Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management

Consultancy Report Prepared for

COUNCIL OF AUSTRALIAN GOVERNMENTS

REVIEW OF URBAN CONGESTION TRENDS, IMPACTS AND SOLUTIONS

by

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This document does not necessarily reflect the views of the Commonwealth, State or Territory governments, and has been prepared by Booz Allen Hamilton to inform the Urban Congestion Review, which was commissioned by the Council of Australian Governments.

Final Report

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1 INTRODUCTION

1.1 Context

Booz Allen Hamilton (BAH) has been engaged by the Australian Department of Transport and Regional Services (DOTARS) to advise the Council of Australian Governments' (COAG) Competition and Regulation Working Group (CRWG) on successful congestion management approaches and the role of charging, taxes, levies, and infrastructure and service pricing in travel demand management.

This assignment is one of several studies commissioned to inform the Review of Urban Congestion Trends, Impacts and Solutions (the Review) initiated by COAG in February 2006. Amongst other things, the Review is to identify and "assess the characteristics and impacts of successful congestion management approaches in Australia and overseas". The Review findings are aimed at "improving the economic performance of national urban corridors and improving productivity outcomes from urban transport".

The Review is focusing on the AusLink and 'associated' networks in the urban parts of Australia. This recognises that, while the AusLink network is vitally important to Australia's economy, congestion management can only be effective if broader urban transport networks are also considered.

This particular assignment has two objectives:

- To provide the Review with an understanding of gaps in Australian approaches to congestion management, and to identify areas where Australian governments can draw upon the evaluation of overseas and domestic experience to improve congestion management on the AusLink urban network and associated networks.
- To consider the specific issues of travel behaviour change incentives including charges, levies and taxes, and infrastructure and service pricing in congestion management.

1.2 Review Structure and Process

The Review is being undertaken through a series of parallel work streams, some of which are being managed by individual state authorities, and with all being coordinated through DOTARS. The work streams include projects on Traffic Management Systems, Freight Travel Behaviour, Public Transport, and Land Use Planning aspects.

This BAH assignment seeks to integrate the work commissioned for the Review, inasmuch as it brings together and draws on the outputs from these various projects to identify current gaps in Australian congestion management practices. The assignment also has a particular focus on pricing-related approaches to congestion management, as noted in the second objective above (no other specialist assignments are being undertaken on such policies).

1.3 Scope and Structure of this Report

This report is the key output of this assignment. It integrates the range of work commissioned or undertaken as part of the Review. The report is structured as shown on the Contents page:

- Chapter 2 presents an overview of the range of congestion management measures available to Australian governments, and sets out a framework for the evaluation of these measures' ability to address congestion in Australian cities.

- Chapters 3-8 describe six classes of congestion management measures, broadly describe overseas and Australian experience with those measures, and assess evidence concerning the effectiveness and 'acceptability' of those measures.
- Chapter 9 consolidates the evaluation of congestion management measures and draws a range of conclusions concerning the relevance of the measures reviewed in this report for the management of congestion in Australia.

Appendices set out some material in more detail.

In preparing this report, BAH has drawn on the following draft reports prepared as part of the Review:

- A report prepared by the Australian Road Research Board on the effectiveness of traffic management systems as a means of managing congestion of urban freeways;
- A report prepared by Maunsell Aecom on the effectiveness of traffic management systems as a means of managing congestion on urban roads other than freeways;
- A report by Geoff Anson Consulting and InfraPlan (Aust) on experience with integrated land use and transport planning as a means of managing congestion;
- A report by IMIS, John G Edhouse and Associates, and Masson Wilson Twiney on the potential to use so-called 'FreightSmart' initiatives to minimise freight-related congestion;
- A report prepared by the NSW Ministry of Transport (with input from transport agencies in various States and DOTARS) on the use of public transport as a congestion management measure.

2 OVERVIEW OF AUSLINK AND OTHER PLANNING OBJECTIVES, CONGESTION MANAGEMENT MEASURES AND EVALUATION FRAMEWORK

This chapter places the review of congestion management measures in the context of the objectives for the AusLink network and other government objectives for urban transport. It also describes the range of measures that are available to manage congestion.

It was agreed at the outset of the assignment that the management of congestion through expansion of existing networks, eg new roads or additional lanes on a road, was not to be reviewed as part of this project. This reflected government interest in understanding demand management approaches to handling congestion, and the existing processes (including AusLink) to add supply where required.

2.1 Objectives for the AusLink Network

The AusLink programme has provided the basis for the Australian and State Governments to agree a defined national network of important road and rail infrastructure links as well as their intermodal connections. The network is defined under the AusLink Act (Cth.) and is the subject of bi-lateral agreements between the Australian and each of the State and Territory Governments.

The AusLink Network has the object of supporting:

"national economic growth by developing sustainable transport solutions that:

- ***increase its efficiency and infrastructure handling capacity***
  - *means reducing the cost of transport (and congestion) and catering for growth in the demand for movement of people and goods*
  - *this relates to physical capacity and may involve infrastructure that is better matched with the current and foreseeable transport task (fitness for purpose/appropriate standard of the road, railway and intermodal transfer infrastructure); the removal of unnecessary choke points and constraints on operational efficiency; promoting efficient mode choice and transfer between modes; and improving the integration of land use and transport planning.*
- ***improve its safety and security***
  - *means providing for safe and secure movement of people and goods.*
  - *this may involve identifying and addressing safety black spots and future areas of high safety or security risk; and improving emergency response, in line with National Road Safety Strategy targets and National Code of Practice for Rail Operations and the National Transport Security Strategy*
- ***improve the productivity of its nationally strategic and export-oriented freight corridors***
  - *means moving more freight without the need for more infrastructure. It is a contributor to efficiency and capacity.*
  - *this may involve smoothing logistics chains; improved traffic management; enabling the use of vehicles best suited to the transport task (and higher productivity vehicles); and improving intermodal connectivity and linkages between the AusLink Network and other major transport networks.*

- ***improve the reliability of travel on its interstate and interregional corridors***
  - *means that the network is usable almost all of the time, and that travel times are consistent and predictable.*
  - *this objective involves better management of impediments to consistent travel conditions, such as flooding and incidents.*
- ***are consistent with viable, long-term economic and social outcomes, and with the obligation to current and future generations to sustain the environment.***
  - *means taking a long-term approach to network development; managing the social and environmental impacts of transport; and meeting current needs without compromising the needs of future generations.*
  - *this objective involves containing and preferably reducing the adverse side-effects of the transport system; and developing the transport network in ways that minimise its impact on people and the environment."*[1]

2.2 Other Planning Objectives

As noted in the Introduction and above, urban congestion needs to be addressed at a network level. It is therefore relevant that State and territory governments have established strategic aims and objectives for their capital cities.. These are typically expressed in metropolitan planning strategies and associated documents setting out more detailed transport plans and infrastructure programmes.[2]

Underpinning many of these strategies are objectives relating to protecting or improving economic competitiveness, improving the 'liveability' of the city in question, and environmental protection. Congestion impinges on the ability of governments (and others) to secure these objectives. Thus, whether it is expressly mentioned in the documents, or is addressed by implication, most of the strategies and programmes seek to manage congestion in one way or another.

The key point here is that, apart from their interest in the AusLink network, State and Territory governments are independently seeking to manage congestion in their major cities as a means of improving opportunities for their citizens.

2.3 The Costs of Congestion

It is not the purpose of this report to document the extent of congestion costs in Australian cities. A separate study has updated forecasts of congestion costs in Australian capital cities to 2020.[3]

It is useful, though, to place the debate about congestion management in some context. The Bureau of Transport and Regional Economics has estimated that the total social cost of congestion in 2005 across the eight State and Territory capital cities was approximately $9.4B:

1 *Department of Transport and Regional Services (2006)*

2 *Geoff Anson Consulting Pty Ltd and InfraPlan (Aust)Pty Ltd (2006) describes the various metropolitan strategies in some detail*

3 *Bureau of Transport and Regional Economics (2006)*

> *"This total comprised of approximately $3.4 billion in private time costs (losses from trip delay and travel time variability), $3.6 billion in business time costs (trip delay plus variability), $1.2 billion in extra vehicle operating costs, and $1.1 billion in extra air pollution damage costs. The national total is spread over the capital cities, with Sydney the highest (at about $3.5 billion), followed by Melbourne (with about $3.0 billion), Brisbane ($1.2 billion), Perth ($0.9 billion) Adelaide ($0.6 billion), Canberra ($0.11 billion), Hobart ($50 million) and Darwin ($18 million).*
>
> *BTRE aggregate projections (using the base case scenario for future traffic volumes) have the avoidable social costs of congestion more than doubling over the 15 years between 2005 and 2020, to an estimated $20.4 billion. Of this $20.4 billion total, private travel is forecast to incur time costs of approximately $7.5 billion (DWL [deadweight losses] of trip delay plus trip time variability), and business vehicle use $8.9 billion (DWL of trip delay plus variability). Extra vehicle operating costs contribute a further $2.4 billion and extra air pollution damages a further $1.5 billion. The city specific levels rise to approximately $7.8 billion for Sydney, $6.1 billion for Melbourne, $3.0 billion for Brisbane, $1.1 billion for Adelaide, $2.1 billion for Perth, $0.07 billion for Hobart, $35 million for Darwin and $0.2 billion for Canberra."*[4]

While there is some debate about how such costs are calculated[5], the sums involved are considerable. However, some parties may not view those costs as excessive. They may argue that congestion is the price of economic success, and that all prosperous cities experience congestion. Moreover, the costs of congestion need to be balanced against the costs (and benefits) of management measures. That said, the COAG decision to initiate the Review suggests that Australian governments view congestion as a problem requiring some attention.

