recently Closed	$1.25 billion	Construction to be complete in mid-2023
WA	Metronet – Byford Extension	Under Procurement	$491 million	Construction to commence in 2021
WA	Metronet – Level crossing removals – Armadale line	Under Procurement	$415 million	Project delivery contract to be awarded in 2021
WA	Metronet – High Capacity Signalling	Announced	$1.232 billion	Construction to commence in 2021
ACT	ACT Light Rail – Stage 2A and 2B	Under Procurement (2A) and Announced (2B)	Estimated cost of $1.3 billion to $1.6 billion	Stage 2A to begin construction in mid-2020

Source: Various sources, primarily Australia and New Zealand Infrastructure Pipeline

19. Infrastructure Australia, (2017), *Project evaluation summary: Cross River Rail.*

The National Faster Rail Program is a federal strategy that underpins several projects that are in the current pipeline. It aims to deliver better rail services in key high traffic rail links.

The National Faster Rail Program is a 20-year rail investment plan, centred on generating increased efficiency between major capital cities and surrounding regional centres. The National Faster Rail Agency is an expert panel that supervises the faster rail plan, partnering with state and territory governments and private industry.[1]

The faster rail plan will utilise the increasingly populated and pressurised capital cities – Sydney, Melbourne and Brisbane - to shape future growth via faster, more efficient and reliable journey times to regional centres. The long infrastructure investment will incite further development and investment into regional areas and bring people, jobs and services closer together. The three general connections, Sydney to Newcastle, Melbourne to Greater Shepparton and Brisbane to the regions of Moreton Bay and the Sunshine Coast, had an initial $20 million government investment. The subsequent business case included $2 billion of both Federal Government and State Government funding into the Melbourne to Geelong rail link.[2]

Other connection lines (refer Figure 4) to benefit from the 20-year plan include:[1]

- Sydney to Newcastle
- Sydney to Canberra
- Sydney to Wollongong
- Sydney to Parkes (via Bathurst and Orange)
- Melbourne to Greater Shepparton
- Melbourne to Traralgon
- Melbourne to Albury-Wodonga
- Melbourne to Ballarat
- Brisbane to Moreton Bay regions and the Sunshine Coast
- Brisbane to Toowoomba
- Brisbane to the Gold Coast.

Through rail connectivity, the faster rail plan utilises Australia's increasing urban population projections and integrates with limited regional economic efficiency to create mutually beneficial opportunities. This can result in reduced congestion, improved access to employment, education, affordable housing and services, and, shifting demand into local services. Furthermore, upgrades to rail networks will allow for faster average journey times and increased frequency of services.

1. National Faster Rail Authority, (2020), *Faster Rail Plan.*
2. Premier of Victoria, (2020), *Faster services for Geelong on the way.*

Figure 4: National Faster Rail Map

Source: National Faster Rail Agency (Faster Rail Plan 2020)

Investment in light rail networks is becoming more prevalent in Australia's smaller cities. These networks present advantages for growing cities as they can accommodate for high levels of demand.

In recent years several new urban rail mobility projects have begun outside of Australia's five largest cities. In particular, several light rail projects have been developed, including those in the Gold Coast, Canberra and Newcastle. Furthermore, there is the possibility of developing a light rail on the Sunshine Coast, which is currently being assessed in an options assessment alongside other transport options.

The Gold Coast Light Rail began operating in 2014 upon the completion of its first stage, making it the first light rail network operating outside of an Australian capital city. The second stage was completed in 2017, providing a light rail link from Helensvale (which connects to the SEQ urban heavy rail network) in the north of the Gold Coast to Broadbeach South. Stage 3 of the project is set to extend the network from Broadbeach South to Burleigh Heads, while Stage 4 will extend the network further south to reach the Gold Coast Airport.

The Canberra Light Rail began operating in 2019 after the completion of its first stage. The route currently operates between Gungahlin in Canberra's north and Canberra City, with stage 2 of the project set to extend the network to Woden in Canberra's south via the parliamentary triangle.

The Newcastle Light Rail began operating in 2019 in Newcastle's city centre. The network consists of six stops running from the Newcastle interchange in Wickham to Newcastle Beach in the east end of Newcastle. The Newcastle Light Rail is set to expand in the future, with a strategic business case completed that assesses several potential transport corridors for expansion of the network.

These urban mobility schemes are set to meet future population growth in these cities and drive urban revitalisation and public transport utilisation. Since the introduction of the Newcastle Light Rail network and a redesigned bus network, Newcastle has seen an emerging start-up and technology industry cluster. The network has helped to revitalise the city and push its reputation away from its industrial past.[1]

Light rail presents advantages for growing cities as it is capable of accommodating for high and growing levels of demand. It counteracts many of the limitations implicit in bus and heavy rail transport, as bus routes have the breadth of coverage but not the ridership capacity for longer commutes, while heavy rail has the capacity and speed but requires significant infrastructure and land use to have a breadth of coverage.[1] Light rail is a good intermediary between heavy rail and bus networks.

The light rail networks are placed to cater for high population growth in cities. They aim to counteract any potential congestion and encourage high density living, where light rail networks work most effectively.

The Gold Coast is set to see its population to expand from approximately 600,000 residents in 2016 to just short of one million in 2041, representing growth of roughly 62.5%. Similarly, the Sunshine Coast is projected to experience a population increase from approximately 360,000 residents in 2016 to nearly 600,000 residents in 2041, representing growth of approximately 63.1%.[2]

The ACT is also forecast to experience major population growth, with an estimated population of roughly 410,000 residents in 2017 projected to grow to nearly 600,000 by 2041, which is growth of roughly 42.7%.[3] Growth estimates for Newcastle and the surrounding Lake Macquarie region are smaller, with an estimated population of approximately 360,000 residents in 2016 set to grow to approximately 430,000 in 2041, which is growth of around 19.1%.[4] It is however worth noting that all population estimates are done by the relevant agency in each state or territory, where forecasting methodologies will differ. This can result in more or less conservative estimates. These are also pre-COVID-19 population projections.

With the addition of several hundred thousand new residents expected to live in the Gold Coast, Sunshine Coast and Canberra over the next 20 years, the light rail networks will play key roles in reducing road congestion and improving urban mobility in these cities.

1. Infrastructure Australia, (2019), *Meeting Australia's future infrastructure challenges: The role of light rail in an integrated transport network.*
2. QGSO Population projections by SA4, medium series.
3. ACT Population projections 2018-2058
4. NSW 2019 population projections by local government area

Federal and State Governments around Australia are increasing their fiscal outlay in response to the COVID-19 pandemic. This has involved increased funding and fast-tracking of several passenger rail projects.

Federal Government initiatives[1]

In response to the COVID-19 pandemic, the Australian Government has committed more funding to invest in new and accelerated infrastructure over the next four years. This investment will generate more construction jobs and stimulate the economy is response to the economic downturn caused by the pandemic.

The Australian Federal Budget announced an additional $14 billion in funding towards infrastructure projects over the next four years. This is expected to support a further 40,000 jobs in construction over this period. This funding will go towards the $110 billion 10-year infrastructure pipeline that the Australian Government is committed to.

Within the 2020-21 Federal Budget, the Australian Government has made additional funding commitments to the following new projects:

- Shepparton Rail Line Upgrade – Stage 3
- Warrnambool Rail Upgrade – Stage 2
- Metronet: High Capacity Signalling

In addition to these new projects, the Federal Government has already committed funding to many rail projects, many of which are captured in the 2020-21 budget. These include:

- Sydney Metro – Western Sydney Airport
- Melbourne Airport Rail Link
- Geelong Fast Rail
- South Geelong to Waurn Ponds Rail Upgrade – Stages 2 and 3
- Ballarat Rail Line Upgrade Stage 1
- Monash rail
- Gippsland Rail Line Upgrade
- North East Rail Line Upgrade
- Warrnambool Rail Line Upgrade
- Frankston to Baxter Rail Upgrade
- Bendigo/Echuca Rail Line Upgrade
- Brisbane Metro (Cross River Rail)
- Gold Coast Light Rail – Stage 3a
- Metronet: Morley-Ellenbrooke Line
- Metronet: Thornlie-Cockburn Link
- Metronet: Yanchep Rail Extension
- Metronet: Byford Extension

State Government Initiatives

State Governments are also playing a role in supporting their economies and are increasing their spend on infrastructure and other initiatives to prompt economic growth and support more jobs. The steps being taken by each relevant jurisdiction are summarised as follows:

- **NSW**: The NSW government is spending more to promote economic recovery. In 2019-20 the government had a deficit of $6.9 billion, and in 2020-21 this deficit will be nearly $10 billion larger at $16 billion. The budget announced funding for several new and ongoing rail projects including $10.4 billion for Sydney Metro West over the next four years and $9.2 billion for Sydney Metro – Western Sydney Airport over the next four years. The total budgeted spend across all transport projects in 20202-21 is approximately $12.7 billion.[2]
- **Victoria**: The Victorian Government is investing in its recovery with a budget deficit of $23.3 billion in 2020-21, which will be just over one quarter of its net debt ($87 billion). This deficit will fund more projects and initiatives that will grow Victoria's economy and deliver jobs while also preparing for the state's future. The budget includes funding for several rail projects including $420 million for early works on the Suburban Rail Loop ($2.2 billion over the four-year forward estimates period); as well as funding for Next Generation Trams, Geelong Fast Rail, Shepparton Rail Line Upgrade Stage 3, Warrnambool Rail Line Upgrade Stage 2 and Waurn Ponds Track Duplication Stage 2 (funding for each of these initiatives in 2020 is 'tbc' [to be confirmed]).[3]
- **Queensland**: Like other governments, the Queensland Government is increasing its operating deficit in its 2020-21 budget. After an estimated deficit of $5.7 billion in 2019-20, the 2020-21 operating deficit is projected to be $8.6 billion. The 2020-21 budget includes $1.5 billion of funding for the ongoing construction of the Cross River Rail project and $50.4 million towards the Gold Coast Light Rail Stage 3A.[4]
- **WA**: The WA government will reallocate its projected operating surplus of $1.2 billion in 2020-21 away from paying off debt towards fiscal stimulus measures such as its $27.1 billion infrastructure investment program. This includes bringing forward several of the Metronet projects.[5]
- **ACT:** The ACT government has budgeted a spend of $77.5 million for Stage 2A of the Canberra Light Rail in 2021-22.[6]

1. Australian Federal Budget 2020-21
2. NSW Budget 2020-21
3. Victorian Department of Treasury and Finance
4. Queensland Government, (2020), Queensland Budget 2020-21.
5. Western Australia State budget 2020-21
6. ACT Treasury, (2020), Budget Review 2019-20.

Growth in rail patronage is forecast to be greater over the next ten years than the previous ten (barring any COVID-19 impacts). The largest growth is expected in WA, where rail patronage is forecast to grow by 2.7% annually.

Rail patronage is expected to grow at a rate between 1.3% and 2.7% every year until 2030 in each Australian state with a rail network (refer Chart 19). The largest growth is expected to occur in WA at a projected annual rate of 2.7%, while NSW is expected to see the smallest annual growth at a rate of 1.3% each year. It is worth noting that while NSW's current patronage sits well above that in Queensland, WA and SA, absolute growth in NSW will exceed absolute growth in these states. It is worth noting that all of these forecasts do not account for the impacts of COVID-19, from which the recovery path is not yet certain and may lead to a proportion of permanent changes in travel behaviour.

The projected growth in WA is largely linked to population growth. Perth's population is projected to grow significantly, which is driving the 2.7% average annual growth in patronage that is expected. This growth would divert away from recent trends of declining patronage despite a growing population. It is expected that the Metronet project will deliver confidence and patronage to Perth's heavy rail network.[1]

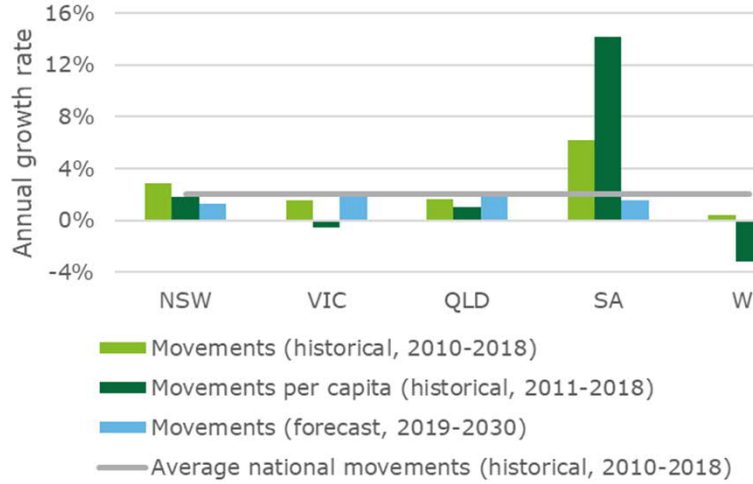
The projected growth in NSW of 1.3% each year is the lowest of all Australian jurisdictions with a rail network, however these projections do not account for the Sydney metro projects. These projects were largely excluded from the analysis as they are expected to drive large growth in patronage, however it is not certain as to how much of the growth on the metro network will come from substitution from other rail networks or other modes of transportation. This makes estimating the overall growth in rail patronage challenging. The current estimate of 1.3% growth each year is expected to be conservative as a result.[1]

Growth in Victoria in recent years has been positive, but not matched by population growth (refer Chart 19). Victoria's growth from 2019-2030 (excluding COVID-19 impacts) is forecast to outstrip the average annual growth from 2010-2018. This growth is expected to be driven in part by Victoria's significant investment into its passenger rail infrastructure, particularly in growth corridors such as Geelong.

South Australia experienced the largest annual growth in rail movements from 2010 to 2018 at an average of 6% each year, and over 14% annual growth in rail movements per capita. This growth is attributed to the state's Rail Revitalisation Program, which saw investment of over $2 billion in the existing passenger rail network to deliver much needed upgrades to the network and the rolling stock.[1] As the Rail Revitalisation Program has finished, the same growth is not expected to 2030, though the state's past performance does show that investment leads to patronage growth. Although SA experienced the largest overall growth, it is worth noting that the state's rail patronage is the smallest in Australia (refer Chart 20), making it easier to achieve higher growth rates.

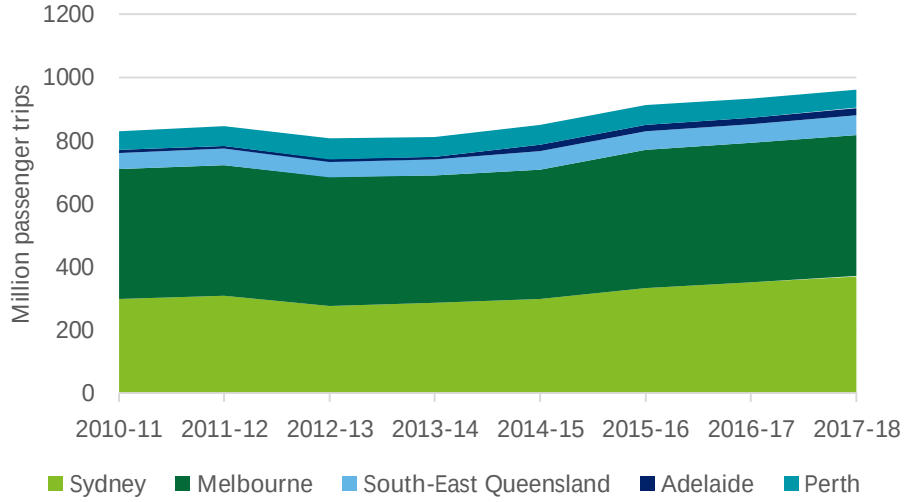
Queensland is expected to experience a slight increase in growth in rail patronage when compared to the growth experience between 2010 and 2018, though not a significant change (refer Chart 19). Projects such as the Cross River Rail are expected to increase rail patronage in Brisbane, though much like the Sydney Metro Projects, whether the project will increase rail patronage overall or merely substitute this new service for existing rail services is yet to be known.

Chart 19: Historical and forecast annual rail patronage growth by jurisdiction / region



Source: Australasian Railway Association, 2020, *Value of Rail 2020.*

Chart 20: Historical patronage by jurisdiction / region



Source: BITRE Statistics Yearbook, 2020

The public health threat that emerged from COVID-19 will impact public transport patronage for years to come. Several trends are creating movement away from cities and the Australian population is also projected to be smaller.

The existing passenger growth forecasts do not account for the impact that COVID-19 has had, and will continue to have, on public transport patronage. While COVID-19 remains to be a threat, the recovery path in a post-COVID-19 world remains unclear. Current trends would suggest that Australian cities will continue to recover their public transport patronage over time as the COVID-19 threat subsides. The question remains as to how long it will take for patronage to return to pre-COVID-19 levels, and to what extent cautious behaviour will remain.

Growing car dependency[1]

While the initial harsher lockdown restrictions brought forth a slowdown in car usage, private motor vehicle use was the first mode of transport to rebound to pre-COVID-19 levels. Private motor vehicles enable people to travel without being in close contact to others, making them far more attractive than shared modes of transport while COVID-19 remains a public health threat.

As Australia emerged from its initial wave of COVID-19, there was an uplift in second hand car sales in the market as mobility was increasing, but reluctance remained around using shared transport. The uplift in second hand car sales may result in a prolonged dip in public transport usage as Australians will want to utilise their investment in their vehicle. High private vehicle mode share may persist for a prolonged period of time.

Increased remote working

COVID-19 prompted a shift to remote working across the nation in response to the public health threat. Firms embedded new ways of working and invested more heavily in collaboration tools and cyber security to reinvent the traditional office in a digital environment.

The increase in remote working was responsible for a significant portion of the downturn in public transport patronage across Australian cities. Commuter transport is the largest market for most urban transport systems, and with the number of Australians commuting into cities for work decimated by the shift to working from home, public transport patronage has taken a major hit.

The shift to working from home in response to the public health threat may trigger some semi-permanent changes to workplaces and remote working that will continue into the future. Many city-centric workplaces may opt to downsize their office footprint or relocate their offices to suburban or regional locations. Similarly, businesses may continue to encourage work from home practices for at least some of the work week. It is quite likely that the number of commuters utilising public transport will not return to pre-COVID-19 levels for some time beyond the end of the public health threat.

Decentralisation of CBDs

With an increase in remote working and less movement in CBDs due to a lack of commuters, tourism and other activity, city centres are most at risk of decline due to COVID-19. It is expected that there will be a sluggish rebound for commercial and retail property, and a decline in the attraction of inner city living may also put downward pressure on inner city property markets.

Since COVID-19 the net migration from capital cities to regional areas increased by roughly 200%, and the gap between arrivals and departures in capital cities grew, with departures exceeding arrivals.[2] Similarly, between March and June 2020 there was a decrease in advertised rents in inner city suburbs, while rents increased in the outer suburbs of cities. There is clear evidence that the pandemic has caused greater trends in decentralisation, but again it is unclear how long the impacts will last, and to what extent CBD decentralisation will impact public transport patronage.

Tourism

The COVID-19 pandemic decimated international tourism in Australia, and for a long time slowed domestic travel. Tourists represent a segment of Australia's passenger rail market – particularly for regional services. Easing of restrictions – particularly those surrounding state borders – has allowed for some interstate and intrastate travel to bring forth some recovery to the tourism sector, though the lingering possibility of sudden border closures should COVID-19 cases enter the community has been a detriment to consumer confidence and willingness to travel within Australia.

As long as state borders remain open there are opportunities for domestic travel that will increase passenger rail patronage from the tourism segment. Rail patronage recovery from international tourists will depend entirely on how long COVID-19 remains a threat around the world, which will determine the reopening of international borders. International travel make take a while to rebound to pre-COVID levels, though Australia's success in containing the virus may make it an attractive destination for incoming travellers.

Slower population growth

COVID-19 is expected to have a lasting impact on Australia's population growth. It reduced net overseas migration (and immigration to Australia), and fewer births occurred in 2020 as well. Australia's population will be smaller and older than what was predicted prior to COVID-19.[3] The slower population growth is likely to have impacts on the projected public transport patronage. With a smaller population base than expected, patronage would be expected to fall below pre-COVID-19 predictions regardless of the other trends that have emerged due to the public health threat.

1. Infrastructure Australia, (2020), *Infrastructure beyond COVID-19: A national study on the impacts of the pandemic on Australia.*
2. ABS, (2020), *regional internal migration estimates*.
3. Australian Government centre for Population, (2020), *Population Statement.*

Public transport recovery from COVID-19 will depend on the severity of the viral outbreak in Australia. Most states have successfully contained the virus, however there may be evidence of slower recovery in Victoria due to its second wave.

Post-COVID-19 recovery of public transport usage is expected to depend on both the severity of the COVID-19 outbreak in Australia and the extent to which certain behaviours (such as mode shift and working from home) cause a permanent change. Recovery in Australia will also depend on global management of the virus to some extent, as migration (resulting in population growth) and international tourism will slow as long as tight border controls remain in place.

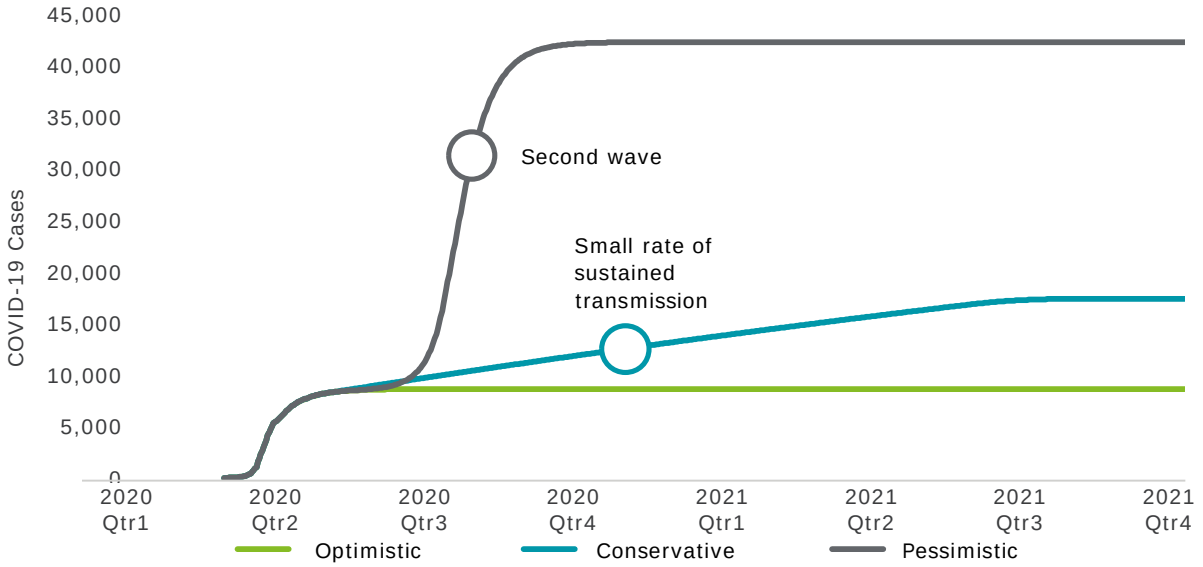
Deloitte Access Economics (2020) prepared forecasts on the economic impacts of COVID-19, based on three scenarios depicting Australia's control of the outbreak (refer Chart 21). While the case numbers depicted on Chart 21 are not reflective of Australia's current situation, Australia's overall success in containing the virus so far would likely put the country on the trajectory of the conservative scenario. Some states could arguably be experiencing the optimistic scenario (WA, for instance), however Victoria's second wave and small cluster outbreaks elsewhere would lend Australia's position overall to lean more on the conservative scenario path.

