

Visions for a sustainable transport future – a comparative analysis of transport planning approaches in Singapore, Vienna and Brisbane

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1 Introduction

Singapore, Vienna and Brisbane represent three mid-to-large sized metropolitan regions with advanced economies and highly developed societies. On a worldwide basis, Singapore and Vienna are recognised for their enlightened approaches to transport and urban planning – and to some extent are recognised reference cases for any city that is developing or improving its transport planning and systems.

This paper offers a comparative analysis of the three city regions and their key transport planning policy arrangements. The overarching concern is for the philosophy of transport planning in the three cities, as well as the effectiveness of the planning documents themselves. In order to draw out other important themes, a number of key areas for comparison will be covered. These include:

- transport and urban performance parameters
- a review of key projects, investments and implementation phases
- the manner in which the cities approach the topic of “an integrated public transport network”
- the role of road network management
- transport/land use relationships and policy.

This five-point analysis approach should allow for meaningful comparisons of the planning settings and has been sourced after a review of key principles emerging from highly-regarded transport planning sources (Banister, 2002; Bratzel, 1999; Cervero, 1998; Laird *et al.*, 2001; May *et al.*, 2003; May, 2004; Swenson and Dock, 2004; TCRP, 2004; and Vuchic, 2005).

The purpose of the paper is to allow for benchmarking of Australian transport planning against world's-best-practice examples. This should prove useful for South East Queensland, for other cities that are facing similar transport challenges in the face of climbing fuel prices, perennial transport concerns like road congestion, and environmental problems.

A starting point for the paper is the belief that best-practice planning involves clear objectives, benchmarking, ambitious performance targets and effective implementation. Cities such as London and Singapore (as examples) are using comparative approaches to their transport planning, and openly stating that they want to achieve world's-best performance levels in transport in comparison to benchmark cities. A city that is aiming to perform well in transport would naturally need to deliver strong planning and projects.

Via the comparative analysis, the paper aims to canvass the broader issue of “universality” in transport planning. This is the idea that effective transport planning requires a more-or-less constant set of initiatives and policy tools (largely represented by the fields listed above) – albeit that local circumstances may determine the relative emphasis of the tools. This stands in contrast to transport planning that insists that local circumstances are “unique” and that cross-benchmarking, and world's-best practice are “not applicable”.

Repeated reference is made in the paper to the concept of “sustainable transport”. For the purpose of this paper, this refers to the most widely-acknowledged definition of sustainable transport, which is simply the use of either; **public transport, walking or cycling** for a particular trip (rather than private motorised transport).

2 Three Cities Performance Parameters

A number of key urban and transport performance parameters are listed in Table 1 in order to facilitate better understanding of the cities under examination.

Table 1 – Comparison of key urban parameters

	<i>Singapore</i>	<i>Brisbane</i>	<i>Vienna</i>
Population (Source: Wikipedia)	4.6 million	1.8 million (SE Qld: 3.1 million)	1.7 million (<i>Vienna Metro</i> : 2.3 million)
Size of metropolitan area (Source: Wikipedia)	704 km ²	5,900 km ² (SE Qld 22,420 km ²)*	415 sq km ²
Measures of Population Density (Source: Vie, Sing - Wikipedia, Bris – ABS, 2008:17)	6,500 people per km ²	918 people per sq km ²	4,000 people per km ²
Public Transport Mode Share, Ridership & Capacity	Morning peak 63%. Target increase to 70% by 2020 (Source LTA, 2008:4) Daily ridership of around 4.5 million – a 14.4% rise since 1996. Committed to increasing trunk capacity by 15% (Source: LTA, 2008:36)	Public transport mode share for CBD destination in 2001 of 56.2% or 45,000 trips per day, an increase of 3.3% since 1996. For Greater Brisbane destinations in 2001 mode share of 12.6% or 78,000 trips, an increase of 0.4% since 1996. (Source: QT, 2007b) Current SEQ patronage is around 163 million passenger trips per annum, with patronage growth for weekday trips is around 7.7% per annum. (Source: QT, 2007a)	34% in 2001, with a target to increase public transport mode share to 40% (“ASAP”) (Source: Vienna, 2003:10)

Note: * Brisbane seems to suffer from problematic statistical definition with respect to metropolitan area and density. The inclusion of ex-urban, conservation, and rural areas within the definition of “Brisbane” and/or “metropolitan South East Queensland” makes meaningful analysis of urban density and form difficult. The “urban area” in use by ABS supplies a more appropriate definition of the true extent of urban development, but is still problematic.

The picture painted here indicates that Brisbane is both lower in density and far more car-dependent than its Asian and European comparators. On the other hand, ABS (2008:17) also indicates that central and inner areas of Brisbane, as well as some pockets in the middle distance, seem to be of a similar density to much of Vienna. It should be remembered that Brisbane’s extremely large, low-density urban fringe, while skewing density figures, is not entirely representative of its urban character. In terms of population, Singapore is slightly larger than the others, but the three should be recognised as belonging to the “mid-sized city” bracket. While some challenges are acknowledged in terms of comparison between the three cities, the authors contend that on balance, the three represent a good set of case studies and reference points in transport and urban planning. The benefits of comparison should outweigh any reluctance to engage in analysis of non-identical cities.

3 Overview of the three planning documents and current observable conditions

This section contains a review of the transport planning documents themselves, the apparent transport planning philosophies that motivates them, as well as a review of conditions on-the-ground, observed during field work in 2007 and 2008.

