

Transport Strategy refresh

Background paper

Public Transport Network

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This report has been prepared by Dr John Stone (University of Melbourne) and Dr Ian Woodcock (RMIT) as independent advice for the City of Melbourne.

The aim of the report is to encourage public conversation and to inform the City of Melbourne's forthcoming Transport Strategy refresh.

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1. INTRODUCTION

This paper is one of a series of discussion papers commissioned by the City of Melbourne to stimulate public debate and to inform the City of Melbourne's *Transport Strategy Refresh*. It provides data and analysis on the current performance and prospects for improvement of Melbourne's public transport networks as these affect the City of Melbourne.

In its 2012 Transport Strategy, the City of Melbourne set clear objectives to improve access from wider metropolitan Melbourne and the regions by public transport, cycling and walking. These ambitions included:

- Creation of a 'go anywhere, anytime' public transport network for inner Melbourne.
- Support for public transport, walking and cycling as the dominant modes of transport in inner Melbourne.

In supporting the work of the City of Melbourne to re-affirm these objectives and to determine appropriate actions for 2018 and beyond, this discussion paper will examine current issues with Melbourne's metropolitan public transport network and indicate where we believe the City of Melbourne, through its advocacy and through work within its own jurisdiction, might most effectively work towards practical solutions.

The Victorian Government is largely responsible for planning and funding the public transport system, which is operated by private companies under franchises and other contractual arrangements. However, Central Melbourne is at the hub of the public transport networks which are crucial to the continuing strength of the economic and social life of metropolitan Melbourne. This means that the City of Melbourne has a key role in advocating for and supporting public transport across the urban region. The City of Melbourne is also responsible for the local pedestrian network that provides access to public transport, and, through its representation of residents and businesses, has a unique understanding of the transport needs of central Melbourne.

The City of Melbourne welcomes responses to the issues raised in this paper and participation in its strategy development processes.

To get involved go to www.participate.melbourne.vic.gov.au/transportstrategy .

2. CURRENT PERFORMANCE

2.1. Mode share

Melbourne's train, tram and bus services play an important role in maintaining the economic and social fabric of the metropolitan region. This is especially true for the City of Melbourne where nearly 70% of the central city's nearly 200,000 workers arrive by public transport (see **Table 1**).

Figure 1 shows that there is a significant drop-off (from 70% to 47%) in the mode share for public transport for the growing number of work-trips to destinations outside the Hoddle Grid. The encouraging aspect of this data is the growth in public transport mode share for all workers in the Melbourne Local Government Area (LGA), with the rate of growth higher for destinations beyond the central city.

Mode Share (Journey to Work) in Melbourne LGA						
	Melbourne LGA		Hoddle Grid		Remainder of Melbourne LGA¹	
	2011	2016	2011	2016	2011	2016
Employed persons	320,247	389,283	167,779	199,223	128,333	161,278
Employed persons (%)	-	-	52.4	51.2	40.1	41.4
MODE SHARES (%)						
Public transport total	51.2	56.4	64.9	69.2	39.3	46.9
Train	39.5	44.1	50.5	54.0	30.2	37.1
Ferry/tram	9.5	10.1	11.7	12.3	7.4	8.1
Bus	2.2	2.2	2.7	2.8	1.7	1.7
Car total	38.0	32.8	24.2	20.5	49.3	41.3
Car driver	34.3	30.0	20.7	17.9	45.5	38.4
Car passenger	3.7	2.8	3.6	2.6	3.8	2.9
Bicycle	3.6	3.7	3.3	3.2	4.2	4.4
Walked only	5.5	5.6	5.7	5.7	5.4	5.8
Other modes	1.7	1.5	1.6	1.5	1.7	1.6

Table 1: Percentage mode splits for the journey to work in 2011 and 2016 (ABS Census 2016)

Footnote 1: Outside of the Hoddle Grid

There are multiple reasons for the significant differences in public transport mode share for destinations in the Hoddle Grid (the City's historical commercial district) compared with travel to destinations in the remainder of the City of Melbourne. These include the relative convenience of car travel (including greater access to parking and lower congestion), and the need for most commuters to transfer between services at some point in their journey. These issues need to be addressed to ensure that congestion does not worsen and to support increased commercial and residential development in locations identified in City of Melbourne land-use plans. Solutions include increased density of the on-road public transport network, faster tram and bus speeds relative to cars, and more convenient conditions for transfers between services.

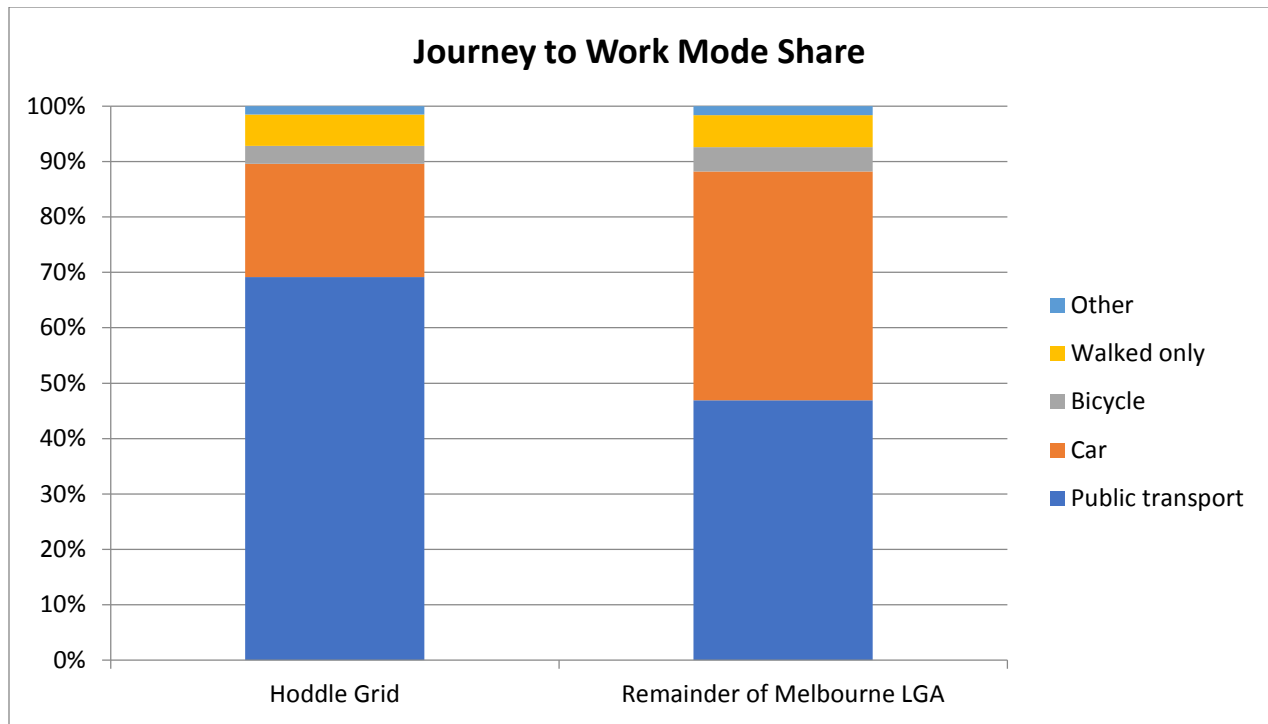


Figure 1: Journey to work mode share comparison for the Hoddle Grid and remainder of Melbourne LGA (2016 Census)

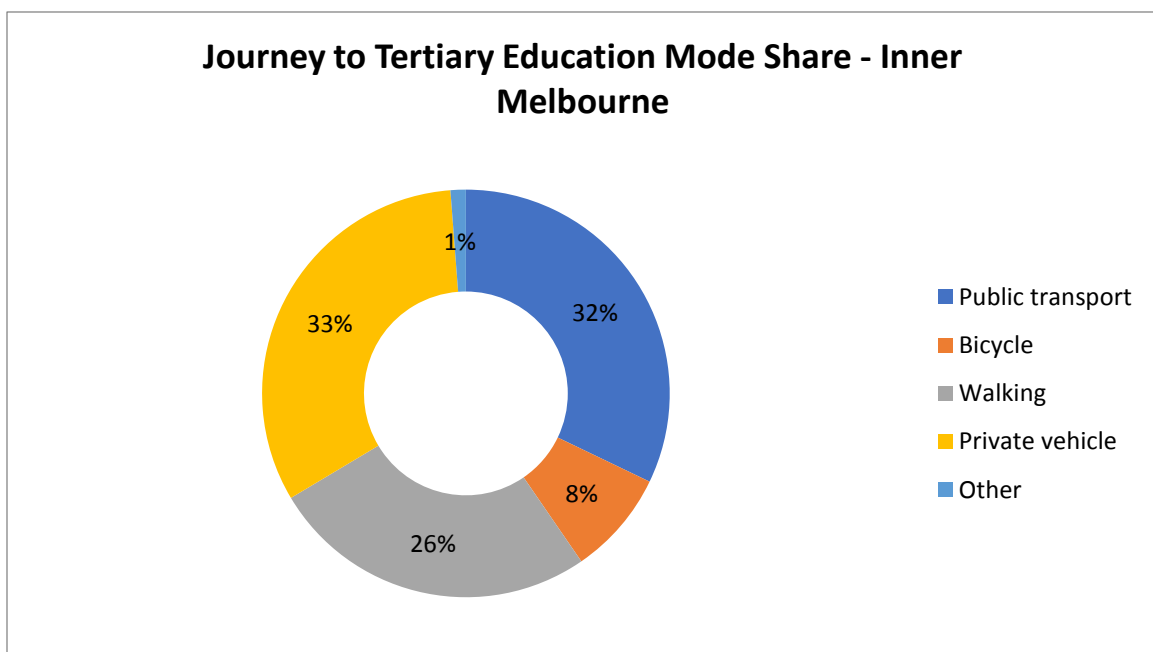


Figure 2: Mode share for travel university students in Inner Melbourne ([VISTA 2013](#))

ABS data also shows that jobs in metropolitan Melbourne remain concentrated in the Melbourne LGA. Additional indicators of the importance of public transport for the City of Melbourne can be found in the Victorian Government household travel surveys ([VISTA](#)). Publicly available data from 2013 shows that students use public and active modes for over two-thirds of their weekday trips in Inner Melbourne (**Figure 2**). This data also shows that trips for work and education account for less than half of all

weekday travel in Inner Melbourne (**Figure 3**), and that private car travel is the dominant mode for these purposes. This shows that there is a large market in social and recreational trips that public transport could be accommodating.

More recent VISTA data held by the City of Melbourne confirms these patterns.

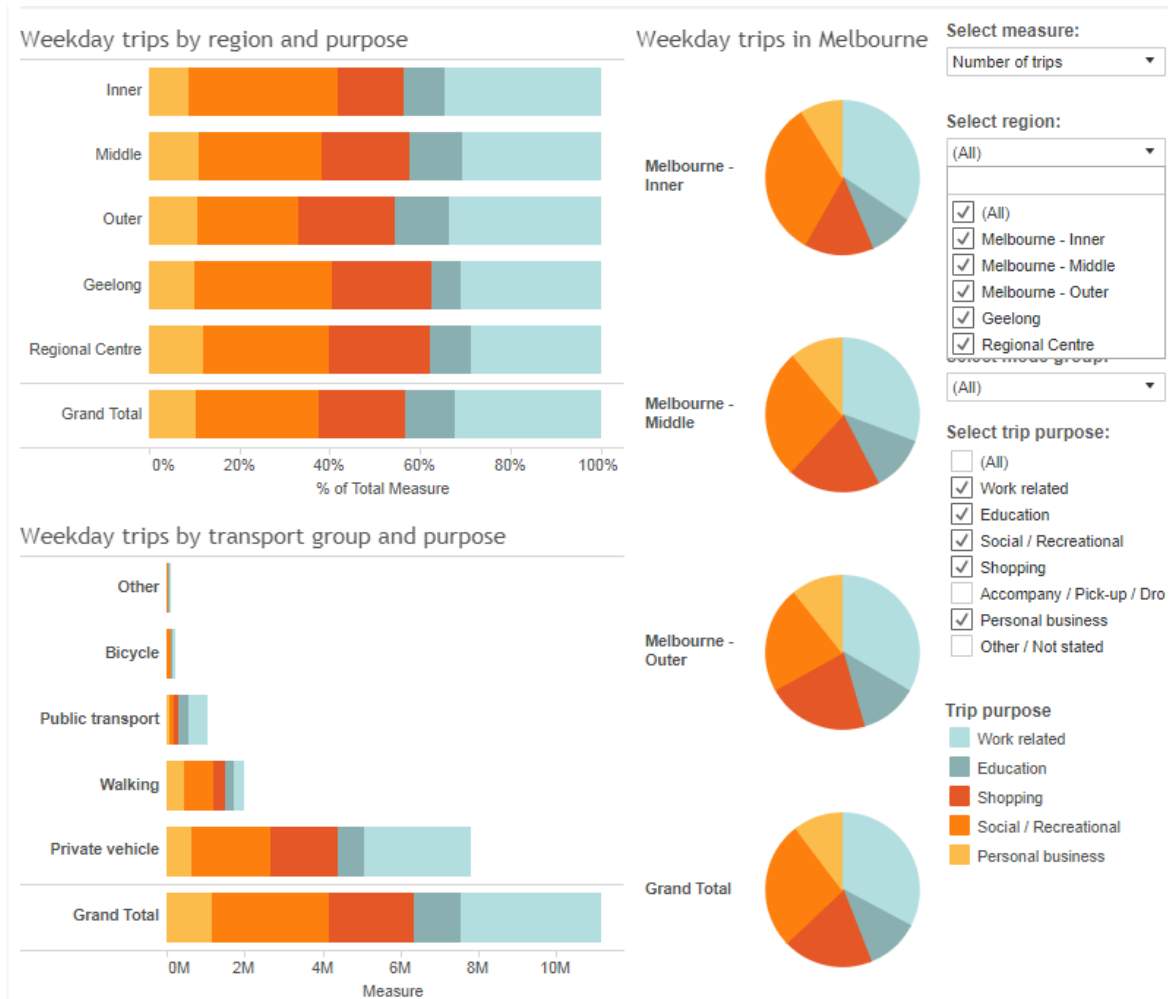


Figure 3: Trip purpose and mode by region in greater Melbourne ([VISTA 2013](#))

2.2. Overcrowding

Public Transport Victoria conducts annual [surveys of passenger loads](#). It reports these against benchmark standards of capacity for trams and trains.

