Submission to the

Victorian Legislative Council Select Committee on Train Services

Prepared on behalf of the Australasian Centre for the Governance and Management of Urban Transport by:

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Executive Summary and Recommendations

The Inquiry’s consideration of the factors leading to and causes of failures in the provision of metropolitan and V/Line train services is welcome.

Urban transport policies of the past fifty years have been based on long-term reductions in energy costs and, to our great social and economic benefit, have led to a dramatic increase in the variety and number of physical exchanges that take place in the urban environment. Future energy use will be severely constrained by the urgent imperatives of greenhouse emissions reduction, peak oil and the global economic crisis. Adapting to these new realities, while maintaining the quality and opportunity for physical exchanges in the urban environment, will require new levels of public transport use. This, in turn, will require new expectations of the quality of public transport service that must be delivered by State transport agencies.

The actual growth in public transport patronage in Melbourne in recent years represents only a small proportion of the shift to public transport that is required to meet the challenges of these new environmental and economic realities.

The recent experiences of over-crowding and high levels of service disruption on metropolitan services, in our view, reflect a systematic failure of the planning and management of public transport services in face of foreseeable external events such as the growth in CBD employment and rising petrol prices.

With the notable exception of Perth, public transport agencies in Australian cities have, to date, largely failed to use available resources to design and deliver services that offer effective competition with the car, and so create and develop public and political support for significant expansion of public transport services.

Cities in Canada and Europe have succeeded in creating urban public transport systems that more effectively compete with car, even though they share many characteristics such as wealth, high car ownership or dispersed suburban form that are used to excuse low public transport use in Australian cities.

Using best-practice international experience and local data, we argue that the key actions that must be taken to improve Melbourne’s public transport services are to:

- Freeze funding for expansion of urban road capacity.
- Recognise the failure of the ‘partnership’ and ‘franchising’ privatisation models to provide clear lines of accountability and responsibility for service planning, timetabling or maintenance and capital works programs; and, if private sector involvement in service provision is to continue, develop a more robust ‘sub-contracting’ model.
- Establish an independent public agency to prepare metropolitan and regional transport plans that include as a minimum:
  - Reorganisation of existing services into an effective integrated network built around reliable, high frequency service corridors and transfer points designed to international standards.
  - Monitoring of changes to access by public transport to social and economic opportunities for a range of user groups.
- Establishment of measurable targets for shift of mode share away from car travel across metropolitan Melbourne and in regional Victoria.

- Development of better mechanisms for contestable evidence-based policy development. The significant shifts in policy and practice which must take place in very short timeframes will require the support of both the expert policy community outside government and the wider public.

In support of these recommendations, this submission provides evidence and analysis from the work of GAMUT researchers in three key areas:

1. A picture of the current performance of public transport operational and planning agencies in Melbourne.

2. Evidence showing that coordinated service planning is a common feature in cities with successful public transport.

3. A summary of the key features of network planning that is required for efficient and effective use of both capital and operational resources for urban public transport.
The current performance of public transport in Melbourne

In late 2007, GAMUT researchers examined long-term trends in urban passenger travel in Australian cities in an analysis of three decades of census data from 1976 to 2006 for the journey to work. While the journey to work represents only one part of the urban transport travel patterns, it is important because it is a key component of the peak travel which gives rise to calls for increasingly expensive road and rail infrastructure. It is also one of the surprisingly few parameters of urban travel behaviour for which there is reliable longitudinal data.

The report can be found in full at www.abp.unimelb.edu.au/gamut/pdf/census-travel-to-work.pdf.

In relation to public transport, the key findings of this report were that:

- There has been a dramatic increase in the number of cars driven to work each day in Australia’s capital cities, with a total increase of 1,439,024 cars, or 70.1%, between 1976 and 2006;

- The most important cause of the increase in car use is a shift away from more sustainable transport modes – public transport, walking and car-pooling.

