

## TTF TRANSPORT POSITION PAPER

### The Benefits of Light Rail



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## In Short

1. Light rail is a high-frequency, medium-capacity rapid transit mode that works alongside, not in opposition to, other modes of transport.
2. Light rail can significantly increase mobility in city-centre and inner-suburban areas, helping to reduce congestion, revitalise neighbourhoods and reduce carbon emissions.
3. Light rail is well-established in Europe and is undergoing a global resurgence.
4. Though not widespread in Australia, except Melbourne, there are moves towards expanding and introducing light rail in other major Australian cities.

## The role of light rail

### What is light rail?

Light rail is an urban rapid transit mode, powered by electricity, typically serving city centre and inner suburban areas, which is prevalent in Europe, North America and Asia. Able to carry more passengers than buses,<sup>1</sup> light rail services can either share road space with other forms of transport or operate on dedicated tracks – or a combination of the two. In Australia, light rail systems exist in Melbourne, Sydney and Adelaide, and one is currently being developed on the Gold Coast. For the purposes of this paper light rail refers to both trams and light rail.

### Light rail within the transport network

Its carrying capacity enables light rail to fill the gap between bus services and heavy rail, making it a valuable part of the public transport mix. Light rail services can provide an alternative to bus travel on busy CBD road corridors and increase public transport choice for journeys between suburban areas, especially inner suburban areas and city centres. Light rail should be regarded as complementary to other modes of transport rather than opposition to them. Not all corridors will be appropriate for light rail, but equally it may be a better option than buses and trains in certain cases. This potential has not fully been explored in most Australian cities.

## The benefits of light rail

Light rail represents a sound option for governments seeking to increase CBD mobility and choice for commuters. It is an efficient, high-capacity mode that can effectively co-exist with other forms of public transport. From a city-branding perspective, light rail is attractive to residents, commuters, tourists and other visitors – an appeal that can be enhanced further by private sector marketing expertise. From a development perspective, light rail is conducive to urban regeneration projects, providing permanent infrastructure and frequently attracting a high ratio of associated investment. Electricity-powered light rail is also one of the most sustainable transport modes, at a time when responding to climate change is a major government priority and public concern.

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<sup>1</sup> A typical light rail vehicle carries between 200-300 passengers. An articulated bus carries approximately 90.

## Economic benefits

The broader economic benefits of light rail include its contribution to reducing congestion – which will cost Australia an estimated \$12.9 billion in 2010<sup>2</sup> – and increasing productivity through greater urban mobility and transport choice. Light rail has been found to be particularly effective in achieving mode shift away from private vehicle travel. It offers efficiency, comfort, and high capacity. The visual reassurance of light rail infrastructure and the guarantee of regular and reliable services are particularly important factors in helping change urban travel behaviour.

### Capital costs

The capital cost of light rail can vary greatly, depending on the need for tunnelling or bridges, adoption of new technologies, whether the system is separated or integrated into existing road infrastructure, whether it is an extension of an existing system or a new system and so on. A typical cost range is between \$20 and \$40 million per kilometre including rolling stock.<sup>3</sup>

While during the construction phase a light rail system is likely to have higher capital costs than a bus system - because of infrastructure requirements - the mode has ongoing cost benefits through its ability to move more passengers per hour. Research undertaken by Transport for London in 2004 found that at capacity levels below 3,000-3,500 bus was generally the lower cost mode; however beyond 4,000 passengers per hour, light rail was the lowest cost mode.<sup>4</sup> Thus, for medium to high density transport corridors, light rail can be best value for money.

### Operating costs

Light rail compares favourably with buses particularly in medium to high intensity transport corridors because the vehicles have a capacity of between 200 and 300 passengers - with the ability to link vehicles together to double that capacity.<sup>5</sup> Each light rail vehicle carries the equivalent of approximately three articulated buses at capacity, enabling the system to carry 12,000 passengers per hour per direction.<sup>6</sup> In addition, light rail vehicles have a service life expectancy of 30 years and beyond, almost double that of buses.