The COVID-19 scenario that Australia encounters determines the speed and success of post-COVID-19 recovery. From a public transport perspective, patronage is expected to return to pre-COVID-19 levels sooner in places where the virus has been more successfully contained. This may mean that Victoria's public transport patronage will experience slower recovery than the rest of Australia, though the nation is well positioned to enter recovery ahead of the rest of the world.

There is early evidence that Victorians may be slower to adapt to pre-COVID-19 behaviours than other Australian states. ABS' November 2020 edition of the Household impacts of COVID-19 survey indicates that 35.5% of Victorians intend to continue working from home (at least some of the time) post-COVID-19 in comparison to an Australian average of 30.2%. Similarly, 10.1% of Victorians intend to continue studying from home, which again is above the Australian average of 8.9% (refer Chart 22). In July 2020, prior to Victoria's second wave of COVID-19, Victorians did not intend to work or study from home any more than the average Australian.

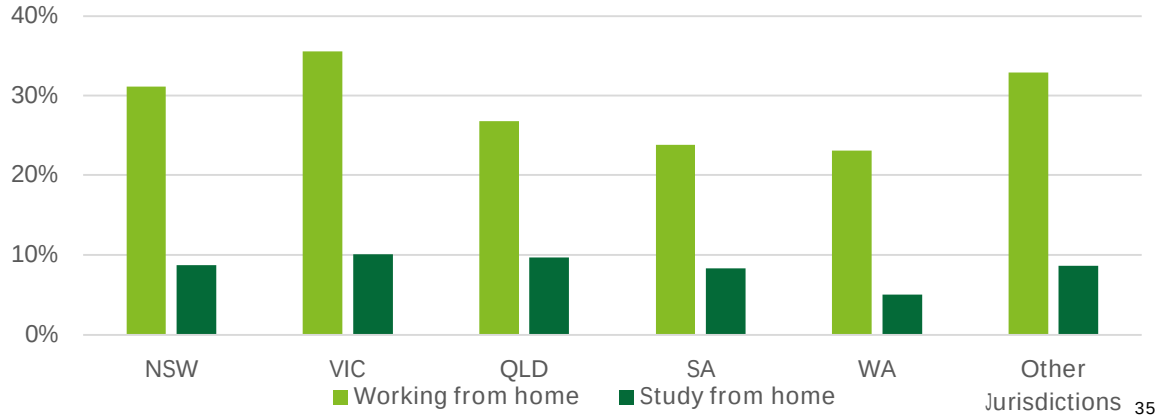
With more Victorians looking to work and study at home post-COVID-19 in comparison to the Australian average, it is quite likely that Victoria's public transport patronage may take longer to recover. Similarly, there is evidence to suggest that a resurgence of COVID-19 in Australia (prompting a less optimistic scenario) may prolong the timeline for public transport patronage recovery.

Chart 21: Economic scenarios for COVID-19 recovery



Source: Deloitte Access Economics, Economic Scenarios for the COVID-19 Recovery, May 2020

Chart 22: Aspects of life under COVID-19 to be continued



Source: ABS Household Impacts of COVID-19 survey, November 2020

Australia's passenger rail sector is expected to grow to 2030, reflective of growing patronage across the states. The sector is estimated to contribute $44.9 billion to Australia's GDP and employ more than 20,000 Australians, nationally.

The size of Australia's passenger rail sector

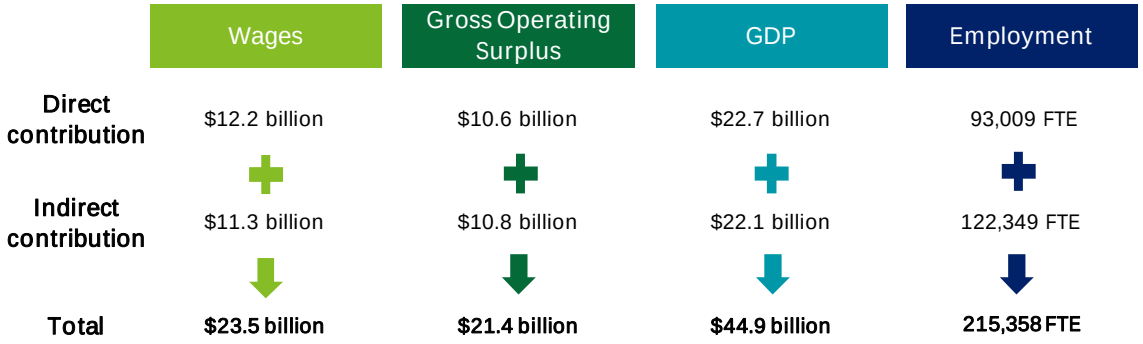
In 2030, the rail industry is estimated to contribute more than $44.9 billion to the Australian economy, reflective of an estimated year-on-year growth rate of 3.8%. This growth rate is reflective of notable government investments in the rail sector, particularly in states such as Queensland. Of this contribution, the passenger rail and passenger rolling stock production sectors are expected to comprise roughly 33% or $14.8 billion of the rail industry's total contribution the Australian economy.

In terms of employee wages, the entire rail industry in Australia (not just passenger rail) is expected to grow at 2.4% on average per year. These estimates are based on industry research obtained from IBISWorld and adjusted by Deloitte. Wages for the entire rail industry are estimated to have a direct contribution of $12.2 billion to the Australian economy, plus an additional indirect contribution of $11.3 billion in 2030.

Industry profits are estimated to directly contribute $10.6 billion to the Australian economy and an additional $10.8 billion of indirect contributions in 2030. Indirect contributions relate to activities in related industries that are supported by the Australian rail sector.

The overall contribution to GDP in 2030 is estimated at $44.9 billion, comprising of $22.7 billion in direct contributions and $22.1 billion in indirect contributions. The breakdown of these components are detailed in Figure 5.

Figure 5: Estimated economic contribution of the rail industry to Australia's economy, 2030



Source: DAE analysis using Australasian Railway Association, 2020, Value of Rail and IBISWorld data

Employment in Passenger Rail in Australia

Australia's passenger rail sector in 2030 is estimated to employ over 20,000 people nationally (refer Table 10). New South Wales, Victoria and Queensland are expected to remain the largest hubs for employment reflective of each states population and developed passenger rail networks.

It is estimated that Western Australia will experience the highest growth of all the states of 1.9% on average per year growth to 2030. This is largely driven by expected growth in patronage for the state that is expected to be approximately 2.7% per year on average over the same period. New South Wales and South Australia are both expected to experience slightly lower than average growth rates over the same period at 0.9% and 1.2% respectively. This is also a function of lower than average anticipated growth in patronage. The other states are expected to grow year on year at or near the average of 1.4% per year.

Table 10: Estimated direct employment in passenger rail in Australia by state and territory, 2030

State or Territory	Rail Passenger Transport (FTEs)	Railway Rolling Stock Manufacturing and Repair (FTEs)
New South Wales	6,129	1,459
Victoria	6,633	991
Queensland	5,951	801
South Australia	689	162
Western Australia	660	233
Tasmania	171	3
Northern territory	24	3
Australian Capital Territory	6	-

Source: DAE analysis using BITRE Statistics Yearbook, 2020 and IBISWorld data

Note: FTEs refers to full time equivalent employment. That is, two part time roles working half the time of a full time role would comprise one full time equivalent role.

Developments in renewable rolling stock technology provide opportunities for Australia to increase efficiency in its rail network and reduce the footprint of the industry.

There are a number of ways governments can further enhance the environmental performance of their rolling stock fleet. A locomotive's age has significant influence on fuel efficiency, as the age of the fleet increases the further outdated its technology becomes. The median locomotive age across Australia is approximately 11-15 years.[1] As the existing fleet continues to age there is an opportunity to introduce new technology into the next generation of the passenger and freight rolling stock fleet. Such technology could see the introduction of hydrogen, electric and battery propelled rolling stock, along with energy use management tools.

Electrified rolling stock

Fully electric and hybrid electric diesel rolling stock are replacing aging rolling stock across Australia. Electric rolling stock technology has been around for many years, with around 75% of existing passenger movements already relying on electricity through electrified tracks. However, it can be expensive, particularly in regional areas with lower utilisation of the rail system.

Continual investment into electrified rolling stock can be seen across Australia, including an announcement made by the New South Wales State Government to roll out a new fleet of hybrid electric passenger trains for the state's regional lines, addressing environmental concerns through the reduction in diesel pollution. The government has indicated that the 29 new trains will be rolled out from 2023, cutting diesel by 3 tonnes and delivering fuel savings of approximately $2 million a year.

Battery Electric Multiple Units

Globally rail is one of the most sustainable transport modes, but its carbon footprint can be further reduced. In recent years rolling stock manufacturers have focused on creating measures to further combat fossil fuel depletion and reduce environmental impact by introducing battery propelled trains.

Whilst electrified rolling stock through overhead wires is seen to be potentially emission free, the electrification of an entire rail network is seen to be financially impracticable due to its high cost of electrification infrastructure. A solution to this is the replacement of the diesel technology with low carbon alternatives such as battery propulsion.

Bombardier Transportation is a rolling stock manufacture at the forefront of this technology development. In 2013 Bombardier delivered 15 catenary-free low-floor trams to the city of Nanjing, which has the ability to operate 90% of its lines without overhead cables due to Bombardier Mitrac traction batteries, which have the ability to recharge through regular passenger operation.

Bombardier has further stated that the potential for battery powered mobility isn't limited to smaller vehicles. Bombardier's success in battery propulsion rail has continued, receiving Research and Development Funding from Germany's Federal Ministry of Transport and National Organisation Wasserstoff, in support of an ongoing project to develop a battery-powered train.

Energy use management tools

Recent years have seen the introduction of energy management tools to both new and existing rolling stock. This technology is utilised by communicating with train drivers on how to best use fuel and reduce in-train forces, with the potential to reduce energy use and carbon emissions by over 20%. Such energy management tools have a proven record of efficiency improvements, and have the potential to be further developed into train automation, with strong export potential.

Hydrogen

The use of hydrogen propelled trains is becoming of high interest to transport bodies across the globe, due to a number of factors, some of which include its reduced carbon footprint and its ability to operate without the need of electrified rail lines. With the large majority of passenger movements by rail already relying on electricity through electrified tracks, the potential of replacing fossil fuel propelled locomotives is largely in regional areas.

Whilst hydrogen trains are currently only in service in Germany, there are a number of trials underway to bring them into the UK and Japan. With Alstom, being the primary manufacturer of hydrogen rolling stock, it offers plenty of opportunity as they are one of Australia's major rail suppliers.

In 2019, the COAG Energy Council developed Australia's National Hydrogen Strategy, which aims to establish Australia as a major global player in the hydrogen industry by 2030. Following the release of the strategy, the Federal Government has launched a funding package focussed on growing Australia's hydrogen industry. With $13.4 million provided to implement and coordinate the strategy, the government will also reserve $370 million from the existing Clean Energy Finance Corporation and Australia Renewable Energy Agency funding to back new hydrogen projects.[2]

Aurecon has developed a "*Hydrogen for Transport*" report, commissioned by COAG Energy Council, after the release of the National Hydrogen Strategy, which identifies key opportunities for early use of hydrogen for transport in Australia. This report identified a potential private rail link for a hydrogen-powered rail link to facilitate a large mine to transport output to a distribution hub. This provides the opportunity to leverage existing in-country manufacturing and produce hydrogen trains in Australia.

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*
2. Department of Industry, Science, Energy and Resources, (2019), *Australia to be a world leader in hydrogen.*

CHAPTER 4

The size, scope and future of the Australian freight rail sector

Rail moves the majority of Australia's freight task, with Western Australia and Queensland as Australia's mining powerhouses moving the largest tonnages via rail.

Australia's rail freight industry currently delivers approximately $6.4 billion in revenue[1] and employs over 9,000 people[2] (see Appendix A). While both 2019-20 and 2020-21 are expected to be slower years for the industry as a result of the COVID-19 pandemic, the industry is forecast to return to growth over the next five years. Industry revenue is forecast to grow at an annualised rate of 4.8% over the five years through to 2025-26, resulting in industry revenue of $8.1 billion in 2026.[1]

Rail as a mode of freight transport

Rail is the most commonly used method of moving freight within Australia and has experienced high growth since the post-GFC mining boom. In 2015-16, 413.5 tonne-kilometres of goods were transported via rail, more than double the tonne-kilometres of any other transport mode. From 2000-01 to 2015-16 there has been approximately 200% growth in freight rail, at an average annual rate of 13.4% (refer Chart 23).

When accounting for export volume, the only transport mode that outperforms rail is coastal shipping, due to the nature of Australia's geography making shipping the only viable method of transporting large volumes of exports. Transporting bulk commodities from mining sites to ports makes up a large proportion of Australia's rail freight.[3]

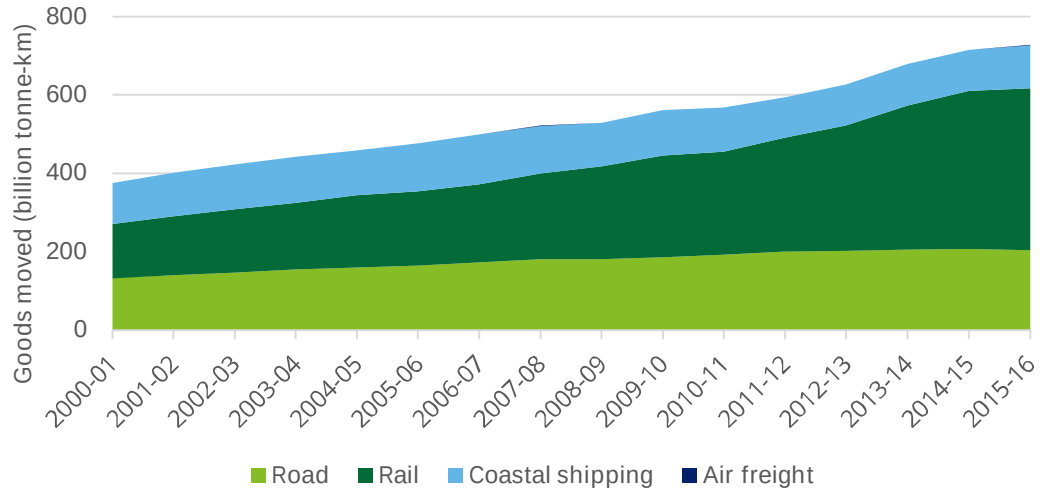
State-by-state outlook

WA is the biggest user of freight rail in Australia, at 170.9 tonne-kilometres in 2009-10. This tonnage is nearly three times higher than any other jurisdiction in Australia. Iron ore is the key commodity responsible for the large demand for freight rail in WA, as it is Australia's largest export by volume. The Pilbara region in particular accounts for approximately 94% of Australia's iron ore exports[3], which would drive a lot of demand for freight rail in northern WA.

Queensland is the second largest user of freight rail in Australia, at 60.7 tonne-kilometres in 2009-10. Queensland's key export commodity is coal, though the state also exports significant volumes of raw and refined metals and grains (agricultural produce).

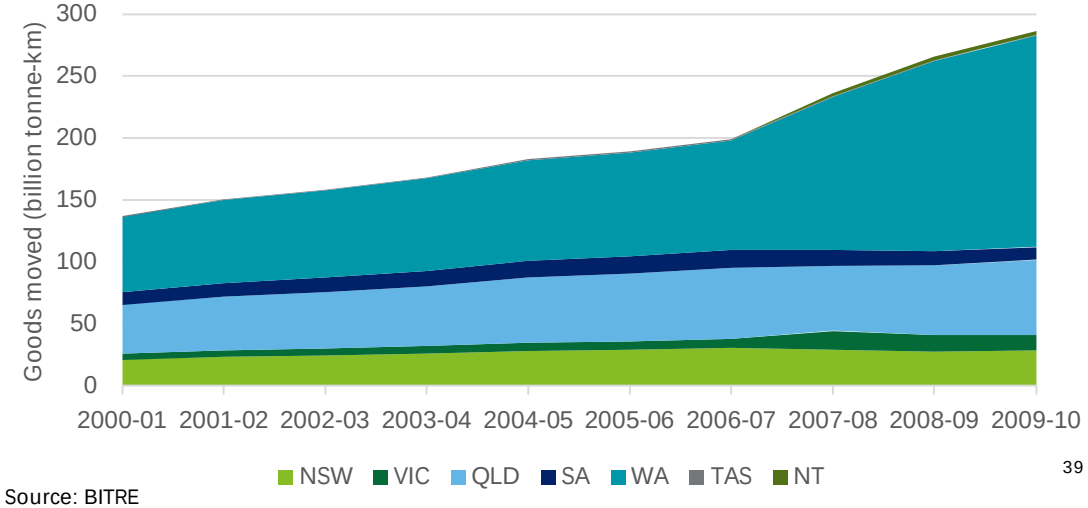
NSW, Victoria, SA, Tasmania and NT each transported 28.2, 12.6, 10.5, 0.1 and 3.2 tonne-kilometres of freight via rail networks in 2009-10 (refer Chart 24). Data from later dates is not available on a state-by-state basis from BITRE.

Chart 23: Total domestic freight (bulk and non-bulk) by transport mode



Source: BITRE

Chart 24: Total domestic rail freight (bulk and non-bulk) by jurisdiction



Source: BITRE

1. IBISWorld, (2020), *Rail Freight Transport in Australia Industry Report I4710.*
2. ABS Census of Population and Housing, (2016).
3. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Australia's freight rail industry consists of several major players who operate predominantly in the transportation of bulk goods – largely from the mining sector.

Freight rail demand[1]

Demand for freight rail primarily comes from coal and mineral freight transport. This comprises 62.3% of the sector's activities. Other bulk transport comprises 18.7% of the industry's activities, while non-bulk freight transport comprises 19% (refer Chart 25). Non-bulk freight in particular competes heavily with road freight transport, which currently transports a higher proportion of non-bulk freight in Australia. With coal and mineral freight transport comprising the majority of the market's activities, the mining division is the largest market for rail freight transport at 57.9%. Freight forwarders and other markets comprise an additional 22.3% of the market's demand for freight rail, while primary producers comprise the remaining 19.8% of demand in the market (refer Chart 26).

The market for freight rail competes directly with road freight – particularly in the transportation of non-bulk goods. In 2019-20 the price of crude oil fell due to lower demand in wake of the COVID-19 pandemic, making road freight relatively cheaper. The world price of crude oil is expected to rise in 2020-21, which will make rail freight more competitive relative to last year, which is expected to increase demand for freight rail.

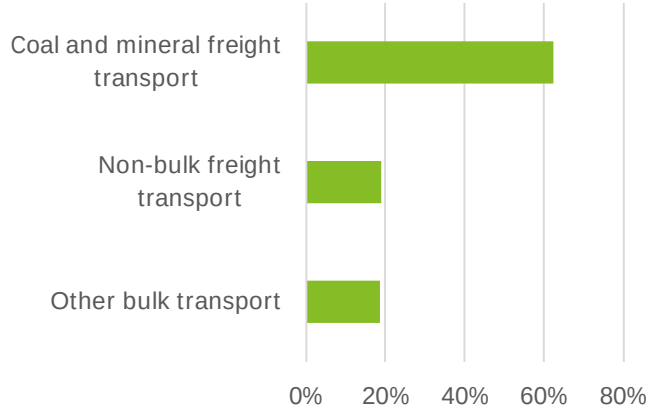
Major players in the market[1]

Australia's rail industry is characterised by a high concentration of major players. Aurizon and Pacific National combined deliver just short of 60% of freight rail services in Australia. Pacific National holds an estimated 36.4% of market share in the Australian freight rail industry, while Aurizon holds an estimated 23% of market share (refer Chart 27). It is worth noting that this market share does not account for privately executed freight haulage. Major mining companies such as Rio Tinto and BHP often operate their own freight haulage.

Pacific National primarily operates in bulk, coal and steel haulage and intermodal transport services. Aurizon operates in bulk, general and containerised freight, heavy haul freight and coal transportation. It previously engaged in intermodal operations but has recently divested several assets and ended its intermodal operations.

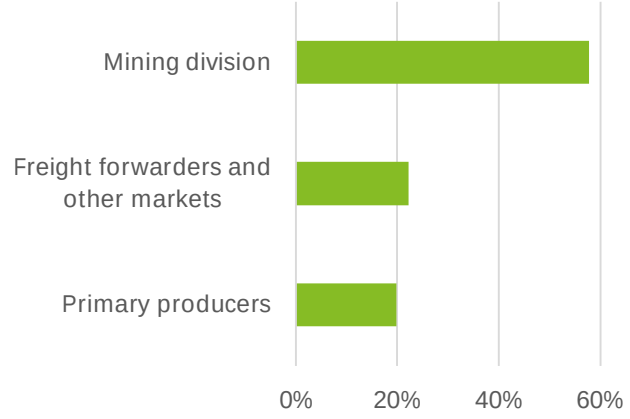
Other players in the market include Qube, who offer largely intermodal services; One Rail Australia (previously Genesee & Wyoming Australia), who offer intermodal services and intrastate haulage services; and SCT logistics, who operate in freight forwarding and intermodal services. In addition there are several smaller players in the market, including mining companies that are privately hauling their freight via rail.