  In Sydney, Melbourne, Adelaide and Hobart, mode shift accounted for the majority of the growth in car use, ahead of increases in the size of the workforce. In the other capitals, rapid population growth was the biggest factor in increased car travel, but mode shift still accounted for nearly half of the growth in car use.

- Public transport’s share of work travel has declined in all cities over the three decades, but at different rates. The biggest decline was in Melbourne; the smallest decline in Sydney and in Canberra (where public transport use was already low in 1976). However, public transport’s mode share has begun a modest revival in the last 5 to 10 years, except in Sydney and Hobart.

The report gave a brief overview of the likely causes of the observed performance of the passenger transport system in each city. A summary of the section dealing with Melbourne’s performance is provided here:

When the different cities are compared over the three decades, Melbourne stands out as the worst performer, with the largest increase in car driving, and the largest declines in car-pooling, public transport and walking. There are now more cars on the road transporting people to work in Melbourne than in Sydney despite the latter’s much larger workforce. Melbourne now has the lowest rate of car-pooling of all seven cities, the lowest rate of usage of public transport modes other than heavy rail, and the third-highest rate of car driving (after Adelaide and Perth). Owing to lower rates of car-pooling and walking, the share of workers who drive is higher in Melbourne even than in Canberra and Hobart!
There are three main reasons for Melbourne’s poor performance:

- Melbourne has built more lane-kilometres of urban freeway and tollway since 1976 than any other Australian city.

- Melbourne has built no significant extensions to its suburban heavy rail system over this period: the last new line was the Glen Waverley line, which opened in 1930.

- Melbourne historically has had remarkably poor public transport management that has worked against coordinated operations of the different modes, a situation exacerbated by the privatisation of trains and trams in 1999. An account of this history can be found in Stone (2008), which can be viewed at [http://hdl.handle.net/1959.3/36049](http://hdl.handle.net/1959.3/36049).

Current Victorian government transport plans include expensive public transport infrastructure projects, but make no effective change to its broad approach to the design and operation of public transport services, and so a continuing decline in Melbourne’s performance relative to other Australian capitals is likely. In addition, the Victorian Auditor-General has noted that subsidies to Melbourne’s public transport operators have doubled in real terms since privatisation in 1999.¹

Part of the reason for some recent positive reporting of Melbourne is the turnaround since 2001 in public transport’s share of work travel, particularly on the rail system. But, this improvement represents a rise in public transport’s mode share of 0.8%, less than was achieved in the same period in Brisbane, Adelaide, Perth and even Canberra. And despite reports of record-breaking rail patronage, the absolute number of people taking the train to work in Melbourne in 2006 was only 9% higher than in 1976. In Sydney, despite the recent patronage decline, the 2006 figure was 21% higher than the 1976 figure. In Brisbane, the equivalent increase was 58%. In Perth, the number of rail commuters in 2006 was four times the 1976 total.

Lessons from successful cities: building an alternative to the car

Internationally and in Australia, it is surprising how few urban transport policy initiatives have been subjected to a rigorous analysis of their impact on travel patterns.

A definitive measure for success in urban passenger transport policy, using both environmental and economic criteria, would be long-term reductions in per capita car travel in favour of more efficient and sustainable modes: high-occupancy public transport, walking or cycling. Unfortunately, the available data does not allow reliable international comparisons using this measure, particularly in relation to the sort of large-scale policy interventions that are the subject of the current Senate Inquiry.

However, using a slightly less rigorous definition of ‘success’ – namely evidence of a shift in the share of total urban passenger travel away from the car to more sustainable modes – Zurich, Ottawa and Vancouver can claim to be public transport success stories.

The following brief analysis of transport policies and their outcomes shows that there has been significant investment in public transport infrastructure in these cities ahead of road construction, but success has been only achieved because this infrastructure spending has been combined with a particular approach to the design and implementation of public transport services. This approach is known as ‘network planning’ and its main attributes are summarised in Appendix 1.

1. Zurich region, Switzerland (pop. 1.3 million)

Car use is increasing in all European countries, but the rate of increase is lowest in Switzerland (Pucher and Lefèvre 1996). The Canton (or state) of Zurich has the lowest rate of car use in the nation.