2.4 Outline of Measures

A wide range of congestion management measures has been used or considered by governments around the world. To provide structure to the evaluation, these measures have been included in one of six broad categories, as shown below:

1. Road supply management
2. Road demand management – non-price measures
3. Road demand management – price measures
4. Alternative means of passenger transport
5. Freight management
6. Urban land use planning.

Table 2.1 on the following page provides a list of the types of measures within each of these categories.

2.5 Evaluation Framework

This assignment seeks to assess the relevance of overseas congestion management practices for Australia. It also seeks to assess the relevance of existing Australian experience, ie whether current congestion management practices might be applied more widely or differently.

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[4] *Bureau of Transport and Regional Economics (2006), p.10*

[5] *For example, the BTRE and Victorian Department of Infrastructure are discussing different approaches to the calculation of such costs, and, in particular, the desirability of using a modelling approach that takes into account the configuration of transport systems in each city. A balance is required between modelling that can be consistently applied across all cities on the one hand and an approach that uses models for each city (which may provide more accurate estimates for each city but may not permit ready comparisons between cities).*

Table 2.1: Typology of Congestion Management Measures

Policy Area	Examples of Policy Types
A. ROAD SUPPLY MANAGEMENT	
A1. Road Space Re-allocation	▸ Public transport/ High Occupancy Vehicle (HOV) priority ▸ Truck priority
A2. Road Capacity Enhancement	▸ Ramp metering ▸ Speed control ▸ En-route information ▸ Incident management systems
B. ROAD DEMAND MANAGEMENT – NON-PRICE MEASURES	
B1. Travel Demand Modification	▸ Staggered/flexible work or school hours
B2. Travel Planning	▸ Household-based travel planning (TravelSmart) etc ▸ Workplace/school travel plans ▸ Ride-sharing
B3. Travel Substitution	▸ Telework centres ▸ e-work programmes
B4. Administrative Measures	▸ Trip reduction ordinances ▸ Transport Management Associations
C. ROAD DEMAND MANAGEMENT – PRICE MEASURES	
C1. Road Use Charging	▸ Comprehensive charging schemes (area/cordon/link-based) ▸ Select route charging (toll roads, HOT lanes)
C2. Parking Pricing/ Supply Policies	▸ Public parking price/supply policies ▸ Private non-residential parking price/supply policies ▸ Parking regulation in new developments
C3. Taxation Measures	▸ Fuel taxes ▸ Car purchase/ownership taxes ▸ Taxation provisions re commuting costs: - cars (ownership/use/parking) - alternative modes
D. ALTERNATIVE PASSENGER TRANSPORT	
D1. PT System/Service Enhancements	▸ Major service expansions ▸ Service level enhancements ▸ Service quality enhancements ▸ Service integration ▸ Information and marketing ▸ Fares/ticketing policy
D2. Walking/Cycling	▸ Provision of infrastructure, marketing
E. FREIGHT MANAGEMENT	
E1. Road Freight Management	▸ Access regulation (routes/areas/times) ▸ Vehicle capacities and standards ▸ Investment in rail transport (as an alternative to road transport) ▸ Inter-modal terminals & facilities ▸ Congestion-related urban freight policies/strategies/ Initiatives
F. URBAN LAND USE PLANNING	
F1. Urban Land Use/Planning Policies	▸ Development densities ▸ Transit-oriented development ▸ Facility location policies

Ideally, any review of existing congestion management practice would be based upon a detailed understanding of the effectiveness and capacity of various measures, and an understanding of the geographic and social circumstances in which the measure has been developed and applied. However, the variety of circumstances in each city experiencing congestion is so broad that it is not possible to hold constant (or 'normalise') various factors

across a number of cities and thereby draw precise conclusions about the ability to transpose experience from one jurisdiction to another.

Even so, it is possible to draw general conclusions as to the relative effectiveness and relevance of particular measures. The criteria used in this report, to assess the effectiveness of particular measures (or packages of measures) in the cities in which they have been applied., are as follows:

1. **Effectiveness** of a measure in reducing congestion in order to improve transport infrastructure performance, including the efficiency, productivity and reliability of strategically significant transport corridors;
2. **Cost-effectiveness** of a measure in reducing congestion – in short, does the evidence suggest a particular measure is likely to minimise overall costs to government/society relative to alternative medium-high impact measures (BCR values above 1 are preferable, however these may be adjusted for social policy reasons);
3. **Suitability,** based on the extent to which a particular measure supports other government transport policy objectives in relation to health, safety, environmental sustainability and accessibility;
4. **Breadth of Australian experience,** based on the extent to which Australian jurisdictions are already implementing such measures;
5. **Transferability,** based on whether the measures have been successfully applied in a number of different settings (note: distributional impacts are considered separately);
6. **Longevity** of the measure, based on the capacity of a measure to protect new transport capacity improvements from being eroded by changes in traffic distribution and induced demand;
7. **Lead times** (for example, some measures may be difficult to implement because they require extensive and prolonged community engagement, the cooperation of different government agencies and levels of government);
8. **'Complementarity'** between measures;
9. **Distributional aspects** of measures across different groups of users, across different parts of the network and generally within the community; and
10. **Applicability** to the urban AusLink network (or corridors which serve similar functions)

In its April 2006 draft report on congestion issues, the Victorian Competition and Efficiency Commission (VCEC) also adopted a simplified and essentially qualitative set of evaluation criteria as follows:

- *Does the option address causes of congestion in Melbourne, Geelong, Ballarat and Bendigo?*
- *Is the option likely to be broadly cost effective in addressing these causes of congestion and how difficult would it be to implement?*
- *What are the impacts on other government objectives?*
- *Are there significant distributional impacts?*[6]

It seems likely that VCEC faced a similar challenge to the Review (and this project) in judging the relevance and efficacy of particular measures.

6 *Victorian Competition and Efficiency Commission (2006), p.261*

In some cases, the following chapters do not refer to the performance of a measure against particular criteria. Generally, this is because there is insufficient information to make an assessment of the measure against the relevant criteria.

Our assessment of the 'transferability' of experience reflects our professional judgement, bearing in mind any similarities and differences between Australian cities and the cities where particular measures have been applied.

2.6 The Limited Range and Depth of Project Evaluations

This assignment was also required to assess the merits of any evaluations of congestion management measures.

The range and depth of published (and unpublished) *ex ante* and/or *ex post* evaluations of congestion management measures is quite limited. This conclusion is just as relevant to international experience as it is to Australian practice. Individual projects and, in some cases, programmes have been evaluated. However, there have been few evaluations of congestion management at a strategic or policy level. The evaluation of the London cordon charge (and the complementary measures such as improved public transport) is a notable exception, though that is perhaps due to the scale and breadth of the management intervention and, at the time, the novelty of the charge.

3 ROAD SUPPLY MANAGEMENT

Road supply management comprises a range of measures aimed at:

- increasing the overall capacity of the road network through the use of targeted infrastructure upgrades, monitoring, vehicle management and information technologies; and/or
- improving conditions for use of the road network by 'high worth' vehicles such as trucks and public transport.

They are distinct from measures aimed at improving capacity through the addition of new lanes or links. These technologies can be applied to the road network to improve its capacity to recover from incidents, as well as to increase the capacity of the road under 'normal' conditions.

3.1 Overview of International and Australian Experience

Public transport (bus and tram) priority lanes are now commonly used around the world to provide improved conditions for the operation of public transport vehicles. Such lanes are frequently supported by traffic signal priority and other measures. In Australia, such measures have been used in a variety of locations, including Melbourne's Eastern Freeway and the Sydney Harbour Bridge.

The allocation of road space to freight purposes is discussed in Section 7.

Capacity increasing measures such as 'ramp metering', contra-flow lanes, and en-route information are used increasingly in Europe and North America to increase the capacity of freeways. The actual throughput of traffic on freeways falls short of what is possible as a result of accidents[7] and other patterns in the flow of traffic. These other movements may be random (eg actions of drivers, such as sudden braking, that then have a cascading impact on the free flow of traffic) or 'guided' (eg merging of traffic in response to line markings and signage). Australian urban freeways are averaging around 1,600-1,700 vehicles per lane per hour during peak periods, whereas flows of 2,100 vehicles per lane per hour have been demonstrated overseas where urban freeways are 'managed'.[8] This suggests that traffic management systems can increase the capacity of 'unmanaged' freeway routes by up to 20-25%.