Chart 25: Activities demanding freight rail



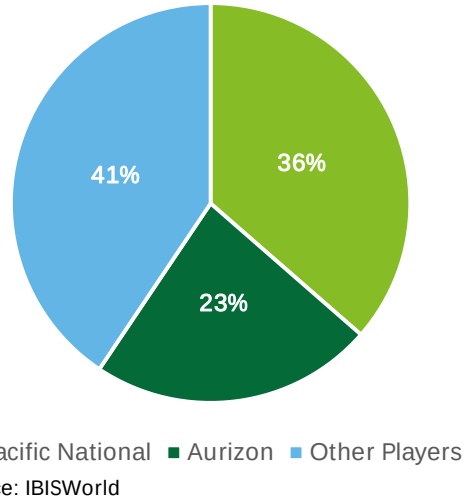
Source: IBISWorld

Chart 26: Sectors demanding freight rail



Source: IBISWorld

Chart 27: Major players in freight rail market – based on services operated



Source: IBISWorld

1. IBISWorld, (2020), *Rail Freight Transport in Australia Industry Report I4710.*

Australia's freight rail network is largely managed by below-track infrastructure managers that are separate from train operators. This helps to drive competition and efficiency in the rail freight market.

Infrastructure Management

The majority of Australia's freight rail network is managed below track by infrastructure managers that do not themselves participate in freight transport. ARTC manages the largest proportion of Australia's freight railways, with over 8,500km of rail across five states (refer Figure 6). ARTC is publicly owned by the Australian Government, though it is financed on a commercially viable basis. Other major infrastructure managers on the freight network include Aurizon, Queensland Rail, Arc Infrastructure, One Rail Australia (previously Genesee and Wyoming Australia), John Holland Rail, V/Line, Tasrail, and Pilbara Railways (a series of privately owned railways that are purpose-built for large scale mining operations – primarily iron ore – in the Pilbara region).

Train operators utilise the networks that are managed by infrastructure managers and pay fees to the infrastructure managers to cover capital and operating costs associated with the networks.

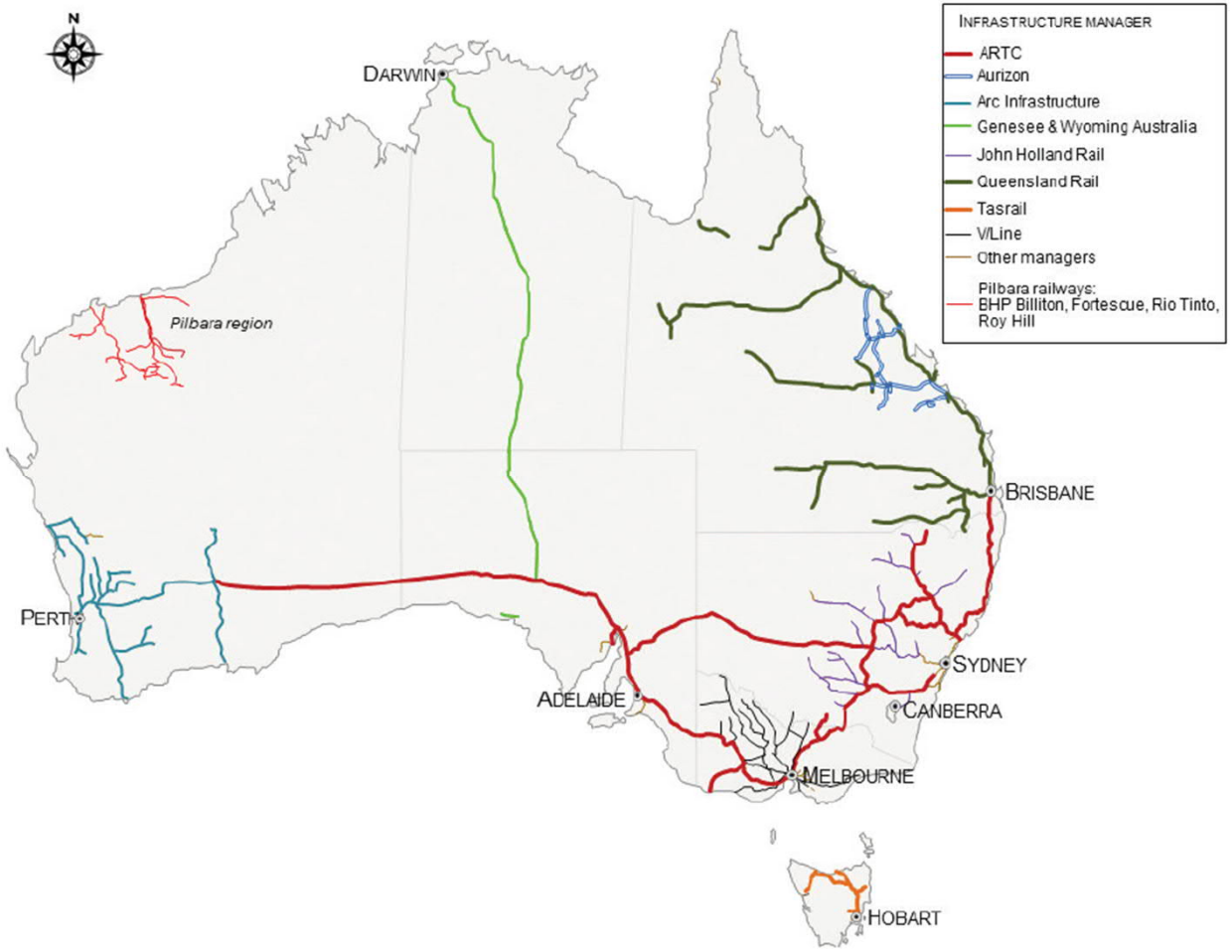
Regulations

The rail freight transport industry is highly regulated, with safety, technical and operational requirements primarily set by state governments. The industry was characterised with compliance burden due to overlapping regulations, though the recent creation of the Office of the National Rail Safety Regulator (ONRSR) has reduced some of this burden. The separation of below-rail and above-rail functions through the role of infrastructure managers such as ARTC being separate to train operators has also reduced some of the regulatory burden on the network.

Due to only a moderate level of market competition as a result of the high barriers to entry into the market, the competitive landscape is regulated by the ACCC. There have been several instances where the ACCC has had to block transactions within the industry to ensure the market remains competitive. As it stands internal competition in the markets is quite low, as many of the major players operate in separate markets and geographic conditions.

The ACCC blocked Pacific National's acquisition of Aurizon's Queensland intermodal business and Aurizon's Acacia Ridge International Terminal in a bid to keep enough competition in the market. The ACCC also forced the divesture of Toll Holdings' logistics business from its infrastructure assets following Toll's hostile takeover of Patrick Corporation.

Figure 6: Map of Australian railways by infrastructure manager, 2019



Source: BITRE, (2019), *Trainline 7*

1. IBISWorld, (2020), *Rail Freight Transport in Australia Industry Report I4710.*

The rail freight network is integral to the transportation of iron ore and coal, which are Australia's biggest export commodities. The network provides key connections from mine to port and enables Australia to export large volumes.

Iron Ore and Coal are among Australia's largest export commodities and are worth billions to the Australian economy each year.

Iron Ore[1]

Australia produced 53% of the world's iron ore in 2019-20, which was worth approximately $100 billion in exports. The majority of this iron ore is produced in the Pilbara region in northern Western Australia (refer Figure 7) and exported to China, Japan, South Korea and Taiwan.

Iron ore prices have remained strong in 2019-20 due to supply disruptions from the COVID-19 outbreak. Prices are expected to remain strong into 2020-21 before reducing in 2021-22 when there is expected to be a surge in supply.

The outlook for iron ore production and prices will impact the demand for rail freight in Australia. Iron ore exports are currently at an estimated 858 million tonnes (2019-20) and are expected to exceed 900 million tonnes by 2021-22. Over $100 million was invested in iron ore exploration in the September quarter of 2020, and with several projects in the region also set to expand, the outlook for Australia's production looks positive into the future.

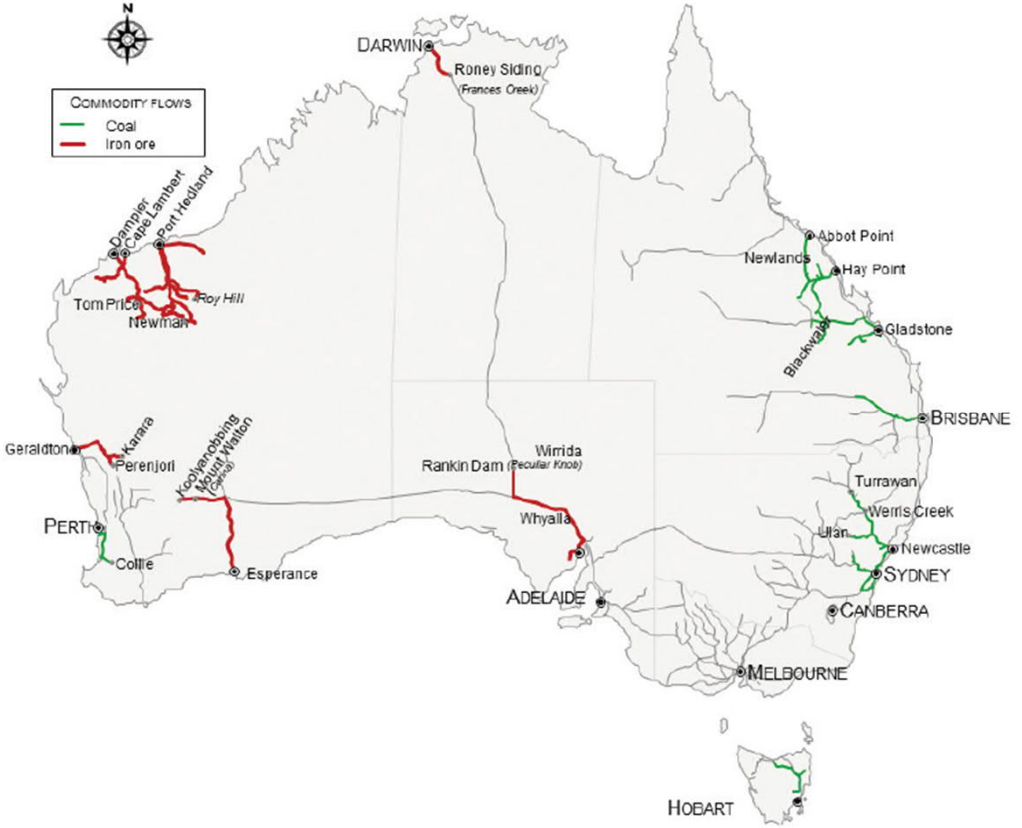
Coal[1]

Australia produced 55% of the world's metallurgical coal and 20% of the world's thermal coal in 2019-20.

Metallurgical coal production in Australia is set to decline over the forecast period, as several companies have announced scaling back of production or intent to focus on producing higher quality materials. Production is set to fall by 5% in 2020-21 to 169 million tonnes, though it is expected that exports will recover to 184 million tonnes in 2021-22. The price of coal exports were volatile in 2019-20 in part due to slowed steel production due to the COVID-19 pandemic, though uncertainty surrounding Chinese import restrictions are also impacting prices. Prices are expected to recover in 2020-21 and 2021-22 in line with recovery in global steel production.

Thermal coal production in Australia is forecast to decrease from 213 million tonnes in 2019-20 to 199 million tonnes in 2020-21. Prices are also expected to be low as demand has eased in 2019-20 due to the pandemic, and recovery in 2020-21 is not set to match pre-pandemic levels.

Figure 7: Map of iron ore and coal commodity flows via rail freight



Source: BITRE, (2019), *Trainline 7*

1. Office of the Chief Economist, (2020), Resources and Energy Quarterly – December 2020.

Transporting grain via the rail is a key activity for the rail freight network, though recently road freight has become more competitive in the grain transport sector.

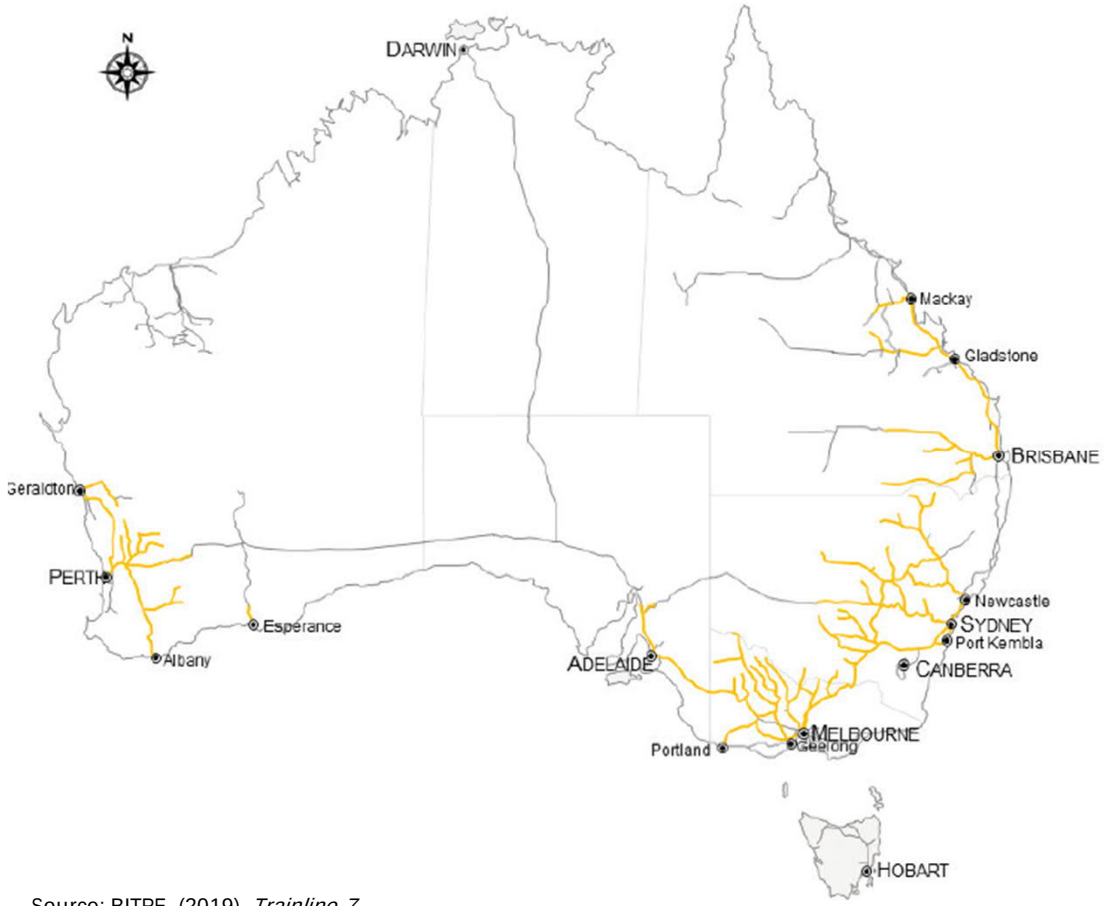
A key role of Australia's freight rail network (refer Figure 8) is hauling agricultural produce from regional and rural areas to ports for exports (and to a smaller extent for domestic consumption). In comparison to the transport of commodities such as coal and iron ore, the freight rail network transports a smaller proportion of grain produced in Australia as there are often greater advantages in transporting grain via road instead of rail – particularly over shorter distances. The production of grain is also more spread out in Australia, meaning that road transport is almost always required for part of the journey in the transportation of grain.

There are several factors that have improved road transport's effectiveness in grain freight over rail transport (particularly over short and medium distances). These include[1]:

- Variable infrastructure quality across networks, slower speeds, the need to change locomotives in places – particularly when travelling between main lines and branch lines, chokepoints and short crossing loops
- Variable rolling stock age and capacity, which can at times be less than what the infrastructure can accommodate
- Degrees of grain handlers' investment in grain receival sites, including closure of smaller sites
- Improved roads and road transport services
- Increased containerisation of grain
- Deregulation of grain export marketing, which has seen smaller shipments being moved on diverse pathways for a broader range of bulk handlers and export marketers
- Rail industry restructuring, funding and ownership changes
- Rail transport and infrastructure availability
- Increased domestic grain consumption of wheat produced in NSW, for which road transport is better suited
- Coordinating train loading times with port receival times
- Weather events

Grain transporters such as Graincorp are investing in better infrastructure and storage sites on the rail network to improve conditions for grain rail freight. Such projects aim to return large tonnages of grain from road freight back to rail freight.

Figure 8: Map of grain flows via rail freight



Source: BITRE, (2019), *Trainline 7*

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Australia is investing in making its rail freight network more efficient. Inland Rail is a nationally significant project that will create a stronger national freight network and prepare Australia for future freight demand.

Australia's investment into freight rail in the coming years (refer Table 11) is primarily centred around the Inland Rail project, which is a dedicated freight line running from Brisbane to Melbourne via regional NSW. The project will relieve congestion on the Sydney freight rail network but still provide additional freight task capacity to NSW via a logistics terminal in Parkes. It is set to increase freight capacity between Melbourne and Brisbane, both of which are expecting to see large growth in freight task in coming years. This project is likely to be complemented by the Port of Brisbane Dedicated Freight Rail Connection, which will link the Port of Brisbane to the Acacia Ridge Intermodal Terminal, which is the current end point of the Inland Rail project.

NSW is also looking to improve its freight capacity in the Sydney region to prepare for future growth. NSW has committed to increasing rail freight capacity from Sydney's Port Botany through the Port Botany Rail Freight Duplication and Cabramatta Passing Loop project. This will increase the freight capacity on the existing rail line at Sydney's busiest port. NSW is also investigating new corridors and opportunities to extend the rail freight network through the Northern Sydney Rail Freight Corridor Stage 2 project and the Corridor Preservation for the Western Sydney Freight Line and Intermodal Terminal.

Several projects have been highlighted for future development that involve improving land access to ports. Freight task arriving by sea is set to grow significantly in the future and ports will need efficient access to other modes of transportation for the final stage of the delivery process. Many Port Authorities and State Governments have recognised the need for better freight rail connections to ports to be able to move large volumes of freight out of ports without causing major traffic congestion. Projects are already in the pipeline for developing or improving rail freight access to the Ports of Brisbane, Melbourne and Botany, with additional projects likely to enter the pipeline in the future to meet growing freight demand.

Table 11: Australia's Freight Rail Infrastructure Pipeline

Jurisdiction	Project	Status	Indicative capital cost	Timeline
National	Inland Rail	Under Construction	$10 billion	Construction began in December 2018 and is estimated to take 10 years.
NSW	Port Botany Rail Freight Duplication and Cabramatta Passing Loop	Announced	$380 million	Expected completion by late 2024.
NSW	Freight Rail Access to Port Kembla	Prospective Pipeline	-	0-5 year delivery timeframe.
NSW	Northern Sydney Freight Corridor Stage 2	Early Stages	-	5-10 year delivery timeframe.
NSW	Corridor Preservation for Western Sydney Freight Line and Intermodal Terminal	Early Stages	-	0-5 year preservation delivery, with actual construction and planning to occur later.
VIC	Murray Basin Freight Rail Project	Under Construction	$440 million	Estimated completion by late 2023.
VIC	Port Rail Transformation Project	Under Procurement	$125 million	Estimated completion in 2023.
VIC	Melbourne container terminal capacity and land transport access	Early Stages	-	0-15 year delivery timeframe.
QLD	Port of Brisbane Dedicated Freight Rail Connection	Early Stages	-	5-10 year delivery timeframe.
QLD	Port of Gladstone land and sea access upgrade	Early Stages	-	5-10 year delivery timeframe.
QLD	Mount Isa – Townsville rail corridor upgrade	Early Stages	-	5-10 year delivery timeframe.
WA	Perth container terminal capacity and land transport access	Early Stages	-	10-15 year delivery timeframe.
SA	Gawler Craton Rail access	Early Stages	-	10-15 year delivery timeframe.

Source: Various sources including Infrastructure Australia and Australia and New Zealand Infrastructure Pipeline

The Inland rail project is one of Australia's largest infrastructure projects currently underway. It will provide huge improvements to the Melbourne-Brisbane freight network and prepare Australia to meet future freight demand.

Inland Rail Project[1]

Inland rail is a 1,700km freight rail line that will connect Melbourne and Brisbane via regional Victoria, NSW and Queensland (refer Figure 9). The cost to build the rail line is estimated to be $10 billion over a 10-year construction period.

Freight on Australia's East Coast is projected to double by 2050, and current infrastructure will not be able to cope with this level of demand for freight. The existing rail line between Melbourne and Brisbane is constrained by passing through Sydney and is not capable of accommodating double stacking. The Inland Rail line will bypass the congested Sydney freight network via regional NSW and reduce the travel distance between Melbourne and Brisbane by 200km. This will also improve transit times for freight between Melbourne and Brisbane, allowing freight to travel between the two cities via rail in under 24 hours.

The Inland rail line will also create more efficient links from Brisbane and Melbourne to Perth via the East-West Line. Parkes will be home to a new logistics terminal at the meeting point of the Inland Rail line and the East-west line that will improve the national efficiency of Australia's freight network. It will reduce the travel time of freight between Brisbane and Perth and Brisbane and Adelaide by 500km.

The Inland rail route is comprised of several greenfield and brownfield projects. There is one project in Victoria, seven in NSW and five in Queensland that make up the broader Inland Rail project. The project as a whole will involve major upgrades to 1,100km of existing railway lines and 600km of greenfield track. It will also involve the construction of several tunnels and other supporting infrastructure.

Several sections of existing railways will require enhancements to be able to accommodate double stacked trains. In many cases this will involve raising clearances along the rail corridor. The use of 1,800km double-stacked trains will give the rail line the equivalent freight volume of 110 B-double trucks. By reducing the road freight burden, the project will improve road safety for all road users and reduce the environmental impact of freight in Australia.

The project is projected to provide great benefits to the community. It has a benefit-cost ratio (BCR) of 2.62, suggesting that the benefits arising from the project more than double the costs. The project is also set to generate thousands of jobs, including 16,000 at the peak of construction and an average of 700 additional jobs per year over the entire period. It is forecast to increase Australia's GDP by $16 billion during construction and in the first 50 years of its operation.