3.1 Singapore's Plan

"Public transport is the most efficient means of carrying large numbers of people."
(LTA, 2008:21)

Singapore's Masterplan prioritises public transport over road-based transport. The Masterplan document initially provides some "challenges" that justify a public transport-based response to transport issues. Overall, the Masterplan's strategy and direction is formulated from the point of view that road expansion cannot meet the transport needs of the community, and that road expansion is not a desirable transport approach. The recent growth in mode share for car usage is discussed in the Masterplan – with the conclusion that new planning and initiatives should be aimed at reversing this trend (LTA, 2008). The Masterplan outlines the pursuit of a "people-centred" transport system. The plan identifies three strategic "thrusts": making public transport a choice mode; managing road use; and meeting the diverse needs of people.

The first of these ends is to be pursued through the facilitation of better public transport performance – which will be measured against targets and benchmarks that are outlined in the Masterplan. The target of 70% of peak hour journeys by public transport is a case in point. There are also targets in relation to average travel times on a door-to-door basis. Ticketing measures are proposed to facilitate better transfers and encourage trips. The expansion of the Mass Transit Rail network (SMRT) is one of the most significant initiatives outlined. Another important target is the goal of doubling daily public transport trips to 10 million by 2020 (LTA, 2008).



Figure 1 – Singapore MRT.

Source: C Hale, April 2008.

Cycling receives minimal attention in the Masterplan (perhaps surprisingly) – and is mainly presented as a means of arriving at rail stations or bus stops. Pedestrian infrastructure also receives minimal attention – which is restricted to climate compatibility and amenity issues such as covered and/or raised walkways. The expansion of exclusive pedestrian zones (for example) is not canvassed in the document.

3.2 Observations from Singapore

Singapore represents a dynamic society and economy, which appears also to be a relatively sustainable urban environment, considering its small geographic size but fairly large population. The scale of pollution and environmental degradation issues readily observable in other Asian locations seem (at face value) to have been effectively avoided.

The transport system is overwhelmingly based on the MRT (mass transit) rail network – which appears set for further emphasis under the expansion plans outlined in the LTA 2008 Masterplan. Although the bus service receives special attention in the plan for targeted improvement, it seems to be functioning effectively on the ground at the moment. The level of integration between bus and rail, while not perfect, would seem to provide an important case study for locations like Brisbane, where the two modes are generally poorly integrated. The transit system is also reasonably well-integrated into shopping, residential and commercial areas. Although Singapore's emphasis on high-rise housing may not suit the tastes of many people in the USA or Australia, it should be recognised for its effectiveness in accommodating large numbers of people in comfort, and with good access to both localised services and broader urban transit connectivity. The overall quality of analysis and policy from the LTA 2008 Masterplan reflects a society that is benchmarking itself against other major world cities in fields such as transport.

3.3 Vienna's Plan

"The desired increase in the proportion of public transport, pedestrian traffic and cycles, means that investment and planning for the modification and expansion measures in the next few years must be in that direction." (Vienna, 2003:20)

The Viennese transport planning document begins with an analysis of the "starting position" of the transport network, with reference to compelling strategic needs and influences such as: "harmonization" of spatial planning and transport; improved rail performance; the option of cross-financing between road and public transport; extension plans for the underground rail network (already identified as a pre-existing priority); globalisation; and the need to reduce pollution and emissions from transport. (Vienna, 2003:6-9)

The Vienna City document outlines the "pentagon of intelligent mobility", which is said to require sustainability, innovation, co-operation, acceptance, and effectiveness. Sustainability measures are based around travel demand management and targeted mode shifts into public transport, walking and cycling. An overall goal of reducing car trips to 25% of all journeys is put forward, with growth to be accommodated mainly by walking, cycling and public transport. Effectiveness refers to the use of a strategic vision and the "conceptual imagination" to meet new transport challenges over the next 20 years. Acceptance is an interesting concept dependent on "permanent dialogue based on trust between all concerned"... This implies an honest and open discussion about transport sustainability issues between the public, politicians and key stakeholders. Cooperation refers to efforts at coordinating and integrating the capabilities of different transport agencies with local, regional and national government as well as industry. Innovation refers to specific areas for "negotiation", or perhaps challenges and emerging needs that must be mastered in order to provide an effective transport system. Innovation is said to be required in the areas of: procedures, organization, implementation, infrastructure and technology. (Vienna, 2003)

The Viennese plan also outlines targets and goals for mode-share change according to the travel patterns and built environments of different urban settings. There are some perhaps surprisingly high targets outlined for travel mode change toward public transport – even in suburban areas.

An aggressive series of road safety targets is embraced, around the concept of a long-term “vision zero” approach. The delineation between road uses, public transport and walking and cycling is further enhanced by reference to public realm improvements – including better street-scaping and pedestrian conditions. Cycling infrastructure receives significant attention in its own right. Public transport needs are identified, including an ambitious series of public transport infrastructure expansion projects, along with the general aim of improving the image and attractiveness of public transport wherever possible. The U-Bahn system is a target of significant upgrades and extensions. For “motorised individual transport”, the Viennese document proposes greater separation and distinction of key road corridors from residential, leisure and open-space areas. A situation is outlined in which increased driving in inner areas seems to have been effectively contained through public transport attractiveness measures – but in suburban and outer areas concerns persist that unsustainable increases in road travel may be occurring.