Between 2016 and 2017, these surveys on trains showed a significant reduction in the number of load breaches. This was largely due to the removal of seats in many rail carriages to lift the benchmark load from 798 to 900 passengers; and to the introduction of new train services. Even so, many passengers in the north and west still travel on trains that exceed the new benchmarks, particularly in the PM peak. Benchmarks are exceeded in the PM peak by 12 percent on the Werribee Line, 33 percent on the South Morang Line and 36 percent on the Craigieburn Line).

The surveys of tram loadings show an increase in the number of periods during the day in which average loads are approaching capacity. This is due to an increase in population along tram routes which has not been matched by service improvements.

2.3. Reliability and speed

Data on punctuality measures (reported in the PTV publication '[Track Record](#)'), does show some recent improvement. However, a service is counted as 'on time' if it runs between one minute early and 5 minutes late and, with this relatively relaxed target, operators currently achieve monthly metropolitan punctuality averages of 61 percent for trams and 92 percent for trains. This is below the expectations of travellers who have a choice of car travel. The Zurich regional rail system operates with targets of 75 percent of arrivals within 2 minutes of schedule and 95 percent within 5 minutes.

Very slow speeds of tram and bus services in mixed traffic in the inner city at most times of the day are also significant deterrent to public transport use. Recent data on tram and bus speeds does not appear to be available. In 2006, the estimated average tram speed was 15.9 km/h (Currie 2006, *Do Melbourne trams have a future?*, 22nd ARRB Conference, Canberra). Buses are similarly affected by low speeds, although data is not publicly available. Anecdotal observations of congestion delays for buses in sections of key corridors such as Hoddle Street suggest that typical peak period travel speeds are hardly faster than walking pace.

These problems with reliability and speed have multiple causes from ageing infrastructure and inefficient work practices on the train system to a vicious cycle of low mode shares for tram and bus leading to large volumes of car traffic and therefore strong political resistance to improving on-road priority for public transport vehicles.

3. BETTER PUBLIC TRANSPORT FOR THE CITY OF MELBOURNE: KEY ISSUES IN BRIEF

Continued improvement in public transport is necessary to support increased economic and social activity in the City of Melbourne. To achieve this, important strategic issues need to be addressed.

The key issues are:

1. **Significant growth is expected in demand** for public transport for trips into and around the City of Melbourne.
2. To cater for this growth, **new public transport capacity is required beyond current Victorian Government commitments**. This capacity is needed in three areas:

- ***Radial trunk rail lines***

New lines beyond Melbourne Metro Rail (Stage 1): Melbourne Metro Rail (Stage 2 – Clifton Hill-Newport); Airport Rail Link; and various suburban rail extensions; and changes to operating patterns in the central city.

- ***A denser and better connected inner-city tram and bus network***

Improved public transport access to the inner-city beyond the Hoddle Grid is vital to support the City of Melbourne's land-use and development objectives.

- ***Suburban orbital lines***

Improved resilience of the existing radial public transport system centred on the City of Melbourne requires stronger orbital networks and intermodal connectivity.

Many options to deliver increased capacity have been canvassed by agencies including Public Transport Victoria and Infrastructure Victoria, and by professional bodies and community groups. Our purpose in describing some of these options in this paper is to encourage informed public debate on priorities for delivery of new public transport projects.

3. Demonstrating benefits, making choices: **why metropolitan transport planning matters**,

Decisions on funding, timing and scope for projects to deliver increased public transport capacity are primarily made by the Victorian Government. A robust and transparent planning process is needed to capitalise on the perspectives and expertise available through the City of Melbourne and from the wider public.

4. **Getting value for money from Victorian Government spending on public transport** and why this matters to the City of Melbourne.

The ability of public transport to provide an attractive alternative to individual car travel clearly depends on the quality of the service. Improving the returns on Victorian Government investment in the quality of service provided by private operators of train, tram and bus systems is an important advocacy issue for the City of Melbourne.

5. **Providing sufficient space** on streets and in stations **for growth in pedestrian movements** associated with increased public transport patronage in the City of Melbourne.

Each of these issues is explored in more detail below.

Note on new transport technologies: It is likely that new technologies and economies associated with autonomous vehicles will create challenges and opportunities for transport planning in coming years. Most international expert opinion suggests that mass public transport systems will remain vital in space-constrained locations such as inner Melbourne.

4. PUBLIC TRANSPORT ISSUES & OPTIONS

In this section, we provide descriptions and analysis of the key issues for improved public transport in Melbourne and outline options for future action. This is done to support public debate as part of the development of the City of Melbourne's Transport Strategy.

First, we demonstrate the mismatch between expected public transport demand in the City of Melbourne and current commitments to increased capacity, then we explore priorities for infrastructure and service improvements for public transport:

- Priorities for radial rail expansion.
- A denser inner-city bus and tram network.
- Suburban orbital public transport.

Following this, we examine current processes for planning and funding future infrastructure requirements. Finally, we consider the requirements for space to cater for growing numbers of pedestrians

4.1. Significant growth is expected in public transport demand

The City of Melbourne forecasts significant growth in activity between 2016 and 2036 (see **Figure 5**). Predictions for daily populations in 2036 include:

- 263,000 residents (up 93 percent on 2016)
- 125,000 students (up 60 percent on 2016)
- 549,000 workers (up 43 percent on 2016)
- 197,000 metropolitan and regional visitors (up 7 percent on 2016)
- 218,000 international and interstate visitors (up 148 percent on 2016)

(www.melbourne.vic.gov.au/SiteCollectionDocuments/daily-population-estimates-and-forecasts-report-2017.pdf)

Even allowing for the typical uncertainties surrounding demographic forecasting of this type, transport systems for travel into and around the City of Melbourne clearly face enormous challenges in coming decades. For the City of Melbourne to remain an attractive location for high-level commercial and social activity, improvements to public transport will be needed.

The Victorian Government's current metropolitan strategic plan (Plan Melbourne) includes policy objectives to encourage growth in employment in suburban Activity Centres and National Employment and Innovation Clusters (NEICs). However, without positive changes to the public transport system, these ambitions are unlikely to be realised.

Instead, suburban employment opportunities will continue to centre on 'population-based' sectors such as construction, education and health services. The economic power of the 'centre' will ensure continuing growth in metropolitan-level commercial and social activity in the central city and in the identified commercial and public-use zones in the City of Melbourne and in surrounding municipalities. This will be particularly true in locations where strong public transport links exist or are created, and is the motivation for our proposals for a strengthened inner-city network in section 4.3.2.

4.2. New public transport capacity is required beyond current Victorian Government commitments

In this section, we look at options and priorities for providing new public transport capacity for metropolitan Melbourne, with a focus on the needs of the City of Melbourne. Many of these options have been canvassed by agencies including Public Transport Victoria and Infrastructure Victoria. First, we demonstrate the gap between demand and currently committed rail expansion. Then, in turn, we consider priorities for new radial trunk rail lines, inner-city bus and tram networks, and suburban orbital lines.

4.3. Demand will exceed new capacity from Melbourne Metro Rail Stage 1

In this section, we compare committed public transport capacity increases against Victorian Government growth projections.

The modelling used to support the case for the current stage of Melbourne Metro Rail (MMR1) predicts large increases in demand for travel to the City of Melbourne. Specifically, the Victorian Government's transport model (VITM) forecasts a 90% increase in morning peak rail patronage into the central city from 2011 to 2031. This equates to an additional 116,000 train passengers each morning.

We have estimated the increase in daily passenger capacity that planners expect to achieve through the works currently in construction for MMR1 and new larger trains now on order. To do this, we have used data on planned increases in train numbers and seating capacity from the current version of the PTV's Rail Network Development Plan (see box below and) and the work plans outlined in the 'extended' MMR1 [business case](#).

The **PTV Rail Network Development Plan (NDP)** was released in 2012 (and updated in 2016) is an unusual document for Victoria: it publicly sets out the ambitions of public transport managers (PTV now TfV) for expansion of the system. It argues that the principal constraint in the current system is the capacity of the City Loop and the Flinders St-Southern Cross Viaduct and presents a plan for staged transformation of the Melbourne rail system into a 'metro-style' operation. This means separating the system into pairs of cross-town radial lines with no need for shared tracks in the central core. This improves efficiency because delays on one line will not cause problems for other services. The first stages of this transformation will be achieved through the current Melbourne Metro Rail project (MMR1), but the NDP argues that the full benefits will only be realised after construction of Melbourne Metro Rail 2 (MMR2) – a second metro tunnel from Clifton Hill to Fishermans Bend.

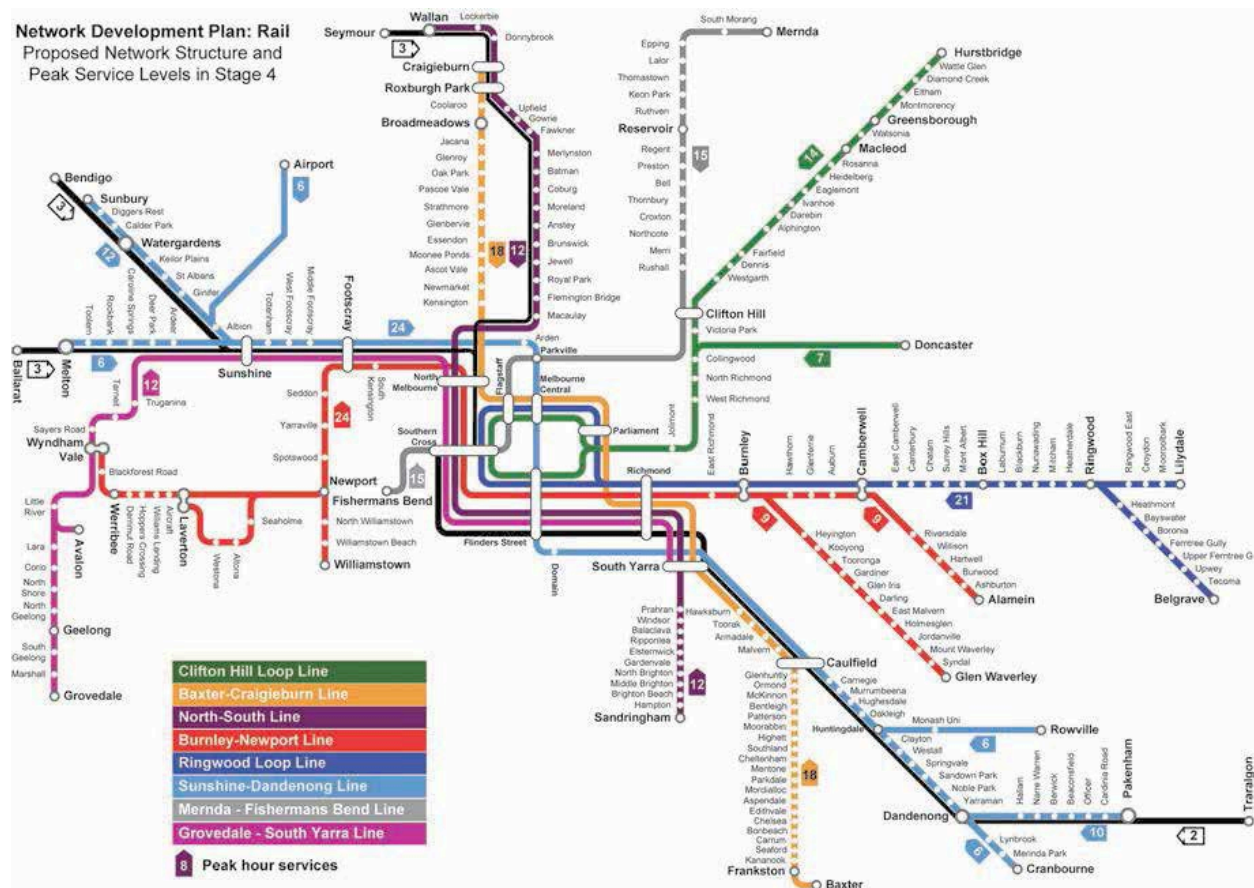


Figure 4: 2032 Metropolitan Rail Network (PTV Network Development Plan - Metropolitan Rail 2012)

The additional daily passenger capacity will meet only around two-thirds of the growth in demand to 2031 (see Figure 5).

The capacity to meet projected demand for rail travel to the central city will only be available following completion of the later stages of the Rail NDP. These works include MMR2 and associated improvements to signalling to achieve the physical and operational re-organisation of the City Loop to allow for full 'metro-style' operation of the suburban rail system.

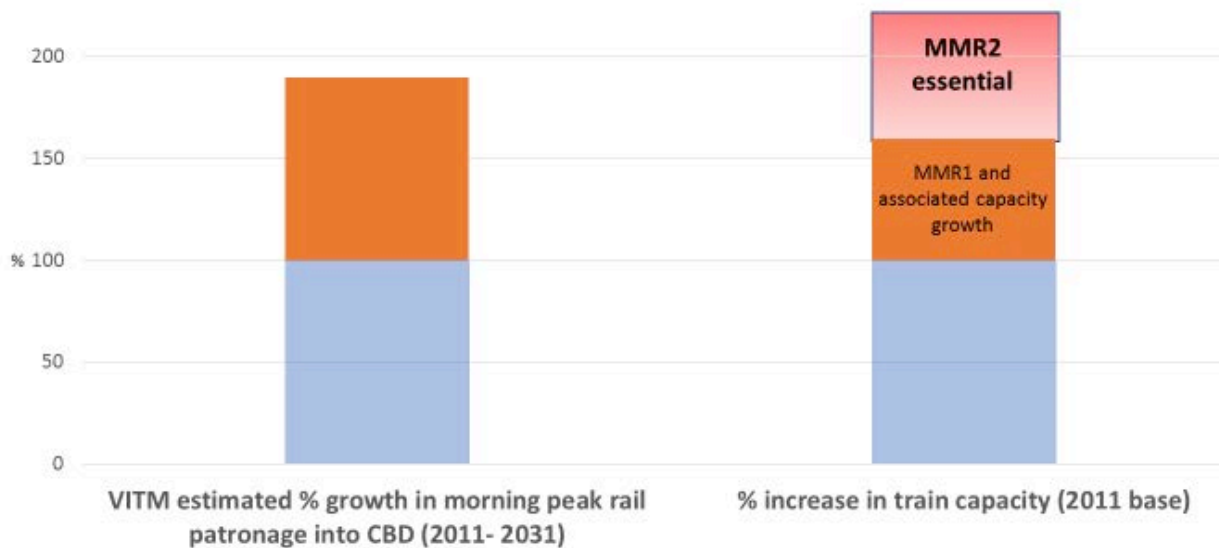


Figure 5: Current capacity improvements will not meet project growth in demand

4.3.1. Priorities for radial rail expansion

With future demand for rail travel to central Melbourne far outstripping the capacity to be delivered through currently committed projects, it is important that the City of Melbourne identify its priorities for new heavy rail projects and to advocate for these. This paper aims to assist the City of Melbourne in this task by summarising the key project options for radial rail expansion.

