A review of current literature on transport greenhouse emissions and abatement strategies: the potential for greater public transport use in Melbourne

A report for the Metropolitan Transport Forum

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GAMUT • AUSTRALASIAN CENTRE FOR THE GOVERNANCE AND MANAGEMENT OF URBAN TRANSPORT

THE UNIVERSITY OF MELBOURNE

Introduction

This document is prepared for the Metropolitan Transport Forum in response to its request, outlined in its brief of 17 April 2007, for a review of current literature on:

- greenhouse gas emissions from the transport sector in Melbourne
- models for the development of public transport that are appropriate to achieving significant reductions in these emissions.

It is understood that the material in this review will be used to support the MTF's advocacy for improved public transport in Melbourne, and it is designed to be of assistance to all member Councils in their consultations and discussions with their communities.

The review is in five parts.

Part one examines recent projections for greenhouse gas emissions in Australia to 2020 and demonstrates that current abatement strategies in the important transport sector are ineffective. This section then examines the range of possible strategies available to achieve significant reductions in transport greenhouse emissions in the 10 to 20 year timeframe that many analysts believe is now vital if the most catastrophic impacts of climate change are to be averted.

It concludes that a shift of travel from cars to public transport and other modes is, uniquely among the strategies considered, both practical and effective within this short timeframe. However, such a shift cannot be achieved without a coordinated approach to the whole of Melbourne's transport and urban development policy.

Part two looks at another significant cost of Melbourne's current car-dependence: the growing vulnerability to rising costs of travel and housing in outer-suburban Melbourne.

Part three, the major component of the review, provides an analysis of current increases in public transport patronage and the problems of crowded trains, and proposes a new model for public transport planning in Melbourne.

This model for a modern 'urban network' is the only way to reach the government's '20% by 2020' target. It would replace the current operation of a fragmented collection of 'commuter' lines that has underpinned public transport planning in Melbourne since the 1920s.

Obstacles to creating this modern 'urban network' are also described. These include the existing cumbersome organisational structure of the DoI and the complex and restrictive franchise agreements, and the levels of skill and experience of our public transport managers.

Parts four and five complete the review with a brief outline of the major problems in planning for reductions in the negative impacts of road freight in Melbourne, and some comments on the questions of congestion and road-pricing, using examples from Vancouver, Singapore and London to illustrate the potential pitfalls associated with road-pricing in the Melbourne context. This section also describes the key outcomes of the 2006 Eddington inquiry in the UK and the implications of this for his current work in Melbourne.

This review is prepared for the member Councils of the Metropolitan Transport Forum. Hard copies are available on request.

Member Councils can also contact the author for further details and discussion of the material presented in the review.

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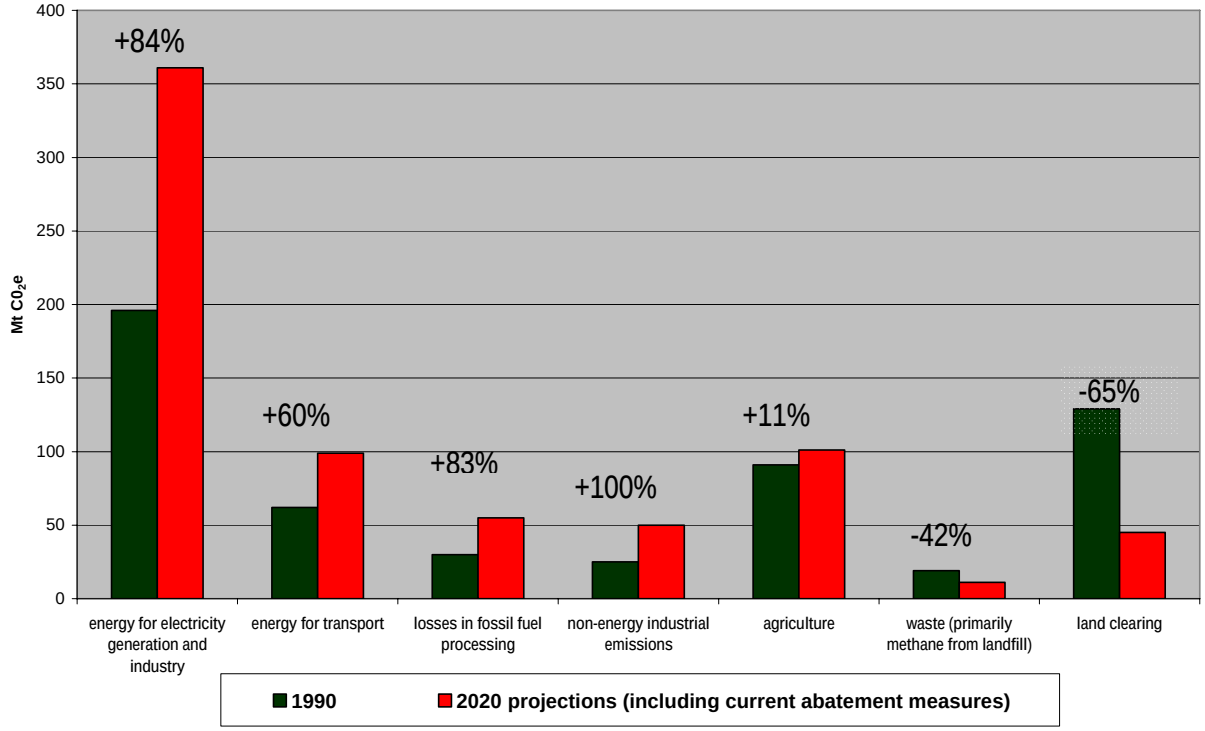
1. Greenhouse impacts of transport in Melbourne and appropriate emission-reduction strategies

After electricity generation, the transport sector makes the greatest single contribution to emissions growth in Australia. It contributes over 14% of the projected increase in emissions between 1990 and 2020. Almost all of this growth is from road transport.

Passenger cars are the greatest single source of transport greenhouse emissions.

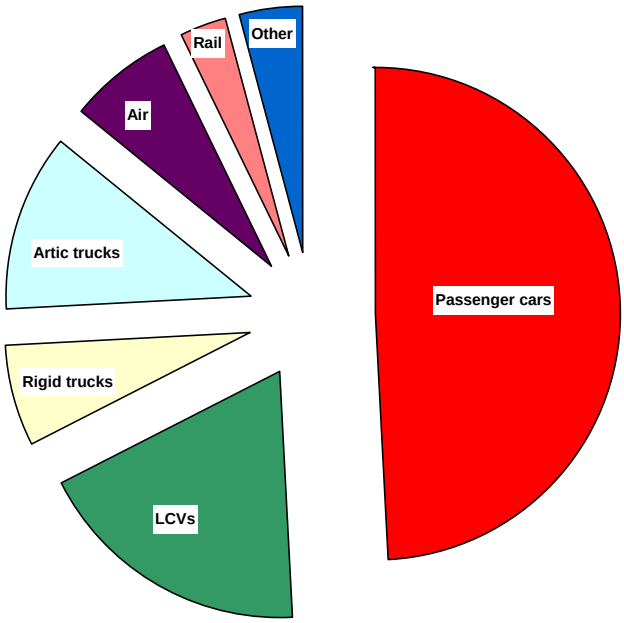


(Source: AGO (2006a): Tracking to the Kyoto Targets: Australia's Greenhouse Emission Trends, Dept of Environment and Heritage, Canberra)

Fig. 1: Projected growth in Australian greenhouse gas emissions

Current emission reduction programs are making little impact in the transport sector. The AGO says that current measures to cut transport emissions will be better than 'business as usual' by only 5%[1]. This includes current state government programs to improve public transport use.

[1] AGO (2006b): Transport Sector Greenhouse Gas Emissions Projections, Dept of Environment and Heritage, Canberra.



(Source: AGO (2006b): Transport Sector Greenhouse Gas Emissions Projections)

Fig. 2: Projected sources of transport emissions in Australia in 2020

The need to reduce greenhouse gas emissions is urgent. The UK Stern Report[2] provides a relatively conservative assessment of the evidence. It concludes that emissions must be stabilised within the next 10-20 years, and then substantially reduced. The recent IPCC 4th Assessment Report (www.ipcc.ch/SPM040507.pdf) reinforces the global scientific consensus on the need for rapid action.

It is essential to act quickly and to take measures that have proven ability to deliver.

Most possible actions in the transport sector are not new. They have been discussed and tested internationally in various forms over many years as the means to deal with other urban transport problems. The speed and effectiveness of the likely contribution of these actions to reducing greenhouse emissions is well understood, and the conditions required for their successful implementation are clear.

The three broad approaches are:

- 'cleaner car-use' through fuel efficiency improvements, fuel substitution, and increased occupancy rates;
- reduced trip numbers and length through increased residential densities and clustering of trip destinations, and through changes to work practices;
- reduced car-trips through improvements to travel time and convenience for public transport, cycling and walking.

The policy frameworks and associated time-scales required to achieve substantial levels of greenhouse emissions reduction for each of these broad measures are set out below.

[2] http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

A. Cleaner cars

Fuel efficiency

The fuel efficiency of the Australian vehicle fleet is unchanged in 40 years with technological gains in fuel consumption traded off against add-ons like air-conditioning, and the marketing of heavier and more powerful cars and 4WDs[3]. Real reduction in the fuel consumption of the fleet will require stricter regulation and changes to industry policy.