The Viennese document addresses the issue of “awareness raising” – a process in which transport planners, policy-makers and politicians are recommended to actively engage in the ongoing promotion to the public of sustainable transport in preference to car-based transport. The Masterplan outlines a scenario in which maximum public acceptance of the need for and benefits of sustainable transport could lead to dramatic mode share outcomes. It is said that optimum travel behaviour patterns could eventuate in a situation where 86% of all trips in Vienna were taken by sustainable modes. The “awareness raising” effort aims to go as far as possible toward achieving this type of figure, through advertising, education and information-provision measures as well as encouraging policy makers and politicians to continue emphasising the importance of sustainable travel. This recommendation to political responsibility for sustainable transport is perhaps uniquely-European, and a contrast for New World transport planning documents which generally do not address this issue.



Figure 2 – Vienna U-Bahn

Source: C Hale, September 2007.

The Viennese plan emphasises adoption of the principle of “true cost” in transport pricing and planning. This goal, which at times seems distant in New World transport planning policy, is elaborated on relatively extensively with reference to internalizing the costs of: crashes, environmental problems, costs to the community of parking provision, and the totality of road construction financing. The Vienna plan includes a detailed break-down of priority projects, funding requirements and implementation timing targets (Vienna, 2003).

3.4 Observations from Vienna

Vienna represents an outstanding urban location in terms of sustainability, architectural heritage, quality urban environments and transport excellence. The extent of the central pedestrianised retail and leisure precinct in the core old-city provides a case study of what can be achieved when human-oriented planning is emphasised, rather than car priority.

As a mid-sized metropolis in the crowded panoply of European cities, Vienna’s primary competitive advantage seems to be its intellectual capabilities and creativity – which are evident both in existing urban outcomes and the sustainability-oriented planning of its 2003 transport document. Vienna, like Singapore, seems to be comfortable with the resource constraints that it faces, and is not beset by particularly obvious planning problems or any inability to deal with the growth and strategic challenges that it faces.

In transport terms, Vienna has placed itself in the top echelon of medium-sized world cities with a public transport-based system that seems at times to generate an inferiority complex from planners in Australian or US locations of a similar size. In future, Vienna’s role on the world planning stage will hopefully be as a point of inspiration and a source of leading-edge planning and design ideas. The multi-tiered public transport network offers regional rail, suburban trains, a subway system, light rail and a relatively advanced bus network. These services seem to connect well with land use and significant activity locations. Access by walking and cycling is facilitated through well-designed infrastructure and conditions. When cycling is taken seriously, it can achieve significant mode shares. Vienna is aiming for an 8% share.



Figure 3 – Bicycle rental, Vienna

Source: C Hale, December 2007.

3.5 Brisbane's Plan

While the Singapore and Viennese approaches are assessed here on the basis of their transport planning documents, Brisbane will be addressed via its "Regional Plan" (OUM, 2005) and the attending "South East Queensland Infrastructure Plan and Program" (SEQIPP) document (OUM, 2007). The Translink Network Plan (QT, 2007a) provides additional details on public transport related infrastructure and services to complement the SEQIPP.

The Integrated Transport Planning Framework (QT, 2003) is an excellent locally-researched and written document outlining world's best practice approaches to transport planning and infrastructure development – but its status as a "guideline document" has so-far sidelined the important role it might otherwise have played. The Integrated Regional Transport Plan (IRTP) developed in 1997 and revised in 2001 (QT, 1997; 2001) is now up for renewal, and while it was also a strong document, the existing edition is no-longer as relevant to the discussion at hand. The Regional Plan and SEQIPP provide the best fit for this comparative exercise in terms of their strategic focus, the significant space dedicated to transport planning and infrastructure in the documents, as well as their currency.

The South East Queensland Regional Plan outlines a growth management vision for South East Queensland (including Brisbane) based on triple-bottom-line principles.

"A key objective in underpinning the Regional Plan is to ensure future growth is managed in the most sustainable way possible."
(OUM, 2005:11)

This statement of intention outlines the challenge for the Queensland Government – as it alludes to both the need for sustainability, as well as recognising constraints within society, government and institutions that may limit the full extent of sustainable outcomes for the region.

"...current trends and patterns of development in SEQ are generally not sustainable."
(OUM, 2005:22)

The Regional Plan's strengths are its ability to refer to a variety of regional development and sustainability issues within the one document. Rural land, conservation areas and open space are to be preserved via more constrained ex-urban growth. Regional development is to be concentrated in various places according to the strengths of those locations as either industrial or mixed-use centres (incorporating residential and commercial uses).

Infrastructure, communities, economic development and water management stand side-by-side in the same document – and are presented in a cross-referential manner. The principle of internalising environmental costs is recognised, if not the full extent of transport costs – including health and negative environmental impacts. The document also outlines the idea of regular reporting on "sustainability indicators" which include transport-related issues such as energy use, housing density, mode share, access to public transport and others, although as-yet this reporting does not seem to have materialised. Once again, the overall strength of the Regional Plan is in its ability to balance transport goals with all of these other important and inter-related needs and priorities. In relation to existing infrastructure, some notable challenges are readily identified – such as the need for better public transport on both the Gold Coast and Sunshine Coast. On other counts, an air of complacency emerges at times:

"The Greater Brisbane area ...is well-serviced with urban infrastructure, including a suburban rail service"
(OUM, 2005:61)

A variety of infrastructure needs are identified, though few are put forward as having any implementation urgency other than meeting the comfortable time frames allocated for their completion. It might be observed that one of the document's areas of weakness is its "business as usual" scenario. On the one hand it outlines pressing growth concerns, and admits less-than-optimal trend development patterns on sustainability criteria. On the other hand it adopts an understated tone. This is common practice for public policy documents, but is perhaps not fully reflective of the sustainability challenges currently facing Brisbane.