Figure 9: Map of Inland Rail route

Source: Inland Rail

1. Inland Rail, (2020), *Australian Rail Track Association*.

Australia's rail freight demand is set to increase by 2040, though at a slower growth rate than observed in recent years. This is largely driven by lower growth forecasts for key export commodities such as iron ore and coal.

The future demand for freight rail in Australia will depend largely on the production and export of bulk goods – primarily iron ore and coal. Transportation of these commodities make up the majority of the freight rail sector's activities, so the forecast for these particular commodities will have the greatest influence on demand for rail freight in coming years.

Demand for rail freight is set to increase in the future, though at a much slower pace than observed in recent years. By 2040 it is projected that rail freight activity would grow by around 24% from 2016 volumes to reach approximately 516 billion tonne kilometres in 2040 (refer Chart 28). Overall, the industry is expected to grow by around 41% on 2016 volumes over the period to 2030.

Both iron ore and coal exports are largely dependent on demand from Asia. The long-term outlook for Australian exports of coal and iron ore are heavily tied to the long-term outlook for global and Asian growth in steel production and thermal coal consumption. Thermal coal demand in particular is expected to be tied to trends of growing public opposition to coal use and growing commercial sensitivities to the potential future liabilities of excessive reliance on coal; as well as increasing economic and industrial development in developing countries where there is high demand for coal in electricity production. It is expected that the growing opposition to coal will drive down demand from developed nations, though coal demand in developing nations is likely to continue into the medium term while coal remains relatively cheaper than renewable energy sources.

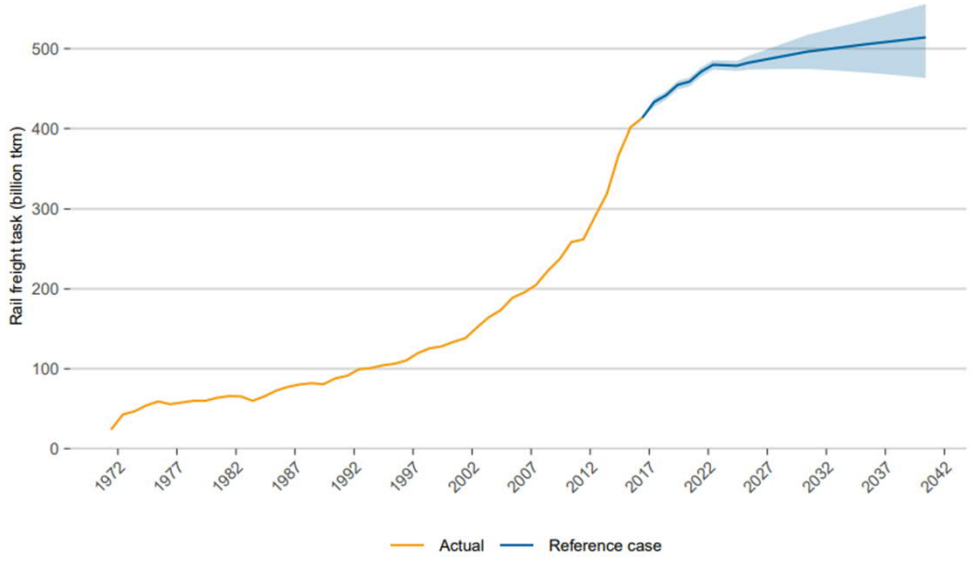
World demand for iron ore is also expected to grow at a slower rate over the forecast period than in recent years. World steel production has increased threefold since 1970 and has doubled since 2000, largely due to the expansion of developing economies such as China. Several factors are influencing the outlook for Australia's iron ore exports, including slowing growth/demand in China and other major Australian iron ore customers and the increasing production of iron ore in other nations. Australia is expected to maintain its share of world iron ore exports at approximately 54%, but is not forecast to see an increase in this share.[1]

Other bulk and steel rail freight (includes steel, grains, sugar cane, and other mineral ores and concentrates) has grown at a slower rate than other commodities since 1970, with growth of approximately 1.8% on an annual average basis. The rail freight task of other bulk commodities and steel is projected to increase from approximately 24.8 billion tonne kilometres in 2016 to 33.8 billion tonne kilometres in 2040. Demand for most commodities/grains is forecast to grow at historical trend rates.[1]

Faster growth is expected to prevail in other rail freight sectors, particularly the interstate non-bulk freight sector which will receive a boost due to the construction of Inland Rail. Interstate non-bulk rail freight is projected to increase from around 26.6 billion tonne kilometres in 2016 to approximately 52 billion tonne kilometres in 2040, representing average annual growth of 2.8% over the period. This is projected to be one of the fastest growing rail freight sectors in Australia, though it currently represents a smaller proportion of rail freight relative to the transport of bulk goods, resulting in a smaller impact on the total growth of the rail freight task in Australia.[1]

The growth in the non-bulk sector is comprised of growth on the north-south corridor (comprising Victoria, NSW and Queensland) and the east-west corridor (comprising NSW, VIC, WA and SA). Freight forecasts for each of these corridors is forecast based on projected growth in GSP in certain states. The east-west corridor forecasts are largely dependent on WA's projected GSP growth, as this region drives a lot of the demand for freight on the east-west corridor, while north-south freight forecasts are determined as a function of projected GSP across Victoria, NSW and Queensland and rail freight costs, as well as the expected impact of Inland Rail.[1]

Chart 28: Forecast rail freight task to 2040



Source: BITRE, (2019), *Australian aggregate freight forecasts – 2019 update.*

1. BITRE, (2019), *Australian aggregate freight forecasts – 2019 update.*

CHAPTER 5

Opportunities for suppliers in passenger rail

Opportunities for suppliers exist in both the repair, maintenance and refurbishment of the existing passenger rail fleet and the design and manufacture of new rolling stock

There are several opportunities for suppliers in the current context of an ageing domestic passenger rail fleet and high government funding commitments to expansions of passenger rail networks and service offerings across several states. These opportunities include repairs and maintenance or asset replacement for the existing passenger rail fleet and as a supplier of new rail rolling stock to facilitate government commitments to expand passenger rail networks.

Existing urban passenger rail rolling stock[1]

BITRE estimates highlight significant existing passenger rail rolling stock provision across the states, largely reflective of population distributions across the country. In urban regions across the country, there are estimated to be in excess of 4,900 heavy and light passenger rail vehicles (including locomotives, carriages, cars etc. used on passenger rail networks). Sydney and Melbourne comprise approximately 75% of these vehicles (refer Table 12).

Existing non-urban passenger rail rolling stock[1]

The provision of non-urban passenger rail rolling stock shares a similar distribution to urban and is largely concentrated in the eastern states (Table 13). Non-urban passenger rail rolling stock (cars, locomotives and carriages) in Australia are estimated in excess of 1,200.

Table 12: Urban passenger rail rolling stock provision in Australia, by heavy and light rail as at 2019

Heavy rail	Brisbane	Sydney	Melbourne	Adelaide	Perth
Total route length (km)	396	400	413	126	181
Metropolitan passenger route length under construction (km)	10.2	30	9	-	8
Passenger network gauge	Narrow	Standard	Standard	Broad	Narrow
Millions of trips	53.6	359.2	240.9	14.5	58.2
Urban rail journey to work mode shares (%)	7.3	19.1	13.7	2.8	7.5
Heavy rail vehicles (no.)*	648	1886	1356	130	330

Light rail	Gold Coast	Sydney	Melbourne	Adelaide	Canberra	Newcastle
Light rail vehicles (no.)	18	12	502	24	14	6

Source: BITRE, (2019), *Trainline 7*
*Rolling stock including locomotives, carriages, cars etc. used on the railway

Table 13: Non-urban passenger rail rolling stock provision in Australia, as at 2019

	QLD	NSW	VIC	WA
Electric multiple unit cars (no.)	138	424	-	-
Diesel multiple unit cars (no.)	27	65	258	14
Locomotives (no.)	27	19	33	-
Carriages (no.)	62	60	133	-
Total cars/vehicles	254	568	424	14

Source: BITRE, (2019), *Trainline 7*

1. Bureau of Infrastructure, Transport, Regional Economies, (2019), *TrainLine 7.*

Analysis of the Victorian passenger rail investment pipeline highlights several potential opportunities for suppliers in the design and manufacture of passenger rail rolling stock

Opportunities in the pipeline for manufacturing and ongoing services

Analysis of the passenger rail investment pipeline for Victoria highlights some immediate and longer term potential opportunities for suppliers for the manufacture of passenger rolling stock (refer Table 14).

An immediate and significant opportunity includes the Next Generation Trams project. This project seeks to facilitate the retirement of the existing high-floor trams and is the biggest single investment in trams in several decades. The project includes the design and manufacture of 100 next generation trams with a Victorian Government estimated investment of $1.48 billion. The Victorian Government website indicates that a supplier will be selected through a procurement process due to occur this year (2021) with trams due to begin roll-out from 2025 onwards. Further detail is provided in Appendix C.[1]

Longer-term opportunities also exist in Victoria such as the High Capacity Metro Trains 2 project. This project seeks to acquire several new 10-car high capacity trains for the Sunbury – Dandenong rail corridor, the Airport Rail Link. This project is in very early stages of planning with the number of trains unknown; however, order of magnitude capital costs have been indicated at approximately $2.3 billion.[2]

Other infrastructure projects also exist with the potential to lead to rolling stock opportunities. These include projects that seek to increase frequencies for existing services and those that seek to establish new services. These projects range in value from $0.6-$50 billion and are in different stages (refer Table 14).

1. Department of Transport, (2020), *Next Generation Trams*.
2. ANZIP (2018), *High Capacity Metro Trains*.

Table 14: Passenger Rail Investment Pipeline for Victoria

Project	Indicative Capital Cost	Timeline	Spend type	Region	Network type
North East Rail Line Upgrade	$235 million	Completion in mid-2021	Infrastructure	Regional	Heavy rail
Level Crossing Removal project	>$6.6 billion*	Completed by 2025	Infrastructure	Urban	Heavy rail
Cranbourne Line Upgrade	$750 million	Construction to start in 2020	Infrastructure	Urban	Heavy rail
Gippsland and Bendigo Package	$689 million	Construction to start in 2021	Infrastructure with potential for additional rolling stock	Regional	Heavy rail
Next Generation Trams	$1.48 billion	New trams to start rolling out in 2025	Rolling stock	Urban	Light rail
Warrnambool Line Upgrade	$512 million	Stage 1 construction expected to be completed in 2021	Infrastructure	Regional	Heavy rail
Suburban Rail Loop	$50 billion**	-	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
Shepparton Line Upgrade	>$300 million	-	Infrastructure with potential for additional rolling stock	Regional	Heavy rail
Melbourne Airport Rail Link	$8 billion to $13 billion	Construction expected to begin in 2022	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
Melbourne Metro Tunnel	$11 billion**	-	Infrastructure	Urban	Heavy rail
Sunbury Line Upgrade	$2.1 billion	Expected completion by end of 2023	Infrastructure	Urban	Heavy rail
Fast Rail to Geelong	$4 billion	Expected commencement of construction in 2023	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
Hurtsbridge Line Upgrade Stage 2	$530 million	-	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
High Capacity Metro Trains 2	$2.3 billion	-	Rolling stock	Urban	Heavy rail
Waurn ponds duplication project	$1.06 billion	-	Infrastructure with potential for additional rolling stock	Urban	Heavy rail

Source: Various sources, primarily Australia and new Zealand Infrastructure Pipeline

*Costs are expected to exceed $6.6 billion as the business case that reported this figure was for the removal of 50 level crossings, while the project has been expanded to remove 75. Some of the level crossing removals may also be included in rail line upgrade projects.
**Reported costs are indicative only, based on prior government announcements. There is indication that these projects will cost more than originally reported.

In NSW, analysis of the passenger rail investment pipeline highlights comparably fewer opportunities for suppliers relative to Victoria

Opportunities in the pipeline for manufacturing and ongoing services

Compared to Victoria, analysis of the passenger rail investment pipeline for NSW highlights comparably fewer opportunities for suppliers in the manufacture of passenger rail rolling stock (refer Table 15).

The XPT Fleet Replacement project contract was signed in early 2019 with Momentum Trains (an international consortium comprising CAF, UGL Rail Services, Pacific Partnerships, CAF Investment Projects and DIF Infrastructure V Cooperatief). The contract includes an allocation of around $1.26 billion for the design and manufacture of over 117 new carriages in order to replace the aged existing fleet. With the first train expected to operate on the regional network in 2023, it is unlikely that additional passenger rail trains will be ordered in NSW in the short term.[1]

Similarly, the More Trains, More Services – Stage 2 project contract was originally signed with Downer with CRRC involvement in the manufacturing. The original order of 24 eight-car trains was expanded by an additional 17 in early 2019 in response to high patronage on the network. It is uncertain whether there is further potential for the Sydney urban passenger network and no announcements for further procurement have been made in this regard.[2]

Both the Sydney Metro – City and South West and the Sydney Metro – Western Sydney Airport projects are infrastructure projects seeking to expand and improve the existing network and improve service quality. It is possible that these projects could result in rolling stock acquisition over the medium-term as they are progressed and *actual* patronage is observed on the upgraded network.

Table 15: Passenger Rail Investment Pipeline for NSW

Project	Indicative Capital Cost	Timeline	Spend type	Region	Network type
XPT Fleet Replacement	$2.8 billion	First new trains are expected to be running from 2021	Rolling stock	Regional	Heavy rail
More Trains, More Services – Stage 2	$2.233 billion	Delivered over the next ten years	Rolling stock	Urban	Heavy rail
Sydney Metro – City and South West	$11.5 billion to $12.5 billion	To be completed in 2024	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
Sydney Metro – Western Sydney Airport	~$11 billion	To be completed for airport opening in 2026	Infrastructure with potential for additional rolling stock	Urban	Heavy rail

Source: Various sources, primarily Australia and new Zealand Infrastructure Pipeline

1. Transport for NSW, (2020), *Regional Rail .*
2. Infrastructure NSW (2020), *More Trains, More Services – Stage 2 .*

Potential opportunities exist in QLD, WA and ACT with the Queensland rolling stock expansion program a sizeable and key opportunity over the next ten years

Opportunities in the pipeline for manufacturing and ongoing services

Analysis of the passenger rail investment pipeline for QLD, WA and the ACT highlights some attractive short- to long-term potential opportunities for suppliers for the manufacture of passenger rolling stock (refer Table 16).

Primarily, the **Queensland Rolling stock expansion program (REP)** which is reportedly in early stages with expressions of interests welcome is a $600 million potential opportunity to support QLD in designing and manufacturing a new fleet of passenger rolling stock. It is reported that the Rolling stock, Maintenance and Manufacturing Package could include an initial fleet of around 20 six-car EMUs and options for a further 45; however, this has yet to be confirmed.[1]

The $600 million allocated for the Queensland Rolling Stock Expansion Program is a component of a broader $1 billion rail manufacturing pipeline commitment by the Queensland Government.[1]

The Metronet – Rolling stock procurement program in WA has passed tender process and was awarded to Alstom, a French multinational rolling stock manufacturer.[2]

Other opportunities such as those for the Gold Coast Light Rail and ACT Light Rail projects have both been tendered to Bombardier and CAF.

Other infrastructure projects also exist with the potential to lead to rolling stock opportunities. These include projects that seek to increase frequencies for existing services and those that seek to establish new services. These projects range in value from $0.5-$5.4 billion.

1. ICNGateway, (2020), *Rolling stock Expansion Program.*
2. ANZIP, (2019), *Metronet Rolling Stock Procurement*

Table 16: Passenger Rail Investment Pipeline for Queensland, WA and the ACT

State	Project	Indicative Capital Cost	Timeline	Spend type	Region	Network type
QLD	Cross River Rail	$5.4 billion[16]	Completion in 2024	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
QLD	Gold Coast Light Rail – Stage 3	$719 million	Construction commencement in 2021	Infrastructure and rolling stock	Urban	Light rail
QLD	Queensland Rolling stock expansion program	$600 million	-	Rolling stock	Urban	Heavy rail
QLD	Beerburrum to Nambour rail upgrade – Stage 1	$550.8 million	Construction to be complete in late 2024	Infrastructure with potential for additional rolling stock	Regional	Heavy rail
WA	Metronet – Morley to Ellenbrook Line	$1.352 billion	Construction to be complete in 2023-24	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
WA	Metronet – Rolling stock procurement	$1.3 billion	Construction to be complete in 2024	Rolling stock	Urban	Heavy rail
WA	Metronet – Thornlie to Cockburn Link and Yanchep Rail Extension	$1.25 billion	Construction to be complete in mid-2023	Infrastructure with potential for additional rolling stock	Urban	Heavy rail
WA	Metronet – Byford Extension	$491 million	Construction to commence in 2021	Infrastructure	Urban	Heavy rail
WA	Metronet – Level crossing removals – Armadale line	$415 million	Project delivery contract to be awarded in 2021	Infrastructure	Urban	Heavy rail
WA	Metronet – High Capacity Signalling	$1.232 billion	Construction to commence in 2021	Infrastructure	Urban	Heavy rail
ACT	ACT Light Rail – Stage 2	Estimated cost of $1.3 billion to $1.6 billion	Stage 2A to begin construction in mid-2020	Infrastructure and Rolling stock	Urban	Light rail

Source: Various sources, primarily Australia and new Zealand Infrastructure Pipeline

Indicative analysis of annualised supplier opportunities highlights on average, approximately $0.5 billion per year in confirmed rolling stock opportunities over the period 2021 to 2030. The time horizon of announced rail projects does not extend beyond 2033.

Annualised supplier opportunity

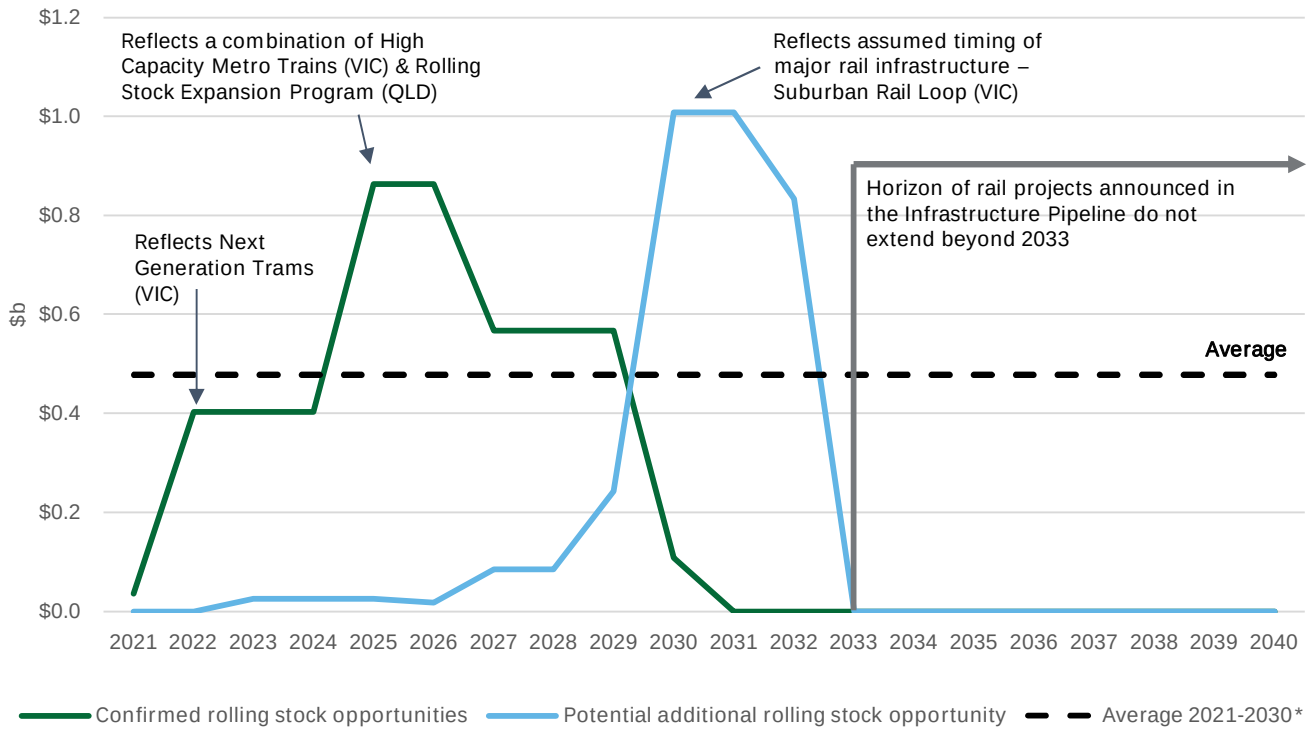
In order to obtain an annualised estimate for supplier opportunities over the period 2021 to 2040, projects with associated rolling stock design and manufacturing have been identified and funding distributed over the life of the project. The indicative results of this analysis are provided in Chart 29 and the assumptions underpinning the analysis are provided in Appendix D.

Confirmed rolling stock design and manufacturing opportunities reflect those projects that have been announced but are yet to be tendered. Analysis highlights the existence of notable supplier opportunities across the next decade; most notably, the Next Generation Trams, High Capacity Metro Trains and Rolling Stock Expansion Program. The indicative annualised supplier opportunity over this period for these projects is approximately $0.4 billion increasing to approximately $0.9 billion between 2025 and 2026. On average, confirmed rolling stock opportunities for suppliers averages approximately $0.5 billion per year across the period 2021 to 2030.

In addition to those confirmed projects with announced funding and timelines there are several infrastructure projects that are seeking to expand and improve the existing networks and improve service quality. It is possible that these planned infrastructure projects could result in additional opportunities for rail rolling stock manufacturers. This is reflected in the indicative estimates of 'potential additional rolling stock opportunity' in Chart 29.

Estimates of these additional opportunities indicates potential over the longer-term pipeline (estimated to be from 2028 to 2032). The indicative annualised supplier opportunity over this period is approximately $1 billion and is largely driven by potential rolling stock acquisition associated with investment in the Suburban Rail Loop project (VIC).