The average age of the Australian car fleet has diminished in recent years, although it is still relatively high by comparison with other developed countries. More rapid changeover of the fleet is unlikely without significant government intervention at the Commonwealth level.

With fuel efficiency constant, past growth in greenhouse emissions from cars is the result of huge increases in vehicle numbers and the average distance that each car travels (measured together as vehicle kilometres travelled or VKT) and declining occupancy rates (currently around 1.4 over the whole day and year). Car-use has increased faster than the rate of population growth, fuelled, in part, by the provision of high-quality road space and greater parking capacity, and the absence of realistic alternatives for many trips.

Containment of future VKT growth will require active disincentives for car-use. This includes an end to urban freeway projects and restrictions on any significant growth in the capacity of major arterial roads and a reduction in the supply of parking. The urgent need to respond to the threat of climate change means that an absolute moratorium on all new major road-building projects in Melbourne is essential.

Fuel substitution

Options for fuel substitution include direct replacement of petrol and diesel with 'bio-fuels' or the development of alternatives to the internal combustion engine through various types of battery-powered vehicles where the energy input is not from fossil fuels. Most of these technologies are untested in financial terms and in the extent of their greenhouse emission reductions. In any case, timelines for large-scale implementation are well outside Stern's critical 10 to 20 year emission-stabilisation horizon.

In the long-term, however, replacements will be required for most of the transport energy currently generated from fossil fuels. It is unlikely that any fuel source will sustainably support current levels of travel demand:

> vehicular travel levels will need to be greatly reduced, by as much as threefold in some [OECD countries]. Such reductions will require far more use of local destinations, accessed on foot or by bicycle, with more energy-efficient public transport modes providing the much-reduced vehicular share of travel[4].

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[3] The average fuel efficiency of the Australian passenger vehicle fleet was 11.4 litres per 100 kilometres in 1963, peaked at 12.6 in 1976, and returned to 11.4 in 2001 and 11.7 in 2005 (ABS, Surveys of Motor Vehicle Usage)

[4] Patrick Moriarty & Damon Honnery (2007): 'The prospects for global green car mobility', available from the author: patrick.moriarty@eng.monash.edu.au.

B. Physical changes for fewer and shorter trips

Increased residential densities and the further development of activity centres can contribute to the *potential* for reduced transport emissions, but provision of good public transport services is essential if this potential is to be fully realised.

Without improved public transport, local opposition to urban consolidation will continue to centre on very real fears about increased traffic, increasing pressure on local government and the planning system in general.

In any case, changing density is a very a long-term project. Most of the population of Melbourne will continue to live in houses and sub-divisions that are already established. Fortunately, densities in much of Melbourne are the same or better than the densities in other cities that have achieved higher levels of public transport use.

The politicised question of Melbourne's supposed "too low for public transport" density is discussed further in Appendix 1.

C. Cutting the need to travel

Given the extent of greenhouse emission reductions required to avert catastrophic climate change, it is likely that the total amount of motorised travel undertaken in Melbourne will need to be cut back over time.

Achieving such change is clearly a long-term project. Even in tackling reductions in travel to work, where potential strategies like working-from-home are already available to some, we are starting from a low base. Only 4.5% of those who worked on census day in 2001 did not travel.

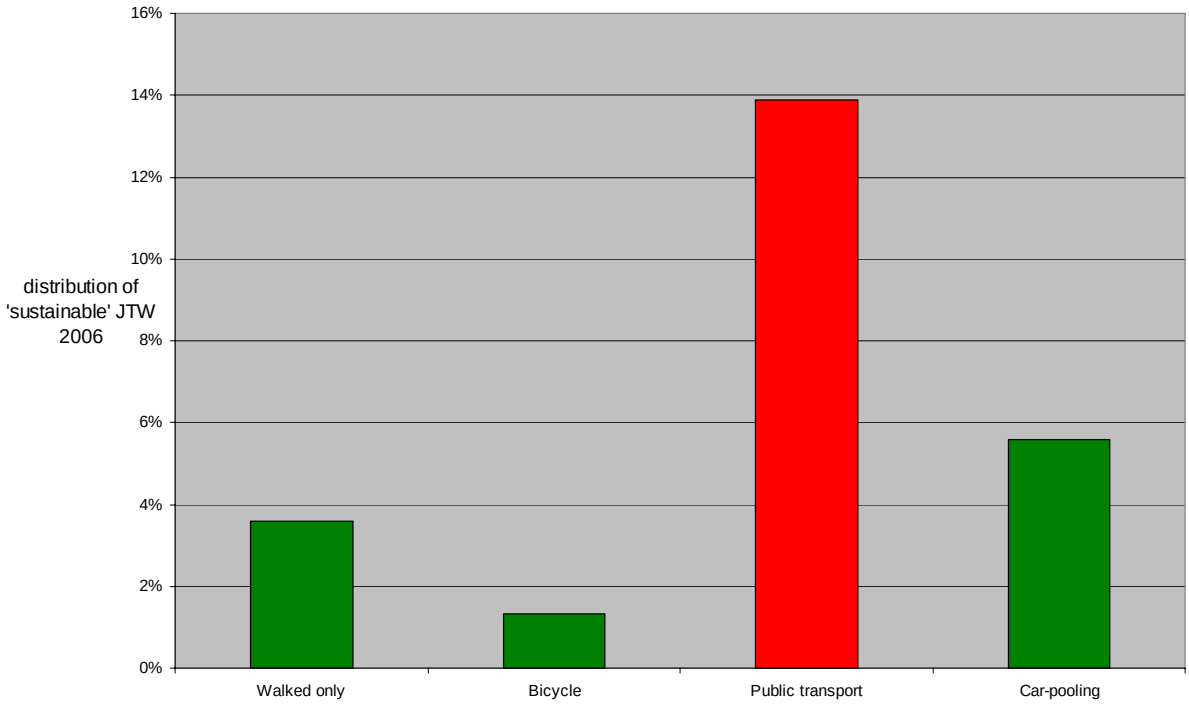
D. Shift some travel to public transport, walking and cycling

Public transport, walking and cycling already provide alternatives to driving for some trips. The 'journey to work' data from the 2006 Census, shown below, gives some idea of the relative importance of these alternatives in Melbourne today. There is clear potential to improve the performance of all non-car modes to reduce greenhouse gas emissions over the next decade.

Mode	**Journeys**	**%**
Car drivers	1,027,149	72.6
Car passengers (car-pooling)	79,023	5.6
Public transport	196,721	13.9
Walked only	50,894	3.6
Bicycle	18,909	1.3
Other modes (taxi, motorbike, or truck)	42,793	3.0

(Source: ABS, 2006 Census)

Table 1: Journey to work in Melbourne, 2006

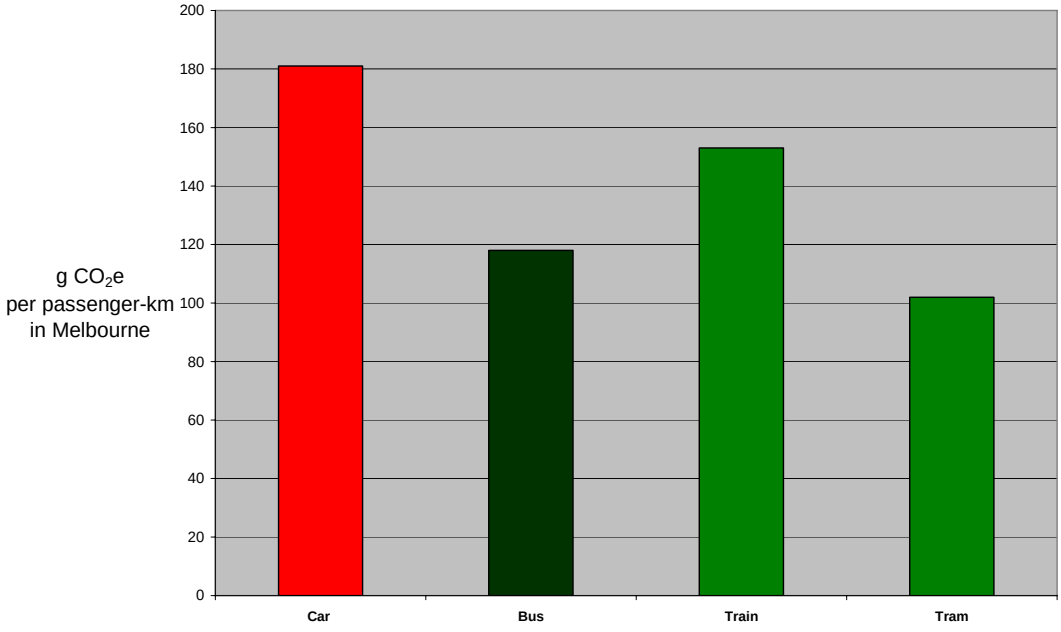


(Source: ABS, 2006 Census)

Fig. 3: Distribution by mode of non-car work journeys in Melbourne, 2006

Fig. 4 shows approximate greenhouse emissions from different transport modes in Melbourne. Even at current occupancy rates, the average trip by public transport in Melbourne has lower greenhouse emissions than the same trip done by car.