With the ability to move more passengers per hour, light rail is able to achieve greater asset utilisation than buses on medium and high intensity transport corridors. For buses to achieve similar passenger movements along these corridors would require high level bus priority, including dedicated road space. It would also require additional rolling stock and bus drivers, increasing both the capital and operating costs. By contrast, the capital and operating costs of light rail systems on a per passenger basis diminish as patronage grows, making it highly cost-efficient in high-density areas and relatively cost-efficient in moderately dense areas.<sup>7</sup> Some

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<sup>2</sup> Bureau of Infrastructure, Transport and Regional Economics, "Estimating urban traffic and congestion cost trends for Australian cities," Working Paper No 71 (2007), p109.

<sup>3</sup> Based on discussions with TTF members and analysis of the capital costs of 12 light rail systems constructed in Europe between 2000 and 2007.

<sup>4</sup> Transport for London, *Board Papers: West London Tram Project*, in Agenda and Board Papers for the meeting of April 29 2004, p6.

<sup>5</sup> Tram capacity will depend on the width and length of each carriage, number of seats and the layout, and the passenger density. Typically in Australia the length ranges between 20 and 30m and width 2.65m catering for a capacity of approximately 200.

<sup>6</sup> Metro Transport Sydney, *Submission to the Independent Inquiry into NSW Transport*, 2009, p6.

<sup>7</sup> Transport for London, *Board Papers: West London Tram Project*, in Agenda and Board Papers for the meeting of April 29 2004, p6.

systems also operate driverless on dedicated lines, such as the Docklands light rail in East London, further reducing operating costs.

### Development and economic activity

Light rail also has the potential to stimulate associated investment activity, such as urban renewal projects and residential and commercial development, often in areas that were previously inaccessible or unviable. The longevity, durability and branding appeal of light rail infrastructure sends a positive message to planners and developers.

### Dallas Area Rapid Transit (DART)

The DART light rail system in Dallas, Texas opened in 1996 and has since expanded to incorporate three lines along 78 kilometres of track. Research undertaken by the Center for Economic Development and Research at the University of North Texas in 2007 found the total value of projects that are attributable to the presence of a DART light rail station since 1999 was US\$4.26 billion. In addition, the total local and state fiscal impact of development associated with DART is estimated at US\$127 million per year.<sup>8</sup>

Planned expansions of the DART network are set to cost US\$2.3 billion over the next five years but are expected to lead to more than US\$4 billion in economic activity during this period and US\$663 million in ongoing economic activity per annum thereafter. They will also generate more than US\$530 million in local and state tax revenue during construction and US\$74 million per annum thereafter.<sup>9</sup>

Light rail is also seen to have a positive effect on property values. The table below shows the increased value of various properties within 800 metres of a light rail system over and above the value of comparable properties beyond this proximity.<sup>10</sup>

**Premium value of properties within 800m of light rail**

System	Property	Location	Distance from Station	Premium
MetroLink	House	St Louis	30m	32%
VTA	Apartment	Santa Clara County	400m	45%
VTA	Office	San Jose	400m	120%
DART	Retail	Dallas	400m	30%

This premium value paves the way for transit oriented development strategies, which increase both density along light rail corridors and increase patronage - improving the cost benefit of the system. This type of development can lead to urban renewal and improve liveability. The Victorian Government recently identified tram corridors as key areas for infill development in its *Melbourne @ 5 Million* plan.<sup>11</sup>

<sup>8</sup> Terry Clower et al, *Assessment of the Potential Fiscal Impacts of Existing and Proposed Transit-Oriented Development in the Dallas Area Rapid Transit Service Area*, November 2007, ppii-iii.

<sup>9</sup> Terry Clower and Bernard Weinstein, *Economic and Fiscal Impacts of Dallas Area Rapid Transit Light Rail System Buildout and System Operations*, June 2009, pp6-7.

<sup>10</sup> Center for Transit Oriented Development, *Capturing the Value of Transit*, prepared for the United States Department of Transportation, November 2008, pp6-9.

<sup>11</sup> Department of Planning and Community Development, *Melbourne @ 5 Million*, December 2008.

With this in mind, there is also opportunity to use light rail in major redevelopments of inner urban areas, such as Barangaroo in Sydney. Incorporating light rail into the planning phase enables the usual problems of competition for road space and signal priority to be mitigated prior to construction, creating greater efficiency once the operation commences.