Infrastructure Victoria, in its [Draft Infrastructure Strategy](#), has identified many new rail projects that might be pursued. The Victorian Government has currently given no clear, public indication of its priorities.

In this section, we examine the options and benefits for the City of Melbourne of some of the key projects identified by IV, these include:

- **Melbourne Metro Rail (Stage 2).**
- **Airport Rail.**
- **High Speed Rail.**
- **Other suburban rail extensions**

We consider that Melbourne Metro 2 and Airport Rail are the two priorities for the City of Melbourne.

4.3.1.1. Melbourne Metro Rail 2

A version of Melbourne Metro Rail (Stage 2) (MMR2) is contained in the 2012 Network Development Plan (see Figure 4). This proposal involved routing the Mernda line in a new tunnel under the central city from Clifton Hill to Fishermans Bend. Infrastructure Victoria's Draft Infrastructure Strategy described the project with its logical extension: a connection between the Werribee and Mernda lines via a tunnel from Clifton Hill to Newport (see bottom map in Figure 6 and further quote from IV in the box below). We consider this to be the major public transport infrastructure priority for the City of Melbourne. It can and should be constructed to be operational before 2030.

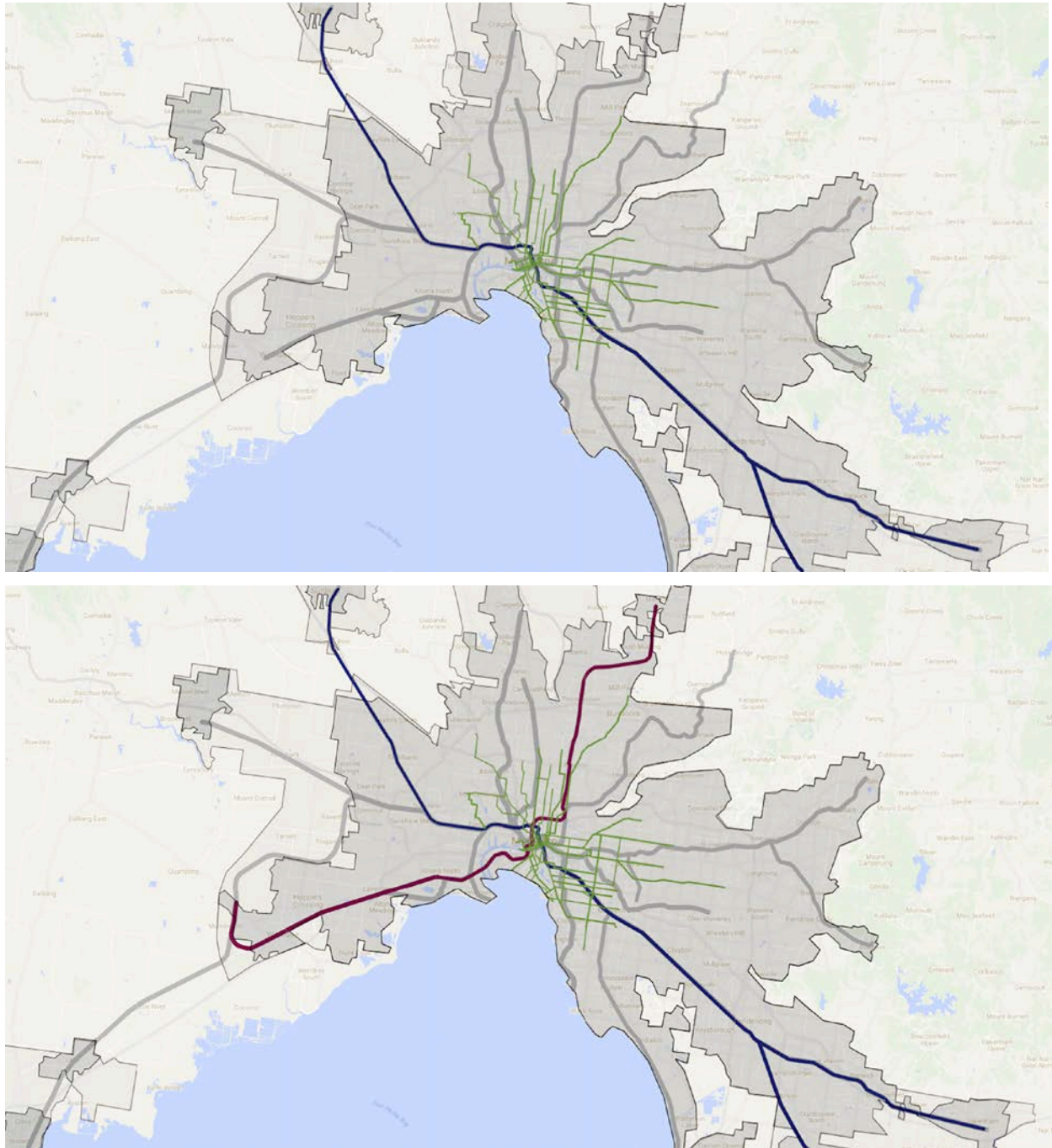


Figure 6: MELBOURNE METRO RAIL 1 and 2 alignments: TOP: MMR1 (Dark Blue, under construction) BOTTOM - Proposed MMR2 (Maroon) – Preferred alignment. With existing tram network (light green)

... the transport modelling found that in providing direct rail connections across the city, this project would enable passengers to more easily travel between destinations on the rail network and reducing travel times. It would improve access to the CBD for both public transport and car travel, the percentage of population within 45 minutes of the CBD increasing by between 2 and 3 per cent. It would also improve access to a number of NEICs, most notably East Werribee (6 percent increase) and Latrobe (3 percent increase), which are located at either end of Melbourne Metro Rail 2. It would provide significant congestion relief to the Werribee and South Morang Lines.

MMR2 assessment, Infrastructure Victoria 2016, Draft Options Book, p.490

The preferred alignment and station locations for MMR2 have not been determined in these plans.

The current [Draft Fishermans Bend Framework](#) contains two possible alignments between Southern Cross Station and Fishermans Bend (**Figure 7**).

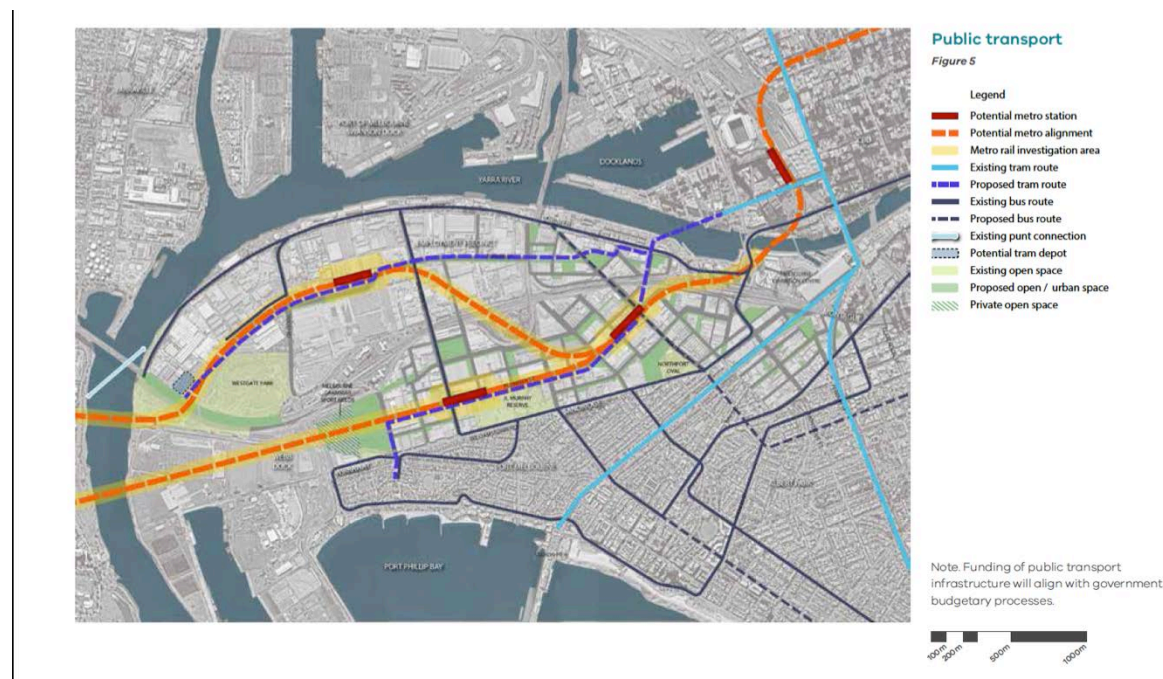


Figure 7: Fishermans Bend Draft Framework – Possible MM2 Stations

The northern route is preferable because it directly serves the NEIC precinct within Fishermans Bend.

This alignment would best drive the transition of Fishermans Bend's from an industrial zone to an extension of Melbourne's central city, with a less car-dependent built form. Early provision of metro services would encourage more active and sustainable travel behaviour than if the line were delivered after the area had been substantially re-developed. Without a rail line, Fishermans Bend would be developed with high levels of structured parking provision, making dwellings and offices more expensive and taller than necessary.

Between Clifton Hill and Newport, we recommend that additional stations are added to the MMR2 project. We propose locating stations in Fishermans Bend (serving the NEIC and Sandridge precinct as a minimum, and ideally also in the Convention Centre/Yarra's Edge precinct to allow better active transport access to a major attractor), Southern Cross, Flagstaff/Victoria Market, Parkville/Haymarket, and Fitzroy before connecting with existing lines at Clifton Hill (see **Figure 8**). The stations at Fitzroy and Clifton Hill will add much-needed network connectivity with surface public transport in the inner north, as well as

east-west accessibility. These proposed interchanges are opportunities to extend the local catchment of the rail network.

New metro stations can expand local accessibility sufficiently for them require to new names. For example, the new CBD South station will be called Town Hall, because it extends access to the rail system into the Town Hall precinct, as well as providing additional ways to enter Flinders Street Station.

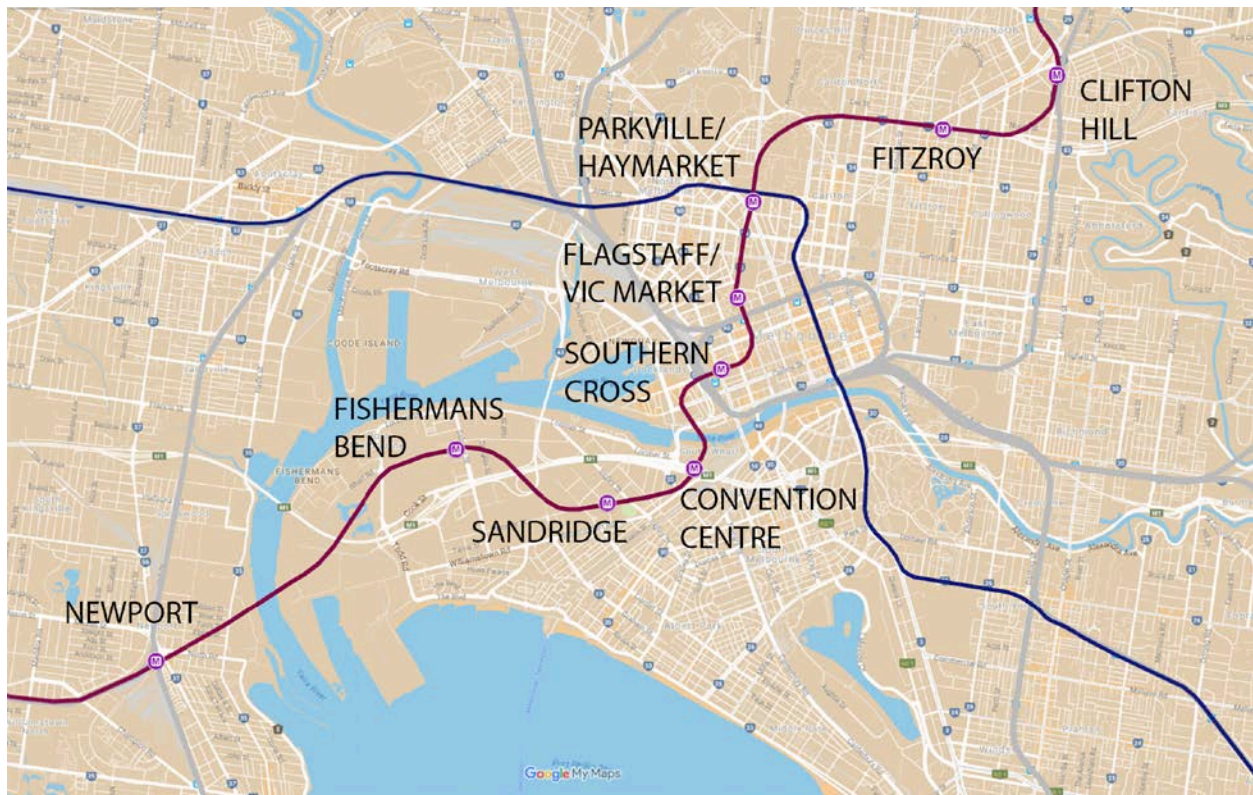


Figure 8: Melbourne Metro Rail 2 (MMR2) – proposed stations

In the same way that MMR1 improves accessibility to commercial zones in the City of Melbourne from the north-west and south-east of the metropolitan area, MMR2 would provide dramatically improved access from the south-west and north-east.

Improving public transport accessibility from the west is a priority for equity reasons. Population growth in Melbourne's west is the highest in Victoria. The region's demographics have shifted to now include a higher proportion of white-collar professionals whose employment and educational aspirations are currently best met in the central and inner city. Long-term land-use change to encourage knowledge economy employment and educational institutions to locate in the west is needed, but in the medium term, better public transport access to the City of Melbourne from the west is necessary.