"It is fair to say that infrastructure provision is on overdrive at present, but the Queensland Government is delivering the projects as scheduled and is on track to deliver the remainder."
(OUM, 2007)

These philosophical undercurrents are presently being tested by obvious traffic congestion and public transport overcrowding issues (Wardill, 2007), as well as the emerging side-effects of fuel price rises in a car-dependent region (Dodson and Sipe, 2008).

3.6 Observations from Brisbane

Brisbane's transport system is overwhelmingly car-dependent, reflecting minimal levels of investment over the decades in public transport, and the relatively low population density of post World War II development patterns – to the extent that traffic congestion problems seem now to be genuinely hindering mobility and movements for businesses and the public in the absence of other viable travel alternatives. Recent media mass media articles, such as Wardill's December 2007 article in the Courier Mail, paint a picture of a system bordering on collapse – with existing schedules and capacity unable to cope with demand, and large numbers of public transport commuters being stranded, as buses and trains arrive late or services are cancelled (Wardill, 2007).

An important reference point is the ABS (2008) analysis of public transport use in Australian capitals. The research suggests that basic network failings and lack of service provision are key elements in low mode share figures – rather than some innate cultural enmity toward public transport. The ABS suggests that "no service at convenient time", "takes too long" and "no service at all" are among the top reasons that travellers do not use public transport for commuting in Australian cities.



Figure 4 – Bus stop at the University of Queensland: Transit infrastructure and service at Brisbane's significant travel activity generation locations may be under-capitalised.

Source: C Hale, May 2006.

These national service and infrastructure-based failings are reflected in Brisbane. Public transport does not provide the comprehensive network that would allow passengers to reach a majority of popular destinations and activity centres. The central city (the CBD) and surrounds are primarily served by radial bus routes and a legacy rail network that has not received the upgrades or extensions required in order to create a 21st century system. The South Eastern Busway is an excellent piece of infrastructure and current extensions to the system offer medium to longer term hope for better service levels, albeit that the Busway roll-out program seems to be behind the pace of passenger demand. Bus, Busway and rail services are experiencing chronic crowding, a level of peak demand that at times exceeds capacity, and the network faces the prospect of continued strong passenger growth due to fuel price increases and a general trend of improved transit patronage.

The broader series of destinations throughout South East Queensland are not connected by trunk transit infrastructure. Key destinations such as Surfer's Paradise on the Gold Coast are not reachable from Brisbane by public transport in any practical sense. Neither would a Brisbane-based traveller be able to reach, for example, the Sunshine Coast Airport or Coolangatta airport on the Gold Coast by public transport. There seem to be significant challenges created for Queensland's tourism-oriented economy by this lack of service provision, but it is not clear that the public transport issue is yet recognised as a genuine problem for this or other key industries.

South East Queensland has been beset by planning problems in a variety of fields including health-care, water infrastructure and storage and electricity networks. Correspondingly, in transport planning and projects, a slow and incremental approach has been in place over previous decades – during which period the population of the region experienced its greatest-ever expansion. Any high profile initiatives and projects seem to remain overwhelmingly oriented to the belief that growth in the road network is the priority. Basic issues of public transport network connectivity and the idea of servicing all major activity centres with public transport trunk infrastructure are not generally accepted or reflected in policy or planning documents.

The South East Queensland Regional Plan of 2005 laid some belated planning foundations for ongoing growth in this large region which sees extremes of density and sprawl across a variety of landscapes. Although the Regional Plan, at that stage, could not have been expected to canvass the variety of desirable public transport infrastructure improvements needed in the region, it is probably still a reasonable comment to suggest that it laid down a future of continued car-dependence and socio-economic vulnerability related to transport (Dodson and Sipe, 2008). The Regional Plan, probably due to terms-of-reference and resourcing issues, was unable to propose new, original and meaningful changes to the public transport landscape.

The terms-of-reference in new planning documents and exercises will need to dramatically shift in order to engage with genuine medium and long-range planning efforts for a high quality, comprehensive public transport outcomes. South East Queensland is now challenged to orient its planning approach to world's best practice examples such as Singapore and Vienna, along with other leading mid-scale urban regions like Munich, Copenhagen and Stockholm. SEQ may also face increasing challenges to match the pace of public transport-based planning and infrastructure development emerging in Sydney, Melbourne and Perth.

4 Investment, Implementation and Projects

This section reviews the emphasis taken toward projects and implementation of policy directions in the plans, as well as the effectiveness with which the documents convey the complex information required to understand project timing and finance.

4.1 Singapore

Singapore's Land Transport Masterplan provides some level of detail on the break-down of projected investments, stemming from the Masterplan, without being clear the cost of all programs involved. There is no direct comparison of road vs public transport investment beyond the headline figures for the mass transit (SMRT) expansion program and the expressway expansions, nor is there an overall budgeted figure provided for investment and/or operational costs.

In terms of implementation, the Masterplan provides clear target completion dates for key proposals – including rapid roll-outs for the SMRT expansion, such as the North-South Line Extension and Tuas extensions to be completed by 2015, with the remainder of the extension program completed by 2020. Projects and initiatives are categorised under the topics of “making public transport a choice mode”; “managing road use”; “meeting the diverse needs of people” (an accessibility, environment and community-oriented category of programs). Most of the initiatives listed have a target completion date attached, but funding figures are often not provided.