Chart 29: Indicative annual estimates of passenger rail rolling stock supplier opportunity, 2021 - 2040



Source: Deloitte analysis using various sources, primarily Australia and new Zealand Infrastructure Pipeline
*Average of 'annual confirmed rolling stock opportunities' between 2021 and 2040

CHAPTER 6

Opportunities for suppliers in freight rail

Repairs and maintenance services in the context of ageing rolling stock represent a large proportion of repair, maintenance and refurbishing revenues in Australia and may indicate an opportunity for suppliers

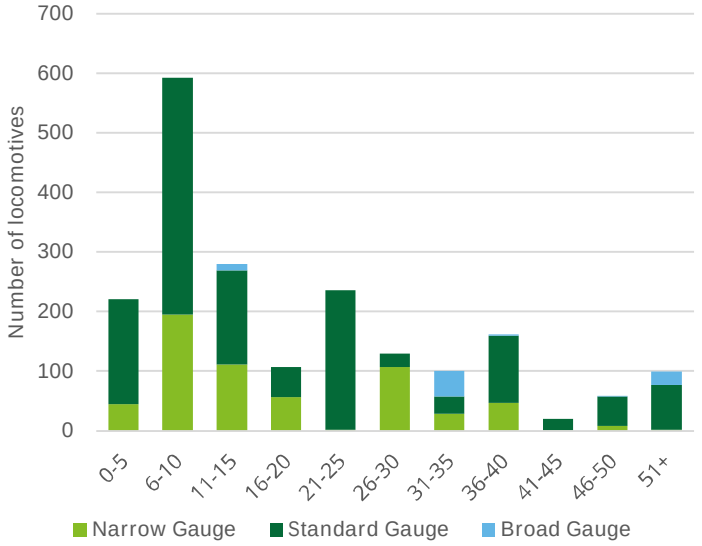
Opportunities for supply of repair, maintenance and refurbishment services of existing rolling stock[1]

Analysis of the age of the predominantly freight locomotive fleet in Australia (approximately 50 or less of these locomotives are passenger) indicates an ageing fleet with around 40% of locomotives exceeding 20 years of service and around 10% exceeding 40 years (refer Chart 30 and Chart 31). This indicates a potential for future business in the repair, maintenance and refurbishment of this rolling stock. Data on private ownership of locomotives and wagons used for freight transport is provided in the Table overleaf. Analysis of this data and an understanding of the narrow, standard and broad gauge networks in Australia suggest that narrow gauge locomotives in Chart 30 are likely to be a mix of Aurizon (operating in Central Queensland coal network and regional services) with Pacific National in Central Queensland. These operators will have a mix of relatively new and older locomotives. Standard gauge locomotives are most likely in New South Wales and Western Australia iron ore areas (as rest of Western Australia is narrow gauge). Watco and Pacific National standard gauge locomotives are likely in the 5-15 year bracket for services in Western Australia and transcontinental routes. A large proportion of the new narrow gauge locomotives (0-15 years) will be Western Australia iron ore – Rio Tinto, BHP and FMG etc. – and reflects major fleet upgrades over the last decade in line with mining boom. It is most likely that the older locomotives will be refurbished and will possibly be regional intrastate freight (e.g. SCT, Fletcher in NSW and Southern Shorthaul Railroad etc. as well as Watco's ex. Queensland Rail locomotives). Broad gauge locomotives are almost exclusive to Victoria, noting that much of Victoria's regional freight lines are now dual gauge (broad and standard) and is the interstate line owned and managed by the Australian Rail Track Corporation (ARTC) from Melbourne to Brisbane via New South Wales (noting that the NSW border to Port of Brisbane section – circa. 100kms - is dual narrow and standard gauge).

An analysis of industry revenues for the Railway Equipment Manufacturing and Repair industry in Australia highlights the relative share of repairs and maintenance compared to other primary activities such as manufacturing (refer Chart 32). In the 2020 financial year, repairs and maintenance* services for this industry was estimated at approximately $1.2 billion, with passenger trains and carriages and light rail and trams manufacturing estimated at a combined $1.1 billion and freight trains and wagons estimated at approximately $0.7 billion.

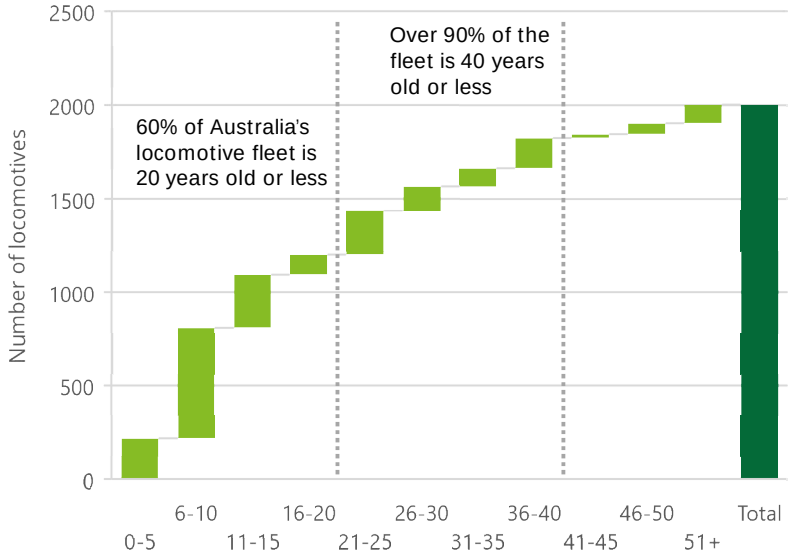
*Repairs and maintenance relate to both passenger and freight rolling stock in Australia

Chart 30: Locomotive age* profile (heavy rail)



Source: BITRE, (2019), *TrainLine 7.*

Chart 31: Locomotive age profile (heavy rail) - cumulative



Source: BITRE, (2019), *TrainLine 7.*

Chart 32: Estimated rail revenues by primary activity ($b), 2020FY

Source: IBISWorld, 2020

*Age is calculated from date of manufacture or date last rebuilt – whichever is most recent

1. IBISWorld, (2020), *Railway Equipment Manufacturing and Repair in Australia C2393*

Analysis of the current rail freight rolling stock fleet highlights Aurizon, Pacific National and Rio Tinto as major rail-asset owners and operators

Current rail freight rolling stock fleet for major rail transport operators and CRRC customers

Robust data on privately owned rolling stock is inherently difficult to obtain due to the lack of transparency in private operations. Analysis conducted by the National Transport Commission Australia provides an indication as to the size of the current freight rail rolling stock fleet including locomotives and wagons owned (refer Table 17).

Major rail freight transport providers, Aurizon and Pacific National, hold the majority of Australia's rail freight locomotives and wagons with approximately 550-600 locomotives, respectively. Other rail freight transport providers of interest to CRRC retain smaller fleets with One Rail Australia (previously Genesee & Wyoming Australia) the largest – 95 locomotives and 950 wagons.

Rio Tinto is a major owner of freight rail rolling stock in Australia, retaining almost as many wagons as Aurizon or Pacific National. BHP's fleet is considerably smaller than Rio Tinto but still a notable customer for CRRC.

Table 17: Current rail freight fleet of major rail transport operators and select CRRC customers

Freight rail operator	Number of locomotives	No of wagons	Kilometre of track
Aurizon	576	13,960	2,670
Pacific National	596	12,880	-
One Rail Australia (previously Genesee & Wyoming Australia)	95	950	5,000
SCT Logistics	36	-	-
Qube	55	-	-
Rio Tinto	191	11,500	-
BHP	107	248	426
FMG	-	-	260
Other	180+	300+	-

Source: National Transport Commission Australia, 2016
Note: Due to the inherent lack of transparency in private operations data gaps may exist. These are indicated by "-" or where a range is indicated e.g. "+"

Forecasts for rail freight volumes and business conditions for long-term CRRC customers highlights positive supplier opportunities

Future rail rolling stock needs

It is difficult to predict the future rolling stock needs of private entities without complete transparency over the range of potential variables that influence rolling stock acquisition including:

- Operational characteristics: how the entities' operations are run including the composition of the standard rolling stock fleet (number of locomotives, wagons), the frequency of round trips on the network or the tonnes moved
- Capacity considerations: How much excess capacity does the entity have in the current rolling stock fleet? i.e. if the entity is expected to move greater volumes in the future does it *need* to invest in additional rolling stock?
- Age of fleet: If the entities rolling stock fleet is relatively new it is less likely to require replacements than an entity employing an older fleet etc.

As such, analysis of future freight rail rolling stock opportunities in this section will focus on qualitative analysis of the expected future for freight rail as an industry and the entities identified by CRRC with consideration for expectations of business conditions i.e. the expectations of volumes on rail and thus the need for additional freight rolling stock. Indicative quantitative estimates of future rolling stock needs are also provided, where data is available and where estimation is reasonable.

Rail freight industry[1]

Despite the recent slow-down in the growth of the rail freight industry since the peak of the mining boom in the early 2010s', volumes are expected to grow over the period to 2030. Overall, the industry is expected to grow by around 41% on 2016 levels over the period to 2030. This is equivalent to a CAGR of 2.5%. This growth results in an average annual growth over the period of 39.66 million tonnes.

With bulk freight assumed to comprise roughly 92% of this expected growth in volumes, growth in the industry to 2030 could require as much as 3000 additional wagons on average per year to service this freight (depending on a range of variables).*

With a range of consist configurations and locomotives available, the number of additional locomotives required to service this freight could be as high as 80 on average per year.**

*Represents an upper bound. Assumes 105 tonne wagon with 2.5 return trips on average per week and operational for 48 weeks per year.
**Indicative estimate and assumes an average consist of 70 wagons and 2 locomotives

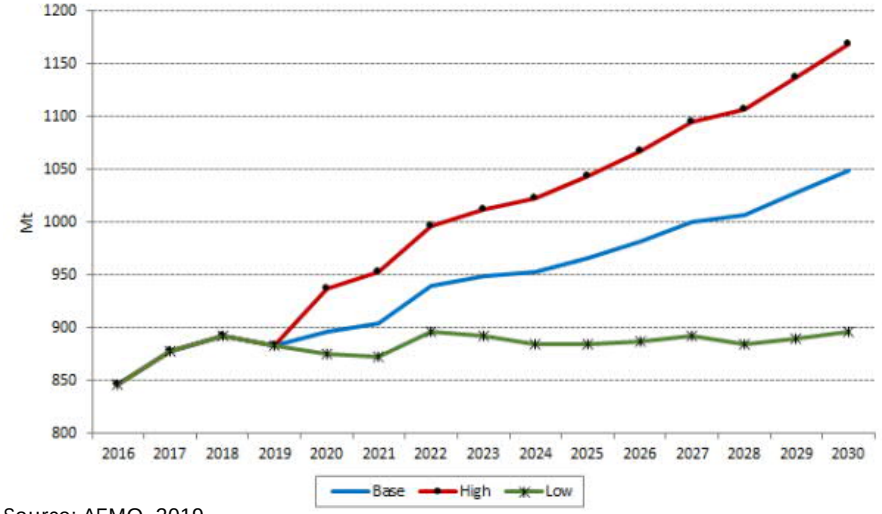
Iron ore (Rio Tinto, BHP, FMG)[2,3]

Much of Australia's iron ore deposits are located in Western Australia's Pilbara region. Mining operations in these regions include important long-term customers of CRRC including Rio Tinto, BHP and FMG. As mentioned, the outlook for iron ore production and export in Australia is positive over the medium term. Australian iron ore production is forecast to grow, year-on-year to 2022 at an average rate of approximately 2.4%.

Australian export volumes are currently 858 million tonnes with Rio Tinto comprising approximately 40%. At 2.4% CAGR, 42 million additional tonnes of exports are anticipated over the next 2 years to 2022. Further, commodity forecasts for Western Australian iron ore production highlight the potential for high growth over the period 2022 to 2030 (refer Chart 33). Analysis by the Australian Energy Market Operator in 2019 indicates a further 1.9% CAGR over this period in the central expected case with a high scenario estimate of 3.2%. If these future estimates are realised, it could result in an additional 150-300 million tonnes of iron ore exports in Australia, requiring as much as 50-100 consists (assuming an average consist comprises of 2 locomotives, 230 wagons carrying 105 tonnes per wagon and completing an average of 2.5 return journeys per week for 48 weeks of the year).

Refurbishment of a railcar dumper at BHP's Port Hedland facilities and conclusion of site maintenance at Rio Tinto's facilities are expected to support short to medium-term growth in iron ore production but it is likely that private investment in additional freight rail rolling stock will be necessary to accommodate growth over the period to 2030.

Chart 33 : Western Australian iron ore production to 2030, by scenario (Mt)



Source: AEMO, 2019

1. Australasian Railway Association (2020), *Value of Rail 2020*
2. AEMO, (2019), *Commodity forecasts for Western Australia to 2030*
3. Office of the Chief Economist, (2020), *Resources and Energy Quarterly – December*

Further, forecasts for non-bulk rail freight and recent investments to support intermodal rail freight at major Australian ports indicate positive future opportunities for suppliers of rail rolling stock

Commercial rail transport providers (SCT, Qube etc.)

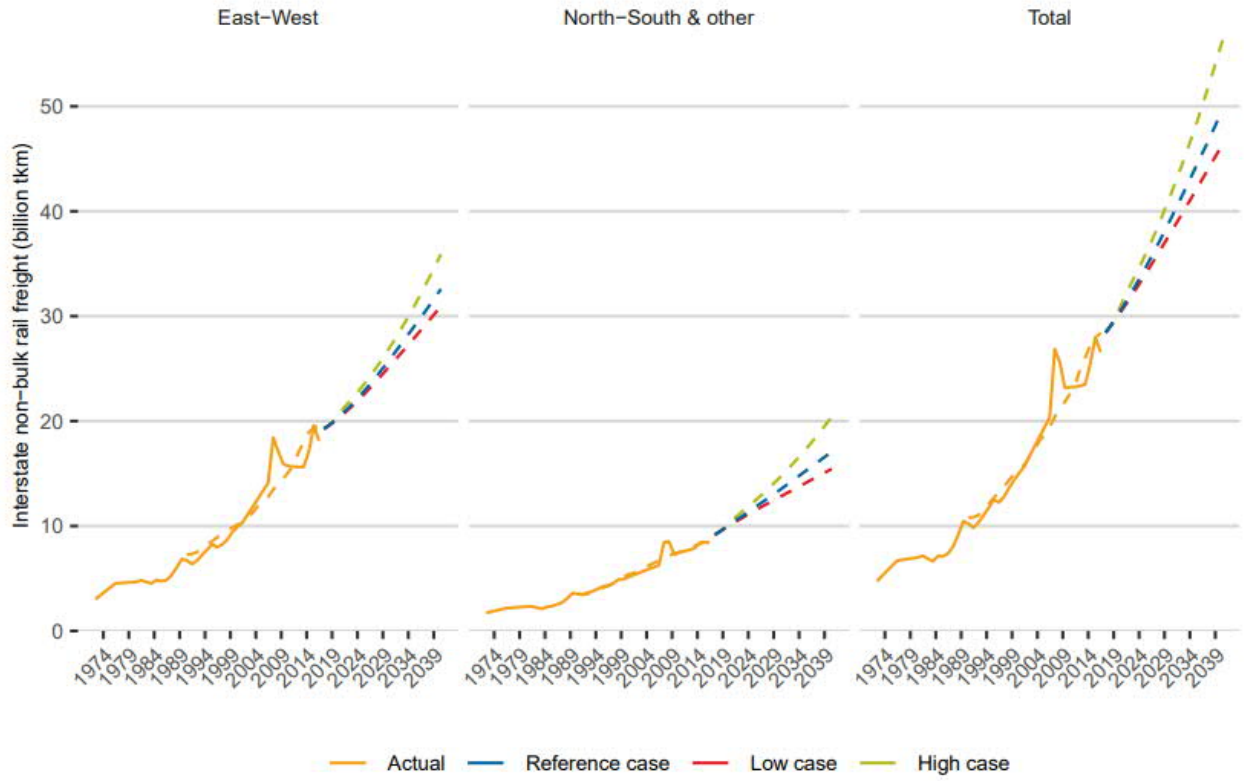
Rail transport operators such as SCT and Qube predominantly offer integrated intermodal rail transport solutions for non-bulk rail freight with other services for commodities such as bulk grains etc. The forecast outlook for non-bulk rail freight is positive and strong for both the East-West and North-South routes (refer Chart 34). This is reflective of population and economic conditions (pre-COVID) and also of major rail freight projects such as the Inland Rail development in Australia's eastern states.

Under the medium case, East–West non-bulk rail freight is projected to increase by 68 per cent over 2016 levels (2.2 per cent per annum), to around 32.5 billion tonne kilometre in 2040. Under the high scenario, East–West non-bulk rail freight volumes would grow 85 per cent (2.6 per cent per annum) to around 36 billion tonne kilometres by 2040, and under the low case East–West non-bulk rail freight volumes would grow by around 60 per cent to around 31 billion tonne kilometres in 2040. Further, total North–South & other non-bulk rail freight is likely to grow by around 2.4 per cent between 2018 and 2040, under the medium case assumptions and absent any other changes.[1]

Forecast growth in non-bulk rail freight volumes are promising indicators for CRRC and indicate sizeable potential for suppliers of rail rolling stock to rail transport providers. This is further supported by recently announced investments by SCT, Qube and state government such as those in the Port of Melbourne, supported by the Victorian Government Port Rail Shuttle Network and at Port Botany supported by NSW Ports to invest in 'on-dock' rail infrastructure capacity.[2,3]

1. Australasian Railway Association (2020), *Value of Rail 2020*
2. HellenicShipping (2020), *Port rail strategy driving new investment*
3. Qube (2018), *Investment in Port Botany rail infrastructure*

Chart 34 : Forecast interstate non-bulk rail freight volumes, 1971 - 2040



Source: BITRE, 2019

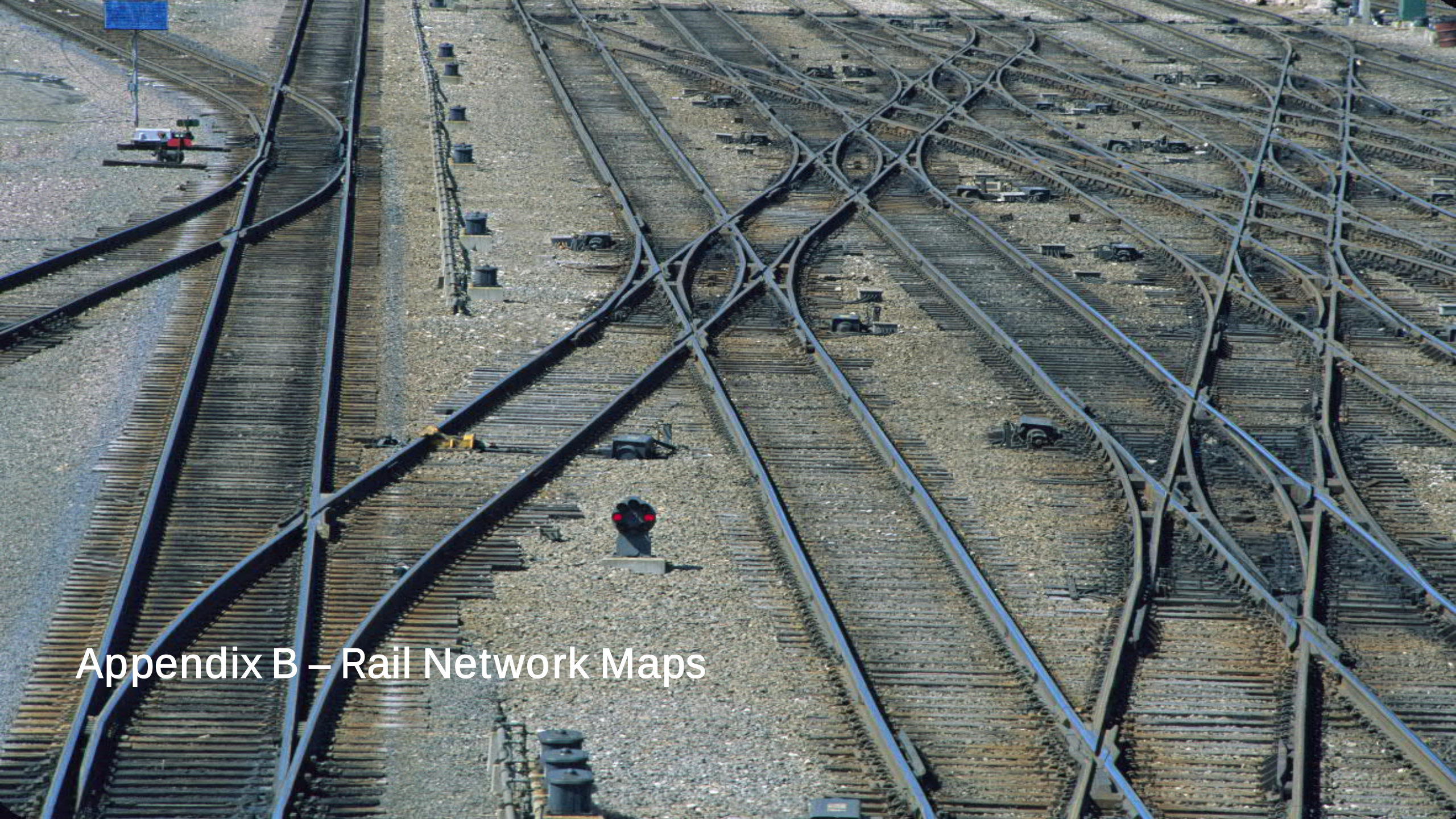
Appendix A – Rail Industry Employment

Australia's rail sector employs over 30,000 people in total between the rail passenger transport, freight rail transport and railway rolling stock manufacturing and repair sectors.