Following requests from the City of Melbourne, DoI and Metlink have now made more information on occupancy rates available. Better estimates of public transport greenhouse emissions have now been prepared, but are not included in this analysis. The recent DoI work explores the likely changes in greenhouse emissions from different scenarios for modal shift to public transport.



(Sources: See note below[5]).

Fig. 4: CO_2e emissions by most-used motorised transport modes in Melbourne

Improved occupancy rates for both cars and public transport would reduce greenhouse emissions from transport in Melbourne. However, international experience shows that attempts to improve occupancy rates for public transport are more likely to be successful.

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[5] The estimates of greenhouse emissions for different transport modes in Melbourne are approximate. Information on the energy used by different transport modes In Australia comes mainly from the BTRE and is aggregated for all cities. To disaggregate the data for Melbourne:

- the fuel efficiency of the Melbourne car fleet is taken to be the same as the Australian average
- the car occupancy rate (over the whole week) is taken as 1.4. This is derived from occupancies given in police accident reports (Moriarty, pers. comm.)
- occupancy rates for public transport in Melbourne are not readily available, so all public transport emission rates are only rough estimates. Estimates of passenger-km for different modes are taken from Kenworthy & Laube (2001): *Millennium Cities Database for Sustainable Transport, UITP, Geneva*
- electricity for Melbourne's trains and trams is generated using brown coal which generates more than 30% greater CO_2e emissions for the same energy output as the 'black coal' electricity that powers Sydney trains (Chris Mardon, pers. comm.)
- the energy per pass-km required to run Melbourne's trams is estimated as two-thirds that used by trains (Kenworthy & Laube).

Data comes from Bureau of Transport and Regional Economics (2005): Greenhouse Gas Emissions from Australian Transport: Base Case Projections to 2020, Dept of Environment and Heritage, Canberra; and from ACG (2006): Australian Transport Facts, Australian Transport Energy Data and Analysis Centre, Mulgrave.

Crystal Legacy, Leigh Glover and Nicholas Low did the primary analysis of emissions data at GAMUT.

Proven ‘technologies’ exist to improve travel times and convenience of public transport. These have achieved reductions in high car-use cities that are very similar to Melbourne.

Short-term strategies for changes to public transport operations to shift more travel from car to public transport are described below in Section 3.

Walking and cycling are clearly better, in greenhouse terms, than either driving or using public transport. Walking is important, both for whole journeys and as part of most public transport journeys.

Even allowing for wintry weather on the August census day, cycling for transport purposes in Melbourne is at levels well below its potential. Census data shows that cycling to work in Melbourne dropped by more than 75% between 1951 and 2001. This fall was the result of an almost total collapse in ‘transport’ cycling in the suburbs offset by some growth in the inner city. There is evidence (from local councils and from Bicycle Victoria) that cycling numbers at some inner-city locations have increased substantially since 2001, but this improvement is coming off a very low base.

The major obstacle to growth in both walking and cycling is the priority given in most road management decisions to maintaining and improving conditions for the movement of large volumes of car traffic.

E. Co-ordinated policy approach required

There is one over-riding lesson from the past half-century of living ‘experiments’ in the management of transport systems in cities around the world.

Experienced researchers[6] have concluded that growth in car-use slows significantly only when there are coordinated disincentives for car use and incentives for the alternatives, and an effective long-term plan to manage the location and shape of urban development.

Vuchic argues that many cities try to provide incentives for cars and for public transport by investing in both freeways and public transport. The outcome is generally a continued poor mode share for public transport but with increased spending on both modes. He also notes that some cities, though rarely in any explicit way, offer disincentives to public transport through deterioration, decrease or discontinuance of services. Despite many claims to the contrary, this is the hard truth of the Melbourne experience over most of the past 50 years.

No city in Australia has developed the necessary coordinated transport policy framework of disincentives for cars and incentives for the alternatives, though Perth has made some positive moves in this direction. So, it is no surprise that current ‘measures’ to reduce transport greenhouse emissions, reported by the AGO, are on track to achieve so little. They are simply fragments of uncoordinated policy continually undermined by the many policy and program decisions that are working in the opposite direction.

[6] For example, Vuchic (1999): Transportation for Livable Cities, Center for Urban Policy Research, New Jersey

2. Costs of car-dependence in Melbourne

Spatial inequalities

An index of the spatial distribution of financial and social vulnerability to oil-price rises in Australian cities, developed by Griffiths University's Urban Research Program[7], has thrown new light on the obvious costs of car-dependence in middle and outer suburban Melbourne.

A high score on the so-called VAMPIRE index means greater vulnerability: higher household exposure to rising costs of both urban travel and housing interest rates and lesser financial capacity to absorb these increases[8].

In Melbourne, as shown in Fig. 5, the concentration of vulnerability to increases in the cost of housing and transport is in the outer suburbs away from the rail lines. Areas that scored particularly highly include new housing estates, such as Caroline Springs and Hillside in the Melton East growth corridor and areas such as Narre Warren and Berwick in the Casey growth corridor.

The researchers conclude that:

> public transport systems appear to be playing a critical role in ameliorating mortgage and oil vulnerability in Melbourne (p.26).

Another group vulnerable to increased travel costs are those at the lower end of the rental market. The ABS Social Atlas shows that there some areas with high concentrations of public tenants, such as West Heidelberg are particularly poorly served by public transport.

[7] Dodson & Sipe (2006): Shocking the Suburbs: Urban location, housing debt and oil vulnerability in the Australian City, Griffiths University, Urban Research Program, Brisbane.

[8] Car dependence is estimated by the proportion of JTW done by car and the average number of households with two or more cars. The proportion of dwelling units that are being purchased indicates exposure to interest rate rises, and median weekly household income is the indicator of vulnerability to increasing costs. These are mapped by census Collection Districts

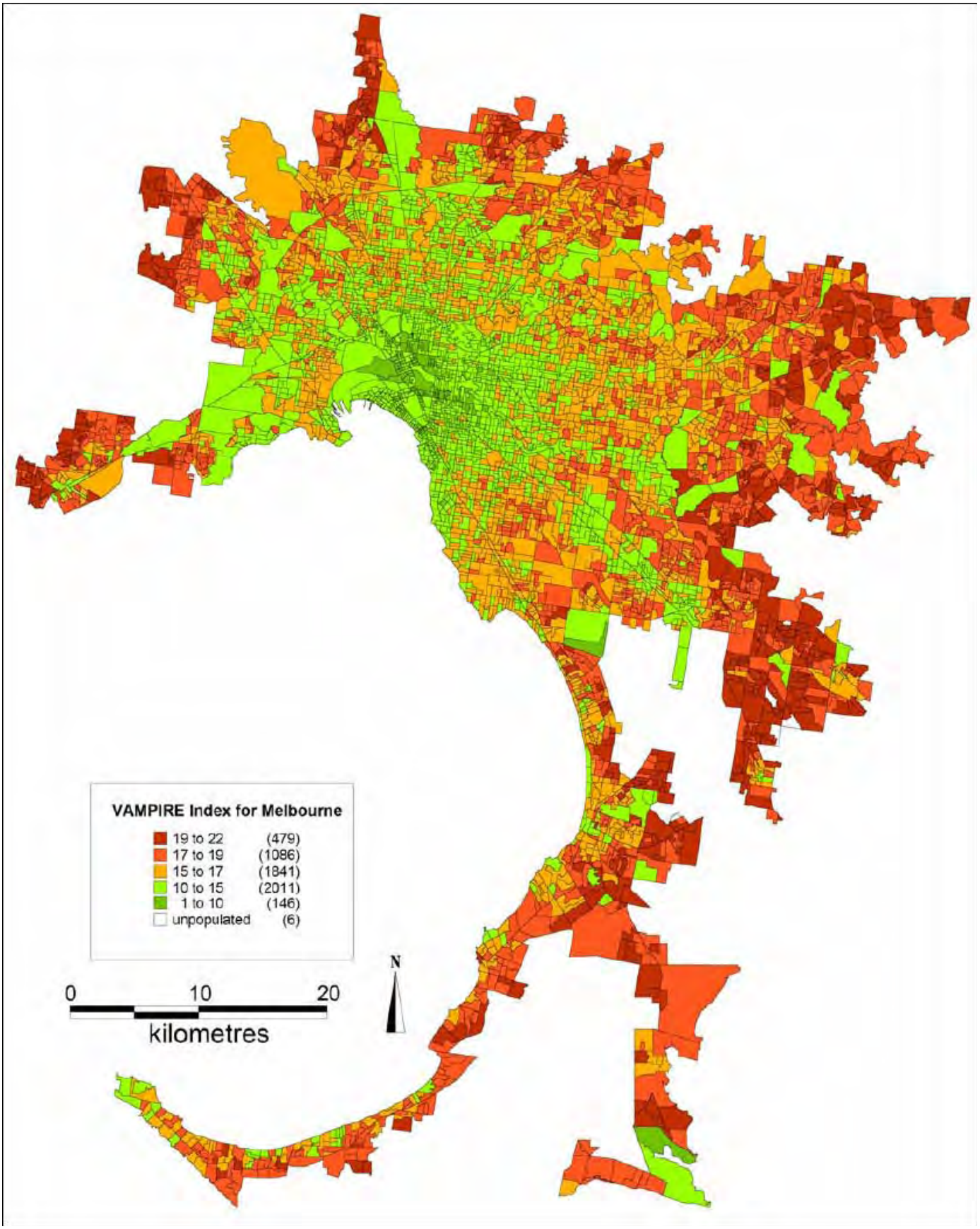


Fig. 5: Vulnerability to rising costs of travel and housing is greatest in outer-suburban Melbourne

Costs of car dependence

A direct result of car dependence in much of Melbourne is that many households own more than one car[9]. At times, there is one car for each adult member of the household.