Funding of \$Sing 8 billion (LTA, 2008:50) is nominated in order to build the North-South Expressway. This is the most significant figure available in the document on roads spending. For the SMRT mass-transit system, \$Sing 20 billion is earmarked to complete the ambitious target to double network size by 2020. It should be noted that Singapore's transport system is largely self-funding from a mixture of transit ticket sales and transfer of road-user charges. The Masterplan outlines SMRT's outstanding 125% farebox recovery ratio. This in itself places funding mechanisms and finance issues to some degree beyond the budgetary cycles that are more relevant to locations like Vienna (listed for comparison by the LTA document on page 93 at 48.5% farebox recovery) and Brisbane (where farebox recovery ratio is not an openly discussed parameter).

4.2 Vienna

An appendix in the Vienna Plan (Vienna, 2003:45-51) outlines funding commitments and timing of projects. Three implementation periods are put forward: 2003-06, 2007-11 and 2012-21. In terms of the various emphases of the funding commitments, notable mass transit categories include: S-Bahn, with a proposed € 820.4 million expenditure (2003 € terms); U-Bahn with around € 2.15 billion; and Trams with € 444m. This puts total earmarked mass transit investment and upgrades at around € 3.4 billion. By contrast, “major road network measures” are projected to receive € 2.1 billion. These figures were calculated by the authors, and are not necessarily broken down in a user-friendly manner in the document.

4.3 Brisbane

Brisbane and South East Queensland's efforts at integrating government policy across a variety of urban themes is effectively supported by the South East Queensland Infrastructure and Program (OUM, 2007) which acts as the implementation and project-oriented counterpart to the Regional Plan. The SEQIPP document has two principal virtues: firstly that it outlines strategic, pre-committed infrastructure projects according to estimated cost and timing; and secondly, the representation of projects in their sub-regional groupings greatly assists the reader or policy analyst. As a general planning “concept” or principle in the realm

of transport, SEQIPP refers to the need to develop: "...modern, integrated, efficient, fast, frequent and reliable public transport" (OUM, 2007:8)

In terms of the cost, benefits and financing of new infrastructure, an interesting concept is outlined:

"In some instances, expenditure on infrastructure will be used to lead development to achieve specific outcomes in SEQ. This will provide clear benefits to some sections of the community. In these instances, the Queensland Government considers it reasonable for beneficiaries to bear some of the cost of this additional infrastructure provision"

(OUM, 2007:11)

As yet, it seems that no high-profile cases of beneficiary-finance have emerged in Brisbane.

A total of \$AUD 35.3 billion (in 2007 dollars) of transport infrastructure and planning commitments are outlined for the SEQ region in the period 2007 – 2026. Another potential \$15 billion in longer-term projects are identified for possible action, depending on the result of planning and design studies. The SEQIPP provides a somewhat innovative visual representation of the project pipeline (OUM, 2007) – and this is another feature of the document that is genuinely user-friendly for industry analysts in particular.

Figure 1: SEQ Infrastructure Plan activity 2007–2015

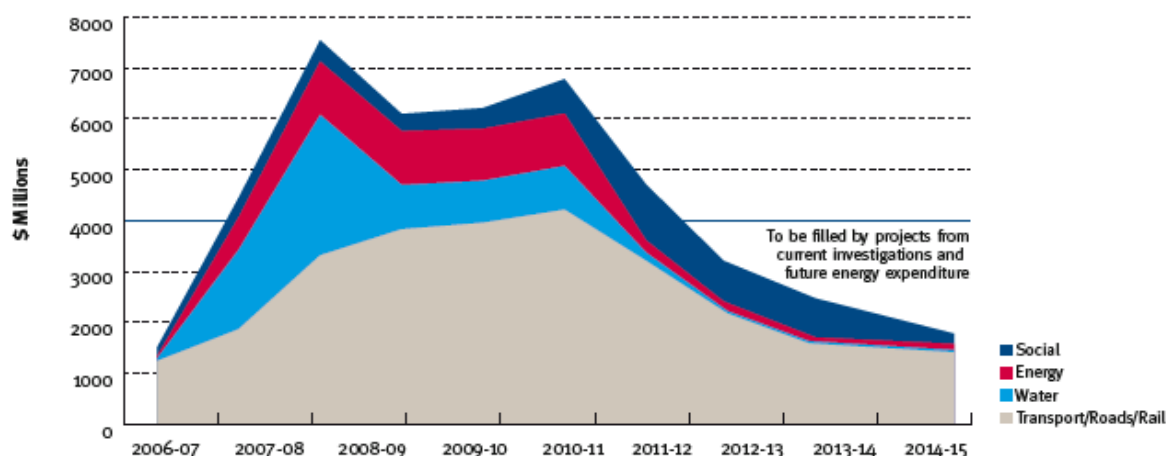


Figure 5 – SEQ infrastructure plan activity 2007-2015

Source: Office of Urban Management (OUM, 2007)

The SEQIPP puts forward a three-phase implementation process, in which the first phase through to 2010/11 represents projects that (generally) have a budgeted funding commitment. The second phase includes "commitments" that are not funded within the budgetary cycle of estimates. Phase three is primarily for longer-range projects that are to be planned or designed beyond the current scope of Regional Plan and SEQIPP. (OUM, 2007:17)

For an indicative picture of the relative emphasis of spending proposed, the original SEQIPP transport project implementation section (OUM, 2007) outlined around \$AUD 3.4 billion in identified public transport investment for Greater Brisbane through to 2026, while "orbital road network" and "improving road connections" receive a combined \$AUD 9.8 billion. Both of these figures are the researcher's arithmetic – the document does not provide a summary of proposed expenditures and investment based on transport mode.