Several of the measures applied to freeways (and others such as the co-ordination and optimisation of traffic signals and parking controls/'clearways') are used on 'non-freeway' arterial roads. Signal co-ordination is widely used in Australian cities. Similarly, parking controls and clearways are now commonplace on most major urban roads in Australian cities. The application of these measures has allowed traffic speeds to be maintained (or limited falls in average speeds) on many urban roads over the last decade, notwithstanding significant increases in VKT.

[7] *ARRB Consulting (2006), p.39 suggests that traffic incidents such as accidents are responsible for around 20% of congestion on freeways. Maunsell Aecom (2006), p.6 (citing OECD and US Department of Transportation data) suggests that traffic incidents account for 14-25% of congestion in OECD countries, though in the US the figure is estimated to be around 50%.*

[8] *ARRB Consulting (2006), p.10*

Australian experience with some 'traffic management systems' is relatively limited. Ramp metering has been used in several cities, and variable message signs are increasingly used on the major urban road networks. However, to date, these measures have tended to be introduced at specific locations, rather than applied to overall links in the network. It is this 'corridor management' approach that is increasingly being used overseas, and which, in at least some cases, is leading to significant increases in network capacity.

3.2 Assessment Against Evaluation Criteria

Public transport priority measures permit an improvement in public transport service performance - a reduction in trip times, an increase in the number of services, and an improvement in reliability – that lead to increased patronage and, in some cases, a shift from other modes to public transport. Increases in bus patronage of between 13% and 61% (and more) have been reported, although mode shift to public transport has been somewhat more modest (as such increases in patronage are often off a low base).[9] Nevertheless, international experience suggests public transport priority lanes are an efficient means of allocating road space. Transit lanes in overseas cities are reported to be carrying 3-6 times the number of people as adjacent general purpose lanes.[10] Indeed, the bus lane on the Sydney Harbour Bridge carries approximately 8 times as many people per lane in the morning peak hour as are carried in each of the adjoining general traffic lanes.[11]

The capital costs of public transport priority measures are dependent on the type and extent of the scheme and surrounding land use. At the upper end, largely dedicated 'transitways' with high quality bus 'stations' can cost over $10M per route kilometre.[12] In addition, on-going enforcement costs can be significant. Indeed, if the priority measures are not enforced (and there is evidence that this is an issue) their utility can be compromised.

Similarly, the capital costs of traffic management systems will vary greatly, depending on the scale and sophistication of the measures to be introduced.

Benefit: Cost Ratios (BCRs) of 4.0 – 7.0 have been reported for public transport priority measures such as bus priority lanes.[13] BCRs of 15.0 have been reported for ramp metering schemes (in this instance in a post-completion evaluation of a scheme in Minnesota), and figures of 4.7 to 11.4 for variable speed limits and lane control measures.[14] However, it would be imprudent to generalise from a small number of projects with high returns. Lower ratios of 1.2 – 4.4 have also been reported.[15]

Road supply management measures offer a relatively low cost, and cost-effective, means of managing congestion, presenting road-users with the choice of trading-off some of the utility of private car use (eg personal control over the time and route of travel) against the ability to bypass congestion in, say, a bus lane. Certainly the likely costs, potential benefits, and implementation lead times compare favourably with those for major expansion of the road (and public transport) networks.

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9 *Booz Allen Hamilton (2006b), pp.8-9*

10 *ARRB Consulting (2006), p.23*

11 *NSW Roads and Traffic Authority data from 2004 suggests that the bus lane carried 14,137 persons in the peak hour between 8.00am and 9.00am compared to 1,808 persons per lane for the 'non-bus' lanes.*

12 *See for example NSW Audit Office (2005), p. 4 which indicates that the 31 km Liverpool-Parramatta Transitway cost $346M. Patronage on the transitway has increased 22%per annum since it opened in 2003. Buses on the transitway now carry 44,000 passengers per week (see Mitchell, 2006)*

13 *Booz Allen Hamilton (2006b), p.12*

14 *ARRB Consulting (2006), pp.15-19*

15 *Booz Allen Hamilton (2006a) p. 17*

3.3 Implications for Australian/AusLink Congestion Management

Traffic management systems appear to offer some benefits for parts but not all of the AusLink network and other urban arterial roads.

For those parts of the AusLink network that are not yet actively managed on a corridor basis, traffic management systems should be able to offer some increase in the capacity of the relevant links. However, in other cases (for example the M5 East), the links are already actively managed and appear to be at capacity. This bears out the point that the AusLink urban network is not uniform. The network varies significantly, both in its configuration and in the demands being placed upon it. The most appropriate solutions to congestion on the network are likely to vary from place to place.

This report is also required to examine the potential to manage congestion on the 'associated networks' such as the major arterial roads connecting with the AusLink network. It is arguable whether traffic management systems will offer the same benefits on those networks. This is because measures such as traffic signal co-ordination and clearways on arterial roads have already been introduced, in some cases many years ago. It is possible, therefore, that the capacity gains from such measures have already been used (in whole or in part), particularly during morning and afternoon peak hours. Nevertheless, there still may be gains to be made by taking a broader corridor management approach to the implementation of traffic management tools. Improved corridor and network modelling and monitoring will assist in identifying where efficiency gains can be made.

Other considerations may also constrain the wider use or effectiveness of such measures on the non-freeway arterial road networks, particularly in the established parts of Australia's larger cities. Local interests (eg shopkeepers and others fronting major roads) are likely to resist any extension of clearway restrictions. In addition, implementation of these measures may conflict with desires to maintain or improve pedestrian amenity and safety in urban areas.

Finally, the complexity of trip patterns in some urban areas may limit the opportunity to make effective use of some of these measures. For example, in suburban areas, the diversity of trip patterns may mean that flows are relatively even in both directions, thereby minimising the opportunity to use measures such as contra-flow lanes. Intersecting flows may also be evenly balanced, thereby limiting the ability to 'phase' traffic signals in favour of a 'peak' direction. This situation is not unique to Australia and there may be further lessons to be learned from international experience on how such issues can best be addressed.

Despite these challenges, the evidence indicates that the extended application and further integration of traffic management systems on a corridor basis could provide some real productivity and efficiency gains for the urban road network, and therefore these tools merit further consideration by Australian jurisdictions.

4 ROAD DEMAND MANAGEMENT – NON-PRICE MEASURES

Non-price demand management measures comprise a range of 'tools' aimed at reducing congestion through:

- Changing aspects of the demand for travel, eg the time of day when people travel
- Encouraging travellers to share vehicles
- Modification of other aspects of travel behaviour, eg encouraging people to use modes that are 'healthier' and/or less likely to contribute to congestion.

4.1 Overview of Australian and International Experience

Travel awareness and marketing campaigns are widely used by transport operators and policy agencies around the world, including in Australia. On the other hand, car-sharing arrangements (where people join a member organisation such as a co-operative to share in the use of vehicles from a fleet at particular times) appear to be more common in Europe (particularly Switzerland) and North America than in Australia. Even overseas, they represent a very small proportion of overall vehicle users.

Ridesharing through measures such as car-pooling and shuttle buses also appears to be more commonly used overseas, particularly in North America. Again, though, they represent very small proportions of overall trips. For example, the US national personal transport survey in 1990 found that only 0.3% of work trips in the country were made in a shared-ride vehicle with 5 or more occupants.[16] Moreover, car-pooling rates fell during the 1970s and 1980s [17], and continued to fall, albeit it at a slower rate, during the 1990s.[18]

Australian experience with modified or variable working hours (eg staggered work hours, flexible working hours, and compressed working weeks such as '9 day fortnights') appears to parallel that from overseas.

Transport Management Associations (TMAs) are essentially voluntary organisations that provide transport services in a particular area, eg a commercial centre, and allow small organisations (eg small employers) to provide collectively a more extensive range of transport services than they would be able to provide individually. TMAs are confined largely to the United States, and parts of Europe, and even there, they represent a small proportion of overall trips. For example, there were 146 TMAs in the United States in 2003, compared to 140 in 1990.[19]

Trip Reduction Ordinances (TROs) are regulatory mechanisms that require developers and/or employers to develop specific plans and programmes to manage trip demand. They have been used mainly in the United States (67% of them in California in 1990).[20] Neither TMAs nor TROs have been widely used in Australia.

In contrast to some of the measures described above, Australia has made relatively greater use of household-based travel behaviour change (TBC) initiatives than most other countries. Household initiatives generally aim to influence travel behaviour by providing targeted information and enticements to try out different travel opportunities. Support is provided

16 *US Department of Transportation (n.d.)*

17 *Ferguson(1995?) attributed the decline to a variety of causes, including declining household size, rising vehicle ownership rates, suburbanisation, and what was then a decline in petrol prices*

18 *See data presented in Hu and Reuscher (2004), p.43. Carpooling (in essence defined in the US National Household Travel Survey to mean any motorised trip that is shared with another person) represented 9.7% of JTW trips in 2001.*

19 *National Centre for Transit Research (2004)*

20 *US Environmental Protection Agency (1998)*

for the development of personalised travel planning and/or promotion of travel blending strategies (eg. park and ride). Monitoring and evaluation through the use of travel diaries often forms a significant component of these schemes. However, new monitoring techniques are currently being developed and trialled.