Table A1: Employment in Australia's Rail Industries

State or Territory	Rail passenger transport			Rail freight transport			Rail transport, not fully disclosed			Railway Rolling Stock Manufacturing and Repair		
	Full time	Part time	Other	Full time	Part time	Other	Full time	Part time	Other	Full time	Part time	Other
NSW	4,664	407	315	2,413	246	177	2,029	316	143	1,207	82	42
Victoria	4,532	477	332	626	73	31	1,095	192	78	793	45	23
Queensland	4,273	360	249	3,570	227	255	1,344	129	71	636	39	21
SA	459	68	55	719	49	33	304	33	12	129	6	9
WA	426	48	32	1,031	72	54	697	52	42	171	12	10
Tasmania	124	11	5	58	6	3	28	8	2	6	3	0
NT	7	10	3	30	5	0	18	0	6	0	0	3
ACT	4	0	1	5	0	0	17	0	0	0	0	0

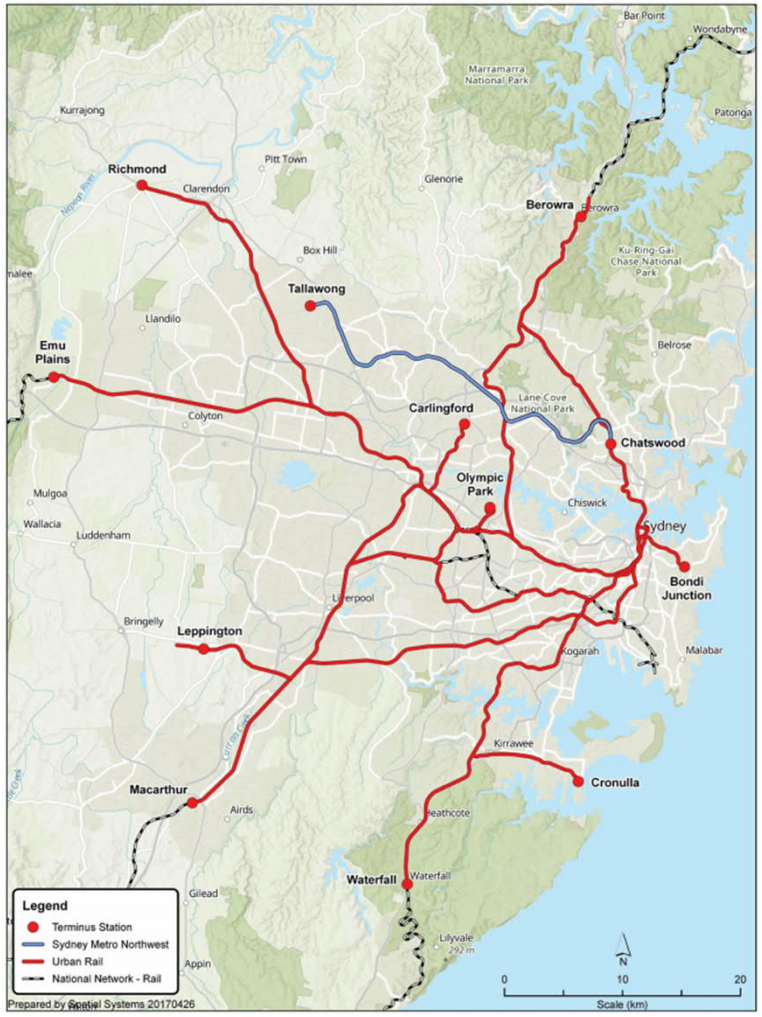
Source: ABS Census of Population and Housing, (2016).
Note: Other employment refers to those who are employed but are away from work, as well as those who are employed but did not state whether their hours were full time or part time. Rail transport, not fully disclosed indicates the respondent did not specific their sector within the rail industry.



Appendix B – Rail Network Maps

NSW Heavy Rail Network Maps

Figure B1: Sydney urban heavy rail network



Source: BITRE Statistical Report, 2019

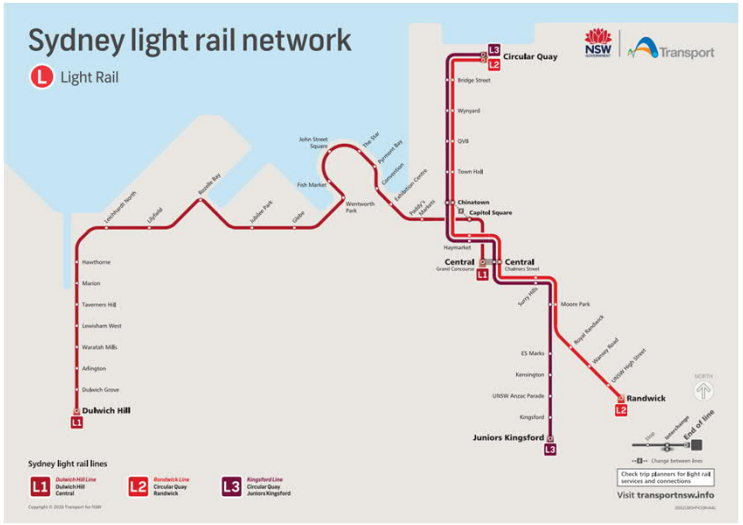
Figure B2: NSW regional heavy rail network

Source: Transport for NSW

Note: Rail lines are indicated in orange

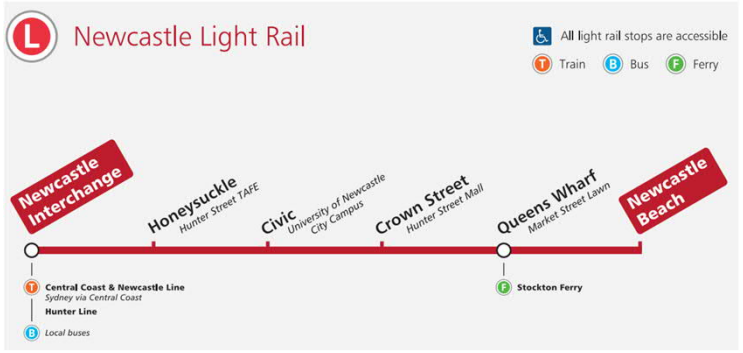
NSW and Victoria Light Rail Network Maps

Figure B3: Sydney light rail network



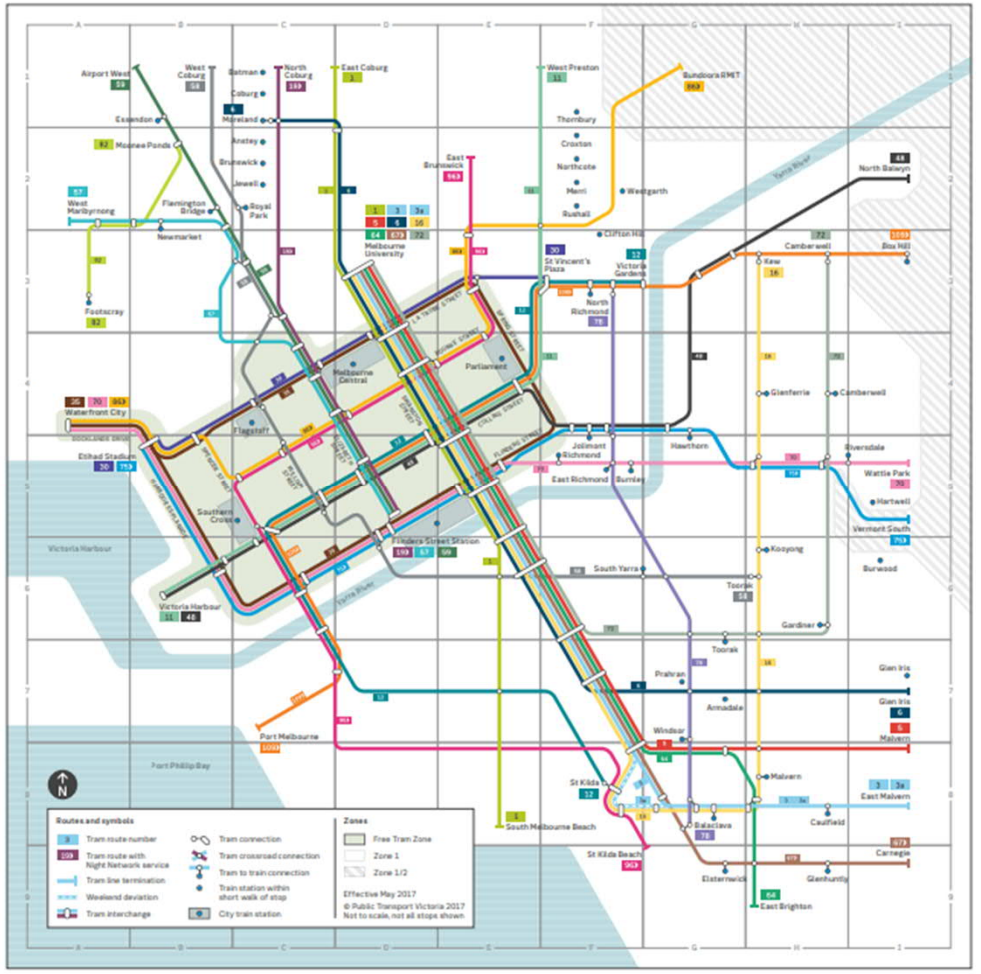
Source: Transport for NSW

Figure B4: Newcastle light rail network



Source: Transport for NSW

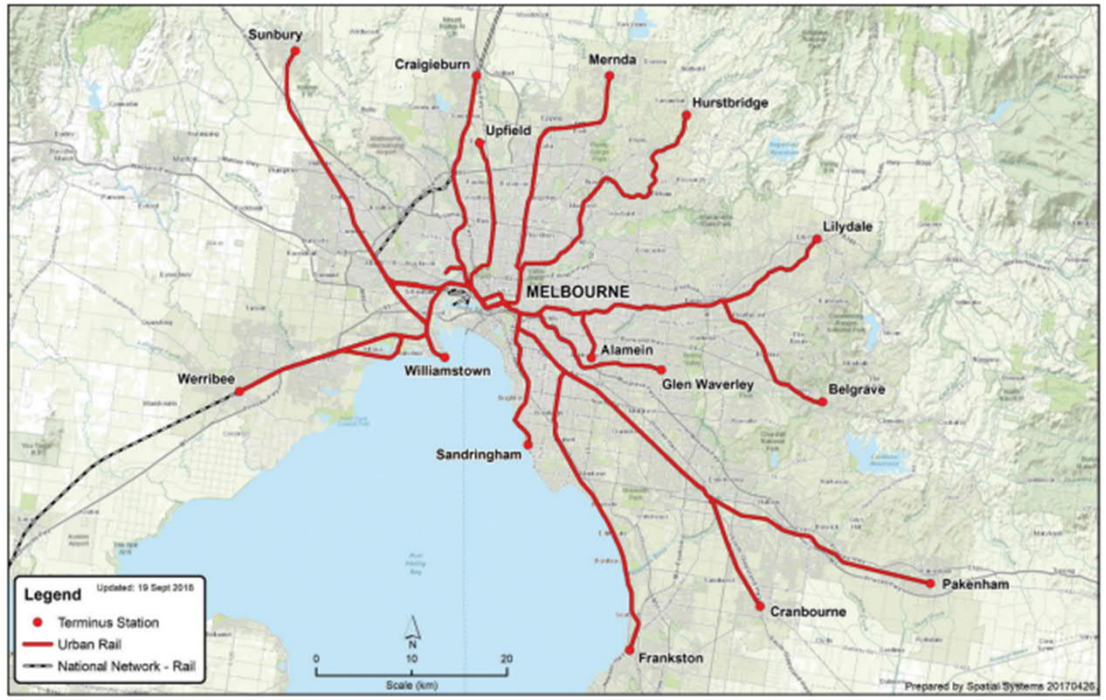
Figure B5: Melbourne light rail network



Source: Public Transport Victoria

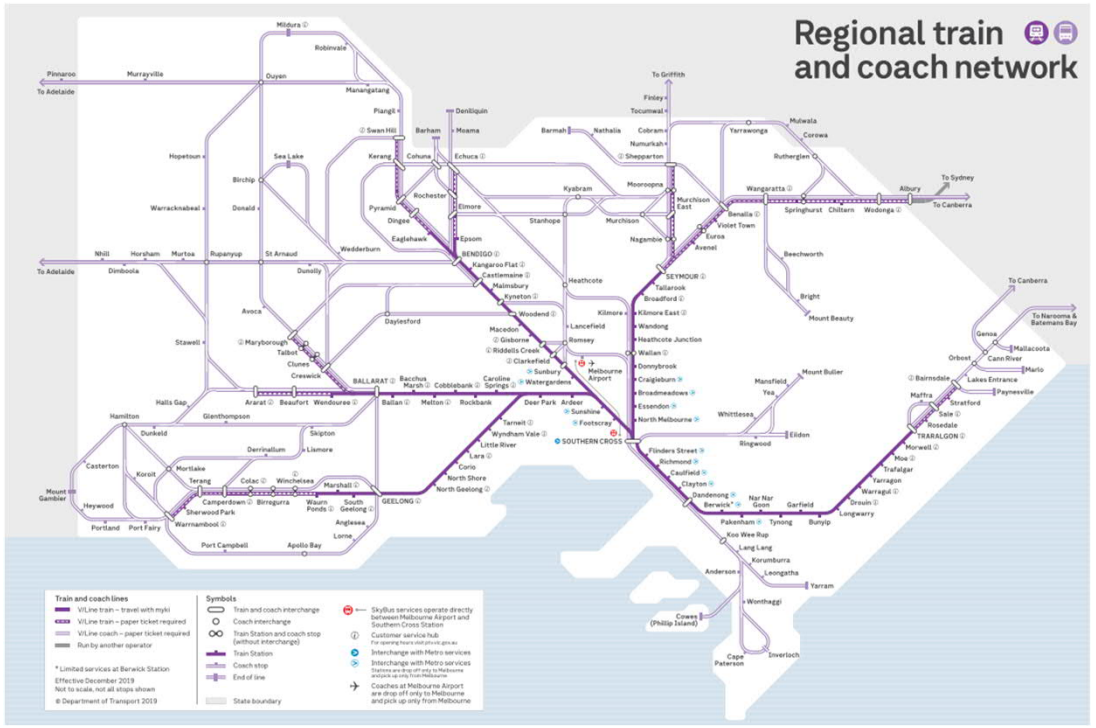
Victoria Heavy Rail Network Maps

Figure B6: Melbourne urban heavy rail network



Source: BITRE Statistical Report, 2019

Figure B7: Victoria heavy rail network



Source: Public Transport Victoria

Note: Rail lines are indicated in darker purple

Queensland Rail Network Maps

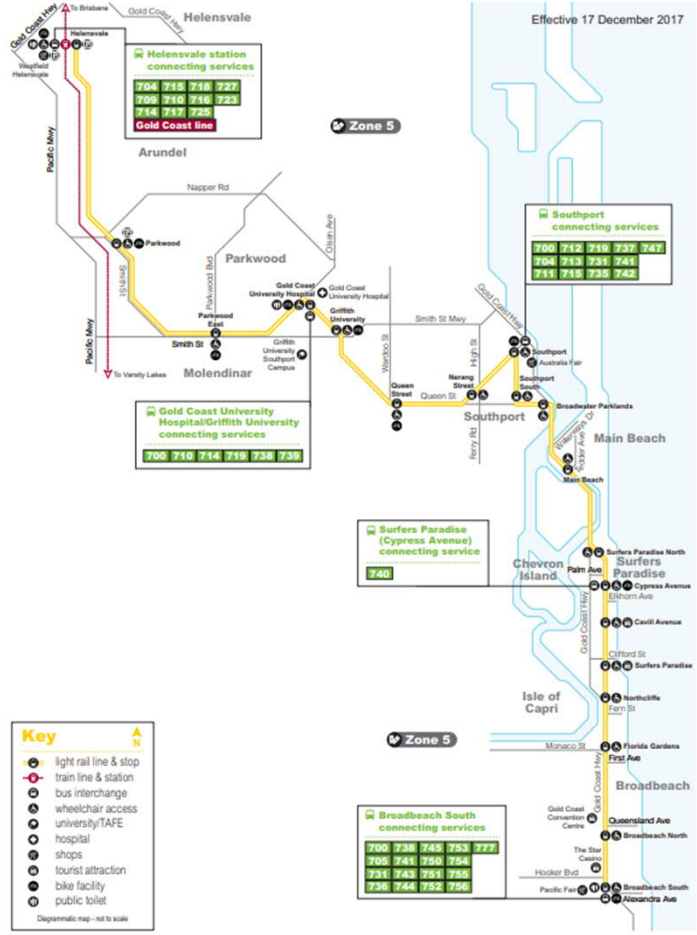
Figure B8: South East Queensland urban heavy rail network

Source: BITRE Statistical Report, 2019

Figure B9: Queensland regional heavy rail network

Source: Queensland Rail Travel

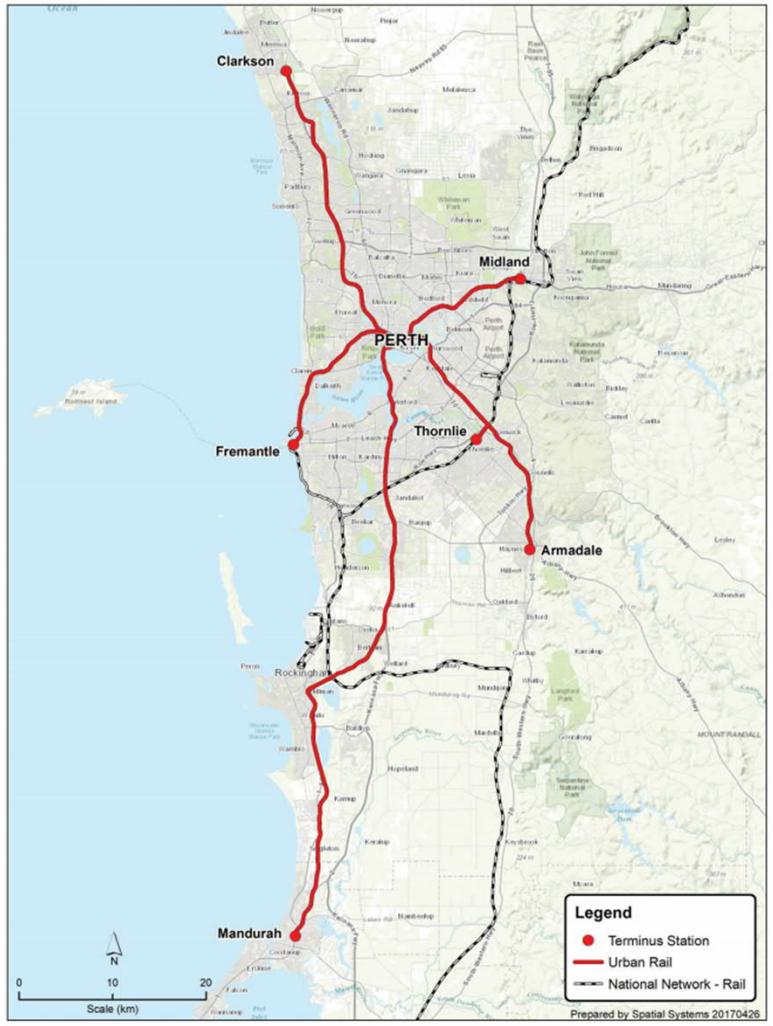
Figure B10: Gold Coast light rail network