By encouraging increased investment, economic activity and higher returns for property owners, light rail is a sound plan for existing medium to high density areas and a sensible transport option for targeted areas requiring urban renewal.

### **Tourism**

Good light rail systems have an 'iconic' value that is attractive to tourists as well as commuters and residents. Whereas bus routes can be difficult for domestic and international visitors to negotiate, light rail networks are often perceived to be simpler and more reliable, largely owing to the fact that routes are permanent and highly visible. Transport is a key element in the visitor experience and an efficient public transport system can significantly enhance a city's reputation among travellers.

In addition, a strong light rail brand can be incorporated into tourism marketing campaigns and information material. Melbourne's world-class tram system is integral to its image as a sophisticated, 'liveable' destination; it is one of the city's tourism signatures.

### **Environmental benefits**

Light rail is an energy-efficient and sustainable form of transport with a number of environmental advantages over modes powered by internal combustion engines. In particular, electricity to power light rail can be generated at a distance from the urban environment – meaning greenhouse gas emissions are taken away from the point of operation. There is also considerable scope to run light rail on electricity generated from renewable sources. A number of overseas light rail systems are powered entirely by renewable energy, including the Tenerife network in Spain and the Calgary network in Canada.

Furthermore, the introduction of light rail in multiple transport networks has resulted in a significant modal shift, reducing the environmental impact of congestion. A review of new light rail systems in the United States and United Kingdom by Parsons Brinckerhoff found up to 20 per cent of the light rail market previously used cars for travel.<sup>12</sup>

### **Social benefits**

Improved public transport encourages interaction between communities and individuals and attracts skilled workers.<sup>13</sup> Light rail improves liveability and amenity by attracting investment along routes. A recent study of resident attitudes and travel behaviour in Salt Lake City, Utah found that light rail commuters have more healthy

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<sup>12</sup> Parsons Brinckerhoff, *Gold Coast Light Rail Feasibility Study: Report - Stage A - Needs and Justification Assessment Report*, 2004 pES-13.

<sup>13</sup> Regional Cities Victoria, Submission 98, p.6 cited in *Sustainable Cities report: Transport House of Representatives Environment Committee* September 2005

walking habits, lower car use, lower prevalence of obesity, higher place attachment and neighbourhood satisfaction, and are more positive about transit-oriented development. In addition, light rail commuters report that light rail enhances city liveability.<sup>14</sup>

## Service Quality

A key perceived benefit of light rail is improved service quality over alternative modes including reliability, amenity, reduced noise, and greater space within vehicles.

Route permanency is a key element in the perception of light rail as reliable. The system provides assurance to commuters and investors that the route will not change, enabling them to plan around services. Light rail priority systems adopted in most light rail operations provide improved on time running and smooth operation. In addition, track crossovers allow for minimal impact in the event of an obstruction. The risk of mechanical failure is minimised by the addition of redundancy systems in vehicles.

Light rail also produces minimal vibration and noise. Both interior and exterior noise levels are up to 15 decibels lower for trams than buses.<sup>15</sup> Modern light rail vehicles are also more accessible, with no steps onto vehicles, specially designed low floors, and wide doorways and aisles.

Operating speeds can vary greatly depending on whether a given light rail system operates on dedicated track or shares road space. Obtaining light rail corridors away from main street traffic is important to obtain competitive speeds and for encouraging mode shift.

While largely subjective, the appearance of light rail infrastructure on the streetscape has at times been an inhibitor of investment in the mode, especially for those cities that do not have an existing system. However, the advent of technologies that mean systems no longer require overhead wires for operation has improved the mode's attractiveness. The INNORAIL system in Bordeaux, France uses underground cabling that is completely safe for pedestrians. Last year both Bombardier and CAF (Construcciones y Auxiliar de Ferrocarriles) unveiled their own catenary (pole and overhead cable) free technologies showing the enormous potential for this new type of light rail system.

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<sup>14</sup> Barbara Brown and Carol Werner, *Before and After a New Light Rail Stop*, *Journal of the American Planning Association*, Winter 2009, Vol.75, No.1, p9.

<sup>15</sup> Metro Transport Sydney, *Technical details*, 2007, p3.