The first 'interventions' were trialled and rolled out in Western Australia and South Australia in the late 1990s. Victoria, New South Wales and Queensland have followed up with more recent programmes. Outside Australia, the bulk of experience has been in the UK, where a number of trials have been undertaken, some of which have been followed up with larger scale interventions.

Workplace Travel Plans (WTP) and Schools Travel Plans (STP) have been much more widely implemented outside Australia. WTP and STP are similar to household TBC initiatives, and are generally aimed at replacing car travel to the workplace and school with other more environmentally-friendly modes of travel (eg. public transport or walking/cycling). The most established practice is in the UK, where such plans have been introduced as part of Government transport and planning policy.[21] More recently, interest in these interventions has been growing in Australia with implementation of WTPs and STPs in New South Wales, Queensland, Western Australia and Victoria.

It is apparent that few of these travel behaviour change techniques have been designed or implemented with the **specific** objective of congestion reduction.[22] For the purposes of this paper, we have looked to identify the potential contribution of these interventions to reducing congestion on the AusLink network. However, it must be recognised that there are a wide range of other potential benefits from these interventions that we have not covered in this report.

4.2 Assessment Against Evaluation Criteria

Assessing the impacts of travel campaigns has often proved difficult. However, a 2004 study from the United Kingdom suggested that such campaigns could lead to a 0.2% – 2.6% reduction in annual car driver kilometres travelled in UK urban areas.[23]

Car sharing appears to result in a significant reduction in vehicle kilometres travelled; though the congestion impacts are likely to be somewhat smaller. This is because most car-share trips are for non-commute or non-work purposes.[24]

Car pooling arrangements have been assessed to reduce vehicle kilometres travelled by between 0-3%.[25] As many car-pool trips are likely to be for commuting purposes, it seems reasonable to conclude that these reductions would occur principally during peak periods.

There has been little formal monitoring of the congestion effects of modifying work/education hours, at least in Australia. In theory, though, it should be able to offer appreciable reductions in congestion, particularly in the so-called 'peak of the peak'. This could be particularly useful in managing congestion on public transport networks. However, the transferability or broadening of these measures is likely to be limited by social

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21 *Such plans are encouraged as part of the local transport planning process required by the Transport Act 2000 (UK). See for example UK Department for Transport (2006). Planning Policy Guidance 13 (PPG 13) requires 'all major developments comprising jobs, shopping, leisure and services' to include a travel plan (A 'major development' is defined as more than 1000m² for retail and leisure, and more than 2500m² for offices and education.)*

22 *The Melbourne Metropolitan Transport Plan (Government of Victoria, 2004) includes an action to "Promote sustainable travel through better demand management". This includes the Victorian Government's TravelSmart programme.*

23 *Cairns et al (2004), p. 341 Projected reduction of 0.6 – 2.6% in London and 0.2 – 0.9% in other urban areas.*

24 *Millard-Ball et al (2005) reports that only 2% of car sharing trips are for commute trips, with a further 12% for work-related trips.*

25 *Victoria Transport Policy Institute (2006a)*

factors, eg the fact that journey to work trips are not infrequently part of a longer 'linked trip' involving the dropping off/collecting of children from school or childcare.

TMAs and TROs have the potential to reduce commuter car trips by 10% or more amongst those participating in the schemes. However, some caution needs to be applied, as the number of projects remains quite small, and there is little in the way of evaluation studies. These measures remain a quite limited part of international experience with congestion management, leaving questions about their 'transferability'. TMAs may assist in moderating growth in congestion in larger suburban centres, ie where congestion is serious enough and the size of the centre is large enough to warrant consideration of such approaches.

Several of these measures have the advantage of relatively short implementation lead times.

Most household-based travel behaviour change interventions have been evaluated, and reported outcomes for reductions in car use (VKT) range between 0% and 17%. There has been some debate about the validity of the evaluations and the accuracy of the reported outcomes. It is notable that independent evaluations, where they have been undertaken, have generally reported smaller reductions in VKT, and with low statistical significances in some cases. The difficulties of collecting reliable and accurate data for evaluation of the interventions has been one of the main factors behind many of the concerns over the effectiveness of these measures.

On the balance of the evidence, it appears likely that reductions in VKTs of between 5% and 10% could be achieved through widespread implementation of household-based interventions. However, this would need to be tested before more general conclusions could be drawn. Very little evidence exists to indicate what the VKT reductions might be during peak periods on the AusLink network, however it is our judgment that reductions would be small, perhaps of the order of 1% to 2%. Depending on the location, even these VKT reductions can make an important contribution to minimising congestion. Nevertheless, careful consideration would need to be given to the relative costs and benefits of such measures, if they were to be considered for use over a wide area or on a sustained basis.

Workplace Travel Plans would appear to have greater potential for contributing to congestion reduction, as they generally seek to reduce single occupancy car commuting during peak periods. UK practice suggests a reduction of between 5% and 9% of car commuting trips could be achieved if a WTP policy was rolled out in urban areas. However, our examination of a sample of WTPs in Australia indicates their effectiveness to be about one-third less than the reported outcomes in the UK.

School Travel Plans have had mixed results and one recent UK study was unable to find any conclusive evidence of significant reductions in car use. Despite this, the broad view from both Australian and international experience is that individual STPs can achieve reductions in car trips in the order of 9%. If a programme of STPs were to be rolled out, the overall effect is likely to be considerably less. However, the impact on the AusLink network of such a reduction in trips is likely to be very limited, as many of these trips may be confined to local roads or of a trip-chaining nature (eg. parents, including those resident outside the school catchment area, dropping off children on their way to work). Of course, STPs may offer other benefits (eg public health benefits). As with other projects in the transport sector, those benefits and any congestion benefits need to be weighed against the costs of such programmes.

Further research may reveal new insights on the effectiveness of STPs. For example, as some people are driving for multiple purposes (eg driving to work after dropping off their children at school), it is conceivable that, to the extent STPs encourage children to take other modes to school, the drivers of those children may feel less need to drive to work, ie. they may then have additional transport options.

There may be also some risk that the target audiences for these three types of travel behaviour change programmes could overlap. Hence, the impacts of these programmes may not be strictly additive from a congestion management perspective.

4.3 Implications for Australian/AusLink Congestion Management

The measures considered in this chapter have the potential to provide limited to modest congestion management benefits in Australian cities and on the urban AusLink network. Of themselves, none seems likely to make a major difference to congestion in Australian cities. The most promising measures appear to lie in the area of workplace-based travel behaviour change programmes (akin to Transport Management Associations) and changes in working/education hours.

It is important to remember that what characterises a number of these measures is that they are voluntary in nature. Unless behavioural change measures offer equivalent or better travel (and other) experiences than those obtained by using private cars, they are unlikely to attract many users. Similarly, variable working hour arrangements have usually been voluntary in nature. Requiring employees to travel at particular times of the day or introducing measures such as staggered school hours is likely to have extensive social (and distributional) implications. These may well be such as to limit public and government support for such measures.

5 ROAD DEMAND MANAGEMENT – PRICE MEASURES

5.1 Area Road Use Charges

This section covers comprehensive road-use pricing schemes that impose charges on all motorists that travel within a defined area: the charges may be levied either for crossing a cordon around the area or for circulating within the area. (Pricing schemes that charge for using specific routes only, such as toll toads, are dealt with in Section 5.2.)

5.1.1 Overview of Australian and International Experience

Area road-use charging schemes have now been in existence internationally for over 30 years, although there has recently been a resurgence of interest in such schemes, with developments in technology and the implementation of the successful London scheme in 2003. Table 5.1 provides a summary of current schemes internationally. It should be noted that three of the six schemes listed have been designed to address primarily congestion management and economic efficiency objectives; while the other three schemes primarily address revenue-raising objectives: the former group are of most relevance in the present context.

To date, there have been no attempts to introduce a comprehensive area road-use charging scheme in any Australian city. However, in 2006, the New Zealand Government completed and published a feasibility study for a comprehensive road pricing scheme for Auckland, a city of some 1.3M people and with similar characteristics to Australian cities.[26] This study found that the benefit: cost ratio for the more promising of the area charging schemes investigated were favourable.