The 2000 national census recorded the mode share for the journey to work in the Zurich region as 38.9% by public transport, 36.7% by car (as driver or passenger), 14.9% walking, and 7.9% by bicycle. The approximate mode share figures for all trips within the Zurich region are 29% of trips by individual motorised transport, 52% by walking and cycling (mainly walking) and 18% by public transport.\(^2\) Importantly, Zurich is also the only Swiss region where the share of trips by car is actually falling – and has been since the 1990 census (ZVV website 2008).

Zurich is particularly significant because it’s the wealthiest region in one of the wealthiest nations on earth, but also because the Canton as a whole is spatially dispersed, with around 1.3 million residents spread across 1729 sq. km (Swiss Federal Statistics Office 2008). The Melbourne ‘urban centre’ covered 2153 sq. km at the 2006 census and housed 3.4 million people (ABS 2007).

The principal factors behind these results are:

- the provision of an excellent-quality multi-destinational integrated public transport network serving the whole Canton, delivered by a single public agency, the ZVV;

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\(^2\) Calculated from the average number of trips by each form of transport reported from the 2005 Transport Microcensus (SFSO)
a virtual moratorium on major new roads in the City of Zurich (equivalent to our inner suburbs) for around three decades;

implementation in the late 1970s and 1980s of a rigorous program of providing absolute on-street priority for trams and trunk bus routes in the City of Zurich. This program has been so successful that there is almost no difference between peak hour and late evening running times for trams.

(for details, see Mees 2000, ch. 5)

2. Ottawa, Canada (pop. 0.85 million/1.1 million)

The 2006 Canadian census results, released in April this year, showed that Ottawa had the lowest rate of car driving for trips to work, at 60.4% of trips (Statistics Canada 2008). This figure is also lower than any Australian city, the lowest figure being Sydney, with 65% and the highest Adelaide, with 76% (Mees et al 2007).

Although detailed comparisons are made difficult by the fact that the Canadian census has only included a question on the mode used for the journey to work since 1996, the key difference between Ottawa and Australian cities is that public transport’s mode share is higher than in the early 1970s in Ottawa, but lower in all Australian cities.

Ottawa was a typical North American city in the early 1970s, in which the car completely dominated travel. Over the next decade, there was a substantial mode shift away from cars towards public transport: see figure below. Significantly, this shift occurred relatively rapidly and occurred before the City’s extensive busway network opened between 1983 and 1996. It involved little investment in infrastructure and no significant change to urban form.

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3 The lower figure is for the City of Ottawa; the higher figure is for the larger region including Hull/Gatineau on the Quebec side of the Ottawa River. The figures used in the following side are for Ottawa proper only: Gatineau has pursued different transport policies.

4 The Canadian census figures combine car and truck drivers: we have adjusted the Australian figures reported in Mees et al (2007) for comparability, by adding ‘truck’ to ‘car driver’.
The principal factors behind the mode shift are:

- a ‘transit-first’ policy that made public transit the priority for new infrastructure investment and major new roads a last resort; this resulted in the effective cancellation of most of the freeways that had been planned in the 1960s;

- restrictions on provision of CBD car parking, and an increase in charges for the remaining spaces;

- establishment of a single regional public transport agency to integrate routes, timetables and fares across the whole metropolitan area;

- provision of operating subsidies to enable the expansion of high-quality transit services into lower-density suburbs;

- less reliance on park-and-ride than in many cities, with passengers relying primarily on feeder bus services;

- on-street priority for trunk bus services, enabling transit to bypass sites of major traffic congestion.
3. Vancouver, Canada (pop. 2.1 million in 2006)

Vancouver was the only Canadian city in which the time taken for the average work journey declined between 1992 and 2005, even though it had the fastest rate of population growth over this period (Statistics Canada 2006, p. 15, table 1).