## Light rail internationally

The past 20 years have seen a resurgence in the popularity of light rail. Urbanisation, rising oil prices and climate change have made effective public transport systems an imperative in managing congestion, and light rail is once again a viable and attractive option for governments and commuters. According to the International Association of Public Transport (UITP), there are 400 light rail systems globally, with a further 60 under construction and plans being developed for another 200.<sup>16</sup>

Light rail remains most prevalent in Europe, where urban development patterns make it a natural fit for many cities. The mode is also well-established in the United States and is growing in popularity in Asia. New markets, such as India and the Arabian Gulf states, are also investigating light rail options.

Arguably, one of the most successful examples of light rail is the tram system in Zurich, primarily due to its ability to maintain a high share of the transport task. In 2008 trams attracted 64 per cent of public transport passengers (197.3 million passenger journeys) on 13 tram routes spanning 111.6 kilometres.<sup>17</sup> The number of trips per resident per year is close to 550, making it one of the most used systems per capita of anywhere in the world - at least four times greater than the total public transport use per person per year of any major city in Australia. The success of the system is largely attributed to the implementation of a transit priority program over the past 30 years, a compact urban form and disincentives to private car travel. The system is currently expanding into the north of Zurich, with further expansion plans over the next 15 years.

## Light rail in Australia

Light rail in Australian cities dates back to the tramways of the nineteenth century. However, at present only Melbourne has a light rail network of any scale, while Sydney and Adelaide have limited systems serving the CBD and some inner-suburban areas.

### Melbourne

Melbourne's tram system is the most extensive in the world and is an excellent example of how light rail can be incorporated successfully into a broader transport network. The Melbourne network covers the city centre and the suburbs north, east, south and west of the CBD. It has 29 routes, running on 250 kilometres of track with 1,773 stops and a fleet of 501 trams. The service has enjoyed strong patronage growth in recent years - passenger numbers increased by 19.8 million or 12.5 per cent in 2008-09. This is the strongest growth achieved by any of the major public transport services in the country during the financial year - though it also presents capacity challenges.

The priorities for Melbourne's tram network are increasing capacity to accommodate burgeoning demand and improving efficiency across the system. The Victorian government must ensure the timely delivery of 50 new low-floor trams, as targeted

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<sup>16</sup> International Association of Public Transport, *Light Rail*, sighted at <http://www.uitp.org/public-transport/light-rail/index.cfm>, 16 November 2009.

<sup>17</sup> Verkehrsbetriebe Zürich, *Facts and Figures*, sighted at [http://www.vbz.ch/vbz\\_opencms/opencms/vbz/english/FactsFigures/](http://www.vbz.ch/vbz_opencms/opencms/vbz/english/FactsFigures/), 16 November 2009.

in the Victorian Transport Plan, and continue programs that provide greater tram priority and expand clearways, as detailed in the *Keeping Melbourne Moving* plan. In addition, more trams will be needed to meet demand on the system and to replace existing, outdated rolling stock. A continued strong partnership between the state government and the tram franchisee will be vital to maintain service standards.

## Sydney

After an absence of almost 40 years, light rail was reintroduced to Sydney in 1997. Though limited in scope, Sydney's light rail line provides a valuable service between the southern CBD and inner-western suburbs, connecting Central Station, the Sydney CBD's primary rail hub, with key business and leisure hubs, before terminating at Lilyfield. The fully privatised system has a 7.2 kilometre operation, 14 stops and a fleet of seven trams. It carries 4 million passengers each year, operating 24 hours a day, every day of the year on a frequency of 10-15 minutes for most of the 24 hour period (30 minute frequencies occur between midnight and 6:30am).

Extensions further into the inner-west to Dulwich Hill and in the CBD to Circular Quay via the Barangaroo precinct have been announced as part of the NSW Government's *Metropolitan Transport Plan*. This 10 year \$500 million program will provide for greater patronage in the inner-west, link the key tourism and business precincts on the western edge of the city centre, facilitate noise reduction and improve city amenity.

Importantly, this investment will consolidate light rail as an integral element of the Sydney public transport network if coupled with integrated ticketing. Further medium to long term light rail extensions should also be considered, including to Green Square, Bondi and Randwick – as well as the potential for a self-contained light rail system to serve Parramatta, Sydney's 'second CBD'.