We estimate that MMR2, with the use of longer trains and metro-style frequencies, would quadruple passenger capacity for the Werribee line corridor. Combined with much-needed frequency and on-road priority improvements for feeder bus services, this will enable modal shift in Point Cook and other parts of the west where rail access is currently poor and car dependence is high.

MMR2, if configured with a separate set of platforms at Newport and separate tracks connecting it to the Werribee line, will also free up capacity on other lines in the inner west, allowing higher service frequencies on the Altona and Williamstown Lines.

Another major benefit of MMR2 is the greatly improved east-west accessibility it provides in the inner north: connections between Parkville, Carlton, Fitzroy and Clifton Hill are very poor at present, and hard to improve due to limited road space.

Based on the timelines required for planning and approvals, tunnel construction and commissioning, and the timelines for completion of major stages of MMR1, we are advised by technical experts that, if the Victorian Government were to commit to MMR2 in 2018, the new line could be operational by 2028 or earlier. This is because MMR2 is not dependent on MMR1 being operational, and builds on work already done to design the MMR1 station at Parkville for the eventual arrival of MMR2.

MMR2 is a strategic alternative to major road projects, including the Westgate Tunnel and the North East Link, which are less sustainable and more expensive ways to cater for increased demand for travel to the central city, as well as from east to west. Notably, MMR2 also provides a new strategic high capacity crossing of the Yarra River from the west.

4.3.1.2. Melbourne Airport Rail

The original intention of Melbourne Metro Rail 1 was to provide capacity in the central core of the radial rail system to allow for a branch line to Melbourne (Tullamarine) Airport via Sunshine and the Albion freight corridor. Growth in demand for passenger services to Melton and Sunbury means that this capacity will not be available for Melbourne Airport trains when the tunnel opens.

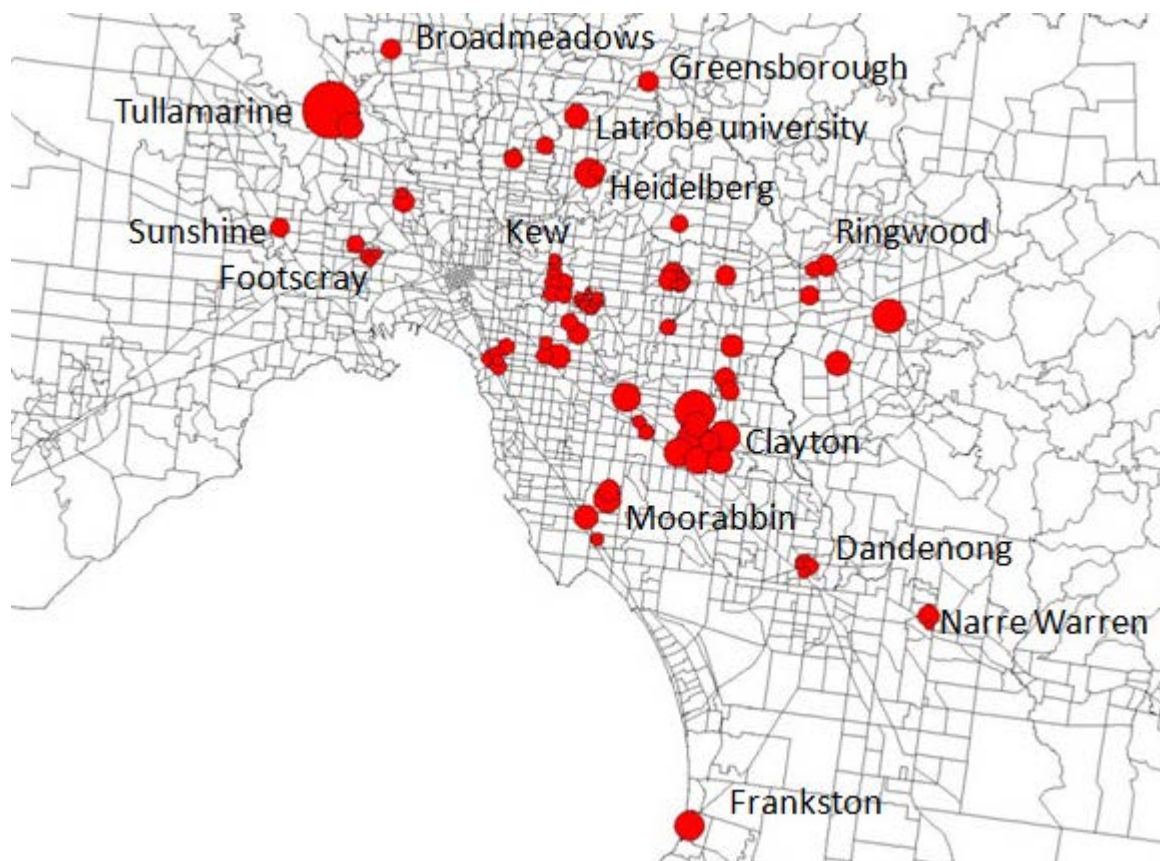


Figure 9: Concentrations of suburban jobs (i.e. excluding the inner and central city), showing the importance of the airport precinct. SOURCE: The Melbourne Urbanist c/- Crikey

The Victorian Government announced in November 2017 a new planning process to identify how capacity between Southern Cross and Sunshine can be increased to allow the Albion route to be used for an Airport Link as part of a high-speed regional network. This is expected to involve new tunnels.

There are other options for a viable public transport service to the airport, but in order to discuss these, we need to be clear about the markets that a Melbourne Airport rail line needs to serve.

International experience shows that airport rail works best if it is designed to serve a number of markets, such as airport employees and people wishing to travel along the corridor, rather than simply carrying businesspeople and tourists to and from the central city.

While air travellers will make up most of the transport demand, Melbourne Airport is a significant employment centre, on a par with many of the higher order activity centres in the west or anywhere in suburban Melbourne already served by heavy rail (**Figure 9**). A rail link to Melbourne Airport will need to service a range of users and employment clusters to be viable. It will need to be planned and delivered as a key node in a multi-modal public transport network.

The State Government has indicated that it favours the express service from Southern Cross, forming part of an eventual higher-speed regional network. There are several options for the route for this service, but the Sunshine route (shown in purple in **Figure 10**) appears to be preferred by state agencies because of the very rapid journey time to the airport from Southern Cross, the availability of railway land north of Sunshine, and the potential to remove regional trains from the suburban network. However, its chief disadvantages are poor connections to the suburban network (which means it will not be attractive to any traveller who cannot easily get to Southern Cross or Sunshine), and the high costs of tunnelling required between Southern Cross and Sunshine.

Other options for new services exist and should be explored and compared with the Sunshine route on cost and quality of service.

These include:

- An express monorail from Southern Cross to the airport (especially if it includes intermediate stations at Bell Street, Essendon Airport and the Western Ring Road to connect with high-quality bus routes – shown in yellow, Figure 10).
- A metro through many of the larger urban renewal and employment precincts in the north-west sector between the CBD and the airport (such as E-Gate, Arden-Macaulay, Showgrounds, VU Footscray, Highpoint, Maribyrnong Defence Site, Niddrie, Essendon Fields, Airport West and Tullamarine) (two possibilities shown in Green and Red Figure 10, preferred option in **Figure 11**).

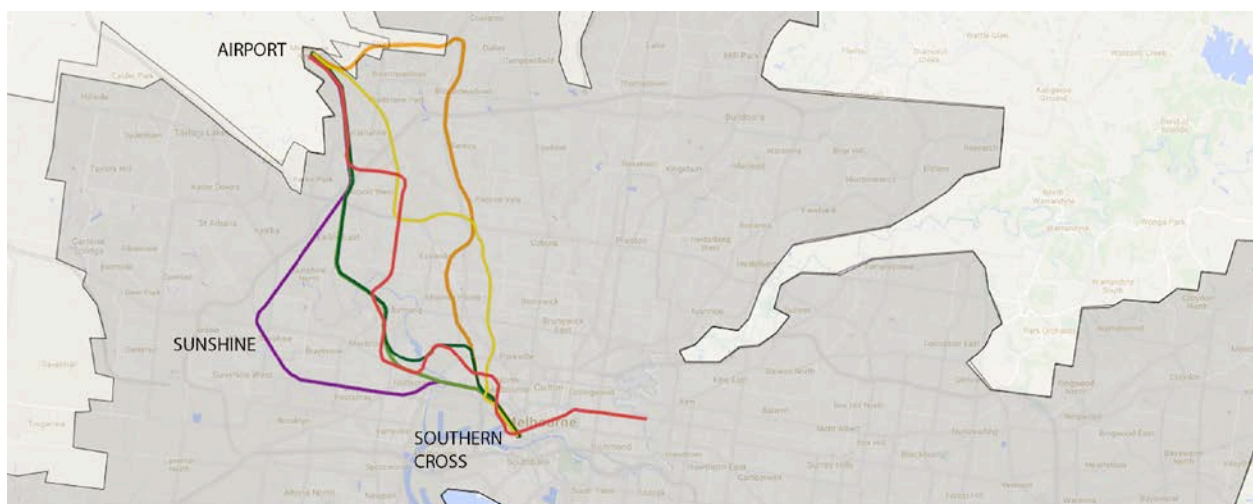


Figure 10: Comparison of possible Melbourne airport rail alignments. L-R: Purple High-Speed Regional rail; Green – metro line from Showgrounds branch; Red – North West Metro (MM3?); Yellow – Monorail along Tullamarine Fwy; Orange – branch from Craigieburn Line

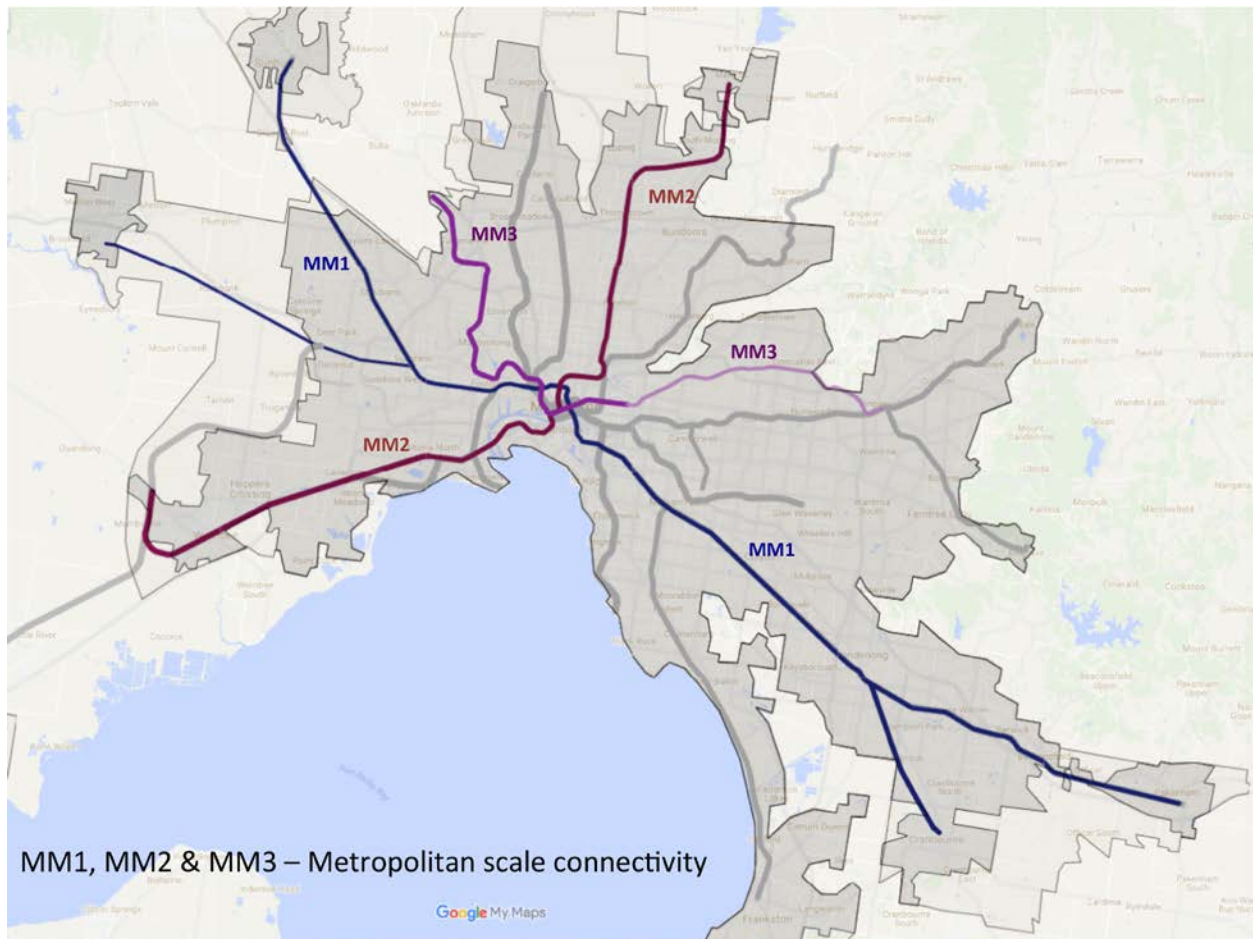


Figure 11: Melbourne Metro 3? – a northwest metro (purple) connecting the airport to the CBD via several of Melbourne’s key urban renewal areas could provide a 25-minute airport trip from Southern Cross (the Light Purple line illustrates a logical extension of this metro to Ringwood via Doncaster).

Figure 11 shows a possible preferred route for a ‘metro style’ service to the airport – a Melbourne Metro 3’ that would extend the market for rail access to the airport by connecting current and growing activity centres and major urban renewal areas in the north-west region between the central city and the airport. Crucially, it would include an interchange with Arden (soon to be renamed North Melbourne) Station on Melbourne Metro Rail 1, and potentially North Melbourne Station (soon to become West Melbourne).

The proposal for ‘MM3’ has been investigated as a high-frequency driverless new generation medium capacity rail service. These have been successfully operating for many years in Europe and more recently Asia. Smaller sized vehicles require lower impact infrastructure and tunnels and stations are therefore less expensive to construct than for standard or the next high capacity Melbourne passenger trains. The benefits of extending the ‘MM3’ to Ringwood via Doncaster and Kew are:

- fills a major gap in the radial passenger rail system in the eastern suburbs
- provides better walk-up access, network connectivity and land use integration benefits than the proposed Doncaster Rail route via the Eastern Fwy (which would be reliant on improving feeder routes to transfer points in the freeway)
- creates network effects of benefit to the outer east by connecting to the interchange at Ringwood with two other heavy rail lines (Lilydale, Belgrave) and the proposed orbital Metro Light Rail from Ringwood to Dandenong via Knox and Rowville (see section 4.3.3 on orbital suburban routes)
- extends the catchment of the MM3 airport metro line to the eastern suburbs

However, the debate about airport rail should not be reduced to a question of a single route for a railway. There are many other access options that should also be examined and where possible, implemented.