TABLE 5.1: Overview of Principal Area Road Use Charging Schemes World-wide

City	Scheme Type	Primary Objective	Implementation Date
1. Singapore	Originally: manual area licence scheme Subsequent: electronic cordon charge and main route charge scheme	Economic - Congestion management	Original 1975 Subsequent 1998
2. Bergen	Cordon charge scheme	Financial - Revenue for transport system	1986
3. Oslo	Cordon charge scheme	Financial - Revenue for transport system	1990
4. Trondheim	Original: Cordon charge scheme Subsequent: Zonal charge scheme	Financial - Revenue for transport system	Original 1991 Subsequent 1998
5. London	Area licence scheme	Economic – Congestion management	2003
6. Stockholm	Cordon charge scheme	Economic – Congestion management Financial – Revenue for transport system	Introduced January 2006 on a 7-month trial basis, followed by a referendum in September 2006[27] [28]

26 *New Zealand Ministry of Transport (2006)*

27 *AFX News Limited (2006) reported that, after counting had been completed in 457 out of 461 districts in the City of Stockholm, 51.7% of voters had voted 'Yes' to continuation of the charging scheme, 45.6% had voted 'No', and the remainder left their ballot blank.*

28 *Swedish Road Authority (2006) The Swedish Government decided in October 2006 to adopt the charge on a permanent basis. In November 2006, the Government appointed a mediator for negotiations concerning Stockholm's infrastructure. The negotiations are to culminate in an agreement concerning priorities and proposals for how to finance investments in road and railway infrastructure in Stockholm County. This is to be presented to the Government by 1 December 2007.*

5.1.2 Assessment Against Evaluation Criteria

The following main conclusions have been drawn from our review of the international experience with comprehensive area road-use charging schemes:

- The schemes have been almost entirely successful in meeting the objectives that they were designed to achieve. Taking London and Stockholm as prime examples, these schemes were successful (in one or both cases) in:
  - significantly reducing congestion levels and travel times
  - improving the reliability of journey times
  - improving efficiency in distribution of goods and services
  - improving the environment and amenity in the city central areas
  - minimising any major adverse impacts (on particular groups or in particular areas)
  - generating additional (net) revenues to support overall metropolitan transport strategies.[29] [30]
- In particular, the schemes have been effective in reducing traffic levels, increasing travel speeds and reducing congestion in the areas affected (within the scheme boundary and with impacts gradually tapering-off further outside this boundary). The schemes directed at economic efficiency/congestion reduction (particularly London and Stockholm) have reduced traffic volumes crossing and within the cordon by in the order of 20%. Traffic delays have been reduced by 30%-50%, and overall travel times by around half this proportion.[31]
- The schemes are at least financially viable even after public transport enhancements are taken into account (in Stockholm, it has been estimated that the benefits would outweigh the investment costs, ie. $500m, after four years, compared to 15-25 years more typical of a road or rail project);
- In London, the traffic and delay reductions have been largely sustained over time (now over 3 years).
- The experience confirms that effective road pricing is technically achievable, and that technology does not place major constraints on the scheme design (although clearly influencing the capital and recurrent costs).
- The economic and financial findings from the various schemes indicate that:
  - schemes that are designed to meet economic efficiency/congestion objectives are generally relatively poor in terms of addressing financial objectives, and vice versa [32]
  - for those schemes directed at economic efficiency/congestion objectives (such as London and Stockholm), typically BCR values are in the range 1.0 to 3.0 [33]
  - this suggests that, with suitable design and optimisation and in the European city context in which they have been implemented, such schemes are well worthwhile (in economic welfare terms) by comparison with other policy options, including expanding road infrastructure, for addressing congestion in inner city areas.

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29 *Transport for London (2006). See also Association of London Governments (2004), which found broadly comparable reductions in traffic volumes to those identified by TfL.*

30 *Stockholm Congestion Charging Secretariat (2006b)*

31 *Transport for London (2006), Toll Road News (2006) and Stockholm Congestion Charging Secretariat (2006c)*

32 *Prud'homme and Bocarejo (2005)*

33 *Transek (2006)*

Area road use charging schemes should be designed as one component of an integrated package of policy measures. Such a package should include complementary measures to provide alternatives for those people adversely impacted by the charging scheme and to maximise effectiveness and efficiency of the overall package: in practice, improvements to the public transport system are the major measure of this type. Mitigatory measures may also be required to ameliorate any undesirable side-effects of the charging scheme: these may include local traffic management, parking restrictions, road capacity enhancements on the 'ring route', etc. Further, a comprehensive package may include measures to take advantage of the opportunities resulting from the reduced traffic levels, eg. traffic calming and/or pedestrianisation measures within the charge area.

Public and political support are critical to securing the decision to proceed with a charging scheme. All experience to date is that public acceptability and support for schemes tends to be relatively low prior to implementation (in part due to a 'fear of the unknown'), but increases substantially after implementation, once people experience the scheme impacts: this effect may lessen in the future, once more schemes have been implemented internationally. Elements in developing support during the scheme development stage include: market research; package design; use of revenues to fund complementary/ mitigatory measures and perhaps other associated 'goods'; and an education/PR campaign at both public and political levels. The lead time for these steps is likely to be significant, probably not less than 2-3 years. If these steps are rushed, there is a risk that the pricing scheme will be poorly conceived and targeted, thereby compromising public support.

The way in which the (net) charging revenues are spent is a crucial aspect of overall scheme design, and is likely to substantially affect the scheme's public/political acceptability. The first call on such revenues would normally be for complementary and mitigatory measures required to 'optimise' the scheme. High priority might also be given to reducing other taxes/charges on road users, to at least partially offset the scheme charges. In practice, there would seem some advantages in hypothecation of scheme (net) revenues, so that the use of the revenue is transparent and any perception of the charges being 'just another tax' is minimised.

The three schemes appraised that had primarily economic efficiency/congestion reduction objectives (London, Stockholm, Singapore) have been successful as congestion management measures, as they significantly reduced congestion in most of the situations (routes, time periods) where it was particularly severe – principally on radial routes approaching the inner city area.

In our assessment, critical criteria for the effectiveness of 'single toll ring' measures as a congestion management tool include:

- Initial severe levels of congestion (on a regular basis, over significant route lengths/ areas).
- The scope for location and design of the toll ring so as to significantly reduce congestion where/when it is most severe.
- A captive market – ie containment within the toll ring of a percentage of total regional economic activity that is high enough to prevent the toll being rendered ineffective by car trips simply diverting to other parts of the region.
- Availability of suitable alternative road routes.
- Availability of suitable alternative modes (principally public transport).

All three of the cities noted above would largely meet these criteria. To these criteria, we would add the following:

- The application of suitable tolling technology to minimise administrative and other operating costs.
- Strict enforcement of the charging regime. Failure to enforce the charging regime would undermine its congestion management impacts, reduce revenues that may be hypothecated to pay for other transport improvements, and undermine public support for the measure (if there is a sense that 'cheats are getting away with avoiding the charge').

5.1.3 Implications for Australian/AusLink Congestion Management

Our initial appraisal of the extent to which the major Australian cities meet the above criteria indicates that:

- The largest Australian cities (Sydney and Melbourne) appear to have sufficiently severe congestion problems to warrant these being addressed by charging policies, whether of the 'single toll ring' or other type.
- Given the dispersed nature of the 'congestion problem' in the main Australian cities, as a function of dispersed employment and other 'centre-type' activities, a 'single toll ring' measure is unlikely to be an effective means of significantly ameliorating the current problems. To be effective, a charging policy needs to influence congestion over a wider area (eg. through a larger toll ring or multi-centre toll rings).
- While some of the cities have suitable alternative routes for drivers not willing to pay tolls, further investigation of this would be required in the context of the development/design of any toll ring measures.
- While all the cities have reasonable levels and quality of PT serving their CBDs (the areas affected by the charging policy), they are likely to require significant PT capacity increases as part of an overall charging package: the required increases in peak period PT capacity to/from the CBD could be as much as 50% in the smaller cities (Brisbane, Adelaide and Perth).

In the absence of more detailed feasibility studies, it is difficult to estimate what impacts area charging schemes in major Australian cities would have on traffic levels and hence congestion levels. However we would comment that:

- The London and Stockholm schemes reduced traffic volumes within and crossing the cordon by in the order of 20%, with consequent reductions in traffic delays in the range 30%-50% and in overall travel times of around 20%.[34]
- The area-wide pricing schemes assessed in the 2006 Auckland Road Pricing Evaluation Study estimated reductions in traffic volumes in the areas directly-affected by 20%-40% and in the region overall by up to 8%, with region-wide average road travel times reducing by in the order of 10%.[35]
- One of the merits of pricing schemes of this nature is that prices can be readily adjusted to the 'optimum' economic level, thus effectively eliminating 'induced' traffic. In this regard, pricing schemes can have an important role in complementing other non-price policies and 'locking in' the congestion reduction benefits from these policies.
- Carefully-developed transport network models, using well-researched assumptions, are likely to play a vital role in forecasting traffic and congestion impacts.

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34 *Transport for London (2006), Toll Road News (2006) and Stockholm Congestion Charging Secretariat (2006c)*

35 *New Zealand Ministry of Transport (2006)*

In regard to the implications of single toll ring schemes for the AusLink network specifically, we would comment that:

- By their nature, these schemes affect congestion within the ringed area and on all routes approaching that area.
- Some of the key approach routes are AusLink routes, some are access routes to AusLink routes, while others do not directly affect the AusLink network.

5.2 Select Route Charging

This section covers 'select route charging schemes', i.e. schemes that involve charging motorists for travel on single routes and corridors only: it covers both 'toll roads' and high occupancy/toll (HOT) lanes on otherwise 'free' roads. It addresses the impacts on demand and congestion of a range of select route pricing policies applied to existing roads. It is not concerned with the impacts of providing new (tolled) road infrastructure.