The RACV gives its assessment of the costs of owning and running a car on its website[10]. As an example of the RACV calculations, owning and running a new small car, like a Holden Astra or a Toyota Corolla, will cost around $150 per week (or $7,800 per year) at 2006 average fuel prices.

Among other things, this assumes a loan is taken out for the whole cost and the car is sold after five years, and the car is driven the Australian average of 15,000 km per year.

The second (or third) car is unlikely to be this expensive. A more realistic scenario is a similar-sized car, but bought as a used car over five years old, run for 10 years until it has little or no re-sale value, and driven only 10,000 km per year. In this case, the total cost is around $95 per week (or $4950 per year).

By contrast, the current price of an adult yearly Zone 1+2 Metcard is $1633, an affordable option that would be worth considering if public transport offered comparable convenience to the car.

There are over 600,000 households in Melbourne with two or more cars. Removing one car from each of these households would cut Melbourne's car fleet by one-third. The greenhouse emissions from these cars are equivalent to around 1.5 million tonnes of CO_2 per year.

[9] In 2001, 65% of households with two or more members reported having more the one car (ABS).

[10] http://www.racv.com.au/wps/wcm/connect/Internet/Primary/my+car/advice+%26+information/car+operating+costs/

How to improve public transport use in Melbourne

The previous two sections have made the case for better use of public transport in Melbourne. This case is little different to many other reports on transport in Melbourne in recent years: the latest in this long line being the report by the Commissioner for Environmental Sustainability.

Most of these past reports lack a clear analysis of the reasons for public transport failure. This section looks at the current performance of public transport in Melbourne and the steps that are required to realise the potential for increased patronage.

3.1. Growth in patronage?

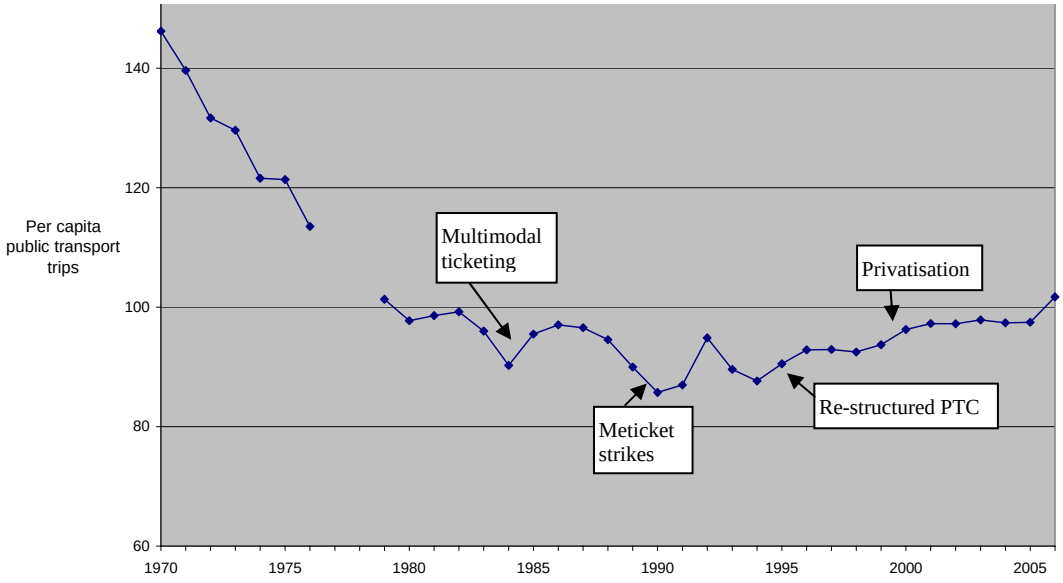
Much recent media attention is drawn to the experience of passengers in crowded trains or those unable to get aboard their chosen train. The government argues that the system is struggling to handle an "18.4% growth in public transport use over the past two years" (*The Age*, 11 May 2007).

These look, at first glance, like signs that the management of the system is on the right track at least with respect to attracting increased train patronage.

But, as detailed in Appendix 2, the reported growth figure does not take into account raising population (which would, all else being equal, lead to a predictable rise in trip numbers). In addition, some of the claimed growth is simply an artefact of changes in the way patronage numbers are estimated from ticket sales.

Using DoI figures, corrected for population growth and for changes in measurement techniques, growth in public transport use is around 4.4% in the last two years.

Nevertheless, this increase is larger than anything experienced in more than 15 years. A major component of this change, using corrected figures, is substantial growth in per capita train patronage. On DoI and operator estimates, which again are not verified by physical counts, there has been an increase of 13% in the two years since July 2004, and a rise of over 9% in the year since July 2005. It is clear that more people are wanting to use Melbourne's trains.



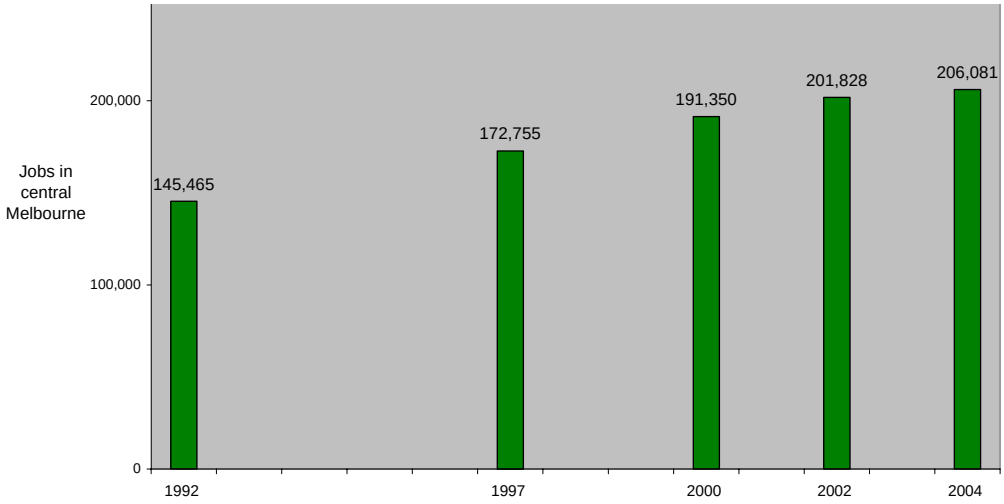
(Source: operators' Annual reports)

Fig. 6: Changes in per capita public transport use in Melbourne since 1970

Where is this new train patronage coming from?

DoI analysts accept, at least off the record, that most new train passengers have come to public transport for reasons that are external to the management of the system itself.

One major influence is the growth of employment in central Melbourne – up 42% between 1992 and 2004. For people in these jobs, many of whom live in the gentrifying inner and middle suburbs, the train is a practical alternative to the car.



(Source: Melbourne City Council, Census of Land Use and Employment (CLUE)

Fig. 7: Jobs in central Melbourne[11]

When petrol prices began to rise, people with jobs in central Melbourne had an alternative to driving. But, the lack of public transport options for many has limited the shift to public transport.

National market research by AC Nielsen in late 2005[12] reported that 84% of respondents were changing their behaviour in response to recent petrol price rises. Of these, 59% were trying to combine car-trips to save fuel and 29% were cutting back on non-essential spending. Only 19% said they were using public transport more, 8% had bought a more efficient car and 2% were switching to bicycle or motorbike.

Prof. Graham Currie from Monash University has attempted to calculate the relationship between petrol price rises and growth in public transport use in Melbourne[13]. Although hampered by the problems of accurate patronage data described above, this work estimates growth in train patronage of more than 4% for every 10% rise in petrol price. This is probably an over-estimate because it does not allow for other influences like the changes in employment patterns.

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[11] Central Melbourne in this context, includes the CBD grid plus a triangle bounded by Victoria Parade, Latrobe and Queen Victoria Market, the four city blocks between the Yarra River and the CBD grid (including Federation Square, Flinders Station, Aquarium and the World Trade Centre), and a part of Southbank.

[12] AC Nielsen (2005): AC Nielsen Fuel Price Survey Results for Australia – November 2005, Sydney

[13] G. Currie & J. Phung (2006): Exploring the Impacts of Fuel Price Increases on Public Transport Use in Melbourne, paper presented at 29th Australasian Transport Research Forum. http://www.patrec.org/atrf/index.php

Crowded trains – deteriorating reliability rather than patronage growth?