## Adelaide

In Adelaide, the light rail network runs from Glenelg, on the coast south-west of the CBD, into the city centre - with the recent City West extension connecting users to the University of South Australia and the proposed new Royal Adelaide Hospital precinct. Eleven trams, operating on 12.4 kilometres of track and covering 21 stops, carried 2.6 million passengers in 2008-09.

To date the system has largely been a victim of its own success with patronage growth constrained by capacity, leading to the announcement of additional trams and track extensions in 2008. The extension to the Adelaide Entertainment Centre is expected to be opened shortly, including a park and ride facility, which will increase access to Royal Adelaide Hospital, Hindmarsh Stadium and Bonython Park and complement the city's growing events calendar. It will also facilitate associated urban regeneration in the surrounding areas, and provide for a future link from the Entertainment Centre to the Outer Harbor rail line at Port Adelaide, with further extensions possible for Semaphore and West Lakes. Six new trams have entered service since late 2009, taking the total number of trams to 17 to meet demand levels and service the new extensions.

TTF believes investigating an extension of the light rail to the airport in the long term would underpin the growth of one of the states most important economic

infrastructure assets. Adelaide Airport contributes \$1.6 billion to Gross State Product, employing over 8,000 people directly at the airport and 16,500 indirectly, and supporting over 6.7 million passenger movements. By 2029 this is expected to double to 13 million.<sup>18</sup> This growth will present significant challenges for land transport connections. TTF recommends the investigation of a light rail extension to the airport as part of a long term transport strategy.

## Gold Coast

Stage 1 of the Gold Coast light rail rapid transit project will be delivered as a partnership between the federal, Queensland and local governments and the private sector, and connect Griffith University and Broadbeach via the tourist hub of Surfers Paradise. The initial 13 kilometre system will operate 24 hours a day, seven days a week on 7-8 minute frequencies during peak periods, and is due to be operational by early 2014. The project is forecast to create 6000 jobs during the construction phase and, once complete, move 10,000 people an hour.<sup>19</sup>

Light rail will provide the Gold Coast with a modern, sustainable rapid transit mode, helping to reduce car reliance in one of Australia's growth cities and providing opportunities for urban renewal and investment. The system will be located within walking distance to more than 20 per cent of Gold Coast residents and 50,000-60,000 overnight visitors.

Significantly, the project has been prioritised and given substantial funding under the federal government's Infrastructure Australia program, as part of the Commonwealth's re-engagement with urban transport. The project is also a model for inter-government and public-private cooperation, with all levels of government and the private sector having stakes in the delivery and operation of the system.

## TTF position

TTF is a strong supporter of light rail as a reliable, high-capacity, sustainable mode of transport well-suited to urban and inner-suburban areas. In addition to being a reliable and attractive mode of transport, light rail routes can trigger denser residential development than has been typical of Australian cities - a desirable goal to limit the unsustainable sprawl of our biggest cities.

We believe Melbourne is a global leader in demonstrating how a high quality light rail system can benefit a city. We advocate continued investment by the Victorian government in the Melbourne tram network, particularly to meet projected demand and provide greater priority. We also support the extension of the existing light rail systems in Sydney and Adelaide, in the context of broader government transport and urban growth strategies for those cities.

For the medium-term, TTF considers the Gold Coast Rapid Transit project to be one of the most important public transport initiatives in the country, with the potential to deliver a world-class light rail system in Australia's fastest-growing region. In drawing on funding and expertise from three levels of government and the private

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<sup>18</sup> Adelaide Airport, *Preliminary Draft Master Plan*, May 2009, p2.

<sup>19</sup> Gold Coast Rapid Transit, *Benefits to the Community and Why light rail for the Gold Coast*, <http://www.goldcoastrapidtransit.com.au>, sighted 10 February 2010.

sector, the project represents a test case for a truly national approach to transport infrastructure prioritisation.

More generally, TTF would urge all levels of government to look at light rail as a potential policy and infrastructure solution to the problems of congestion and urban mobility. Integrated public transport will be essential if Australian cities are to meet the economic, social and environmental challenges of the years to come, and light rail has an important part to play in delivering urban productivity, liveability and sustainability.