Vancouver built no major new roads between 1992 and 2005, and traffic congestion increased as it did everywhere else in Canada, so travel times should have increased had everything else remained constant. Slower road speeds appear to have been outweighed by shorter journeys arising from the locational decisions made by businesses and households combined with improvements in the speed of public transport.

Between 1996 and 2006, the proportion of workers using transit in greater Vancouver rose from 14.5% to 16.5%, and the median commute distance fell from 7.6 kilometres in 2001 to 7.4 kilometres in 2006 (Statistics Canada website 2008).

Travel surveys by the regional planning authority conducted regularly showed that between 1994 and 2004 there were modest increases in the share of trips made on foot (from 12.7% to 13.0%) and by public transport (from 10.2% to 10.8%; or from 12% to 13% of motorised trips) and a corresponding small decline (from 76.2% to 75.2%) in the automobile mode share. (See Al-Dubikhi 2007, p. 157)

Greater Vancouver has only one commuter freeway – the Trans Canada Highway – and this passes through the suburbs more than 6km from the downtown core. Road congestion is explicitly used as a policy lever to encourage mode shift to transit.

The region’s transit system has an effective management structure and the operational focus is on providing service patterns that offer a competitive alternative to the car for travel to some suburban destinations as well as to the downtown core. Since 1986, when Vancouver’s first rapid transit SkyTrain line was opened, there has been considerable investment in new rapid transit infrastructure and further expansion is planned.
**Network planning: the common feature of successful cities**

Urban transport policy packages in different cities vary, in content if not rhetoric, in the balance of incentives and disincentives that exist for both car and transit use.

A policy package made up of coordinated incentives for transit and disincentives for car use appears necessary to shift travel mode from cars to transit, and so make real gains in reducing transport greenhouse emissions. In addition, these coordinated transport policies must be linked to complementary policies for other physical and functional components of the city including housing and economic development.

Two other transport policy packages are commonly employed in western cities, but neither appears useful for either reducing the cost of operating the whole urban transport system or for achieving greenhouse emission reductions:

- First, cities can try to provide incentives for both cars and transit by investing heavily in both freeways and metro systems and providing subsidised car parking in their central core or at major regional centres or transit nodes. Transport systems of this type are difficult to integrate and that the outcome is generally a continued imbalance in mode share towards car travel but with greater subsidies required for each.

- Second, incentives are provided for cars while transit service declines. This policy package seldom explicitly pursued but is followed, de facto, in cities with no clearly agreed intermodal transport goals and where transit is given little real priority in planning or investment.

(This characterisation of urban transport policy packages is explained in detail in Vuchic’s comprehensive text *Transportation for Livable Cities* (1999, pp. 239-248).)

In the effort to create incentives for growth in public transport use, a common factor can be seen in all relatively successful cities, including Perth. This common factor is the existence of strong public institutions for transit management that have:

- long-term political and public credibility built on project achievements

- a strong focus on ‘network planning’

Network planning is central to designing public transport services that can successfully offer a competitive alternative to the car. Its purpose is to offer maximum flexibility to travellers by making it easy to transfer between different services or modes. It provides a basis for cost-effective operations and for prioritising capital investment in rolling stock and infrastructure to maximise patronage growth.
Key features of network planning

Elements of network planning

Urban public transport managers in a small but growing number of cities, across a range of sizes and degrees of dispersed suburban development, have achieved long-term growth in patronage or market share. These public transport managers have built their success on an approach to the design and operation of their services described as ‘network planning’.

The key operational elements of the ‘network planning’ approach are:

- integration of all modes with easy and comfortable transfers at a number of locations across the city region;
- a clear line structure that is easy for users to learn;
- direct route alignment with the fastest possible vehicle operating speeds, high frequency where demand is greatest and coordinated timetables elsewhere.

The ‘network planning’ approach has been developed as the most efficient way to design public transport services to provide a competitive alternative to the car for urban travel and to meet the growing demand for travel to multiple destinations across the city region.

At its core, this approach to public transport planning relies on the efficiencies produced by the ‘network effect’. The ‘network effect’ is best demonstrated through the example of a hypothetical city of ‘Squaresville’ described below.
Figure 1: The ‘network effect’ – the best use of available resources.  