Options to improve airport access by suburban public transport include (See Figure 12):

- extending the 59 tram by 7km from Airport West to the airport
- adding new bus routes and increasing the frequencies of the PTV bus services already serving the airport.
- building a station at Campbellfield on the Upfield Railway line and adding a bus along Camp Road to the airport.
- providing a light rail or frequent bus service between the airport and Greensborough via La Trobe University, with connections to rail lines serving the north and north east.
- Providing light rail or frequent bus services between the airport and various destinations in the west (eg. Caroline Springs, Sydenham/Watergardens, St Albans, Deer Park, Laverton, Point Cook). Deer Park is a priority as it is a major interchange for suburban and regional rail lines.

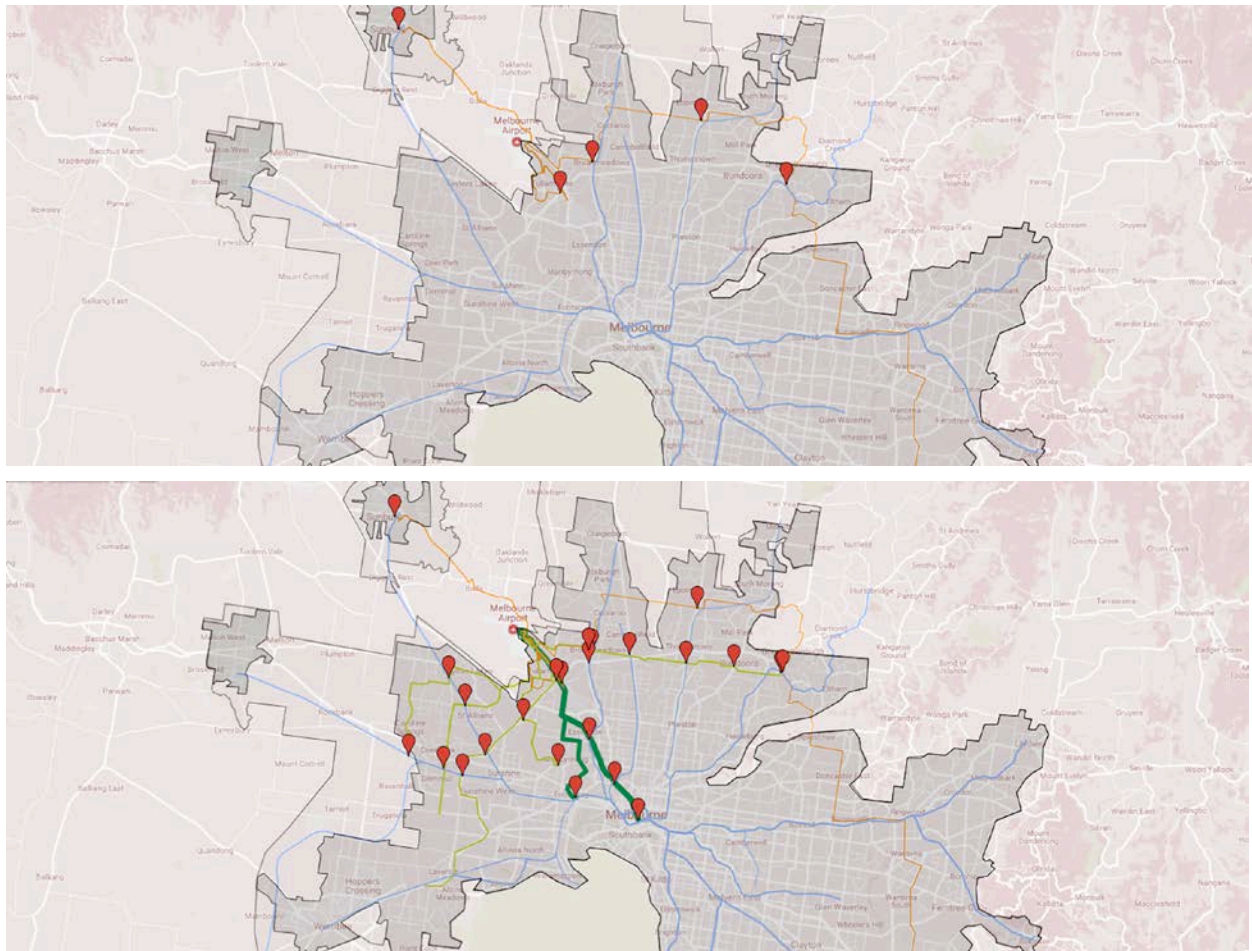


Figure 12: Options to improve public transport access to Melbourne Airport: TOP – Current airport access by suburban public transport (Orange = PTV Bus); BOTTOM – possible extended and additional public transport to improve access to the airport (Orange = PTV Bus; Dark Green = Tram extension/upgrades; Light Green = New Smart Bus routes; interchanges with rail or tram marked with red balloons).

Demand for access to the airport by passengers and workers is already large and is predicted to grow to levels comparable to current arrivals at Heathrow Airport in London. Comparison with Heathrow is enlightening. Commuter rail access was first provided in 1977 by an extension of the 'Tube', with an express line added in 1998. In 1986, Heathrow was serving 31.7M passengers - the same number of

Melbourne is projected to serve in 2020. By 2028, Melbourne will have similar landside access needs (55.2M) as Heathrow had in 2017 (57.7m). Heathrow currently has 3 rail services, 13 public bus lines and 27 coach services. 40% of passengers access Heathrow via public transport (27% rail, 13% bus / coach). 35% of Airport staff access Heathrow by public transport, and this is rising. Melbourne Airport has various private buses and shuttles and 4 public buses and regional coach services, which together have a mode share of about 14%, the remainder being via private cars and taxis (Booz 2014: 15). All access is via road-based modes, and the capacity constraints of the Tullamarine Freeway have become all too clear.

Trips to the airport have origins across metropolitan Melbourne. If public transport is to properly serve these markets, the airport will need to be firmly linked into the suburban public transport network through multiple modes and good connections between them. Moreover, if the airport is to remain viable, alternative means of providing reliable access for increasing numbers of employees and passengers requires quantum leap in public transport provision

In short, the City of Melbourne should advocate for detailed analysis of all routes that receive a positive assessment from Infrastructure Victoria and any route with an evidence-based strategic rationale.

4.3.1.3. High-speed rail (HSR)

The City of Melbourne, in its 2012 Transport Strategy, expressed general support for the concept of the East Coast HSR.

The important issue for current advocacy work by the City of Melbourne is the consideration of alignments for HSR inside the boundaries of greater Melbourne.

In this regard, we support the directions of the Rail Futures Institute (RFI 2016) [InterCity](#) paper, released at the end of 2016. This document proposes a long-term upgrade of Victoria's regional rail network to become a series of high-speed lines to connect Melbourne with Victoria's larger regional cities. The key node for this proposed network in Melbourne north-west is Melbourne Airport, which, as described above, would be linked to the central city by an express rail link. This alignment could also be used by interstate HSR along the east coast.

4.3.1.4. Other suburban rail expansion

There has been long debate about the need to expand Melbourne's radial rail system to keep pace with outer suburban expansion in the growth corridors and to fill in coverage gaps in the east (Doncaster) and south-east (Monash NEIC/Rowville). There are many other proposals in the PTV Network Development Plan from 2012 (see Figure 4), extending the Upfield Line to Wallan being especially urgent.

These are necessary components of a system that can relieve the problems of suburban car-dependence and should be pursued at all costs as an alternative to suburban freeways.

There is little detail available publicly from which to assess the specific value of proposals such as the Doncaster BRT that is suggested as an adjunct to the North East Link. However, any attempt to seriously compete with car travel in this corridor must offer much faster travel times than the current bus services. This means that there must be an alternative to leaving passengers stuck in congested traffic west of Hoddle Street. Ongoing improvements to Doncaster and other suburban buses that offer a demonstrable improvement to public transport's competitiveness with the car can be used to prove patronage demand for heavy or light rail along these corridors in future, but only if reservations are not lost to road-widening in the short term.

4.3.2. A denser and better connected inner-city tram and bus network

Continued improvement in public transport mode shares for key locations outside the Hoddle Grid where land-use intensification is planned is necessary to avoid congestion and minimise the space requirements of the transport system. This will require increased capacity (largely achieved through improved vehicle speeds and on-road priority) for tram and bus movements into and around the City of Melbourne.

The Victorian Government has no public plans for improvements to inner-city bus and tram networks, although we understand that work of this nature has been undertaken by Transport for Victoria and Public Transport Victoria.

A key aim for City of Melbourne advocacy should be to encourage the public release of these plans as means to engage with interest groups and the wider public, and to support the Victorian Government and private operators in establishing a staged program of works.

The comparison of the benefits in accessibility and system resilience for specific scenarios for new services is beyond the scope of this paper, but Section 4.4 proposes the use of the SNAMUTS model in a public process to explore the relative merits of different proposals.

In this context, it is useful to refer to the aspects of the experience of network development in two exemplar cities, Vienna and Zurich.

Greater Vienna, with its population of 2.6 million, is one of the world's most 'transit-connected' cities (see comparison with Melbourne in Figures **Figure 13** and **Figure 14**).

Use of motorised modes has fallen continuously since the early 1990s, and residents of cheaper housing in suburban locations have cost-effective access to jobs, education and other benefits of city life.