Source: TransLink

WA and ACT Rail Network Maps

Figure B11: Perth urban heavy rail network

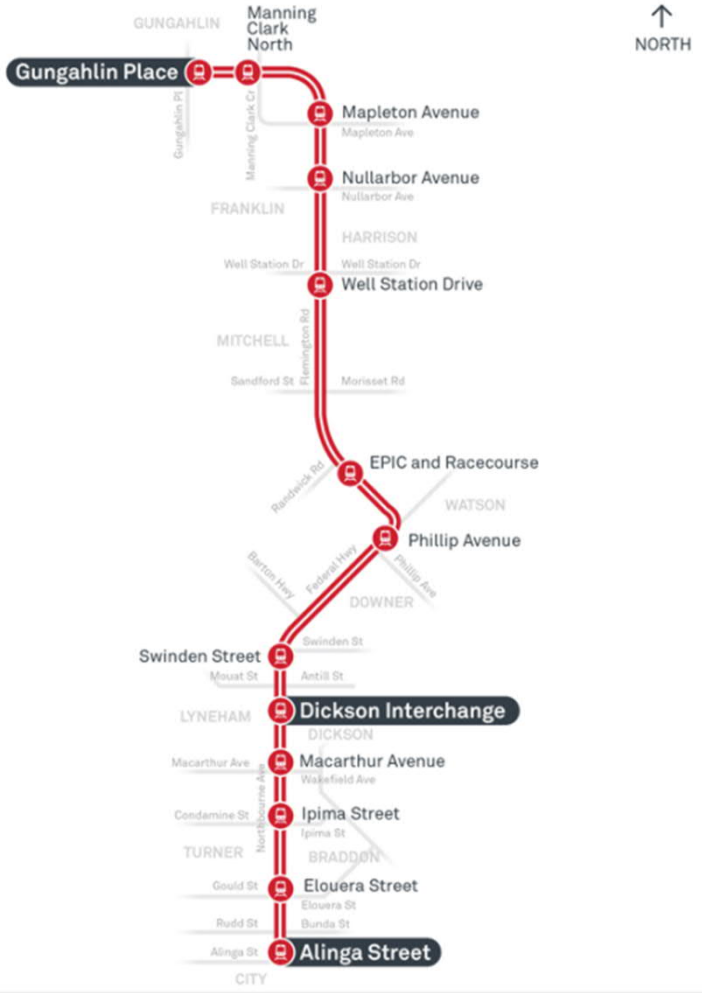


Source: BITRE Statistical Report, 2019

Figure B12: Western Australia regional heavy rail network

Source: BITRE Statistical Report, 2019

Figure B13: Canberra light rail network



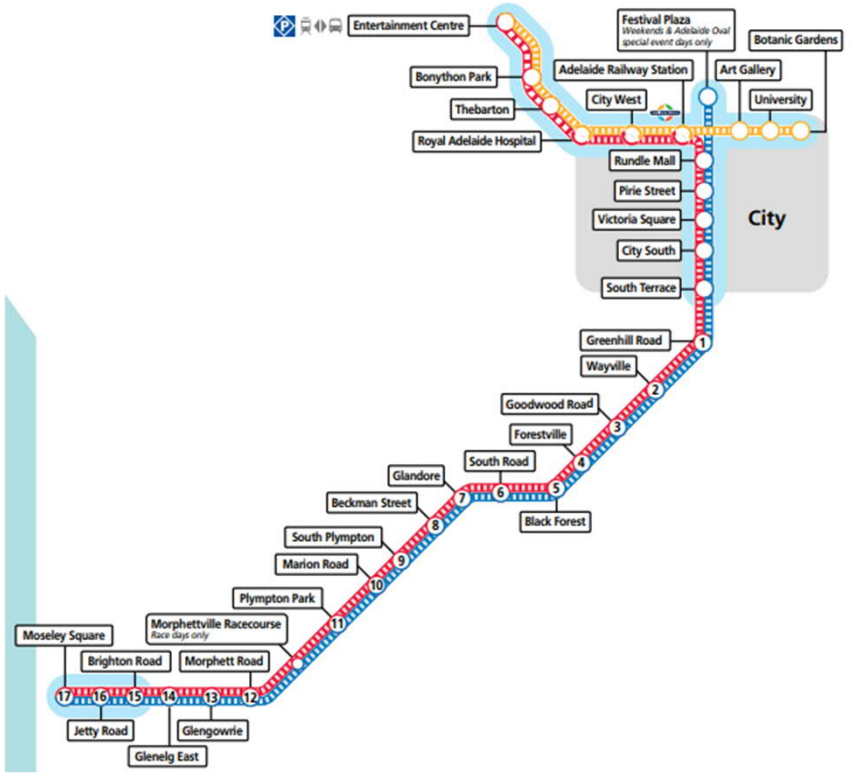
Source: Transport Canberra

SA Rail Network Maps

Figure B14: Adelaide urban heavy rail network

Source: BITRE Statistical Report, 2019

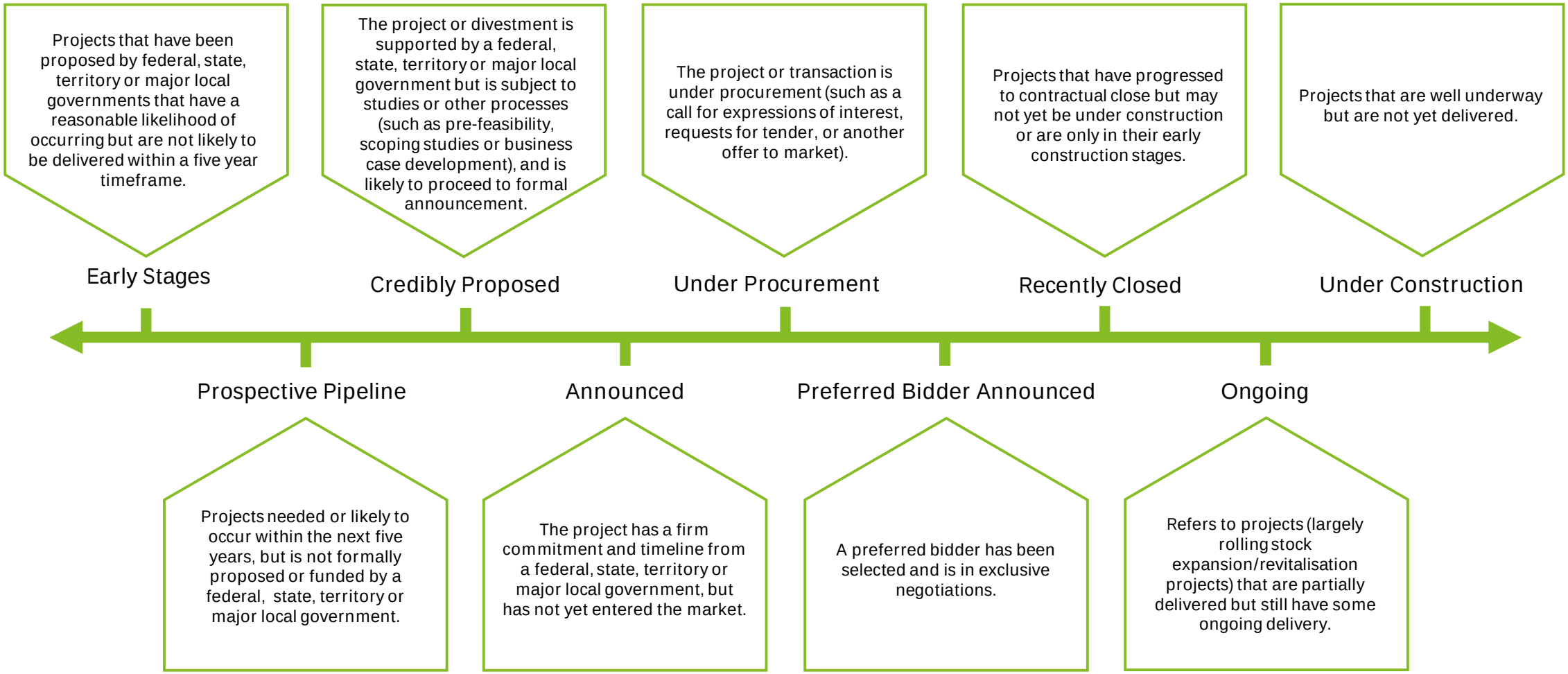
Figure B15: Adelaide light rail network



Source: Adelaide Metro

Appendix C – Major Projects

Infrastructure Pipeline Definitions



Adapted from the Australia and New Zealand Infrastructure Pipeline.

Suburban Rail Loop, VIC

The Suburban Rail Loop (SRL) has been announced as a key passenger rail project which will be undertaken in Melbourne, Victoria.

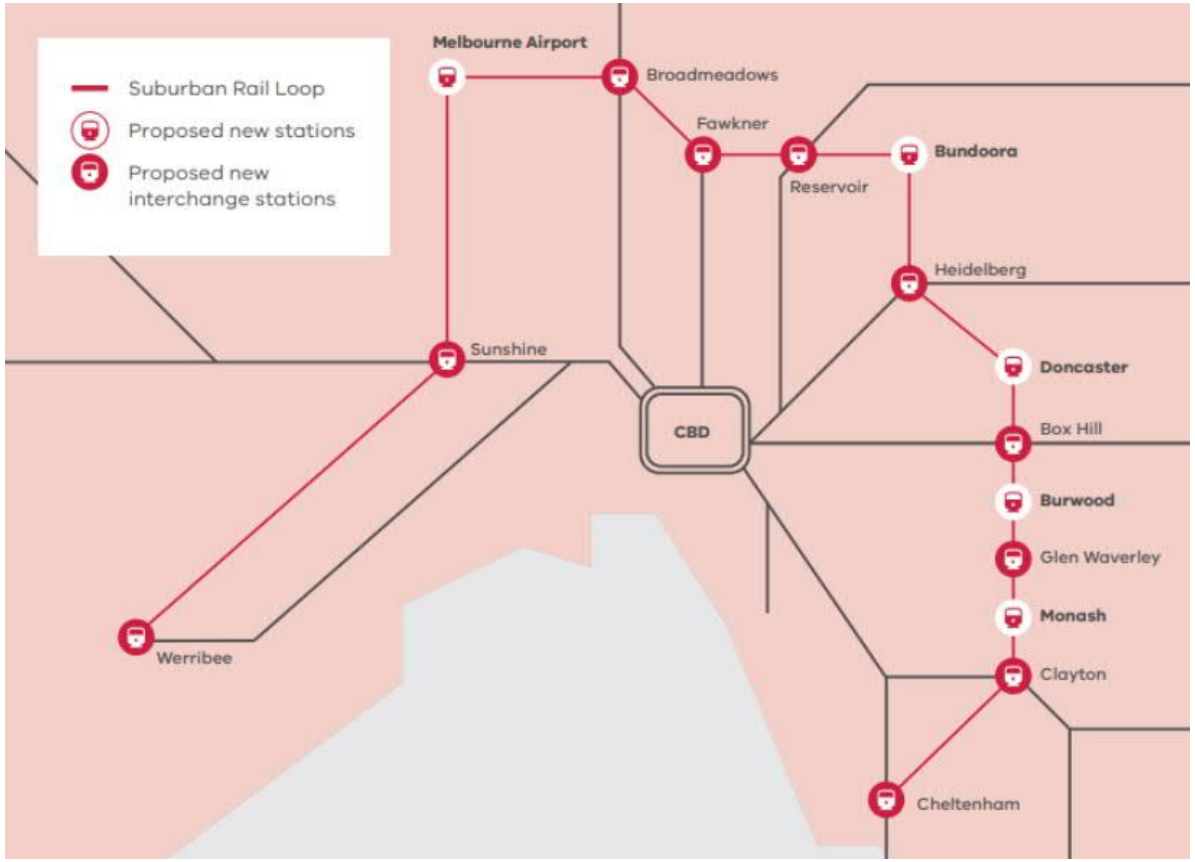
The SRL is a 90km passenger rail network which aims to connect every major Melbourne suburban rail line from the Frankston Line (West of Melbourne) to the Werribee Line (South East of Melbourne) via Melbourne Airport (Figure C1). This suburban loop will utilize existing infrastructure as well as build new rail infrastructure, including 12 new underground stations.[1] This project is expected to be completed in four stages over several decades. Relative to Melbourne CBD, the four stages include:[2]

- **Stage One:** South-East (Cheltenham to Box Hill)
- **Stage Two**: North-East (Box Hill to Melbourne Airport)
- **Stage Three:** North-West (Melbourne Airport to Sunshine – MARL project)
- **Stage Four:** South-West (Sunshine to Werribee)

The overarching aim of SRL is to increase rail accessibility and connectivity in urban areas of Melbourne. SRL aims to help elevate the growing pressure on Melbourne's public transport system by removing pressure form CBD stations through a 'ring road' type connectivity. Upon completion, SRL users will also be able to travel more efficiently as SRL train connectivity will allow people to bypass the CBD when transiting between urban areas. It has been estimated that SRL will be Melbourne's busiest train network by 2051, as it is estimated to service 400,000 passengers per day.[1] Furthermore, the SRL also aims to help transition Melbourne's current radial rail system to a polycentric system, which should help provide more jobs in strategic areas around Melbourne.[1]

The Suburban Rail Loop Authority has been established to oversee this project on behalf of the Victorian State Government. This project is expected to span over several decades where construction of Stage One is estimated to commence in 2022. It has been estimated that this project will create 20,000 jobs during construction.[1] The project is expected to be funded in stages where stage one and two are estimated to cost between $30 to $50 billion, stage three (as apart of the MARL project) is estimated to cost between $8 to $13 billion and as of December 2020, the estimated cost of stage four has not been publicly announced.[2] In November 2020, the Victorian State Government announced $2.2 billion in funding for Stage One of SRL.[3]

Figure C1: Suburban Rail Loop Map



Source: Victorian Government, (2020), *Victorian Budget 20/21*

1. Development Victoria, (2021), *Suburban Rail Loop – Strategic assessment*.
2. Australia and New Zealand Infrastructure Pipeline, (2021), *Suburban Rail Loop*.
3. Victoria's Big Build, (2020), *2020/21 Victoria Budget Announcement*.

Melbourne Airport Rail Link, VIC

The Melbourne Airport Rail Link (MARL) has been announced as a passenger rail initiative which aims to relieve transport congestion between Melbourne CBD and Melbourne (Tullamarine) Airport. MARL has been identified as a priority initiative on Infrastructure Australia's 2020 Infrastructure Priority List.

MARL has been proposed as a result of increasing vehicle congestion as well as increasing public transport demand in the corridor between Melbourne CBD and Melbourne Airport. The key drivers of current and future congestion are Melbourne's population and airport passenger growth. Road congestion in this area is a growing concern, as it has been estimated that Tullamarine Freeway has been operating close to or at full capacity since 2016, were peak hour commutes are expected to increase by eight to 10 minutes by 2031 *(IA)*. Presumably, as a result of increased road congestion, recent trends also show increased demand for passenger rail in Melbourne's North, West and South East.[1] This strengthening demand suggests that there is likely to be a strong trend where commuters switch from private vehicle usage to rail patronage as a primary means of transportation in this corridor. This trend further emphasizes the need for greater passenger rail capabilities in this corridor. In terms of air passenger growth, Pre-COVID19 projections estimate that Melbourne airport is expected to accommodate 67 million passengers annually by 2038, which is a substantive increase from 35 million passengers in 2016/17, hence further contributing to congestion in this corridor.[1]

MARL is a proposed rail transit service which will facilitate passenger travel from Melbourne CBD to Melbourne Airport in less than 30 minutes, where trains are expected to leave Melbourne Airport every 10 minutes.[2] The route is expected to pass through Sunshine in Melbourne's West, utilize Melbourne CBD's metro tunnel as well as become integrated with the new Suburban Rail Loop in Melbourne's CBD upon its completion (Figure C2).[2] Upon completion, MARL aims to meet the growing passenger travel demands in this corridor, which will ultimately help to improve the reliability and comfortability of commutes between Melbourne CBD and Melbourne Airport as well as increase productivity and liveability in Melbourne more generally.

MARL is a medium term project where construction is expected to commence in 2022 and is expected to be completed by 2029. This passenger rail initiative will be overseen by Rail Projects Victoria and it is estimated to cost between $8 to $13 billion. MARL is a joint Federal and Victorian State Government funded initiative, where both Governments have committed up to $5 billion each, as of November 2020.[2]

Figure C2: Proposed MARL route

Source: Infrastructure Australia, (2020), *2020 Infrastructure Priority List*

1. Victoria's Big Build, (2020), *Melbourne Airport Rail Link: Sunshine Route – Strategic Appraisal.*
2. Australia and New Zealand Infrastructure Pipeline, (2021), *Melbourne Airport Rail Link.*

Melbourne Metro Tunnel, VIC

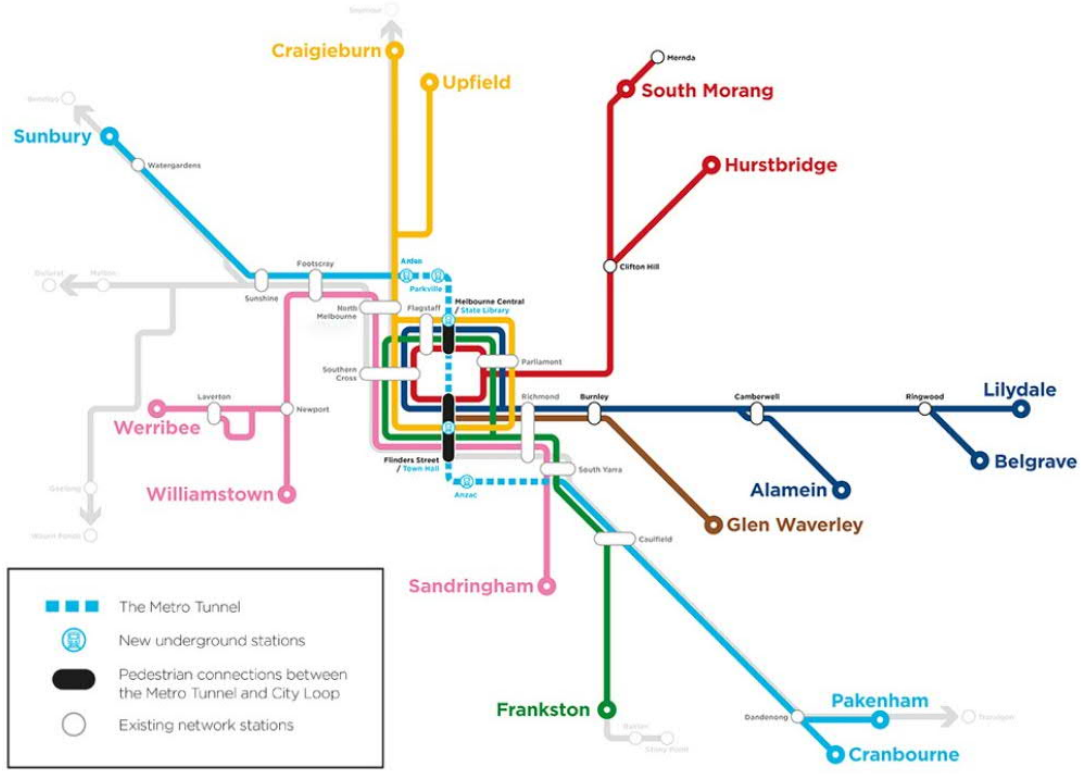
Melbourne's Metro Tunnel has been announced as a passenger rail project which will be undertaken in Melbourne's CBD.

Melbourne's Metro Tunnel aims to simplify Melbourne CBD's current rail system. This project will include the construction of two nine kilometre twin rail tunnels which will facilitate a rail line from Sunbury (West Melbourne) through Melbourne's CBD to Cranbourne and Packham (South East Melbourne) (refer Figure C3). This project will also include the construction of five new underground train stations which will be located along the new rail line at Arden, Parkville, State Library, Town Hall and ANZAC. The proposed Metro Tunnels are expected to have high signalling capacity to compliment and more efficiently utilize Melbourne's incoming fleet of high capacity metro trains. This project also aims to construct a train and tram interchange at Domain in Melbourne's CBD.

As a result of this project, rail services will run through the Metro Tunnel instead of the pre-existing city loop, meaning that the city loop will have more capacity to increase services on other lines. As a result of increased passenger capacity upon completion of Melbourne's Metro Tunnel , it is expected that Melbourne's passenger rail network will be able to facilitate 504,000 more passengers per peak period.[1]

This project is being overseen by Rail Projects Victoria, on behalf of the Victorian State Government. Various Australian and International companies are working collaboratively to construct the Metro Tunnel (VIC Big Build). Construction on the tunnel began in 2016 and it is due to be completed by 2025 at an estimated cost of $11 billion. Although, it has recently been reported that the project is already $150 million over budget *(ABC). C*urrently the Victorian Government State are funding the entirety of this project.

Figure C3: Melbourne's Metro Tunnel Map



Source: Big Build Victoria, (2020), *Melbourne Metro Tunnel*

1. Big Build Victoria, (2020), *Melbourne Metro Tunnel.*
2. ABC News, (2019), *Melbourne Metro Tunnel Project cost blowout sparks warning from auditor-general.*

Fast Rail to Geelong, VIC

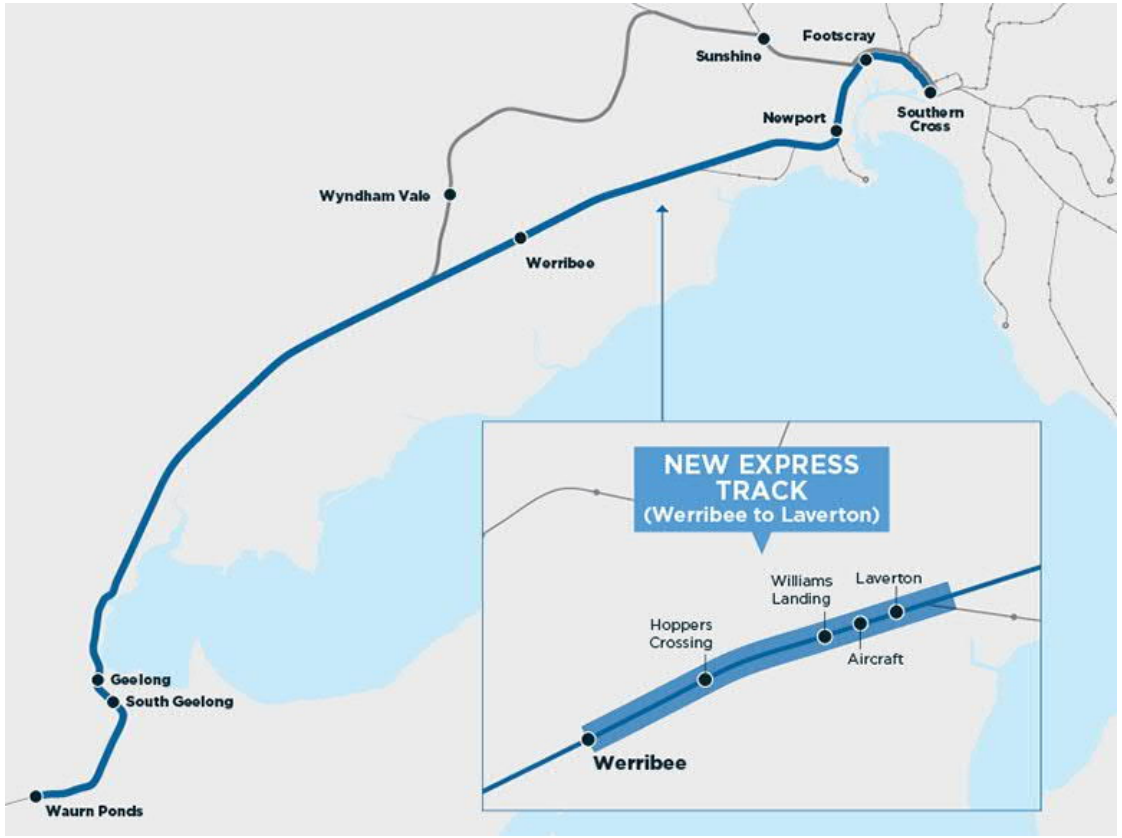
The Fast Rail to Geelong has been announced and it forms part of the Federal Government's *Faster Rail Program* as well as the Victorian State Government's *Western Rail Plan.*

As Victoria's fastest growing and largest regional city, Geelong is a strategically important regional area which fosters economic prosperity in Victoria. As a result, greater passenger rail connectivity and quicker passenger rail services between Geelong and Melbourne's CBD is a priority for the region. Over the past decade population growth and increased public transport demands have contributed to a 191% increase in patronage along the Geelong line.[1] Demand for the Geelong line is expected to increase in the future as Geelong's population is expected to grow by up to 50% by 2051.[1] As a result of Geelong's population and passenger rail growth, pressure has been mounting on Geelong's service lines. Fast Rail to Geelong aims to elevate growing line pressure, as well as develop a quicker route from Geelong to Melbourne's CBD.

Fast Rail to Geelong will include the construction of a new express track which will create a more direct route between Geelong and Melbourne's CBD. As shown in Figure C4, the new line will travel through Werribee and as a result this route will bypass Sunshine in Melbourne's West. This new route is expected to be 72.6km compared to the Sunshine route which is 80.7km. As a result of the shorter route, travel times are expected to reduce by up to 15 minutes to approximately 50 minutes per trip.[1] This project will be completed in stages with scope of works including the construction of a new express track, bridge upgrades, station upgrades at Werribee and Laverton as well as signalling and train control system upgrades. Currently only stage one has been announced. The first stage will focus on the corridor between Werribee and Newport and construction on this stage is due to commence in 2023.

The Fast Rail to Geelong project will be overseen by Rail Projects Victoria, on behalf of the Victorian State Government. The Federal and Victorian State Governments have agreed to jointly fund this project, with both Governments committing $2 billion each towards stage one.[2]

Figure C4: Geelong Fast Rail Route



Source: Rail Projects Victoria, (2020), *Geelong Fast Rail*

1. Rail Projects Victoria, (2020), *Geelong Fast Rail .*
2. Australia and New Zealand Infrastructure Pipeline, (2021), *Fast Rail to Geelong.*

High Capacity Metro Trains, VIC

The Victorian Government has ordered 65 'next generation' High Capacity Metro Trains in a public-private partnership with Evolution Rail*. With a total investment of $2.3 billion and the creation of approximately 1,100 local jobs,[1] this project involves designing and manufacturing 65 seven carriage trains, the construction of a new train depot in Pakenham East, the construction of a new service facility at Calder Park and signalling upgrades.