The network effect: the “Squareville” example

1. “Squareville” with ten bus lines running north–south

The streets are well suited for a bus service since they are 800 meters apart. “Squareville” is a homogeneous city with a travel demand that is entirely dispersed. Assume the area around each of the city’s street crossings generates one journey to every other street crossing: 9900 trips per day in total.

For the whole of “Squareville”, the ten bus lines can only serve 900 trips in the city, which is less than 10 percent of the total trips of 9900. Assume that the public transport service presently attracts one-third of the journeys it can theoretically serve. This gives 300 trips per day by public transport, which is a modal share across the whole city of only 3 percent.

2. “Squareville” with ten bus lines running north–south, double frequencies on all lines

Imagine that services on the existing bus lines are doubled in order to make more people in “Squareville” to use public transport. According to traditional transport demand modelling the elasticity of demand might be assumed to be some 0.5. This means that a 100 percent increase in service will produce a 50 percent increase in demand. The result will be 600 public transport trips per day and a modal share of 6.5 percent. Since the operational costs are likely to increase by more than 50 percent, the cost-recovery through fares is likely to fall.

3. “Squareville” with twenty bus lines running north–south and east–west

Imagine that the extra operating resources instead were used to run ten new bus lines in the east–west direction. This would create a grid network of twenty lines. The number of trips that are directly served would double to 1800; the 900 initial north-south journeys and the 900 new east-west journeys that can be made without transferring between lines. But if passengers are willing to transfer, then all 9900 trips between all blocks can be served by this network; 1800 directly and 8100 by transferring. Assume that the modal share for journeys involving a transfer is half of that for direct journeys, i.e. one-sixth of these trips that can be attracted to public transport. This gives a total number of 1950 public transport trips per day (1800 + 8100/6). The modal share has increased dramatically from 3 to 20 percent.

This gives an elasticity of demand that is 5.5, rather than the traditional figure of 0.5. Increased revenue from the fares should more than cover the extra costs of operation and vehicle occupancy would rise.

(Adapted from Paul Mees, 2000)

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‘Squaresville’ illustrates the intent of network planning: serving the maximum number of possible journeys with the minimum of operational resources. Obviously, this is an abstraction from the reality of a functioning urban system. But, as shown in Fig. 1, the traditional elasticities of public transport demand considerably underestimate the impact of a well-designed network. This underestimation is a significant problem in most transport modelling exercises in which the potential for improved public transport mode share is typically dismissed as unreasonably expensive.

Four key elements in the practical application of the network approach to planning a successful public transport network are described here.

1. Creating a consistent operational pattern

The first important feature of a network is a consistent operational pattern. Instead of a system that overlays a variety of services designed for different users, a good network is built on a basic layout of lines operating at high frequency and with a stable stopping pattern though most of the day. The frequency of the basic network can be increased in peak periods and reduced at night, and the network is supported by local lines and other demand-responsive services that are available to all users.

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Figure 2: A consistent operating pattern serving many markets.6

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6 From Nielsen, G. and Lange, T. (2005), op. cit., p. 35.
2. **The building blocks of a network**

It is useful practice to distinguish between a ‘line’ as the operational element of the transit system and the ‘route’ which refers to the physical path of a bus or train through the city. Chapter 3.3 of the HiTrans *Best Practice Guide* describes the basic rules for the assembly of a network from a collection of public transport ‘lines’. Simplicity is the key: routes and timetables must be easy for users to understand.

![Properties of public transport lines](image)

**Figure 3: Building blocks of a public transport network.**

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3. Making transfers work

The third feature of a successful network is ease with which travellers are able to transfer between services. The Squaresville model makes it clear that transfers are integral to a public transport system that can offer a large number of potential destinations at an affordable cost to the operator.