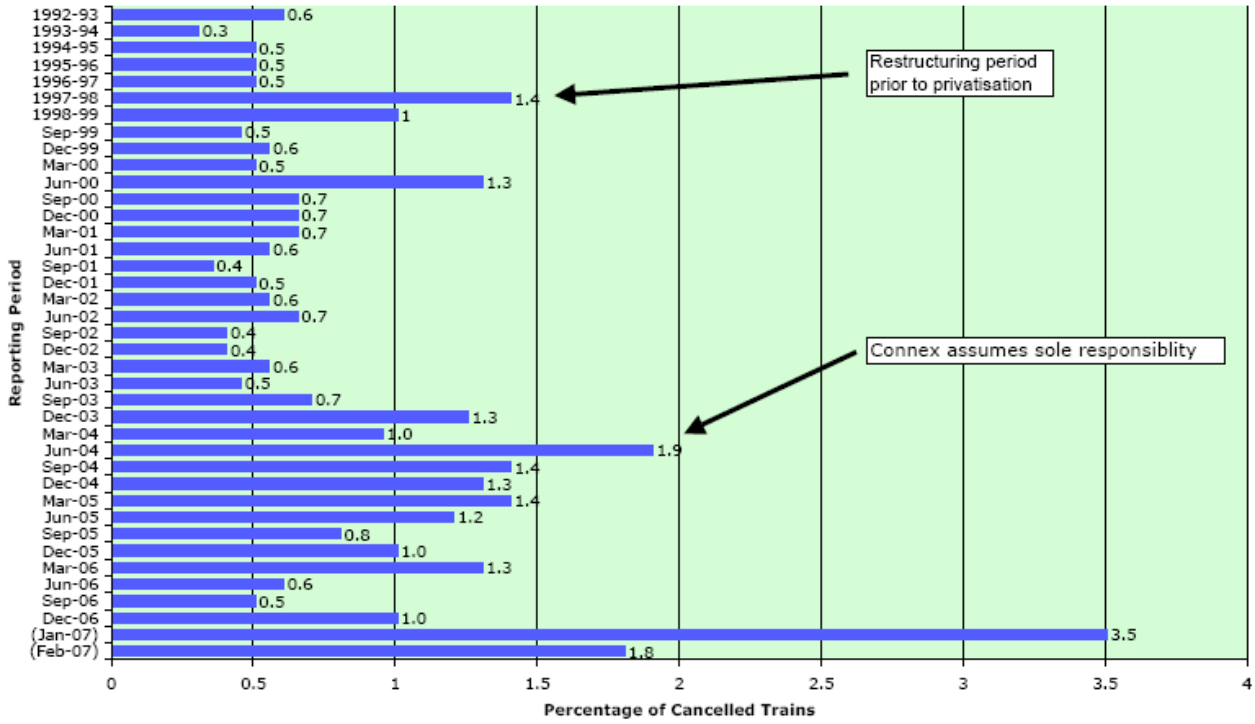
The growing frustration of train passengers with crowded trains in recent months does look like corroboration of the scale of reported patronage growth, but there is another factor at work.

In most peak periods, there are some cancellations, and those trains that do run are often late. Even a train that meets the current standard for on-time running (by being 5 minutes 59 seconds late) may have two trainloads of passengers waiting for it[14].

As the two graphs opposite show, the reliability of the system has declined consistently since privatisation. Weakening of the definition of 'late running' in 1999 makes it impossible to compare current punctuality with the period before the disruption caused by preparations for privatisation, but this can be done for cancellations.

Connex claims that the main cause of the declining punctuality is longer loading times due to increased patronage, but this excuse cannot be used to explain the rise in cancellations.

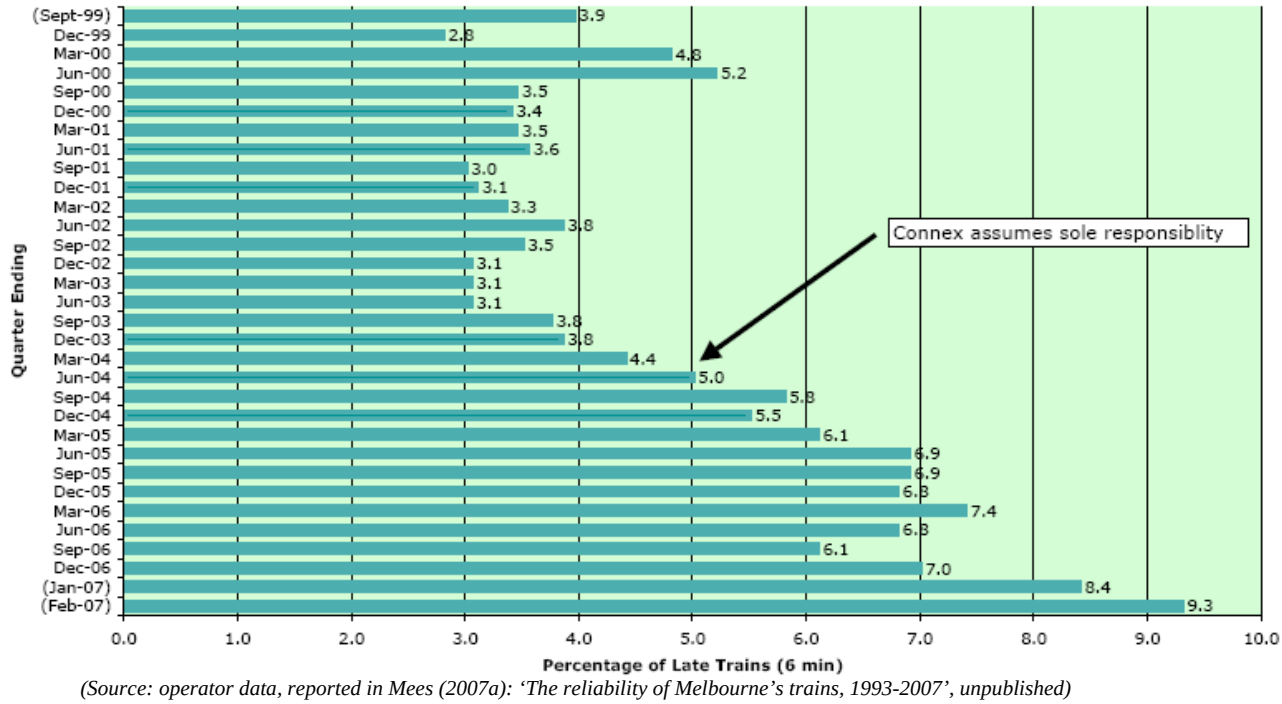
[14] The Auditor-General recommended in 1998 that the standard for on-time running be raised from 5 minutes (the standard before privatisation) to 3 minutes (the current standard in Perth), at least for peak services. Instead, the standard was relaxed to 6 minutes when the new franchises began in 1999.



(Source: operator data, reported in Mees (2007a): 'The reliability of Melbourne's trains, 1993-2007', unpublished)

Fig. 8: Cancellation figures for Melbourne train services 1993-2007

Cancellations have worsened since privatisation compared with operations under the old PTC.



(Source: operator data, reported in Mees (2007a): 'The reliability of Melbourne's trains, 1993-2007', unpublished)

Fig. 9: Punctuality figures for Melbourne train services since privatisation

Punctuality has worsened since Connex took sole responsibility in early 2004.

3.2. A new model for public transport planning in Melbourne

How should public transport in Melbourne be organised to meet the current growth in demand and the future increases in patronage required to reduce greenhouse emissions?

Current public transport services in Melbourne are the historic legacy of fragmented and competing train and tramlines largely built for a CBD-commuter market of declining relevance, and a confusion of bus routes that cater for a largely captive market of pensioners and school students. Timetables and route layouts are complex, confusing and unattractive to users. Basic operating patterns were set during the first half of the 20th century, and they have become increasingly inefficient through decades of tinkering.

Any debate about the future of public transport has to recognise the differences between the old fragmented 'commuter' model, which is still guiding public transport planning in Melbourne, and the modern 'urban network' model used in more successful cities.

The modern 'urban network' meets 21st century urban travel needs.

The main principle behind the 'urban network' model is to use rigorous planning and high standards of service delivery to achieve maximum flexibility for travellers.

The **flexibility** for users is created by making it easy for travellers to transfers between different services or modes. A regular grid is the most efficient service pattern, offering a huge range of possible destinations via a single transfer.

The **rigorous** planning and **high standards** of service delivery are essential to make the system work for the greatest numbers of potential users, and to make the best use of existing tracks and vehicles.

The steps in developing a network are to:

- develop a multimodal timetable and route layout, primarily focussed on maximising the convenience of passengers. Across Melbourne, this would mean either high frequency services (requiring no timetable for transfers) or tightly coordinated timetables for train, tram and bus connections.