5.2.1 Overview of Australian and International Experience

Australia is among the leading countries internationally in the introduction of single toll routes in urban areas. There are now some 12 toll route schemes in the metropolitan regions of the eastern capital cities (Sydney, Melbourne, Brisbane). However, these schemes are all on 'new' routes (or routes with major enhancements in capacity): the emphasis has been on route tolling as a means of funding new infrastructure rather than managing congestion on existing routes. Further, most Australian toll road schemes are privately owned and funded, with the (net) toll revenues being applied to recoup the up-front private sector funding to construct the route.

In consequence:

- There is limited Australian experience with the introduction of tolls on a previously free route. A toll was introduced on a section of existing road on Queensland's Sunshine Coast. However, it was removed after a relatively short period, following public opposition.
- There is also one case of the opposite, where tolls have been removed from a previously-tolled route (tolls were removed from Melbourne's Westgate Bridge in 1985).
- There has been rather limited study or consideration given to the relative merits of different tolling options (including no tolls) on the toll road schemes that have been implemented.
- Such study of tolling options that has been undertaken (whether by government authorities or private toll road proponents) is, in several cases, not obtainable for reasons of commercial confidentiality.
- The Australian road tolling schemes have had very largely the same pricing structure at all times of the day/week, and there has been minimal experimentation with varying tolls by time-of-day.
- Thus, the evidence that can be gained from the Australian toll road experience that is useful to this project is somewhat limited (but refer below).
- There has been little experimentation with price structures designed to advantage a particular class of road user. Given the typically higher charges paid by heavy vehicle users of tolled routes, it would appear that structures are set principally on the basis of the business operators' willingness to pay (with recovery of the costs of pavement damage possibly also a relevant factor).

- Sydney's M2 motorway includes a bus-only lane which carries an increasing number of well-patronised services, with buses charged a heavy vehicle fee which would translate (for a fully-laden bus) to a lower per-passenger toll cost than would apply in the case of even a fully-laden car.
- For other 'high-value' classes of toll road users (eg. trucks), there has been limited study of opportunities to 'reverse' normal pricing patterns in order to, for instance, encourage trucks to use toll roads out of congested commuter peak periods. In Brisbane, for a trial period, tolls have been removed for trucks using the Logan Motorway at night. The objective is to reduce freight traffic on the nearby Brisbane Urban Corridor (BUC). Results from the trial have yet to be published; though, with many trucks having destinations along the BUC, there is some question whether many heavy vehicles will divert to the toll-free route.
- For Sydney's (mostly) tolled orbital motorway route, the NSW Government has recently signalled that 'off-peak' pricing options should be explored, opening up the possibility of differential price incentives for truck and car trips to shift away from congested time periods.[36]

Internationally, toll roads operate in many countries, with the USA being perhaps the leading country in this regard. However, select road tolling policies are generally broadly similar to the Australian model, i.e. tolls are set to meet financial objectives rather than congestion or economic objectives. Very limited evidence appears to be available for specific road schemes internationally on the impacts and merits of alternative tolling policies.

An alternative model is one of variable tolling on existing and new tolled routes. For existing tolled routes where a concession applies, charges could be increased during congested periods to the extent required to achieve 'free-flow' conditions on the route, and then reduced during off-peak periods to a level resulting in a revenue-neutral outcome for the operator.

In contrast, if introducing tolls on existing non-tolled routes, the approach should be directed toward 'optimising' traffic flow efficiency during peak (and non-peak) periods, with consideration being given to adjoining parts of the network. The objective here should be demand management rather than revenue maximisation. Such an approach to peak charging policy is similar to that adopted in Singapore[37] for its radial expressways and also to that adopted for HOT lane pricing in the USA.

5.2.2 Assessment Against Evaluation Criteria

Without accompanying complementary congestion management measures, the introduction of select route charging on existing 'unpriced' routes is generally not a desirable policy option because:

- It is likely to result, in most urban network situations, in some level of traffic diversion away from the newly 'priced' route: the extent of this diversion may be up to half (or more) of the 'unpriced' traffic level, but would depend on the level of the toll and the extent to which alternative routes are competitive in terms of time and operating costs.
- This traffic diversion would typically result in increased traffic volumes and adverse environmental impacts on alternative routes, which may be less suitable for carrying high traffic volumes.

36 *Baker (2006)*

37 *Luk (1999), Willoughby (2001) and Goh (2002)*

- The traffic diversion may result in a net reduction in transport user benefits for those using the newly tolled road and associated networks: the benefit reduction is closely related to the extent of diversion.
- The traffic diversion, together with the capital and recurrent costs associated with the infrastructure required to apply the new pricing regime, would generally result in substantial losses in economic welfare being associated with the 'priced' scheme relative to its 'unpriced' equivalent.
- The users of the newly 'priced' route should experience a reduction in congestion (for which they pay) but alternative routes will continue to experience time delays.

From a review of theoretical studies[38] internationally on alternative toll road pricing policies, it was found that:

- Network pricing of existing infrastructure is superior to select route charging, both in economic welfare terms and in revenue-raising terms. Network pricing would involve pricing of each link in a road network based on the marginal social cost of travel on that link, ie the charge could vary by link, type of vehicle and/or time of day. [39]
- If any type of select route pricing policy is to be pursued, welfare-maximising ('public') pricing is superior to revenue-maximising ('private') pricing policies. Public pricing involves distinctly different price levels and structures than revenue-maximising pricing. Typically, public pricing will result in toll prices and revenue levels in the order of half those with revenue-maximising pricing.
- Revenue-maximising pricing typically results in lower net economic welfare than would an all-free network.

5.2.3 Implications for Australian/AusLink Congestion Management

The discussion above focused on the management of congestion through the introduction of a charge or price on routes that are presently 'unpriced'. However, as noted earlier, a number of (typically privately-funded) tollways have been developed around Australia over the last 15-20 years. They are already 'priced'.

That being the case, it is worth considering how **existing** Australian toll route pricing policies might be modified to better address congestion problems and enhance economic efficiency.

Select route pricing policies aimed at better meeting congestion management and/or economic efficiency objectives would generally involve higher charges at peak periods, but with lower charges at off-peak periods, or in other situations where use of the tolled route instead of a untolled routes delivered particular community benefits. However, it is unlikely that such an approach would minimise congestion costs or maximise economic efficiency for the road system as a whole.

Careful consideration of the network impacts of any change in tolls (particularly on nearby roads and public transport services) would be essential before any decision to change existing tolls. These network impacts suggest that any move to change tolls on the existing tollway network would need to be considered on a corridor basis. For example, it may be desirable to upgrade public transport systems, not only to increase capacity but also to improve other service attributes (principally service frequency and reliability), in order to

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38 *Gronau (1999)*

39 *See Darling (2006) The Secretary for Transport's speech affirmed his intention to focus on moving towards a national system of network road pricing, "moving the debate from 'why' to 'how' we might make a national system work in practice."*

attract diverted car users rather than facilitating the diversion of drivers to other parts of the road network. Alternatively, analysis of the corridor may suggest that investment in traffic management systems would be the most effective means of managing congestion on nearby roads. This approach to managing corridors in an integrated way is consistent with the principles underlying the planning and development of the AusLink network.

Existing tollways are subject to concession deeds with the private sector owners of the routes in question. Any move to introduce variable tolling on existing tollways would therefore require some form of negotiation with the concession holders. These negotiations would probably be quite challenging, as the concession holders would almost certainly seek to protect their legal and financial position. In cities with a number of connected tollways (eg Sydney), bringing all tolls on to a consistent regime presents an additional opportunity (and challenge). Notwithstanding the issues mentioned above, it would be appropriate for governments to carefully consider this option. Opportunities such as the end of existing concessions or potential changes in the ownership of the concessions could be utilised as a catalyst for change.

In summary, the main merits of select route charging measures as a congestion management tool appear to be:

- To raise public awareness of the need to better manage travel demand to achieve improved community outcomes (ie. reduced congestion, improved 'liveability');
- To provide opportunities to test and develop road charging technology and administrative systems, as a starting point for more extensive and comprehensive pricing schemes;
- To provide an opportunity to pilot peak/off-peak pricing structures, and/or 'truck-shifting', which would contribute to both congestion management and economic efficiency objectives; and
- To complement other congestion management measures.

5.3 Parking

This section covers parking policy measures, with an emphasis on the use of parking policy as a demand management tool, i.e. to restrain the level of parking and hence of road traffic movements.

Parking policy represents the interface between the parking system and the socio-economic and land use system. As a consequence of its position in the system, there are two basic roles for parking policy:

- To determine the way in which parking management is used to meet specific parking system objectives (eg balancing supply and demand, revenues to cover costs, etc); and
- To determine the way in which parking management is used to meet other policy area objectives (eg traffic management goals, local amenity, accessibility for business and shoppers, etc).

The first of these roles focuses on the parking system only. In economic terms, the objective might be to balance parking demand and supply; while in financial terms the objective might be for charges to cover parking system financial costs (capital and recurrent). However, the second role is wider, and could include the use of parking policy as a traffic restraint measure, as a proxy for (and in place of) direct road-use charging. A number of road pricing studies have indicated that parking regulation (including pricing) is a serious policy alternative to direct road-use charging as a means of approximating to economically-efficient pricing of motorists. Many cities internationally have used parking policy in this

way, particularly prior to the availability of advanced technology for road-use charging.[40] In its consideration of parking policy as a demand management tool, this study recognises both the narrower and wider policy roles.