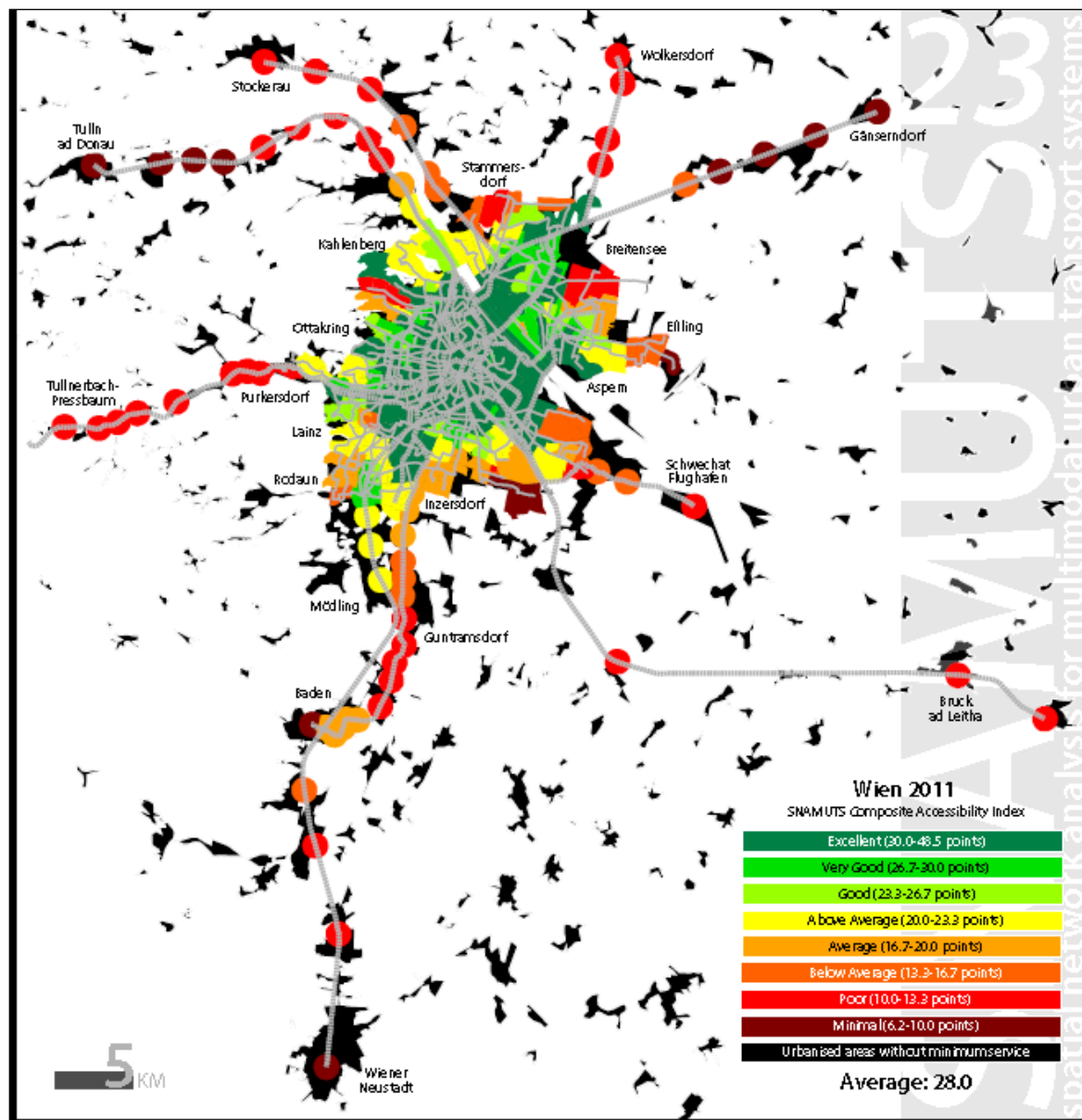


Figure 13: Greater Vienna, SNAMUTS accessibility analysis

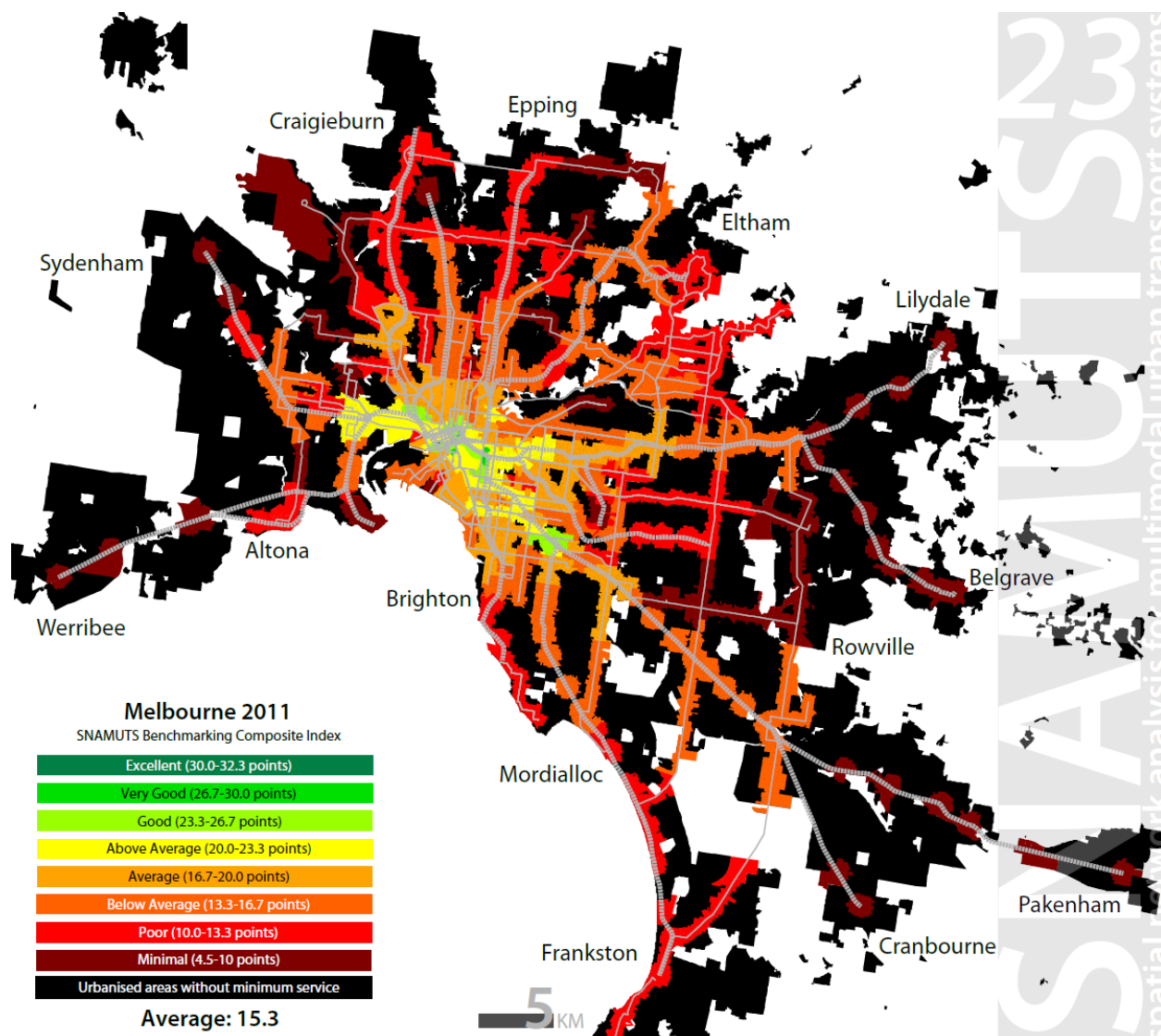


Figure 14: Greater Melbourne, SNAMUTS accessibility analysis

Wiener Linien – the city’s public transport operator – uses the slogan *Die Stadt gehört Dir* (the city belongs to you). The sale of 1 million yearly transit passes for a subsidised price of €365 (A\$590) within 12 months shows the truth of this slogan.

Planning to achieve this high-level of performance is based on a standard for public transport supply quite different to that used in greater Melbourne. Here, the standard for public transport supply is that every house should be within 400m of a public transport stop, regardless of the quality of the service. In Vienna, a location is considered by planners to be adequately served only if it is possible to reach a rapid transit line within 15-minutes travel-time at most times during the day and at weekends. This goal is supported by most politicians and by planners of land-use and transport, so budgets and works programs are directed towards its achievement in coherent manner over many years.

For Melbourne, an interesting comparison with Vienna is their creation of a dense network since the 1950s, contrasted with the stagnation of public transport in Melbourne (**Figure 15**). As the metro system of ‘medium-capacity’ rail has been expanded, the tram (and bus) routes of the inner-city have been repurposed as an effective distributor and connector system, creating a dense and highly-accessible network. These routes concentrate high-frequency bus and tram services on key corridors, feeding the

heavy rail system. The benefits of a 'medium capacity' model for network expansion in Melbourne are described [here](#) (Knol and Stone 2015).

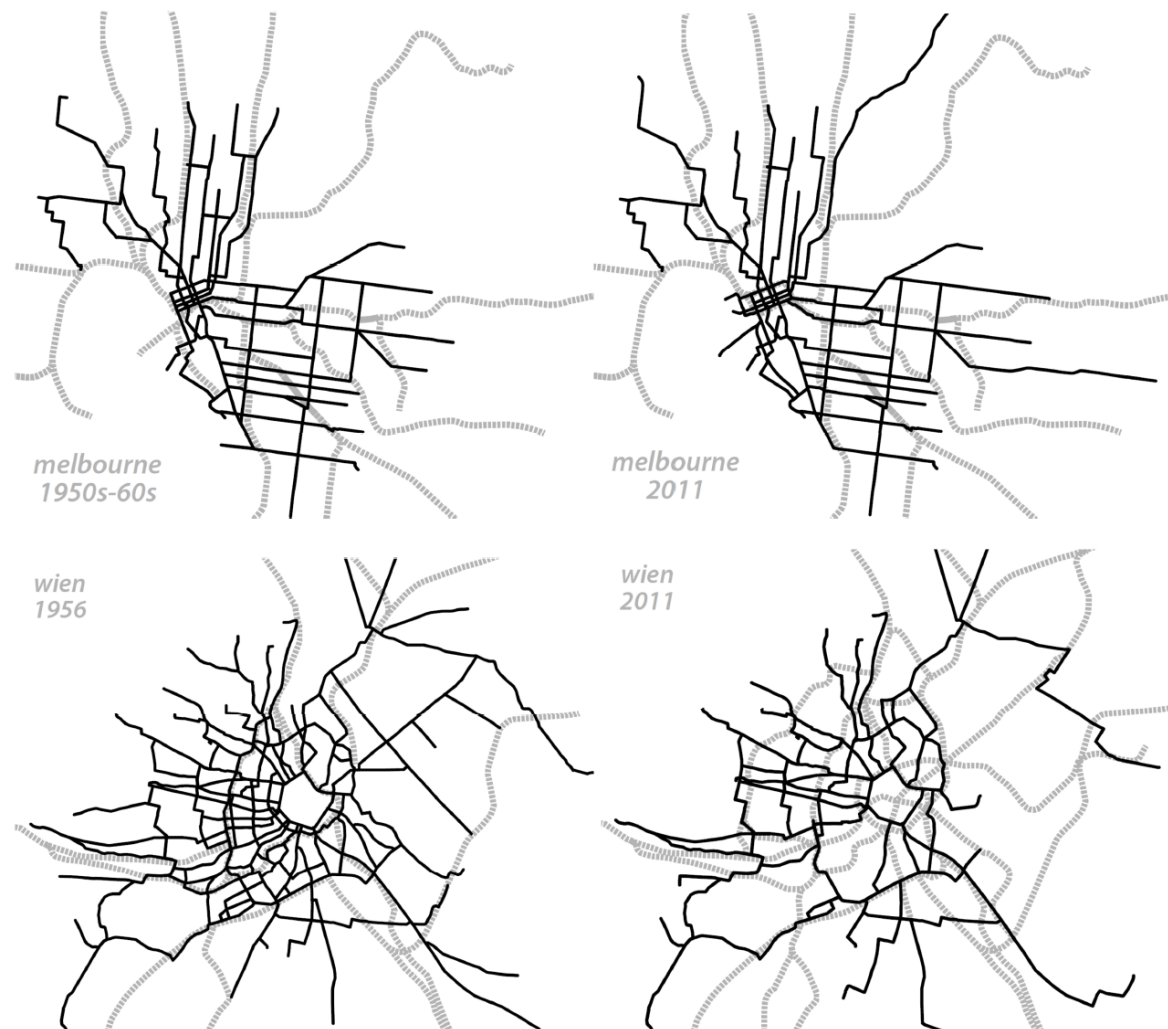


Figure 15: Comparison of Melbourne and Vienna: fixed route public transport networks

Outline of Melbourne's fixed-route public transport network (trams in black, suburban rail in grey) in the 1960s and in 2011

Outline of Vienna's fixed-route public transport network (trams in black, metro and suburban rail in grey) in 1956 and 2011

Zurich has also re-modelled its suburban and regional rail and inner-city tram and bus network to support a dramatically upgraded radially-oriented suburban/regional rail system. The Swiss planning model that underpinned its cost-effective creation of conditions for high-performance regional and suburban rail development is described [here](#) (Stone 2013).

Of particular interest to the City of Melbourne is Zurich's experience in transforming its historic street-car system to one of the world's most efficient light-rail networks. The catalyst for this change was a referendum in 1973 that rejected a city council proposal to put the trams underground on the contemporary model of the German U-Bahn ([subway](#)). Instead, citizens voted to direct transport planners to not only keep the trams but also to ensure that they could travel 'as fast as was technically possible'.

After some internal debate, the city's transport planners changed direction and, over the next decade, largely achieved this objective. On some central city lines, trams travel at the same speeds during peak as they do at midnight. This feat was achieved through a combination of gradual removal of on-street parking on tram routes (a political decision that is still honoured as the 'historic compromise'; and a unique system of traffic signals which allow only a small number of cars onto tram streets at any one time and which give absolute priority to trams at intersections. (For details see Cervero, 1998, *The Transit Metropolis*, Island Press.)

4.3.3. Suburban orbital routes

4.3.3.1. Why suburban orbital public transport lines matter to the City of Melbourne

Melbourne's high-capacity public transport comprises rail and tram lines that converge on the central city in 'radial' spokes (see Figure 16)

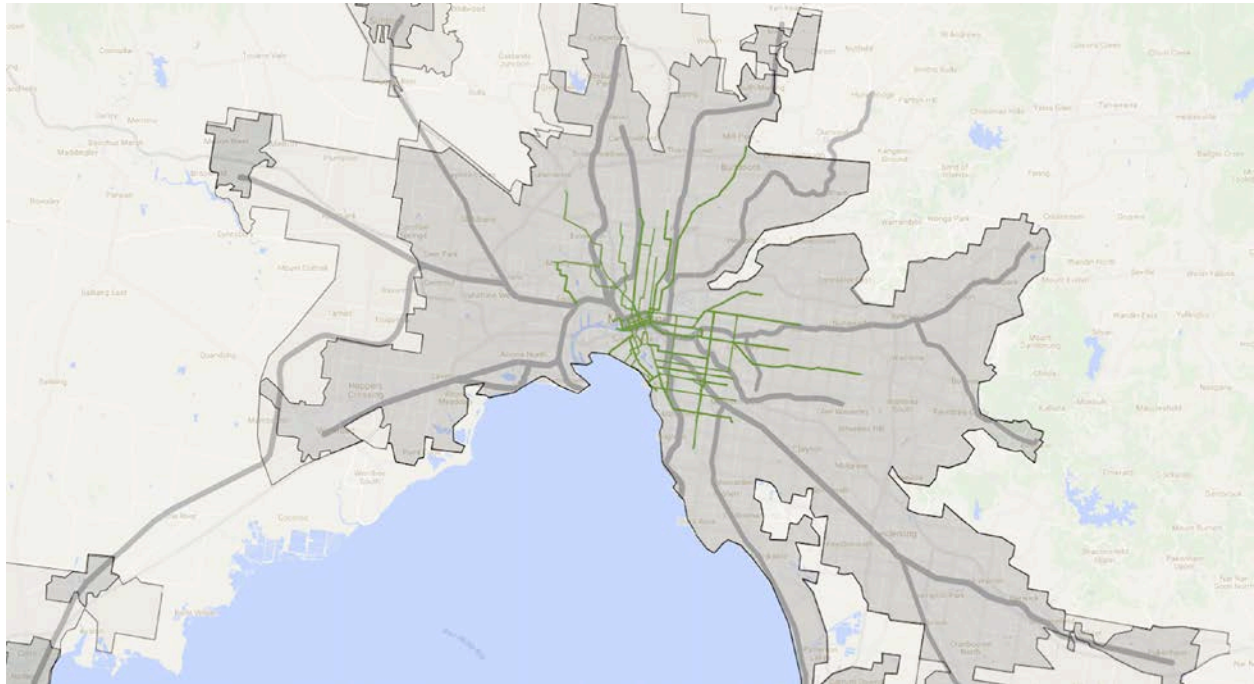


Figure 16: Melbourne's trains and trams radiate from the central city area like 'spokes'

It is immediately obvious to most potential users of the system that most cross-town or suburb-to-suburb ('orbital') trips will be long and inconvenient. In addition, such a system will require increasingly expensive capacity upgrades on its key radial routes and is vulnerable to disturbances because there are no alternative paths that might be used to bypass congestion or delay at the centre.

In an analysis of possible alternatives to this inefficient and vulnerable pattern of service delivery, [Curtis and Scheurer \(2016 p. 9\)](#) note that the radial model will:

minimise public transport usage for journeys between suburban nodes that are not on the same line, and ... simultaneously convey a sense of capacity crisis for ... journeys to and from the CBD. Cities often address this conundrum by adding ever more services to the radial lines ... while failing to investigate and realise the accessibility benefits and added resilience that may be associated with a greater dispersion of network paths away from established public transport trunk lines.

Further, it "leaves the grid-shaped (suburban) arterial road system unutilised by public transport routes", despite the large number of journey paths (i.e. potential public transport patrons) using these routes.

The role that orbital public transport can play in Melbourne was demonstrated by the 901, 902 and 903 orbital SmartBus services (Figure 17). Introduced between 2005 and 2010, these routes have become some of the busiest in Melbourne. By linking centres of activity such as shopping centres and high streets with radial tram and train lines, the orbital SmartBus system complement radial rail lines, as well as increasing demand for the latter by enlarging the accessible catchments for public transport overall.

We recommend that the City of Melbourne advocate for new approaches to network design to support the creation of effective and efficient suburban orbital lines that build on the patronage growth already achieved through the SmartBus program, with high-quality interchanges that connect to radial public transport services.