  The existing train and tram lines would be the backbone of such a system with supporting buses operating on as close to a regular grid as road and rail layout and topography allow;

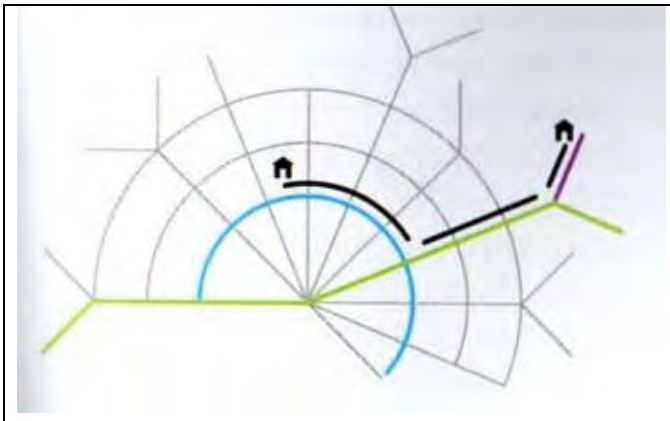
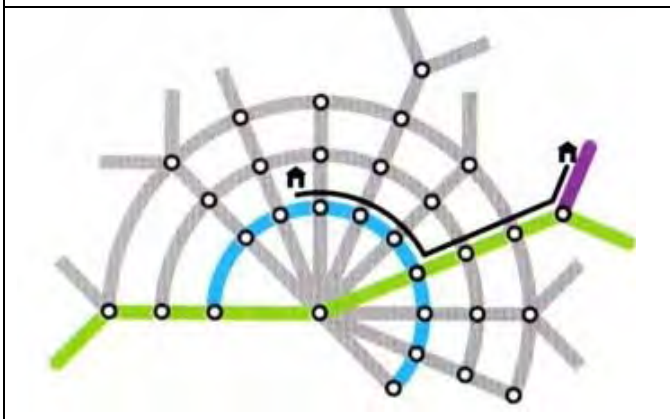
- identify any additional infrastructure, vehicles and staff needed to efficiently deliver the timetable;

- prioritise budget allocations to deliver the new timetable and route layout.

The apparent density of services seen in the inner and middle suburbs is often confused with existence of a high-quality network, making it easy for residents of inner and outer Melbourne, and their political representatives, to be set against each other in the competition for public transport improvements. A real urban public transport network would improve cost recovery and so provide additional resources to meet outer suburban public transport needs.

The beginnings of this sort of network planning for Melbourne was done for the MTF by Rolf Bergmaier, the designer of the Zurich public transport network, in 2001[15]

[15] E. W. Russell, R. Bergmaier (2001): Melbourne's Northern Gateway: an Integrated Approach, MTF

	**An unlinked collection of low-frequency routes (a non-network)** The area you can reach by a simple journey is restricted to walking distance from your closest line. Users need to have detailed information about timetables. Transferring is difficult and crossing points have little value. This is the case with many bus-train 'connections' in Melbourne today.
	**Some high-frequency services** Good service along high-frequency lines makes some transfers are more attractive, but only in the direction towards the high-frequency service. Increased frequencies on the best sections will do little to improve general conditions.
	**The full network effect** Many lines operating at high frequencies, or with coordinated timetables, create a **network**. In the same way that motorists use roads, travellers can go anywhere, anytime. Transfers open up many travel options.

(Source: HiTrans (2005): Best Practice Guide 2: Public Transport – Planning the Networks; EU. See www.hitrans.org)

Fig. 10: Creating a network using the modern 'urban public transport' model

There is no network plan guiding public transport service delivery in Melbourne.

Some telltale signs include:

- the apparent randomness of bus operating hours and route patterns;
- the complete separation of the 'Nightrider' bus lines from the day-time system;
- the perversity of the midday direction change for trains in the City Loop.

3.3. Obstacles to establishing a modern passenger-oriented 'urban network' in Melbourne

Proposals for modern 'seamless' public transport in Melbourne are not new. Why is it not happening?

Institutions and governance

A recent review of factors contributing to 'best practice' in urban transport, published in 2005 by engineers from the University of Toronto,[16] concluded that, while adequate finance, infrastructure and urban planning are important, the critical requirement for increased use of public transport is effective 'governance'. Good public transport needs an organisation for planning and service delivery with the necessary powers, skills and responsibilities.

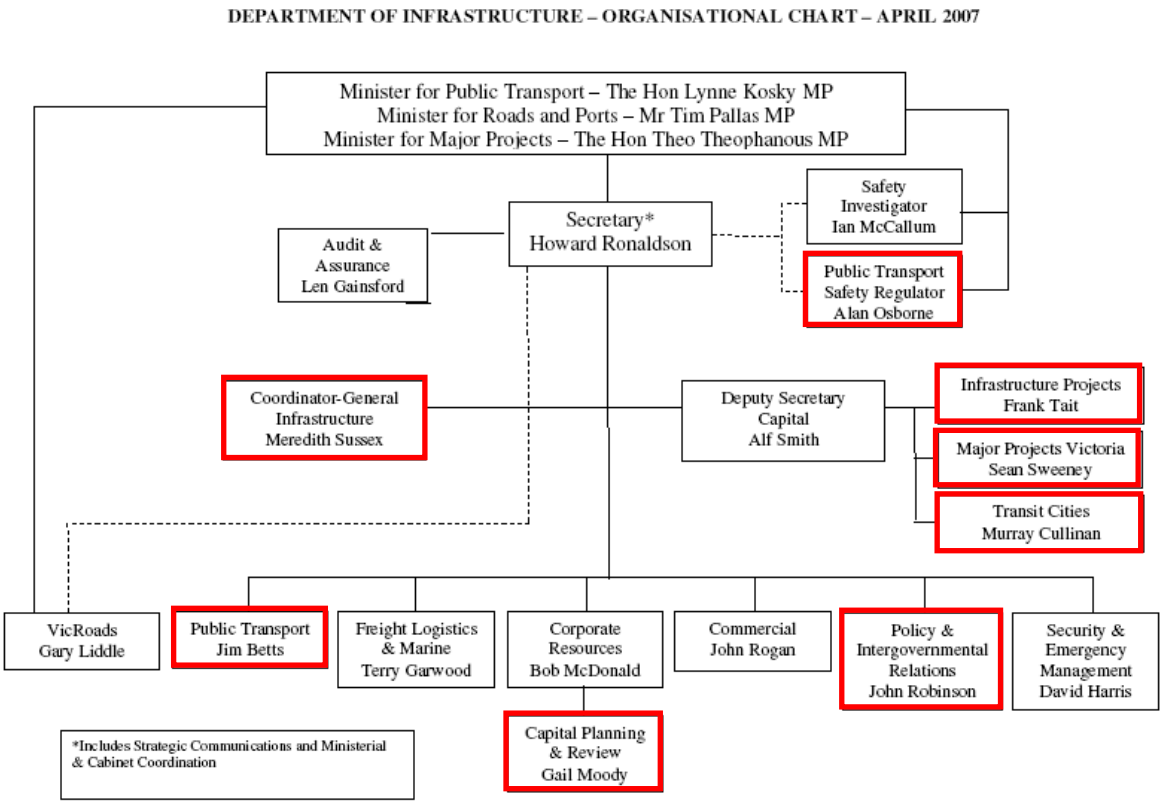


Fig. 11: The current DoI organisational chart

As seen here, the current DoI organisational chart shows up to eight functional units (marked in red) that conceivably have a role in planning improvements to public transport services. All are at a similar level in the hierarchy. Compare this to the simple and direct lines of communication between VicRoads and the Ministers.

This complex picture is compounded further by the structure of the franchise arrangements with Connex and Yarra Trams. The franchisees are not simply the recipients of commands from the DoI. Through the nature of their operational

[16] C. Kennedy et al. (2005): The Four Pillars of Sustainable Urban Transportation, Transport Reviews, Vol. 25, No. 4, 393-414, July 2005.

responsibilities and the intricacies of the contracts, they are also important players in any process of planning for future public transport services.

Public transport 'governance' follows a common model in cities that have increased public transport use. In Perth, Vancouver, Munich and Zurich, for example, a small and focussed public agency has developed the plan for the modern urban public transport network.

In successful cities, the private sector often plays a role in the delivery of the services set out in a modern network plan. But, their role is much more constrained than is currently the case in Melbourne. Without these constraints, the cost of operating public transport in Melbourne has grown significantly since 1998 and the degree of risk faced by the private companies has been reduced with successive restructuring of the franchises[17].

The argument for ending the current franchise arrangements in Melbourne when they expire in 2008 does not rely on an ideological preference for public ownership. It does not support a return to the operating practices of the old Public Transport Corporation.

Simply, the current governance structure for public transport in Melbourne is too cumbersome and unfocused to deliver a modern network. Like all the modern cities that have delivered sustained growth in public transport use, we need a public agency that has the powers and the single-mindedness to drive the reorganisation of Melbourne's fragmented collection of public transport lines into a modern urban network.

The need for new skills in Melbourne

Beyond governance, a further obstacle to developing a modern public transport network in Melbourne is the level of expertise among current transport planners. The current senior managers and planners are have either spent their whole working life holding together the old, fragmented collection of train, tram and bus lines, or they were brought in to administer the complex franchise agreements.

Few, if any, have experience of managing successful modern public transport.

A few examples will show how far current initiatives fall short of the basic requirements of a modern urban public transport network.

1. Smartbus

Smartbus is said to be the result of "extensive research", and it aims to:

> greatly improve the quality of public transport services in suburban communities as part of *Meeting Our Transport Challenges* (by providing) 'cross-town' bus services connecting train stations, shopping centres and other community facilities (DoI website).

An excerpt from the timetable for one Smartbus line – route no. 900 from Caulfield to Rowville via Wellington Road – shows how this new initiative has limited benefit to travellers.

[17] See Mees et al. (2006): Putting the Public Interest back into Public Transport, available at http://www.gamutcentre.org/gamut_debates.htm

Short transfer times are an essential part of a successful urban public transport network. But, even though the train and the so-called ‘Smartbus’ operate on the same 15-min frequency, transfer times are consistently long.