A wide range of policy measures may be used to manage the quantity, quality and price of parking. These may be concerned with:

- on-street v off-street parking
- existing parking supply v parking controls on new developments
- privately owned v public parking
- residential v commercial parking
- long stay v short stay parking
- inner area v outer area parking (including park and ride policies)

Parking management policies, through pricing and supply restraints, have a considerable history in many cities in the developed world. Initially their focus in central/inner city areas was largely as a means of balancing the demand for on-street parking space with the supply, and thus raising revenue for local councils; and, when demand was sufficient, with commercial construction and operation of parking buildings. In this context, policies for parking space provision as part of new developments were historically expressed as minimum standards to be achieved, on the basis of accommodating generated parking demand 'on-site'. This has encouraged rather than discouraged car ownership and use.

More recently, in some cities, CBD parking policy has been increasingly used as an active tool for congestion management. Controls over on-street parking (time limits and pricing) have increasingly discouraged long-stay (typically commuter) parking, while encouraging shorter-term parking (used primarily by shoppers and for personal business trips). Some cities (eg London and, latterly, Sydney) have moved to policies of parking 'maximums' for new developments, with standards depending on the area's accessibility by alternative modes, principally public transport.

A major issue with using parking policies as an effective management tool is that, in most central/inner city areas, the public authority (typically the local council) has control over only a minority of parking spaces, certainly in the shorter term. Most spaces are typically outside the authority's control – in commercial and business premises, in residential premises, or in commercial (publicly-available) parking buildings. Authorities generally have been reluctant to impose any controls over such spaces (other than through parking standards imposed on new developments). However, the introduction of parking space levies (refer below) represents a move by public authorities to extend parking controls across the great majority of parking spaces in designated centres, as an active form of demand management.

5.3.1 Overview of Australian and International Experience

Parking policy development in the central/inner areas of Australian cities has tended to follow the UK model, although generally some years behind, with Australian cities tending to have a greater supply of parking relative to potential demand. Generally, parking policies have been developed in an incremental manner, and very little monitoring has been undertaken of their impacts. In the major cities, on-street parking controls have been used to encourage short-stay rather than long-stay parking: this policy has been adopted perhaps more to support local business and retail activity than as a means of discouraging commuter trips.

The introduction of Parking Space Levy (PSL) policies in Sydney (1992), Perth (1999) and Melbourne (2006) represents perhaps the first steps by Australian city authorities to use

40 *Transportation Research Board (2005)*

parking policy as a more active and comprehensive demand management tool. While the PSL policies appear not to have been closely monitored in terms of outcomes (car travel, mode shares, etc), all the indications are that they have had at most small positive impacts in terms of congestion management:

- Even in the case of the highest levy rates (Sydney CBD and North Sydney)[41], the levy represents only 10-15% of typical commuter parking costs, and hence under 5% of typical total 'generalised costs' of commuter trips.
- This implies that, for those commuters forced to pay the levy, the proportion that would be expected to change their travel mode is less than 5%.
- A proportion of those people using the spaces subject to the levy will either not incur the charge themselves or will pay for it indirectly (eg as a payroll deduction), and thus will be relatively unaffected.
- The levy does not in practice affect all parking spaces used by commuters in the areas concerned.
- The 'induced traffic' effect (which is greatest in more congested situations) will be such that a proportion of any traffic reduction due to the levy will be offset by additional traffic.

Bearing this in mind, our (indicative) conclusions from this appraisal are that the current PSL schemes in the three cities are likely to have resulted in:

- a reduction in car commuter traffic attracted to the areas concerned of at most 2-3%;
- this reduction being in part offset by 'induced traffic'; and
- any net traffic impacts diminishing in magnitude with increasing distance from the levy areas.

Parking Guidance Systems, eg active signage alerting drivers to the availability of parking spaces at major destinations, have been introduced in various cities with the aim of reducing the incidence of drivers circulating around streets seeking a parking place. The aim is usually to reduce congestion in a local area, such as a shopping centre. Some experience exists in Australia, including the use of electronic devices to record and communicate the number of available spaces at commuter parking stations. However, the accuracy of the counters has been a problem area with such systems.

5.3.2 *Australian Assessment Against Evaluation Criteria*

The Western Department of Planning and Infrastructure has noted that:

> *The sensitivity of demand for parking to price is not well understood or researched. Much data is "commercial in confidence" and generally not available in sufficient detail or covering a sufficient sample size, time period or geographical area to draw meaningful conclusions. Many parking suppliers use differential price rate systems designed to maximise their returns meaning that price can vary within a day, between days of the week and between seasons. As well, parking demand is often obscured with other compounding factors such as fuel cost, tolls or congestion charging, employer subsidised or free parking, traffic congestion, availability*

41 *The parking space levies are presently $900 per annum per commercial car space in the Sydney CBD, North Sydney and Milsons Point and $450 per annum in the suburban centres of Chatswood, St Leonards, Parramatta and Bondi Junction. In Melbourne, the Congestion Levy (as it is known) applies to various parkiong spaces in the CBD and adjoining Southbank area. The rate is $400 per annum space, and will rise to $800 per annum in 2007. The levy in Perth's CBD is presently $169 per annum for short stay parking and $195 per annum for commuter parking. In l;ate 2003, the ACT Government foreshadowed introducing a parking levy (in the range from $89 – $192 per annum per space). This was scheduled to be introduced during 2005/06..*

and cost of alternative transport options and even the weather or drink driving enforcement can influence demand. However, the US Institute of Transport Engineers asserts that:

> *What research has been done generally indicates that parking demand elasticity ranges from – 0.1 and - 0.6 with –0.3 being the most frequently citied value.*

A range for –0.1 to –0.6 makes it hard to predict outcomes with precision.[42]

Parking management – whether limits on the supply of parking and/or increases in the cost of parking - potentially imposes costs in terms of lost business activity in areas with parking restrictions. However, in macro-economic terms, any costs would more or less be off-set by gains in other centres. Provided the supply of parking and access in one centre is not greatly different to alternative centres, it is questionable how much trade would be lost in the centre in question. Moreover, if trade losses in particular centres are a concern, there is scope for governments, councils and other to pursue parking policies at a metropolitan level, eg as part of broader approaches to managing access to retail and other centres. Managing the use of available parking spaces (especially the balance between short-stay and long-stay parking) is critical, as is providing reasonable conditions for other modes to gain access to the centre.

5.3.3 *Implications for Australian/AusLink Congestion Management*

Parking policies should be considered as one of the principal policy measures for congestion management in Australian cities. They are relatively simple to administer, are currently accepted by Australian urban communities as the most familiar 'face' of car use pricing and – in the case of PSLs – can raise a direct funding stream for an improved public transport alternative (which bolsters community acceptance). Parking policies may operate at two levels:

- At the parking system level – as a means of balancing parking demand and supply, while at least covering parking system financial costs through revenues.
- As a key component of a wider congestion management policy – in this case, parking policies can be used as a proxy for direct road-use pricing (this seems to be the intent of the Australian PSL policies).

Various feasibility studies of alternative road-use pricing policies (eg. early London studies, the recent Auckland study) have indicated that parking pricing policies are a serious alternative to direct road-use charging policies as a means of addressing congestion reduction and economic efficiency objectives on congested metropolitan road systems. They do have a number of draw-backs in terms of their effectiveness as congestion management tools:

- It is difficult for public authorities to impose controls on all, or the great majority of, parking spaces in the defined area. PSL policies on privately-owned parking spaces are one approach to such controls.
- Such controls are usually imposed over only relatively limited areas (principal business areas). Any consequent reductions in traffic volumes are likely to be partly offset by traffic reassignment, trip retiming (reversion to the peak) and induced traffic.

Further, for such policies to be effective in terms of having substantial impacts on congestion levels, the charges levied would need to be an order-of magnitude higher than the present PSL rates charged in the three Australian cities. In the case of Sydney and Melbourne (at least), the levy would also need to be extended to apply beyond those centres that are currently the subject of a levy. As foreshadowed by the discussion of cordon pricing above, a wider and stringently enforced 'rollout' of PSLs would be consistent with the multi-

42 *Western Australia Department of Planning and Infrastructure (2006)*

centred form and dispersed employment of Australia's largest cities, mitigating the danger of local centres undercutting each others' parking controls in an attempt to attract development. It could also generate funding for public transport improvements needed to serve non-CBD employment concentrations where employment – and congestion – are growing fast.

On the basis of such refinements, we would suggest that parking pricing policies (involving PSL schemes or similar) should certainly be considered as part of more detailed feasibility studies of pricing options to address congestion issues in major Australian cities.

Parking pricing policies would, in the first instance, focus on the nominated 'centres' of the larger cities. Any resultant reduction in peak period congestion would tend to be greatest in these areas, gradually dissipating with increasing distance from the priced area. The impacts on the AusLink network would thus be greatest on routes in/approaching such priced areas.