4.4 Comparative Analysis

A vast array of differences between the cities exists which make direct comparisons of investment programs tenuous. These might include differences in: their respective transport systems, the planning documents, time-periods and international currency purchasing power, among other factors. Nonetheless, a brief comparison makes for an interesting and thought-provoking point of discussion.

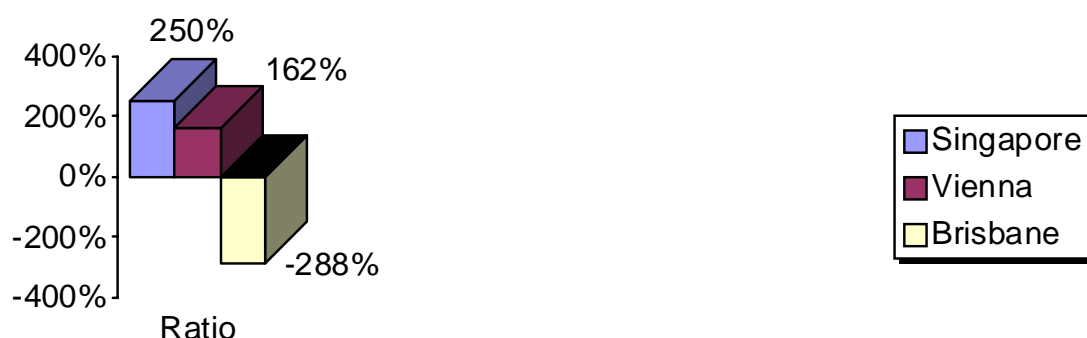


Figure 6 – Ratio of announced public transport vs. road spending in planning documents

Figure 6 analyses the ratio of public transport investment compared to road spending announced in the planning documents. The figures in the documents may not represent eventual allocation and project outcomes, and refer to slightly different time horizons, but the relative emphasis of road v PT spending is interesting. Singapore and Vienna have announced that public transport investment will be significantly greater than the allocation to roads. Brisbane, facing problems of car-dependency and other issues, has announced that road spending will be almost three times that of investment in its severely-undercapitalised public transport network.

Table 2 analyses the absolute amounts allocated to road and public transport in the three documents. Brisbane, which is growing almost as quickly as Singapore and is starting from a low base in terms of mass transit infrastructure and service, and has greater geographic distances to cater to, sees a headline public transport investment figure only a fraction that of Singapore's.

Table 2 – Headline funding in planning documents

City	Announced public transport investment*	Announced road spending*	Time horizon of planning document
Singapore	AUD\$ 16.2 billion	AUD\$ 6.5 billion	2008 - 2020
Vienna	AUD\$ 5.75 billion	AUD\$ 3.5 billion	2003 - 2021
Brisbane	AUD\$ 3.40 billion	AUD\$ 9.8 billion	2007 - 2026

* Converted to AUD\$ at August 2008 exchange rates

Another comparison reveals that Brisbane has announced that it is intending to invest roughly two-thirds (in absolute terms) in its overburdened public transport system, what Vienna is prepared to allocate for burnishing its world-class mass-transit system (not including other public transport measures). Perhaps as a result of car-dependence, among other factors, Brisbane is set to almost triple Vienna's broad-brush allocation to road expenditure. It is also worth noting that Singapore's figures and projects are slated for completion within a shorter time horizon (2020).

5 Integrative Solutions for Public Transport

5.1 Singapore

The Singaporean transport planning document provides relatively strong emphasis on integration between its two major modes; metro rail, and bus services.

“To make public transport a choice mode, the public transport system must be well integrated from the commuter’s perspective, provide good coverage with seamless connectivity, high quality service in terms of reliability, comfort, convenience and competitive travel time relative to cars...” (LTA, 2008:27)

The LTA document sets high targets for providing speedy door-to-door travel times to the average public transport user – this implies a close degree of integration between the modes, and short connection times delivered via high levels of service frequency. In addition, the fare structures and travel pass options for public transport ticketing are set to be revised in order to ameliorate transfer costs and encourage multi-modal travel (LTA, 2008).



Figure 7 – Lakeside transport interchange, Singapore

Source: C Hale, April 2008.

Although Singapore is planning for ongoing transit integration improvements, existing configurations are already quite functional.

5.2 Vienna

“Today’s requirements demand the optimum networking of different modes of transport and the activities of individual service providers, bringing together the individual services to provide a high-quality operation covering the whole of the city region.” (Vienna, 2003:26)

Vienna’s integration of transit services goes one step further than either Brisbane or Singapore, in that a high-degree of integration between localised, or metropolitan services and broader regional, inter-city and international services is stipulated (Vienna, 2003).

Particular attention is given to new initiatives to integrate U-Bahn (subway or metro-style services) with “another mode” (presumably either bus or tram, but this concept is not elaborated in depth). This idea is noteworthy because of the tendency to think of metro-systems as stand-alone infrastructure, along with the design challenges of integrating above and below ground transit modes seamlessly.



Figure 8 – Praterstern Station, Vienna: The Praterstern hub is an internationally-significant case study in the integration of multiple tiers of public transport – it offers regional, suburban and U-Bahn rail services, as well as light rail and bus.

Source: C Hale, December 2007.

The Praterstern hub is an internationally-significant case study in the integration of multiple tiers of public transport – it offers regional, suburban and U-Bahn rail services, as well as light rail and bus.