Monday to Friday

Stops	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM
1 Rowville	2.15	2.30	2.45	3.00	3.15	3.30	3.45	4.00	4.15	4.30	4.45	5.00	5.15	5.30	5.45	6.00	6.15	6.30	6.45	7.00
2 Mulgrave	2.21	2.36	2.51	3.06	3.22	3.38	3.53	4.08	4.23	4.38	4.53	5.08	5.23	5.38	5.53	6.08	6.21	6.36	6.51	7.06
3 Springvale Road	2.27	2.42	2.57	3.12	3.29	3.46	4.01	4.16	4.31	4.46	5.01	5.16	5.31	5.46	6.01	6.16	6.27	6.42	6.57	7.12
4 Monash Uni	2.35	2.50	3.05	3.20	3.37	3.55	4.10	4.25	4.40	4.55	5.10	5.25	5.40	5.55	6.10	6.25	6.34	6.49	7.04	7.19
5 Huntingdale	2.42	2.57	3.12	3.27	3.44	4.03	4.18	4.33	4.48	5.03	5.18	5.33	5.48	6.03	6.18	6.33	6.41	6.56	7.11	7.26
City Train dep. Huntingdale	*2.52*	*3.07*	*3.22*	*3.37*	*3.50*	*4.14*	*4.27*	*4.35*	*4.50*	*5.14*	*5.22*	*5.46*	*5.55*	*6.16*	*6.24*	*6.37*	*6.49*	*6.59*	*7.28*	*7.28*
6 Oakleigh	2.49	3.04	3.19	3.34	3.51	4.10	4.25	4.40	4.55	5.10	5.25	5.40	5.55	6.10	6.25	6.40	6.48	7.03	7.18	7.33
City Train dep. Oakleigh	*2.55*	*3.10*	*3.25*	*3.40*	*3.53*	*4.17*	*4.30*	*4.53*	*5.05*	*5.17*	*5.34*	*5.49*	*6.07*	*6.19*	*6.27*	*6.52*	*6.52*	*7.14*	*7.31*	*8.01*
7 Chadstone	2.56	3.11	3.26	3.41	3.59	4.18	4.33	4.48	5.03	5.18	5.33	5.48	6.03	6.18	6.33	6.48	6.53	7.08	7.23	7.38
8 Caulfield	3.10	3.25	3.40	3.55	4.12	4.34	4.49	5.04	5.19	5.36	5.51	6.06	6.21	6.36	6.51	7.06	7.04	7.19	7.34	7.49
City Train dep. Caulfield	*3.18*	*3.33*	*3.48*	*4.01*	*4.18*	*4.43*	*4.58*	*5.10*	*5.24*	*5.42*	*5.57*	*6.15*	*6.27*	*6.48*	*7.00*	*7.22*	*7.10*	*7.25*	*7.39*	*7.54*

Fig. 11: Part of the weekday timetable for the Wellington Road Smartbus

To see the problems with this timetable, imagine you want to travel from Monash University to the city at around 3pm.

The bus schedule means that you will face a choice of either a 10-minute wait at the nearest station (Huntingdale) or a 6-minute wait at Oakleigh after an indirect bus ride (taking 6 or 7 minutes to do what the train does in less than half the time). At Caulfield, you would still wait 8 minutes, but you would catch a later city train.

The same problem faces by travellers in the opposite direction, with a standard 7-minute wait at Oakleigh and 11 minutes at Huntingdale. During peak periods, the transfer times are sometimes shorter, but long waits are still common and there is no pattern to the interaction between the two services.

Unfortunately, such poor connections between buses and trains are common in Melbourne. Often, the rationalisation for this huge disincentive to public transport use is the difficulty in coordinating one bus route with trains at several stations. But, this is a poor excuse. In this ‘Smartbus’ example, not one of the three stations has a good bus connection.

In any case, using the modern urban network model, bus routes and frequencies would be designed to fit with re-modelled ‘clock-face’ train timetables to maximise the opportunities for easy transfers.

There is little incentive for the private operators of Smartbus or any other bus lines to improve coordination or to operate direct routes in order to create a network that will attract more passengers. Under current bus contracts, operators are paid by the distance and time their buses run, regardless of the number of passengers carried. These contracts expire at the end of 2007. Although some performance incentives based on patronage are being considered, the industry expects that the primary basis of the new contracts will remain the same.

2. Delivering service integration through the re-development of Camberwell station

Plans for re-development of Camberwell station have pitted residents against the government in a familiar battle over the medium-density aspirations of *Melbourne 2030*.

Missing from any of the makeover plans are measures to bring tram and train services together at this important transfer point.

Currently the tram stop in Burke Road (no. 64 on the map in Fig. 12) does not allow for quick and direct transfer to the trains. It is located, according to the Metlink trip planner, 3 minutes walk from the station.

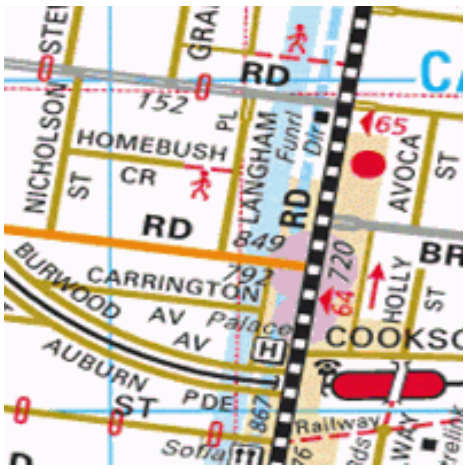


Fig. 12: Existing tram stop (No. 64) at Camberwell station

If Melbourne public transport managers were working with a modern urban model, then they would recognise the opportunity provided by the Camberwell re-development, move the tram stop, and offer easy access from the Burke Road to the station. This is how it is done in Freibourg in Germany (the tram stop is at the top of the stairs):

Fig. 13: Direct access from trams to trains in Freibourg

3. The third track to Dandenong

The $1 billion proposal for a third track to Dandenong is a centrepiece of *Meeting our Transport Choices.* But, professional transport planners and community organisations have pointed out that significant capacity for extra trains exists in current track layout, which includes four tracks between Caulfield and the city and, importantly, third tracks and platforms and associated signalling at Oakleigh and Dandenong.

The Dandenong line carries approximately 60,000 passengers a day. By international comparisons, this makes it a lightly loaded rail corridor. In European and Canadian cities, two-track rail corridors routinely carry loads more than ten times as large.

Paul Mees has offered a simple description of how the existing track layout can support a timetable that allows 60-80% more passengers to be transported without requiring any additional trains, and without disrupting V-line services from Gippsland that share the track[18].

There are signs that some of this analysis is being adopted within DoI. However, while questions about infrastructure expansion continue to be considered without an urban network plan and a new multimodal coordinated timetable it is likely that considerable amounts of money will be spent without delivering the best possible service quality

4. Capacity of the Loop

The potential to improve rail services in peak periods is said to be limited because the City Loop is approaching capacity. This is simply wrong.

Before the Loop, many trains did not reverse their direction in the city but travelled into Flinders Street and Spencer Street and out on a line to the other side of the city. The Loop was built as a 'turning circle' to allow some trains to enter and leave the city via the same line, but other trains were still expected to operate in the old way, and the tracks to so this are still in place.

The old practice of 'through-running' has been largely abandoned, and so the current layout of tracks in central Melbourne is operating at around half its design capacity. There is no reason that 'through-running could not be resumed. In fact, from an urban network perspective, such service patterns offer more easily accessible destinations to potential travellers.

[18] Mees (2007b): 'How to double the capacity of the Dandenong line without new infrastructure', available on www.gamutcentre.org

4. Understanding freight

After passenger cars, road freight is the second largest source of transport greenhouse emissions and its other impacts in urban environments are arguably even more severe then cars.

The potential success of any plan to reduce the impacts of road freight is diminished because we are 'flying blind' in our basic understanding of freight movement in Melbourne.

There are significant gaps in knowledge about the routes taken for different freight movement tasks in Melbourne, and the reasons underlying those choices.

The *Victorian Activity and Transport Survey* (VATS) and similar studies, although somewhat erratic in their timing and now apparently discontinued, have provided some data about the trip-making habits of Melbourne households. No comprehensive origin-destination or route-choice data has been collected for truck movements in Melbourne since 1964.

Data is sometimes collected on the numbers of trucks using particular roads and 'screen counts' of number plates give some localised information of localised route choices, and some generalised OD information for port container traffic is available from an SKM mapping exercise done for DoI in 2003. However, this is different to having good information about origins and destinations for the full range of freight movements, and for route-choice factors, such as toll avoidance, for which strategies other than building additional road capacity might be more effective.

There have been some moves to improve this with a survey of freight producers by Fotios Spiridonos' modelling group at DoI. This data is not yet available, but will no doubt be used in the Eddington study. Any analysis of new data will need to be done in a public and transparent way.

Whatever computer models are used to predict the future of freight, these are only as good as the data that is fed into them. Most projections for future freight volumes are simply extrapolations of existing trends. Many of the factors that led to previous increases in road freight have changed. Increasing fuel prices will have some dampening effect on freight demand. Rail freight volumes are now recovering from record lows. The previous decline in rail freight was a major contributor to rapid growth in road freight volumes. The current reversal of this trend will reduce the pace of future growth in road freight movements.

Also implicit in some projections of growth in freight volumes is an assumption that economic growth is directly proportional to increases in freight tonnage. Melbourne's increasing move towards a post-industrial economy will reduce the validity of this assumption.