The contract with Evolution Rail was executed in late 2016 and train manufacturing began in 2018. The total project is expected to be completed by mid 2023.[2]

Once in operation, the high capacity metro trains will be primarily deployed on the Cranbourne Pakenham line. These new trains will also service the incoming Metro Tunnel and their services will proceed to Sunbury. As well as the service lines, the two facilities being built in Pakenham East and Calder Park will have the ability to cater for future rolling stock needs in this corridor.[2]

This new fleet of high capacity metro trains are expected to be smoother, quieter and more comfortable than existing passenger trains on Melbourne's rail network. Some features of the fleet include real-time information for passengers, cooling and heating systems as well as increased train accessibility. This new fleet will also allow for increased patronage capacity as they will be able to carry 20% more passengers per service.[3]

*Evolution Rail is a consortium which includes Downer, CRRC and Plenary.

High Capacity Metro Trains 2, VIC

As a result of a recommendation in Infrastructure Victoria's 30-year Strategy (2016), High Capacity Metro Trains 2 (HCMT2) is a prospective pipeline which involves the procurement of an unspecified amount of 10-car High Capacity Metro Trains. The prospective pipeline expects the HCMT2 to be introduced on the Sunbury to Dandenong rail corridor, which upon completion, will pass through the incoming Melbourne Metro Tunnel. It has also been proposed that the Airport Rail Link could potentially utilise the new high capacity trains. HCMT2 key aim is to expand patronage capacity on Melbourne's busiest rail lines. The estimated cost and project funding arrangements have not been announced as of December 2020.[4]

Next Generation Trams, VIC

The Victorian Government has announced that it will purchase 100 Next Generation Trams in the coming years. With over 200 million patron trips per year, the Victorian Government aims to deliver more modern, accessible and energy-efficient tram services to its network in coming years.

In their 2020/21 State budget, the Victorian Government announced that they will commit $1.48 billion[5] towards manufacturing 100 Next Generation Trams as well as construct a tram maintenance facility in North West Melbourne. Key features of the trams include lower floors therefore making these trams more accessible to patrons, modern heating and cooling systems as well as on-board energy storage facilities which will reduce energy consumption.[6] The project will support Victoria's rolling stock manufacturing industry as trams will be manufactured locally which will support up to 1,900 local jobs.[6]

The Next Generation trams will help to retire older high-floor trams and roll out is expected to begin in 2025. This project is still in an announcement stage and a tram manufacturing is due to be chosen through a procurement process in 2021.[6]

1. Victoria's Big Build, (2021), *High Capacity metro Trains*.
2. Victorian Department of Treasury and Finance, (2021), *High Capacity Metro Trains project*.
3. Victorian Department of Transport, (2021), *High Capacity Metro Trains project*.
4. Australia and New Zealand Infrastructure Pipeline, (2021), *High Capacity Metro Trains 2*.
5. Australia and New Zealand Infrastructure Pipeline, (2021), *Next Generation Trams*.
6. Victorian Department of Transport, (2021), *New train and tram orders*.

Sydney Metro, NSW

The Sydney Metro is the first fully automated driverless metro rail system in Australia. The project is a response to Sydney's population and employment growth challenges and aims to ease congestion and improve liveability in Sydney.

The project aims to deliver 31 metro stations and more than 66 kilometres of new metro rail. The network will be under the banner of Transport for NSW with services privately operated by Metro Trains Sydney (MTS), which is a joint venture between Hong Kong's MTR Corporation and Australia's John Holland Group and UGL Rail. These three companies also jointly operate Melbourne's metropolitan heavy rail network. The rolling stock for the project has been contracted to Alstom for their Metropolis trains which are manufactured in Sri City, India.

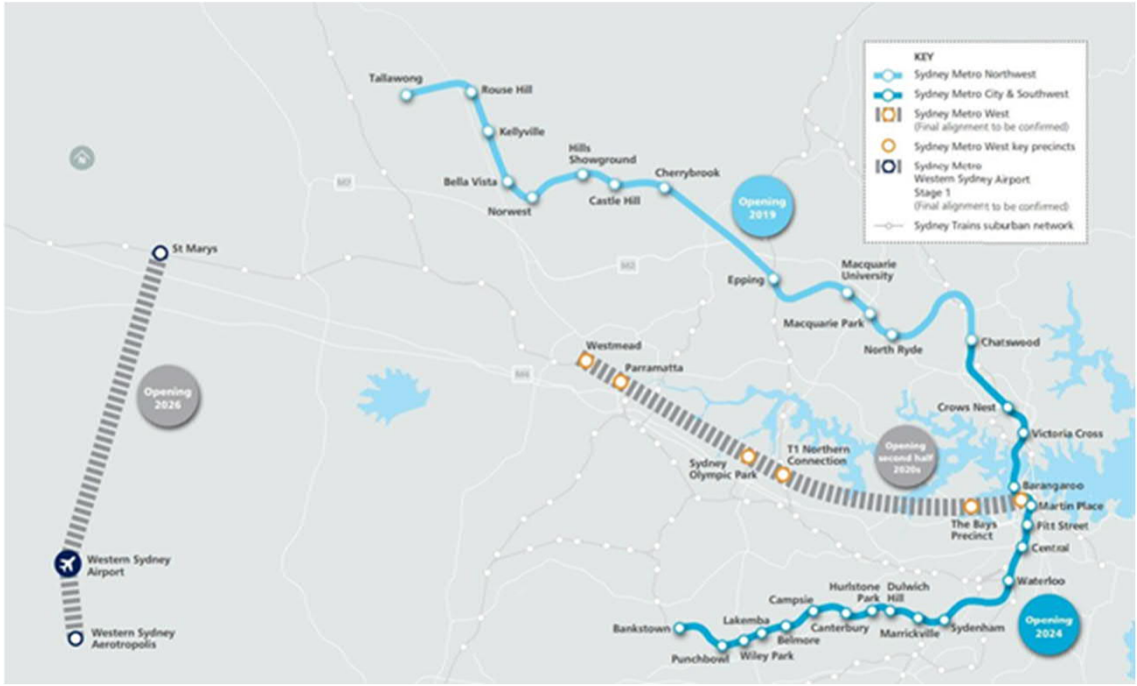
The Sydney Metro consists of two core components. The first stage is the Sydney Metro Northwest line, formally known as the North West Rail Link which has been operational since May 2019.

The second stage is the Sydney Metro City & Southwest which extends the end of the Northwest through to the central business district (CBD) and south west to Bankstown. The line is due to open and be operational in the second half of 2024 and beyond (refer Figure C5).

There are also plans to further extend the Sydney Metro through the Sydney Metro West and the Sydney Metro – Western Sydney Airport projects. The former is set to link Sydney CBD and Greater Parramatta, with Paramatta being a major commercial hub in the Western Sydney region. The latter is set to link the new Western Sydney International (Nancy-Bird Walton) Airport with the surrounding Western Sydney region. Both projects are in their early planning stages with early site investigations being undertaken. However, both the Federal and NSW State Government have indicated their intention for the first stage of the Sydney Metro Western Sydney Airport project to be completed in time for the opening of the airport in 2026.

The Sydney Metro authority has been tasked with the projects, on behalf of the NSW State Government. The Sydney Metro Northwest component was delivered under budget at $8.3 billion. The Sydney Metro City & Southwest part of the program of works was budgeted at $12.5, although it has been reported that the project will be over budget at an estimated cost of $15.5 billion. In the 2020-2021 NSW Budget, the government committed $10.4 billion to the Sydney Metro West over the next four years. The Sydney Metro Western Sydney Airport line was allocated $9.2 billion over four years although the full line is estimated to cost between $15-$20 billion. [1,2]

Figure C5: Sydney Metro map



Source: NSW Department of Transport

1. Australia and new Zealand Infrastructure Pipeline, (2021), Sydney Metro.
2. NSW Government, (2021), Sydney Metro.

More Trains, More Services Program, NSW

Phase one of the More Trains, More Services program saw more than $1.5 billion invested in new rolling stock for Sydney's urban heavy rail network. The program aims to add new trains to the suburban network and extra services between Parramatta and Sydney CBD[1]. The NSW Government procured 24 new eight car Waratah Series 2 trains from Downer EDI Limited (Downer) as part of their suburban rail strategy. In February 2019, an additional 17 Waratah Series 2 trains were added in February 2019 for $900 million including maintenance[2]. This rolling stock procurement project has allowed for the phased retirement of the older S-sets fleet.[1]

Stage 2 of the More Trains, More Services program is set to improve the capacity of the T1, T4 and T8 Lines and Central Sydney through new services and the use of digital systems technology. The project also seeks to trial and enable works for future stages of the More Trains, More Services program. Stage 2 of the program has a capital cost of approximately $2.2 million and is set to be complete at the end of 2021.[3]

XPT Fleet Replacement, NSW

The NSW government is replacing the ageing fleet of XPT, XPLORER and Endeavour trains on its regional network. In February 2019, The NSW Government awarded the contract to deliver the Regional Rail Fleet project to Momentum Trains*. This rolling stock initiative will replace the ageing regional fleet which are up to 37 years old[4] with trains that will allow the network to operate more efficiently. The procurement contract has a budget of $2.8 billion which includes a capital cost of $1.26 billion for the new fleet, a new maintenance facility in Dubbo, some minor network enabling works and project costs and maintenance service for the first 15 years. The new maintenance facility in Dubbo, NSW aims to boost regional employment and skills. The regional fleet will also be the first train fleet in Australia to have bi-mode technology.[4]

* Momentum Trains is an international consortium comprising CAF, UGL Rail Services, Pacific Partnerships, CAF Investment Projects and DIF Infrastructure V Coöperatief

New Intercity Fleet, NSW

The procurement of the New Intercity Fleet is set to replace the aged V-Set trains currently transporting customers between Sydney and the Central Coast, Newcastle, the Blue Mountains and the South Coast[5]. The $2.3 billion contract was awarded RailConnect NSW to design and build the 55-train fleet with 554 new carriages.[6] The first trains were delivered in 2019 with the rest of the fleet being delivered progressively through to 2022. The contract also includes the maintenance and asset management of the fleet with a maintenance facility being built at Kangy Angy on the NSW Central Coast to stimulate the local region.[5]

* RailConnect NSW is an unincorporated joint venture between Hyundai Rotem Company, UGL Limited and Mitsubishi Electric Australia

1. Transport for NSW, (2020), *More Trains, More Services Program*.
2. Downer Group, (2018), *First Sydney Growth Train enters service*.
3. Infrastructure Australia, (2020), *Infrastructure Priority List 2020*.
4. Transport for NSW, (2020), *Regional Rail*
5. Transport for NSW, (2020), *New Intercity Fleet*.
6. ABC News, (2016), *NSW inter-city train fleet to be built overseas*.

Cross River Rail, QLD[1]

The Cross River Rail (CRR) project is set to transform Brisbane's public transport system into an integrated world-class system. The CRR will help increase the capacity of Brisbane's public transport system as well as support the strategic importance of SEQ as Queensland's primary commercial, industrial and services hub. As a result of its economic and strategic importance, CRR is one of the Queensland Government's highest priority infrastructure projects.

SEQ is a growing region where the population is anticipated to grow from 3.5 million to 2.9 million by 2036. It is further expected that 45% of SEQ jobs will be concentrated inside the Brisbane metropolitan area. Pressure is mounting on Brisbane's public transport system as a result of current and future population and concentrated job growth. CRR aims to elevate pressure on Brisbane's public transport system as well as reduce congestion in the city's current public transport bottleneck.

CRR was proposed in 2010, with a subsequent business case being produced in 2011. The business case was updated in 2016 to reflect updated market conditions, costs and regulatory changes. In 2012, Infrastructure Australia recognised the CRR as a critical project. Construction on the CRR began in 2017 and it is due to be completed by 2023, with network testing and commissioning likely to extend into 2024. Upon completion, the CRR aims to deliver a 'turn up and go' transport system, similar to other major cities.

The CRR line will span 10.2km from Dutton Park to Bowen Hills via the CBD (refer Figure C6). Part of the CRR will run under the Brisbane River and CBD via 5.9km twin tunnels. Brisbane currently has only one river crossing, meaning that the construction of a second river crossing will significantly help to elevate congestion in it's current bottleneck. Four new underground stations will be constructed as part of the CRR and these will be located at Boggo Road, Woolloongabba, Albert Street and Roma Street. This project will also upgrade infrastructure at existing above ground stations at Salisbury, Rocklea, Moorooka, Yeerongpilly, Yeronga, Fairfield, Dutton Park and Exhibition.

The CRR is estimated to cost $5.4 billion and the QLD Government has committed to fund the entire project.[2]

Figure C6: Cross River Rail Route

Source: Infrastructure Australia, (2020), *Infrastructure Priority List 2020*

Gold Coast Light Rail (Stages 3 & 4), QLD[3,4]

The Gold Coast light rail is Queensland's first ever light rail system. The project will be undertaken in stages according to forecasted population growth.

Construction of stage three is due to commence in 2021 and it is expected to be completed by 2024. Stage three will expand the southernly part of the network via the construction of a 6.7km dual-track light rail, which will run through eight stations from Broadbeach South to Burleigh Heads (refer Figure C7). Stage three will also include the expansion of the existing depot and stabling facilities, construction of a light rail-bus connection at Burleigh Heads and Miami, five additional trams as well as supporting pedestrian and traffic upgrades. Upon completion of stage three, a trip from Broadbeach to South Burleigh Heads will take 16-17 minutes and the light rail network will total 27kms. A total of $709 million will be invested in stage three and the project is expected to be jointly funded by the Australian Federal Government, the Queensland State Government and the City of the Gold Coast. It has been estimated that the Federal Government will invest $269 million, the Queensland Government $348.5 million and the local government $91.5 million.

Stage four of the Gold Coast Light Rail network has been creditably proposed. This stage plans to extend the network by 13km, from Burleigh Heads (upon completion of stage three) to the Gold Coast Airport (Coolangatta). Currently only $5 million in joint Federal and State funding has been announced for the business case of stage four. Upon completion of stage four, the Gold Coast Light Rail will span 40km.

Figure C7: Gold Coast Light Rail Stage 3

Source: GoldlinQ, (2021), *Stage 3 Overview*

1. Building Queensland, (2017), *Cross River Rail Business Case*.
2. Queensland Treasury, (2020), *Queensland Budget 2020-21: Budget highlights*.
3. Queensland Department of Transport and Main Roads, (2021), *Gold Coast Light Rail Stage 3*.
4. Australia and New Zealand Infrastructure Pipeline, (2021), *Gold Coast Light Rail Stage 4.*

ACT Light Rail

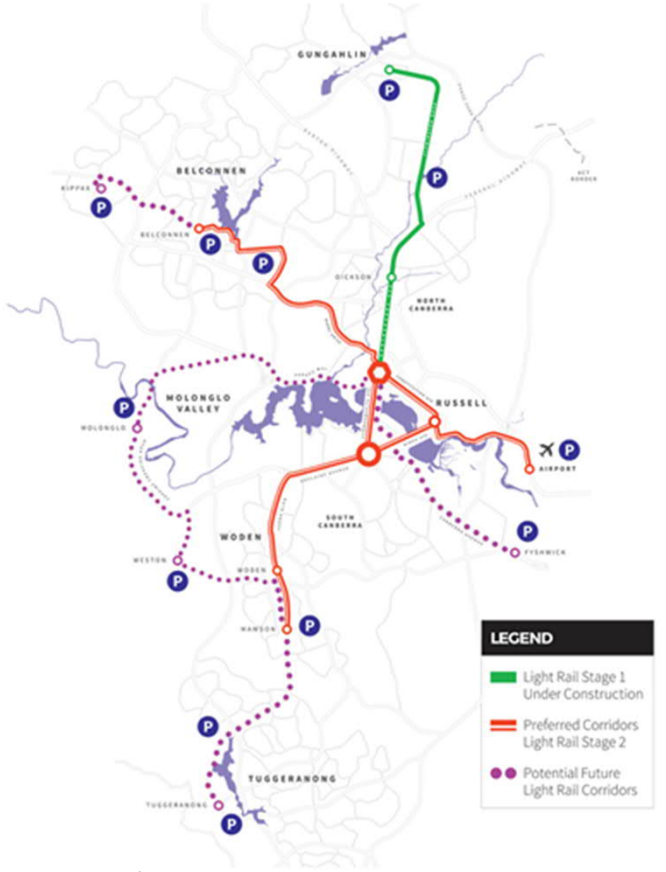
The ACT Light Rail project aims to grow the ACT's public transport system and improve liveability. Following the commencement of Stage 1 of the ACT Light Rail in January 2019, the project is currently in its second stage. Stage 2 plans to extend the Stage 1 line which currently runs from Canberra CBD to the northern suburbs. This 1.7km extension is split into two components – 2A and 2B. 2A is set to link the City to Commonwealth Park and 2B is set to run from Commonwealth Park to Woden (refer Figure C8). Work on 2A has started with operations due to commence in 2024. The project plans on delivering a stage of light rail every decade with potential future corridors being identified by way of Stage 3 and Stage 4.[1]

Stage 1 was built and is operated by Canberra Metro* with the supply and maintenance of the light rail vehicles being contracted to CAF[2]. Contracts for the future stages are also likely to be awarded to Canberra Metro.

The ACT Government anticipates Stage 2 to cost between $1.3 to $1.6 billion.[1]

* Canberra Metro are a consortium consisting of Pacific Partnerships, CPB Contractors, John Holland, UGL, Mitsubishi Corporation, Aberdeen Infrastructure Investments, DB Engineering & Consulting (formerly Deutsche Bahn International), CAF and Mitsubishi UFJ Financial Group Ltd (MUFG).

Figure C8: ACT Light Rail Map



Source: WA today

1. Australia and New Zealand Infrastructure Pipeline, (2021), *ACT Light Rail Stage 3A*.
2. CAF, (2016), *CAF awarded the supply of Canberra Trams, in Australia*.

Metronet, WA

Metronet is a multi-government agency which aims to significantly expand Perth's public transport network. The Federal Government has announced its intentions for Federal planning approvals for any Metronet projects to be fast-tracked with the goal of reducing approval times by up 50% from an average of 3.5 years down to 21 months.

Metronet oversees several projects (refer Figure C9), including:

- Rolling stock procurement ($1.3 billion)
- Morley to Ellenbrook line ($1.352 billion)
- Thornlie to Cockburn Link and Yanchep Rail Extension ($1.25 billion)
- Byford Extension ($491 million)
- Level crossing removals – Armadale line ($415 million)
- High Capacity Signalling ($1.232 billion)

The rolling stock for Metronet has been proposed to comprise of at least 50% local manufacturing and the Federal Government has announced its intentions for Federal planning approvals to be fast-tracked with the goal of reducing approval times by up 50% from an average of 3.5 years down to 21 months.[1]

The WA Railcar Program aims to deliver 102 new rolling stock for Metronet projects and 144 to replace ageing A-series trains. 6 new diesel railcars will also replace the existing Australind service between Perth and Bunbury. This 246 new-generation C-series and 6 diesel railcar contract was awarded to Alstom and is the largest rolling stock order in WA's history.[2] The other respondents originally shortlisted for the contract included Momentum West which is a CAF UGL joint venture) and Downer (EDI Rail) which is a Bombardier joint venture.

The Morely-Ellenbrook line is a new 21-kilometre rail line in Perth's north-eastern suburbs which Infrastructure Australia has identified as a "Priority Project". The main works contracts was awarded in Oct 2020 with construction expected to commence in 2023.

The 17.5km Thornlie to Cockburn Link and Yanchep Rail Extension is the first east-west cross line connection. The project is expected to be completed mid 2023.

The Byford Rail Extension extends the existing Armadale line south to Byford. The main construction contract is expected to be awarded mid-2021, with construction due to commence before year end 2021.[1]

The level crossing removal projects consists of the removal of several of the 31 level rail road crossing on the Transperth network. There are currently seven level crossing which have been nominated on the Armadale line. The contract for this project was awarded to Downer EDI in May 2020.[2]

The High Capacity Signalling project will upgrade the existing signalling and control systems to an integrated high-capacity signalling system to an integrated high-capacity signalling system. Construction is expected to commence in 2021 and reach completion in 2030.[1]

Figure C9: Metronet Projects Map

Source: Government of Western Australia, (2021), *Metronet*

1. Australia and New Zealand Infrastructure Pipeline, (2021), *Metronet*.
2. Government of Western Australia, (2021), *Metronet.*

Appendix D – Supplier opportunity

Supplier opportunity analysis

Indicative annualised supplier opportunity was determined through analysis of rail infrastructure and rolling stock projects in the investment pipelines for each state / territory.

For projects that are infrastructure focused but have the potential to increase patronage or service frequency or generally increase the rolling stock need of the existing network a proportion of the projects capital spend is assumed to result in rolling stock opportunities. On average, it is assumed 5% of these projects total capital spend results in opportunities for rolling stock manufacturing and design. Ultimately this provides an indicative estimate of other potential opportunities for suppliers that have not been announced yet.

The structure of the capital flows are assumed to be straight line over the identified timeline.

Table D1: Assumptions supporting the indicative supplier opportunity analysis

Project	Total size of supplier opportunity	Assumed timing of opportunity
Confirmed rolling stock opportunities		
Next Generation Trams	$1.5 billion	2022-2026
High Capacity Metro Trains 2	$2.3 billion	2025-2029
Rollingstock expansion program (REP) and broader rail manufacturing pipeline as committed	$1 billion ($600 million for REP)	2021-2030
Potential additional rolling stock opportunity		
Gippsland and Bendigo Package	$0.04 billion	2023-2025
Suburban Rail Loop	$2.5 billion	2030-2032
Shepparton Line Upgrade	$0.02 billion	2023-2025
Melbourne Airport Rail Link	$0.5 billion	2029-2031
Fast Rail to Geelong	$0.2 billion	2027-2029
Hurtsbridge Line Upgrade Stage 2	$0.03 billion	2023-2025
Waurn ponds duplication project	$0.05 billion	2026-2028

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