5.3 Brisbane

Although the Regional Plan positions transit oriented development (TOD) of activity centres and pre-existing public transport nodes as a primary measure toward better efficiency, there is only limited attention given to the idea that upgrades of public transport nodes to a more integrated, inter-modal function would be required. The Regional Plan often mentions that TOD transit should be “high quality” and “frequent” (OUM, 2005), but the connectivity idea – one of the most challenging, yet fundamental principles of public transport service provision – only receives one mention as a “principle” for TOD: “Facilitate a high level of intermodal connection”.

An “interconnected” transport system “across all modes” is also mentioned in the Regional Plan – but while transit connectivity is widely acknowledged by transport experts, the urgency of car-to-public transport connectivity is open to debate in transport literature, rather than being an accepted principle. The SEQIPP refers to “modern, integrated, fast, frequent and reliable public transport” as “essential characteristics” of infrastructure planning. Although a station upgrade program sees \$75 million in allocated funding, there is no direct mention of a program or project in the Greater Brisbane area to specifically address inter-modal public transport connections.

The Translink Network Plan (QT, 2007a) provides some level of attention to this vitally important aspect of network planning and strategy. It states that currently only 10% of urban public transport trips included a transfer. Bus-rail transfers featured in only 8.6% of train trips. Train-to-train transfers occurred at a rate of only 2% of all train trips. The Translink plan identifies poor network connectivity as a weakness of the SEQ transit system, and that it should be a high priority in any transit network. A total of 38 strategic nodes have been identified as “key transfer locations” in Greater Brisbane. On balance, only limited attention is given to the fundamental precept of integration in Brisbane’s suite of planning documents.

6 The Role of Road Network Management

Road management is increasingly playing a role in the overall transport mix. Making more effective use of existing and new road infrastructure is seen as a hallmark of enlightened transport planning.

6.1 Singapore

“The building of more roads is by itself not a sustainable approach in addressing traffic congestion...” (LTA, 2008:51)

Singapore’s Electronic Road Pricing (ERP) framework is its most visible road network management measure. The LTA plan discusses various aspects of the ERP approach, and outlines some of the rationale. It is pitched as a measure to smooth “peak demand” problems, as well as an opportunity to retain the full costs of road infrastructure provision. Additionally, it is said to act as a means of leveraging the attractiveness of public transport options. Refinement of ERP is a key component of the transport management strategy outlined in the LTA Masterplan. Other road management initiatives include: measures to reduce the growth in private vehicle numbers; using monitoring and communications technology to better manage traffic flow on congested roads; and parking policy. Expansion of road infrastructure is presented as a targeted, strategic intervention, occurring within a wider transport planning context - rather than as a cornerstone to the future transport system.

6.2 Vienna

“The development of the main road network must be carried out according to clear criteria and as part of a fully-integrated overall package.” (Vienna, 2003:29)

Vienna follows some similar themes in road management to Singapore, although there is little attention given to road pricing or the option of congestion charges. The Masterplan outlines the travel demand growth from private vehicles in recent years – with implications for congestion on motorways and in suburban areas. Targeted road network expansion priorities are outlined, but the document is careful to frame these within the context of a strategic emphasis on holistic transport planning, which prioritises sustainable modes ahead of private vehicle travel. Advanced traffic management and information systems are discussed. The strategic emphasis is on minimising car travel and “...the objective of sustainable transport behaviour patterns”. Freight and commercial goods movement is targeted through more effective road network management measures.

6.3 Brisbane

“For the road system, orbital road networks and new links that connect centres are needed to reduce traffic congestion and manage growth”. (OUM, 2005:109)

As previously discussed, there is considerable tension in the Regional Plan and SEQIPP between stated regional goals of sustainability (OUM, 2005), and the package of infrastructure measures, which is heavily biased toward road network expansion. The Regional Plan acknowledges that “private cars will continue to be used into the future for the majority of trips”.

Car parking provision is targeted for management within activity centres. Demand management is mentioned as a broad principle, applicable across all areas of infrastructure provision – but little is given in the way of specific emphases or projects for transport demand management. The principle of “true cost” is put forward, without specific initiatives. The section on “integrated transport” plays out a scenario of rapid growth in travel demand from private vehicles – which is recognised as a strategic challenge. The desirability of sustainable transport is recognised, but the dominance of car travel is also acknowledged – and there is support for policy settings that see road construction as a viable response to congestion problems. In the SEQIPP plan (OUM, 2007), the relative preference for road spending over public transport infrastructure that was previously discussed with respect to Greater Brisbane is reflected across the SEQ region. Road infrastructure expansion is outlined in extensive detail, while road management measures include the use of new technology, which provides the opportunity to significantly enhance the operation of the road network.

Overall, Brisbane’s current transport planning settings seem to under-utilise the full opportunities that modern Travel Demand Management and road network management can provide – as cost-effective and efficient alternatives to road infrastructure expansion.

7 Transport / Land Use

7.1 Singapore

The Singaporean Masterplan (2008) does not explicitly address the issue of land-use/transport integration in any detail. While the Masterplan is an excellent document with strong policy and project directions across a range of transport issues, it does not directly discuss transit oriented development-style concepts such as: better precinct design, public space configurations with respect to public transport, or typologies for the mix of uses that might surround mass transit stations. Observation might suggest that Singaporean planning generally sees a close relationship between mass transit (in particular) and major urban development initiatives, but that urban design and architectural finesse are areas in which greater attention could perhaps yield important results.