US researchers argue that different understandings of the role of transfers lie at the heart of the divide between the network approach to public transport policy formulation, which they call the ‘multidirectional’ approach, and the more traditional approach to public transport planning that concentrates on the provision of radial services to the CBD. In describing the new understanding of the importance of the transfer, Thompson and Matoff say:

Surveys asking what passengers like and dislike about transit find that transferring is at or near the top of the list of dislikes (Black, 1995; Meyer & Gomez-Ibanez, 1981). Passengers prefer a direct trip from their home to their job or other destinations. The express bus in some radial systems takes this finding to heart by designing systems based on direct routes from suburbs to CBDs. Transfers are avoided, but at the cost of limiting opportunities for travel to non-CBD destinations. In contrast, the multidestinational approach uses transfers to open travel paths to and from non-CBD destinations that are reachable in radial systems only by lengthy and circuitous travel. The intent is to induce new ridership through the provision of new travel opportunities created by transfers in the belief that the induced non-CBD patronage will exceed any CBD patronage that may be lost due to an added transfer.

…In its reliance on transferring, the multidestinational approach does not, however, embrace transfers that fail to confer a passenger benefit – by increasing travel opportunity or improving frequency, for example. Transfers on many older radial systems sometimes are an annoyance without offering compensating advantages. Eliminating these transfers can increase ridership …

…The differing views on transferring lead to differing views of suburban bus lines. In the multidestinational approach, suburban bus routes are neither parallel routes to the CBD nor specialized "feeder routes" to trunk lines running to the CBD. Rather, they are treated as general purpose routes that interlock with each other through transfers to make intrasuburban mobility possible, while also feeding passengers onto trunk routes or dispersing passengers from trunk routes. It is as accurate to say that a rail or bus regional trunk line is a feeder to suburban bus lines as it is to say that bus lines feed the trunk line, or that suburban bus lines feed other suburban buses.8

To be effective, transfers must be carefully designed in both time and space to overcome the strong aversion to transferring that is expressed by users and potential users, particularly those whose past experience is of annoying transfers that offer no compensating advantages. In timetabling for effective transfers, a frequency of six services per hour (10 minute headways) in both directions on each line is generally regarded as the minimum acceptable to travellers using a system without reference to timetables. This is called a random access pattern.

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If frequencies cannot be sustained at this level then timetable coordination is essential. A ‘pulse’ timetable, in which arrivals and departures of all services at chosen nodes are coordinated, is one way to maintain a network when frequencies are relatively low. This would be appropriate, for example, in a small suburban centre on a train line that operates on half-hourly or hourly frequencies. If different parts of the suburban district are also served by local bus lines, then an effective transfer point can be created by arranging for the local buses to all arrive shortly before the train and leave as soon as transfer passengers have reached the right bus (see Hitrans, p. 117).

The physical layout of a transfer point is also crucial. At interchanges, walking distances must be short and information systems must exist to support passengers who are making transfers (see HiTrans, pp. 100-101).

A ticketing system that places a financial penalty on transfers creates another obstacle to a successful network. Multi-modal ticketing systems are, therefore, an important part of good network design.

4. **Institutions to manage network design, cross-subsidies and multi-modal fares**

Although many cities have moved towards networked operations for their public transport systems, the most successful cities share certain characteristics in the balance they have found between centralised and market-oriented institutional structures for the delivery of public transport services.

As the HiTrans guide says:

> Planning and competition are not necessarily contradictory. It is more a question of appropriate allocation of the roles of the two approaches in the institutional setup (p. 11).

The benefits of market-oriented institutional arrangements are best realised through tendering to the private sector for public transport operations, infrastructure development and maintenance within the context of a network plan. However, a public planning agency is required for a number of crucial functions. These include:

- **design of the network.**

- **provision of cross-subsidies.**

  In the real world, the distribution of trip origins and destinations will not follow the regular pattern assumed in the ‘Squaresville’ model. So, within a working public transport network, some lines will experience greater patronage than others. This means that institutional arrangements must allow for cross-subsidies to maintain on lower-demand lines the frequencies that are essential to operation of the network.

- **operation of a multi-modal fare system.**
References