5. Congestion and road-pricing

Many transport policies developed for Melbourne aim to reduce congestion.

Most attempts to reduce congestion by building more roads fail because they encourage more car use. This point appears to be better understood in Melbourne in recent years (see, for example, Carlo Carli's submission to the Eddington Inquiry, available on the Inquiry website).

However, the general ambition to reduce congestion needs to be considered carefully.

If a mode shift to public transport is a major goal of transport policy – as it must be to reduce greenhouse emissions – then 'worsening' congestion may provide a valuable incentive to change, if a public transport option is available.

In Vancouver, for example, the 1993 long-range transport plan, *Transport 2021* (see www.gvrd.bc.ca), set targets for increased public transport use and consciously proposed growing road congestion as one way to encourage the desired mode shift. The negative impact of this policy – increased cost for goods movement – was acknowledged, but the quantified estimate of these costs at around $185 million was seen as a "tolerable" (p. 43) when compared with the wider benefits of reduced car use for passenger travel.

Allowing congestion to grow is one way to change the 'price' of car travel. This can be done in a constructive way by changing priorities in road space usage to create, for example, tram-only lanes.

Other, more formal, road-pricing schemes charge more for peak periods, and so aim to shift the time of travel, but they do not necessarily try to cut total car use. Others, like the freeway-tolls in Melbourne and Sydney are simply taxes used to pay private-sector construction costs and, in practice, shift some travel from freeways to suburban arterial roads.

Few cities have overcome political resistance to road pricing, and, where this has been done, the results measured against environmental objectives are mixed.

In Singapore, where opposition to government policy is a lesser obstacle to policy change than in western liberal democracies, the combination of congestion-related tolls on the extensive freeway system and high taxes on car ownership has meant that those who can afford a car drive astonishing distances given the tiny size of the island state.

	Singapore	Melbourne
cars/1000 people	116	594
km/car	18,490	12,880

(Source: Kenworthy & Laube (2001): Millennium Database for Sustainable Cities, UITP)

Table 2: Car numbers and distances driven: Melbourne and Singapore, 1995

In London, Mayor Ken Livingstone was able to introduce a tax on cars entering central London and use the revenue for public transport because, for a long period before the introduction of the charge, only around 10% of people coming into central

London did so by car. The rest were happy to support a tax on the small, wealthy minority who could still afford to park in the City. This political equation does not yet exist in Melbourne[19].

One year after the implementation of the charging scheme, bus patronage into central London in the morning peak had increased by 44%, to around 116,000[20]. But, it is worth noting that bus patronage had been growing at the same rate since 2000. Over the period from 2000 to 2004, bus kilometres went up by one quarter and fares fell by 16% in real terms.

The 'Tube' remains by far the most popular way of moving in and out of central London. Even with the new growth in bus use, around five times more people travel into central London by train in the morning peak. In fact, fluctuations in train patronage, for reasons unrelated to the 'congestion' charge, were greater than the growth in bus ridership.

Enthusiasm for London-style congestion charging, and its relevance to Melbourne, needs to be tempered by an acknowledgement of the long-standing dominance of public transport in travel to central London and the political circumstances that this creates, and by recognition that the charge is only one of a number of changes that made public transport more attractive compared with the car.

The 2006 inquiry (see www.dft.gov.uk/about/strategy/eddingtonstudy) into long-term links between UK transport systems and economic productivity and growth, chaired by Sir Rod Eddington, strongly supported road pricing encompassing the costs of both congestion and environmental impacts, including greenhouse emissions.

The UK report may provide some hints on Eddington's likely approach to his current task in Melbourne. It emphasises the need to focus future investment in urban areas on points of high congestion. In this context, it is not clear if Eddington would describe any congestion that Melbourne experiences now, or in the near future, as 'high' when compared to the mammoth delays experienced on London's M25 ring road.

The UK report argues that many of the very high return schemes, in both road networks and in alternative modes, are small projects, with returns dropping off sharply beyond the £1 billion point (Vol. 3, p. 131).

In public transport, Eddington supports the Thatcher-era deregulation of bus systems in provincial UK cities, but thinks that better coordination of services is now critical in large urban areas where multi-trip journeys are more common.

While these latter two points might strengthen the hope that Eddington will not support the east-west link tunnel, it is important to remember the local political strength of the proponents of the scheme and the fact that the Government has chosen to ignore the recommendations of the 2003 draft NCCC Study.

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[19] VATS data from 1999 showed that 45% of all trips to central Melbourne on weekdays were by public transport and 42% by car. More recent information from the 2006 City of Melbourne's Central City Users Survey suggest that public transport use has grown considerably, but there is still a strong public perception the car access to the CBD should still be available to 'ordinary' motorists.

[20] Information from Transport for London (2005, 2006): *Central London Congestion Charging Impacts Monitoring: Third and Fourth Annual Reports.*

Appendix 1: Density & public transport potential in Melbourne

Many people appear impervious to the evidence about Melbourne's density and continue to hold a strong belief that Melbourne is a very low-density city, and that this supposed low-density explains our poor public transport performance.

Part of the problem is that the 'low-density' myth supports pro-freeway arguments and provides an 'external' explanation for public transport failure. The problem is compounded because density can be calculated in many different ways[21], and so any comparisons between cities have to be done carefully. The table below shows that other cities with similar densities have achieved greater levels of public transport use than in Melbourne.

	Overall urban density (per ha. in 1991: includes all land within the contiguous 'built up' area)	***Annual public transport trips per capita*** (unlinked)
Melbourne	16.8	97 (in 2004)
Toronto	23.7	233 (in 1990)
Vancouver	14.0	128 (in 2004)

(Sources: Mees (2000): A Very Public Solution; local transit operators)

Table 3: Urban density and public transport use in Melbourne, Vancouver and Toronto

Many influential public statements about the difficulties faced in making improvements to public transport in Melbourne use flawed density or urban boundary comparisons.

The authors of *Melbourne 2030* (in section 2.1), wrongly claim that Toronto's density is nearly three times greater than that of Melbourne[22]. And, both Jim Betts[23] and the IPA[24], in making an identical argument to reject the idea that Melbourne can learn from Zurich, say that Melbourne covers 100 times the area and has ten times the population of Zurich.

In fact, Zurich's enviable public transport system operates over the entire Canton of Zurich, an area of 1,834 km^2, and it serves a population of over 1.3 million. In comparison, Melbourne's urbanised area in 2004 was around 2,100 km^2 (*DSE Melbourne Atlas*) and the population was 3.6 million. Nothing in these numbers should suggest we couldn't learn from Zurich!

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[21] The crucial factor in any residential density calculation is the way the area of the city is defined. Some calculations use total land area, others exclude farms, parks, roads or other non-residential uses. Varying definitions of city area according to administrative boundaries can also lead to problems where the density of an entire urban region is compared to a smaller inner-city area.

[22] In the Newman & Kenworthy data, the Toronto urban area is defined by the Metro Toronto boundary (around one-third of the contiguous 'built up' area) and excludes many non-residential land-uses within this boundary, giving a result of 41.5 per ha.. The Melbourne calculation uses a much larger urban area defined by the whole metropolitan region and includes parks and industrial land, with the result that Melbourne's recorded density is only 14.9 per ha..

[23] Jim Betts, 'Truth and untruth', circulated to DoI staff on 27 February 2006, available at www.gamutcentre.org.

[24] Richard Allsop (2007): 'Victoria's public transport: assessing the results of privatisation', Institute of Public Affairs, available at www.ipa.org.au/files/ALLSOP_Transport.pdf .

Appendix 2: Estimating Melbourne's public transport patronage

In Melbourne, patronage is reported as 'unlinked' trips, which means that each transfer is counted as a separate trip[25]. However, with our time-based ticketing system, boardings do not match ticket sales because some passengers use a single ticket to make multiple trips.

The average number of separate boardings made on a single ticket is best determined through regular and systematic physical surveys of actual boardings. Checks on the numbers of actual boardings in Melbourne are limited: barrier counts at stations are unreliable, holders of unexpired tickets seldom use validating machines when transferring to trams, and physical surveys are conducted only sporadically. Instead, factors used to calculate the number of trips from sales of different types of tickets are simply 'estimated' by the operators[26].

Claims about patronage growth often ignore these changes in calculation methods.

A further distortion comes from an assumption that bus boardings have remained constant since 2003/04 even though there was a downward trend before the adoption of the new 'boardings per ticket' factor and a drop of 13% when the new factor was used.

Another source of inflation in patronage estimates comes from the use of gross patronage numbers without any correction for population growth. In this way, operators can claim patronage increases even when the proportion of travel carried on public transport remains the same.

Correcting for all these 'inflationary' tendencies, except for the probable exaggeration of bus boardings, a better estimate of patronage changes in recent years is an increase of 4.4% in per capita public transport trips.

[25] For example, a journey made by bus from home to the station, train to the city, and then a tram to work, counts as three 'trips'.

[26] These 'boardings per ticket' factors changed in the mid-1980s, in 1992 and in 2004. No detail of the basis for these changes is available publicly, other than claims that the new methods are more accurate. Each change resulted in increases in reported boardings: the 1992 change lifted the estimate of boardings by between 4% and 5%; the 2004 change raised estimates by around 2.5%.