7.2 Vienna

“In addition to the re-evaluation of the street network, the increased provision of permanent and temporary traffic-free zones and generously-dimensioned pavements should provide tangible quality of life on the urban street scene. Areas dedicated to meeting places, seating, relaxing, and more commercialised purposes ...lead to a positive animation of the street scene.” (Vienna, 2003:20)

The Viennese Masterplan provides a strong vision for integrated land use/transport decision-making, perhaps reflected in the fact that Vienna's city planning department is the document's publisher. Strong emphasis is given to the idea of better public space as a function of quality transport planning and design. Pedestrians and cyclists receive attention. It is suggested that new public transport infrastructure be configured as to best take advantage of development opportunity, or of the ability to capture new riders in existing locations with sufficient density and activity.

"When undertaking the lines extensions and network expansions priority is given to those sections where there is adequate potential for further urban development or an essential contribution to improve traffic mode split can be made..." (Vienna, 2003:, 27)



Figure 9 – Pedestrian area, central Vienna. C Hale, Sep 2007: Viennese planning emphasises the separation of activity areas from through-routes for cars.

7.3 Brisbane

The Regional Plan document contains repeated reference to the principle of transit oriented development in the context of "land use efficiency" and the desire that "...transport infrastructure and service investment across all modes will lead and support the desired future urban form". (OUM, 2005:12)

Clarity and depth are provided on the nature and criteria for transit oriented development approaches. More compact urban form, and the densification of appropriate locations are discussed. A mix of transit oriented development angles are reviewed, including urban renewal, consolidation around existing centres and better transit-oriented design for greenfields projects. A hierarchy of activity centres across SEQ is identified. Better planning is advocated for a range of scales – across "cities", "towns" and "villages". Specific parameters for the accommodation of housing growth are set within a strong framework of transit-orientation. Design recommendations mention climate-compatibility, open space, pedestrian amenity and housing mix, density and parking. Some locations for shorter-term TOD attention are mentioned by name, while a broader series of principles and strategies are reviewed. Local government is directed to prepare "structure plans" and "growth management strategies" according to transit oriented development principles.



Figure 10 – Queen Street, Brisbane: Queen Street provides a successful example, but pedestrian zones beyond the CBD are hard to find.

Source: C Hale, May 2006.

8 Recommendations toward “universal values” in transport planning

In considering best-practice principles for transport planning it is important to be mindful of the different contexts and operating environments, and other characteristics such as population density, mode share and existing planning approaches, infrastructure, services and travel culture. Nonetheless, a clear set of important “universal values” presents itself, and these should be pursued in any location that is serious about a planned transport future.

This paper sought to engage in the following issues:

- a review of the overall philosophy of three planning documents from different countries
- the need to make comparisons between Australian urban planning approaches and international exemplars of enlightened practice in cities where high mode shares to sustainable transport have been delivered
- the workability of a 5-category analysis for good transport planning – looking at:
 - a) transport and urban performance parameters;
 - b) key projects, investments and implementation;
 - c) the manner in which the cities approach integrated public transport networks;
 - d) the role of road network management; and
 - e) transport/land use relationships
- the idea of the “universality” of good public transport planning

The five categories, drawn from a scan of quality transport research sources, seem to have been confirmed as meaningful reference points for analysis. The concept of their “universal” applicability and relevance has emerged strongly during the research and analysis effort for this paper. Engagement in the philosophy of different planning documents, and undertaking comparative analysis has also proven to be worthwhile and useful. This approach is surprisingly rare in Australian transport planning efforts. The authors recommend that comparative analysis, benchmarking and the other tools and “angles” utilised in the paper should be utilised more often as effective starting-points for better, clearer, more up-to-date planning in Australian cities.



Figure 11 – Light rail, Vienna: Brisbane is yet to embrace a multi-tiered, fully-integrated vision for public transport.

Source: C Hale, December 2007

On the basis of current planning settings in Australia, car-based travel will remain the dominant transport mode into the future. This is partly because of legacy, and partly the result of planning decisions (conscious or otherwise) to preference road construction. These decisions and settings are open to change. Significant policy change is both likely and desirable. More effective use of the road network and managing road space to preference more 'efficient' and higher value trips (high occupancy vehicles, public transport and freight priority, etc) will reduce the impact of congestion on mobility and the regional economy.

The movement to more "universal" values in Australian transport planning is to be encouraged, and should be supported through greater research, skills development and a general lift in the qualifications levels and world outlook of Australian transport professionals. Best practice, globally aware policy is required, and Australian cities must now be willing to benchmark themselves against the best-performed cities in the world.

Transport planning needs to facilitate a move towards sustainability. This requires an increased emphasis on integrated land use and transport planning, transit-oriented development, travel demand management, balancing of transport modes, and emphasising more 'efficient' and sustainable transport modes such as public transport, walking and cycling. Making more effective use of the existing transport system is also important. Implementation of transport plans needs to be well considered with attendant funding programs over a reasonable time-frame, plus accountability reporting measures to ensure success. Greater statistical clarity is needed in a variety of areas in order to provide platforms for new planning – and this includes (as but one example) a more focused definition of the "urban area" of Brisbane.

Integrating public transport, and providing a connected network is critical to maximising mode share and providing the convenience to attract patronage. Having a high quality, frequent, fast, connected network of mass transit - covering rail, bus and ferry - is required, and should be at the heart of future planning efforts.



Figure 12 – MTR Station, Singapore: Brisbane increasingly needs to investigate best-practice examples in public transport infrastructure.

Source: C Hale, September 2007

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