Figure 17: Melbourne's orbital and radial SmartBus routes

4.3.3.2. Trams and Suburban Light-Rail Transit (LRT)

Infrastructure Victoria has recommended trams as a city-shaping tool as much as mode of transport, because of its association with land value uplift and suburban intensification. Tram lines promote residential development and mixed land uses such as commercial office space and retail. Recent analysis

has suggested that there is a strong connection between tram corridors and locations for increased residential and commercial development in Melbourne (Scheurer and Woodcock 2017). As a result, tram services along these corridors are becoming increasingly crowded as they struggle to keep up with demand. Given the scale of Melbourne's tram network, this considerable challenge will take many years to solve. Until these changes are made, the problems of slow speeds and poor punctuality will not be overcome.

Transport advocacy groups have proposed improvements to Melbourne's tram system. Broadly, these can be categorised into upgrades to achieve on-road priority and incremental extensions to the existing tram network, and far more ambitious proposals for a new network of suburban light rail (LRT) alternatively referred to as 'Metro Light Rail' (MLR).

The distinction between trams and LRT is important. Melbourne's existing tram network is a legacy streetcar system, with 80% of its routes running in mixed traffic with other road vehicles, often in streets with insufficient width to easily provide separation. This leads to slow speeds (and therefore inefficient use of expensive vehicles) and poor reliability.

Incremental improvements to the streetcar system are ongoing with the provision of universal access stops, allocation of dedicated tram space on roads, traffic signal priority, and tram fleet renewal. The ideal target for these processes would be a system of high-capacity and accessible trams completely physically separated from other vehicles. A key benefit would be reduced delay, that would allow more services to be run with the same number of vehicles. That is, more services could be run without the cost of buying new trams or purchasing land and constructing more tram depots.

Light rail, by contrast, is an urban rail-based system designed from the outset to run in segregated rights of way with accessible platform stops (at far greater spacing than tram stops) and high capacity vehicles. This guarantees higher performance than can be achieved with streetcars. Light rail has many of the speed and capacity advantages of heavy rail, but is easier to retrofit into established urban environments and requires lighter infrastructure.



Figure 18: Gold Coast Light Rail (SOURCE: <https://plenarygroup.com/news-and-media/news/2016/full-steam-ahead-for-stage-2-of-the-gold-coast-light-rail>)

The best examples of LRT in Australian cities are the Gold Coast and Sydney light rail lines (Figures 18 and 19). These services have demonstrated good patronage accompanied by land value uplift and intensification along their corridors. LRT, because of its higher capacity, can afford to utilise a mixture of ground level, tunnelled and elevated alignments that would be too expensive to justify for more inefficient street car-style trams.



Figure 19: Sydney Light Rail (SOURCE: <https://ausbim.com/projects/sydney-light-rail>)

There is great potential to retrofit LRT into Melbourne's suburbs, due to the well-established grid of wide arterial roads. The great benefit of LRT in the Melbourne context is the ability to avoid expensive tunnelling and land acquisition by using existing corridors.

For the City of Melbourne, this is needed to extend high-quality surface public transport to emerging zones of high land-use intensity beyond the Hoddle Grid (**Figure** and 21). To improve the resilience of the entire system, it is also important for the City of Melbourne that orbital LRT is extended to the middle suburbs.

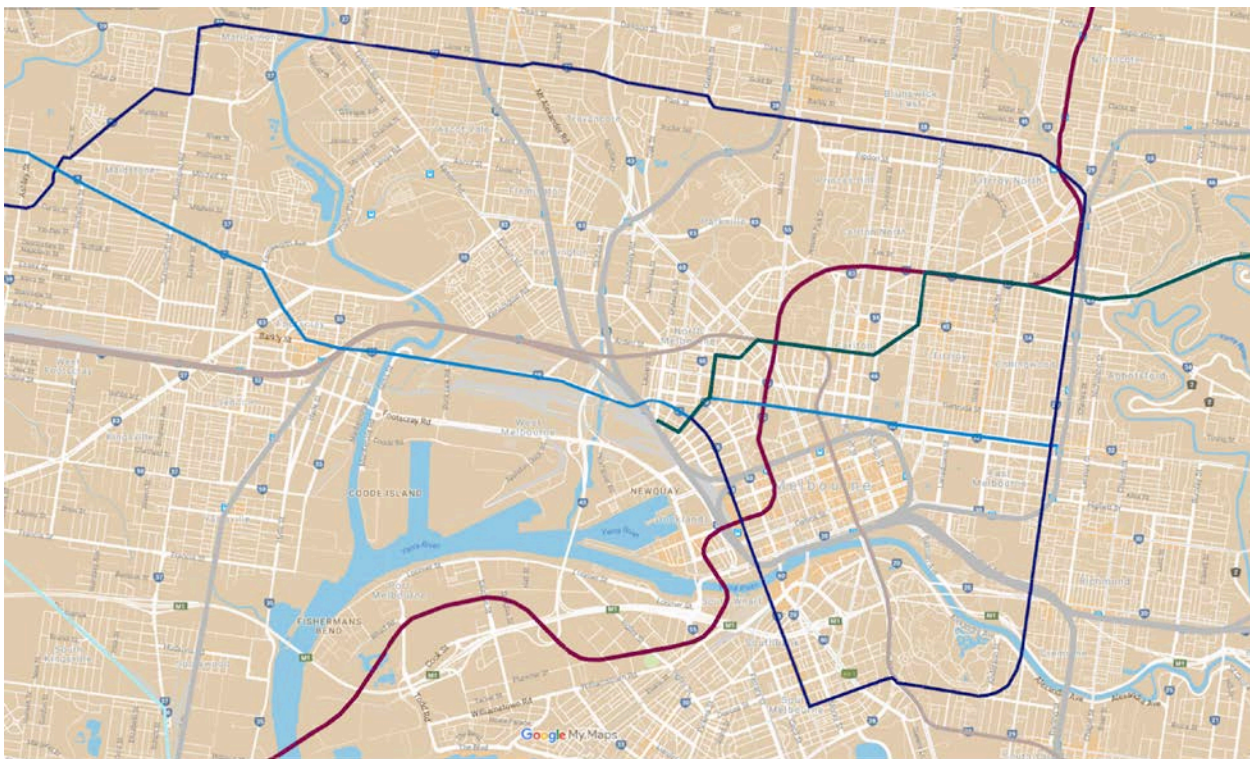


Figure 20: Inner and central city view of proposed new LRT network, showing new orbital routes (Dark Green, Light Blue, Dark Blue; Maroon is MMR2. Note: Dark Blue LRT would run in a tunnel from Punt Rd and re-emerge near the corner of Anderson St and Domain Rd).

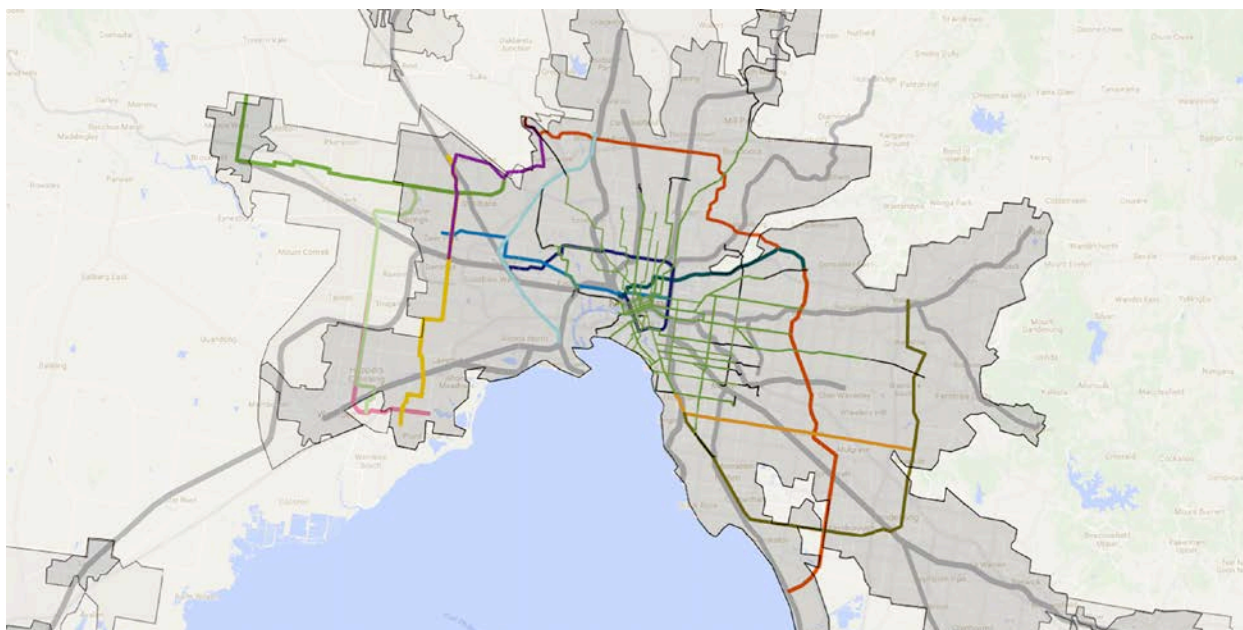


Figure 21: Suburban Light Rail – priority corridors

Many of these LRT routes shown in Figure 21 would provide much-needed orbital and inter-suburban connectivity between the lines of the radial heavy rail system. Some of the proposed routes provide rail access to areas such as Doncaster and Rowville, which have long been proposed as extensions to the heavy rail system. Compared to radial extensions to existing rail lines, LRT enables the creation of a true high-capacity public transport network by connecting areas to multiple rail lines. The need for these kinds of services has been demonstrated by the patronage on the orbital Smart Bus routes, which is significantly higher than almost all suburban bus routes. These LRT corridors could initially be served by improved bus services to demonstrate viability and passenger demand.

A case study of comparable development of LRT in suburban Toronto is described in a paper presented at SOAC 2017 and will be published in early 2018.

If planning for a city of 8 million people by in just over a generation is the aim, then serious work must be done to rethink how the majority of Melburnians are to be given adequate transport choices.

4.4. Why metropolitan transport planning matters: the need for an integrated transport plan

The previous sections make it clear that very many improvements are needed to ensure that the public transport system of greater Melbourne continues to serve the needs of residents and visitors to the City of Melbourne.

Making decisions on competing priorities between road and rail, and on budgets, timelines and detailed designs is a responsibility of the Victorian Government under the Transport Integration Act. International experience shows clearly that such planning processes are most effective when they are open and transparent and engage effectively with interest groups and the wider public.

For this reason, it is important that the City of Melbourne works closely with Victorian Government agencies to strengthen processes for metropolitan transport planning in greater Melbourne.

We have noted the lists of project proposals put forward by Infrastructure Victoria, the PTV and interest groups such as the Rail Futures Institute. There are many others, which take ideas from various Victorian Government proposals over the years and embellish them. These ideas should be examined and collated for what they have in common and assessed for their merit. A common theme, apart from extending and adding radial lines is adding orbital (i.e. cross-town or inter-suburban) lines to connect suburban activity

centres and ensure that all NEICs are accessible by heavy rail or LRT. These additions would have the effect of reconfiguring the current rail-based system into a network, with a variety of ways to get between destinations.

Decisions about major transport investment are inevitably political, and there is a clear need for new ways to consider the relative merits of competing proposals.

Curtis and Scheurer's SNAMUTS accessibility modelling tool (www.snamuts.com/) provides a useful way to understand this point. Examples have been included in this paper (Figures **Figure 13** and **Figure 14**).

The Spatial Network Analysis for Multimodal Urban Transport Systems (**SNAMUTS**) model is described by its creators as: "an interactive decision tool designed to assist in examining the performance of a city region's current public transport network framed around the accessibility of the transport network and accessibility of place".

We are encouraged by the use that the City of Melbourne has already made of the SNAMUTS accessibility model as a tool to illustrate and compare the benefits of different scenarios for multi-modal public transport network development in inner Melbourne and across the metropolitan region. The strong visualisations available through use of this tool offer a useful way to bring a new level of public and practitioner engagement in consultative processes. For this reason, the proposals outlined in this paper have been developed with the option of SNAMUTS testing in mind.

4.5. Getting value for money from Victorian Government spending on public transport

We have noted earlier that, in addition to the need for new capacity, the reliability of existing services is a major barrier to increasing the use of the public transport system as means to meet the City of Melbourne's economic, social and environmental objectives. Current City of Melbourne policies support increased public transport use by residents and visitors through the improvement of reliability and system performance.

The Victorian Government is to be congratulated for investing considerable resources to address long-standing problems of maintenance and capital-renewal across the train and tram systems. The historical shortfall has been well documented by PTV and operators. However, repeated institutional re-structuring has slowed down efforts to build the institutional capacity and skills base necessary to manage growth on the required scale, and to maintain pressure on operators to improve system performance.

The adoption of new performance targets and benchmarks can take time due to the nature of the franchise agreements with the train and tram operators. (More detail is available [here](#). Stone et al 2017) As was the case with the recent changes to eliminate Metro's practice of 'skipping stops' to meet punctuality targets, public pressure is an important mechanism for change. Therefore, this issue is an appropriate topic for advocacy by the City of Melbourne.

New benchmarks will provide valuable impetus for the implementation of effective solutions.

These new performance measures could include:

- Targets for improved reliability and efficiency achieved through the maintenance expenditure and capital renewal investments that are included in the newly re-negotiated tram and train franchises.

One example is a reduction in the daily number of rail signal failures. Currently, there are more than [five failures per day \(Currie, slide 18\)](#).

- Targets for improvements in the reliable arrival of trains to designated platforms. This is an important element of a positive user experience. Data from Metro (**Figure 16**) shows the current extent of this problem (technically known as 'transposal').

- More reliable cross-platform transfers between Loop and through trains at Richmond, North Melbourne, Flinders Street and Southern Cross would help to alleviate user resistance to changes in service patterns such as those proposed for the Frankston Line. The proposal to run trains from Frankston to Werribee via Southern Cross and Flinders Street (bypassing the City Loop) were met with some public concern over accessing stations in the central city.
- Numbers of transfers between public transport services to reflect progress towards the development of a true 'network' rather than the current system that is still suffering the legacies of many decades of competition between modes. More transfers indicates that the network is becoming more useful for a wider variety of trips than just 'suburb to city'.

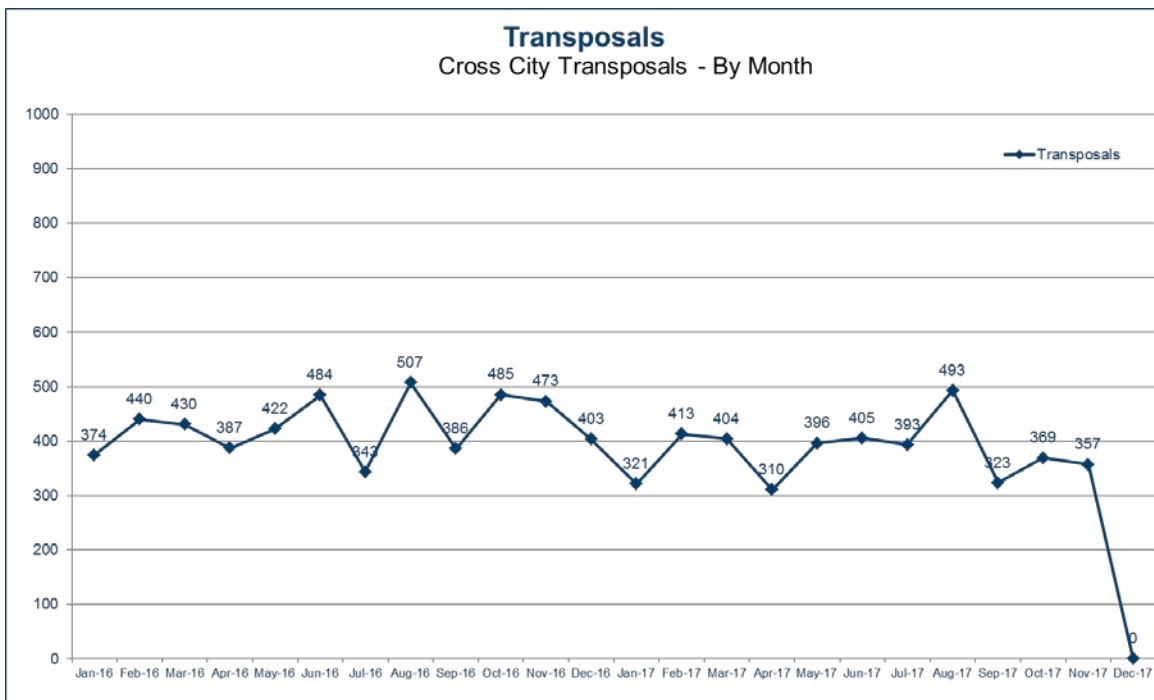


Figure 22: Numbers of trains requiring platform re-allocation (transposal) at Flinders St (Metro Trains)

4.6. Providing space for pedestrian movement related to public transport access

Improvements in public transport performance will require further reallocation of public space from private motor vehicles to pedestrian activity.

This is a key theme of other discussion papers. The ability of pedestrians to move freely and directly to and from station entrances and tram stops is fundamental to public transport performance. For this reason, the City of Melbourne should continue to advocate strongly for improvements to the location and design of street access to the new MMR stations, to meet objectives outlined below.

4.6.1 Stations and urban design

Stations are key places where people access the public transport network. They provide the point of access to the highest capacity and fastest parts of the network, and important transfers between them and other modes such as trams, buses and bikes. In central Melbourne, the main way that people access stations is on foot. Station design, and the number, location and design of station entrances has a big impact on the flows of pedestrians in the streets and other spaces that stations give on to. By global

standards, for stations with the levels of patronage currently occurring, Melbourne's central city stations do not have sufficient points of entry. This manifests on the streets as overcrowded footpaths with potential safety issues.

Rail stations are also important civic places that contribute to the amenity and functionality of the precincts in which they are located – they are far more than places to catch trains.

Best practice globally for stations in intensively used urban settings is to maximise the number and extent of station entries, whether stations are underground (as in London, Singapore, New York) or elevated (as they are in many places in Vancouver, Berlin and Tokyo). [For example](#), using precedents that many Melburnians will be familiar with from London, Leicester Square Tube station has four exits, allowing passengers to get directly to the footpaths on either side of the streets above the station without having to cross any roads. Similarly, Oxford Circus Station has eight exits, allowing the same degree of safe pedestrian access to the retail precinct above without forcing pedestrians to cross roads. Kings Cross, and Charing Cross, both interchanges between the Tube and the surface railway lines have 11 and 9 exits respectively, while Piccadilly Circus has seven.

Examples like this can be found in many cities with high capacity metro systems serving dense central city areas, and even in some parts of cities that are less dense. These arrangements serve to minimise pedestrian congestion on streets, and to reduce the potential for conflicts between pedestrians, cyclists, trams, buses and other users of busy streets. They provide safety, amenity and increased opportunity for commercial activity, all of which have reinforcing effects on each other.

There are 16 railway stations located within (or at the boundary of) the City of Melbourne: the five city loop stations and eleven in the rest of the municipality. Of these, it is the five city loop stations (Flinders Street, Southern Cross, Melbourne Central, Parliament and Flagstaff) that have the highest patronage (number of entries), followed by Richmond and North Melbourne. When MMR1 opens in 2025, three of the five metro stations will be totally new access points to the rail system (Domain/Anzac, Parkville and Arden/North Melbourne), while the other two (Town Hall and State Library) will significantly extend the access points via Flinders St Station and Melbourne Central Station respectively. All five of the new metro stations will eventually cater to very high patronage levels, as will Flagstaff and Southern Cross when MMR2 is built.

Pedestrian congestion is already a significant problem in many places in central Melbourne, especially related to station access.

The problem can be addressed using techniques including:

- increased footpath widths,
- 'scramble' crossings (where all vehicle movements are stopped for pedestrians to cross, as is done now at the Flinders/Elizabeth intersection),
- faster timing cycles for traffic signals,
- reduced motor vehicle speeds and numbers.

However, the priority must be to increase the number and geographic extent of station access entry points by extending, re-opening existing and adding subways to metro stations should be a priority.

5. SUMMARY & RECOMMENDATIONS

The recommendations in this paper are presented as a starting point for consultations with the public in the preparation of the City of Melbourne's new *Transport Strategy*.

1. The social, economic and environmental health of the City of Melbourne depends on continued improvement to public transport networks in greater Melbourne and beyond. Demand will exceed capacity even after completion of Melbourne Metro Rail 1.
2. The City of Melbourne's principal advocacy goal for new public transport infrastructure should be Melbourne Metro Rail 2 (linking Newport to Clifton Hill via Fishermans Bend). MMR2 is required to meet forecast demand for travel to central demand. If planning commences in 2018, the line could be operational by 2028 or earlier.
 - Of the two canvassed alignments for MMR2 in Fishermans Bend, the northern alignment is preferred because it provides better access to the employment precinct.
 - MMR2 should include a station serving the Convention Centre/Yarra's Edge precinct, Fitzroy and Clifton Hill.
3. Rail to the Airport from Southern Cross is vital. The Sunshine alignment with regional services, which received Victorian Government backing in 2017, should be supported by the City of Melbourne.

But, if the car-dependence of the airport precinct for passengers and workers is to be successfully challenged, further public transport connections are required. These include tram extensions, new and improved bus services and potentially a second rail line via the north-western suburbs.

4. A denser and better-connected inner-city tram and bus network on the model of European cities such as Vienna or Zurich is required to provide access to new land-uses beyond the Hoddle Grid. The success of Melbourne's tram and bus operations is highly contingent on dedicated space on roads and priority over general traffic at intersections. Private vehicles should not delay any tram or bus in Melbourne as this undermines investment and decreases the attractiveness of public transport.
5. To improve the resilience of the suburban public transport network and to increase public transport use for journeys to the central city, the City of Melbourne should advocate for Victorian Government agencies to adopt new approaches to network design to support the creation of effective and efficient suburban orbital lines (mode to be chosen to match demand) with high-quality interchanges to connect to radial services. The orbital Smart-Bus routes have attracted significantly greater patronage than other suburban bus services, proving the potential for higher capacity modes such as Light Rail (LRT) or even Medium-Capacity Rail (MCR) to be serious contenders for serving the transport needs of the middle and outer suburbs and especially, those National Employment and Innovation Clusters (NEICs) that are away from the suburban passenger rail system.
6. The City of Melbourne, located at the epicentre of Melbourne and Victoria's public transport system, as well as being the most productive part of the Victorian economy, needs to advocate for a comprehensive and integrated Victorian Transport Plan.
7. The City of Melbourne should advocate for greater efficiency in the allocation of Victorian Government resources to the operations, maintenance and renewal of the suburban public transport system.
8. The City of Melbourne should continue to use its own resources and to advocate for allocation of more space for pedestrian movement related to public transport access.

6. References

WEBSITES

Fishermans Bend Draft Framework 2017

<http://www.fishermansbend.vic.gov.au/framework/fishermans-bend-draft-framework>

Melbourne Airport Masterplan 2013

<https://www.melbourneairport.com.au/Corporate/Planning-projects/Master-plan>

Melbourne Metro Rail 1 Business Case

<http://metrotunnel.vic.gov.au/library/business-case>

Heathrow Airport Sustainable Transport Plan 2014-2019

https://www.heathrow.com/file_source/Company/Static/PDF/Heathrow_STP_inter.pdf

Heathrow Facts and Figures

<https://www.heathrow.com/company/company-news-and-information/company-information/facts-and-figures>

Infrastructure Victoria – Draft 30-Year Infrastructure Strategy

<http://www.infrastructurevictoria.com.au/30-year-strategy>

Infrastructure Victoria – Draft Options Book, Version 2, October 2016

<http://www.infrastructurevictoria.com.au/sites/default/files/files/Draft%20Options%20Book%20Version%20Two%20-%20FINAL.PDF>

Public Transport Victoria (PTV) Network Development Plan – Metropolitan Rail 2012

https://static.ptv.vic.gov.au/siteassets/PTV/PTV%20docs/Metro-rail-network-development-plan/PTV_Network-Development-Plan_Metropolitan-Rail_Overview_2016update.pdf

Public Transport Victoria (PTV) Operational Performance,

<https://www.ptv.vic.gov.au/about-ptv/data-and-reports/operational-performance/>

SNAMUTS (Spatial Network Analysis for Multimodal Urban Transport Systems)

<http://www.snamuts.com/>

Victorian Integrated Survey of Travel and Activity (VISTA)

<https://transport.vic.gov.au/data-and-research/vista/>

Street Sensation: Your Guide to London's Favourite Streets (tube station entrances)

http://www.streetsensation.co.uk/tube_station_exits/kings_cross_st_pancras_underground_station_exits.htm

PUBLICATIONS

Booz & Co. 2014 *Accessing Our Airports: Integrating City Transport Planning With Growing Air Services Demand*, Tourism & Transport Forum, Sydney, NSW

<http://www.ttf.org.au/wp-content/uploads/2016/06/TTF-Accessing-Australias-Airports-2014.pdf>

Cervero, R 1998 *The Transit Metropolis*, Island Press

<https://islandpress.org/books/transit-metropolis>

- Currie, G 2016 “Benchmarking Public Transport in Melbourne”, *Transport for Melbourne: What’s the Plan? Public Forum*, RMIT University, Melbourne, Australia, 4 Aug
<http://publictransportresearchgroup.info/wp-content/uploads/2017/02/PRESENTATION-2016-Transport-for-Melbourne-Benchmarking-PT-in-Melbourne.pdf>
- Currie, G 2006 “Do Melbourne Trams have a future?”, *22nd ARRB Conference – Research into Practice*, Canberra Australia, 2006
<https://trid.trb.org/view/805824>
- Curtis, C and Scheurer, J 2016. *Planning for Public Transport Accessibility - An International Sourcebook*. London and New York: Routledge.
<https://www.routledge.com/Planning-for-Public-Transport-Accessibility-An-International-Sourcebook/Curtis-Scheurer/p/book/9781472447241>
- Knol, D and Stone, J 2015 “Superior mobility achieved through an alternative to heavy rail - Melbourne south-east case study”, *Australasian Transport Research Forum Proceedings*, 30 September – 2 October, 2015, Sydney, NSW, Australia
http://atrf.info/papers/2015/files/ATRF2015_Resubmission_53.pdf
- Lawrie, I, Woodcock, I and Stone, J 2017 “What’s best for the West? Plan Melbourne 2017-2050 and alternative transport futures for Melbourne’s western suburbs”, *State of Australian Cities National Conference 2017*, Adelaide, Australia
<https://www.dropbox.com/s/qxv4w1riphwwalk/LAWRIE%2C%20WOODCOCK%20%26%20STONE%2017%20What%27s%20best%20for%20the%20west%3F%20SOAC.pdf?dl=0>
- RFI (Rail Futures Institute) 2016 *Intercity: how regional rail can re-balance population growth and create a “state of cities” in Victoria*, Rail Futures Institute, Melbourne, Australia
<http://www.railfutures.org.au/2016/08/intercity-how-regional-rail-can-re-balance-population-growth-and-create-a-state-of-cities-in-victoria/>
- Scheurer, J, Curtis, C and McLeod, S 2016 “Making Melbourne’s public transport multi-directional: Can the associated accessibility boost mobilise latent potential for ridership and city-building?” *Australasian Transport Research Forum Proceedings*, Melbourne, Monash University, Victoria, Australia
http://atrf.info/papers/2016/files/ATRF2016_Full_papers_resubmission_56.pdf
- Scheurer, J and Woodcock, I 2017 “Trams and Politics in Melbourne: managing complex adaptations”, *State of Australian Cities National Conference*, Adelaide, South Australia, Australia
<https://www.dropbox.com/s/03kiwo8v65n4wk0/SOAC%20paper%202017%20%28scheurer%20woodcock%29%20final.pdf?dl=0>
- Scheurer, J and Woodcock, I (2011) ‘Transforming Melbourne through transit-oriented intensification: implications for public transport network performance, accessibility and development densities’, in Whitzman, C and Fincher, R (Eds) *Proceedings of the 5th State of Australian Cities (SOAC) National Conference 2011*, Melbourne, Australia, 29 Nov - 2 Dec 2011, pp. 1-15
<https://trid.trb.org/view/1141750>
- Stone, J, Ashmore, D and Kirk, Y 2017 “Protecting the Public Interest in Melbourne’s Rail Franchise”, *Issues Paper No. 8*, February 2017, Melbourne Sustainable Society Institute, The University of Melbourne, Parkville, Australia
<http://sustainable.unimelb.edu.au/transport-issues-paper>
- Stone, J 2013 “Planning for affordable transit infrastructure and service expansion: two European case studies”, *Australasian Transport Research Forum Proceedings*, 2-4 October, 2013, Brisbane, Australia
http://atrf.info/papers/2013/2013_stone.pdf