The discussion above has focused primarily on the **price** of parking. Constraining the **supply** of parking is also a potential, and complementary, means of managing congestion.

Where feasible, reducing the amount of available parking can have a more significant impact on congestion than parking pricing policies in isolation. Cities with tight parking controls (eg. Zurich and Berne) have achieved high public transport mode shares in the peak period. Internationally, parking controls (pricing and availability) have often been linked to public transport availability/access.

Provided a high quality public transport system is available as an alternative means of travelling to the destination in question, placing strict constraints on the supply of parking is potentially an effective means of moderating traffic growth and any associated congestion. However, the limitations of such an approach also need to be recognised. Supply constraints are (arguably) only relevant to the development of new centres, or, possibly, as a means of moderating any increases in congestion arising from new development in existing centres. The difficulty lies in the fact that, in many existing centres, there is already a significant supply of parking. All that can be done (in the absence of steps aimed at reducing the supply of existing parking, such as buying back spaces) is to limit the increase in new supply.

5.4 Financial and Taxation Measures

Financial and taxation measures aim to provide monetary incentives for travellers to use modes that reduce congestion.

Financial measures are primarily direct financial incentives to use such modes. Typically, these measures take the form of subsidies or allowances to use particular modes. The most common form of subsidy is that provided by governments to reduce public transport fares (refer Section 6.1 of this report). Other examples include allowances to participate in car-pooling schemes and purchase bicycles. In some cases, higher travel allowances are paid by employers to those who use public transport rather than driving a car. In other cases, car parking allowances have been 'cashed out' to provide payments to workers who travel by public transport or by carpool.[43]

Taxation measures are aimed at reducing congestion by adjusting taxation regimes to favour travel by congestion-reducing modes. Other taxes, such as fuel taxes, are also cited by some as a demand management measure, though, as noted below, their effectiveness in this regard is somewhat limited. The tax treatment of employer-provided cars and parking, and public transport fares, is also available as a congestion management measure.

43 *Shoup (1997) and Enoch (2002)*

Financial and taxation measures may be introduced for a variety of reasons: these include to address environmental objectives, eg to improve air quality, as well as reduce congestion.

5.4.1 Overview of International and Australian Practice

Financial Measures

The most common use of employer-based financial incentives has been in the United States, where regulatory measures, eg Trip Reduction Ordinances, have forced employers to look for ways to reduce the use of single occupancy vehicles for travel to work.

Employer subsidies for environmentally-friendly modes have become more common in recent years in the United Kingdom, and in Europe as part of employer travel plans (Mobility Management Plans). A major study of employer travel plans in the United Kingdom[44] found that where employers provided incentives for employees to switch to alternative travel modes, the extent of modal switching was much greater than where these incentives were not provided.

The most recent development in financial incentives has been the trialling of travel behaviour based insurance premiums in the United States.

There is limited evidence on the use of financial measures in Australia to manage congestion.

Taxation Measures

Taxes and charges on car purchase, ownership and use are potentially a means of congestion management. Most countries (especially countries with an automotive industry) do not impose differential rates of taxation on the purchase of cars: the same rate of GST or VAT is applied to cars as to other goods and services.

Taxation on car ownership generally involves payment of an annual registration fee. In most countries, this tax varies in a manner reflecting the power of the car or weight of the vehicle, which has a link with fuel consumption.

Taxation on car use mainly involves taxes on motor fuels. There are large differences between countries in the taxation of motor fuels, both petrol and diesel. Australian fuel taxation levels are low by world standards.[45]

Commuting expenses are treated in two main ways by countries for taxation purposes:

- As a tax-deductible expense. This group of countries includes France, Denmark, Finland, Luxembourg, Germany, the Netherlands, Switzerland, Norway and Canada.
- As a personal expense which is not tax-deductible. This group includes Australia, New Zealand, United States, United Kingdom, Austria, Greece, Ireland, Italy, Portugal and Spain (although several of these countries have recently changed their taxation schemes in regard to Travel Plan related benefits).

In several countries where commuting expenses are tax deductible, the measures do not differentiate between modes, and may in fact encourage travel and congestion.

However, in some countries providing tax relief on commuting expenses, the taxation system has been adjusted to encourage congestion-reducing modes. In the Netherlands, for example, changes to the taxation system which came into effect in January 2001 abolished

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44 *UK Department for Transport (2002)*

45 *See for example Fuel Taxation Inquiry Committee (2002), p.87 which presents data showing that, as a percentage of the retail price of petrol, fuel taxation in Australia (c.55%) was the fourth lowest of the 17 countries reported. Only the USA (c.25%), and Canada and New Zealand (between 40-45%), were lower. The highest percentages were around 70% (in the case of Norway, France, Germany and the UK).*

tax relief for car drivers' commuting expenses, but retained tax relief for public transport users and for cyclists. A similar regime exists in Switzerland: public transport commuters can claim actual costs, whereas car travellers have to make a case to be granted tax relief (e.g. they live too far from public transport, their work is unsuited to the use of public transport, physically handicapped).

In several countries where commuting expenses are not tax exempt, special provisions have been introduced to support employer travel plans. In the USA, for example, employers can provide employees commuting on public transport a benefit up to $100 a month which is tax deductible to the employer and tax free to the employee. Employers do not have to contribute to their employee's public transport costs, but employees still benefit. This scheme applies not only to scheduled public transport but also to private buspools, shuttle buses, vanpools, and subscription buses. This tax exemption has also been extended to cashing out of employer-provided parking.

On 1 July 2006, the Canadian Government commenced a 15.25% income tax credit on the purchase of monthly (or longer) public transport passes.[46]

Taxation of Company Cars

The measures described above are designed to encourage the use of transport modes that reduce congestion or reduce the environmental impacts of travel. However, other taxation measures may have the opposite effect, ie they contribute to congestion. Thus, it is possible that the reform of such measures can also lead to a reduction in congestion. The taxation treatment of company cars is a case in point.

Many countries have established a taxation regime that enables a tax deduction for business-related travel. The Fringe Benefit Tax (FBT) scheme in Australia operates in such a manner. Some countries have made changes to these regimes with the aim of minimising the use of private vehicles.

The UK Government announced in 1999 that it was reforming the company car tax system with the aim, amongst other things, of reducing traffic and congestion levels arising from the 'unnecessary' business usage of company cars.[47] The reforms took effect in 2002. The old system applied a declining rate of taxation from 35% (for vehicles used less than 2,500 miles per year) to 15% on those used more than 18,000 miles per year. Under the new company car tax system, the "business mileage discounts have been removed in order to eliminate the financial incentive which existed under the old system for some company car drivers to do unnecessary business miles."[48]

5.4.2 Assessment Against Evaluation Criteria

Financial measures have been found to have a significant impact on modal share at employer worksites. The degree of impact will differ depending on: the size of the financial incentive; the extent to which 'sticks' such as parking restraint are present; the extent to which complementary measures such as public transport services are provided; and the size/type of centre involved.

A general finding regarding travel plans is that plans without financial incentives can achieve up to a 5% reduction in car use, whereas travel plans with financial incentives for alternative modes can achieve an 8-10% reduction car use. Thus, financial incentives can achieve an additional 3-5% reduction in car use in these circumstances.

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46 *Cannon (2006) and Department of Finance Canada (2006). The program, at a cost of $370 million (CAD) in 2006/07, is expected to take 56,000 vehicles off the road.*

47 *UK Inland Revenue (2004), p.7*

48 *UK Inland Revenue (2004), p.8*

The US Government's original tax exemption for employer-provided travel passes ($65/month) was found to increase public transport usage by 25% among employees offered the incentive[49]. Out of the employees who accepted the incentives, one out of four was a new transit user[50]. After the increase in the cap in 2000 (to $100/month), an 11% modal shift in Washington from private cars to public transport was attributed to the provision of employer-provided transit benefits.

Fuel taxation has a direct impact on car use. The elasticity of car travel with respect to fuel price is typically found to be in the order of, –0.1 to –0.2 in the short run, and up to –0.5 over the long run[51]. However, fuel taxes are incurred whether a vehicle is being used on a congested road or not. In this sense, fuel taxes are a relatively ineffective congestion management measure. The evidence indicates that the response to fuel price increases is less for peak-period commuter travel than for off-peak period travel.

The change in taxation of company cars in the UK has had only a limited impact on total car usage. Surveys of company car drivers undertaken as part of a 2006 evaluation report found the reduction in vehicle usage was only about 70-100 million miles per annum or less than 0.1% of total car mileage in the UK in 2005.[52] However, the evaluation report does not provide data about reductions in peak period usage of company cars. It is likely, though, that the percentage reduction would have been rather higher for peak periods.

Car-related FBT exemptions are currently estimated to be 'costing' the Australian Government around $1.25B per annum, an amount which has been increasing faster than the rate of inflation.[53]

In Australia, the Productivity Commission has noted that, "The FBT methodology provides an incentive to use a company-provided vehicle more, either by substituting for other modes of travel or for other family vehicles, or by increasing the amount of travel undertaken."[54] Similarly, the House of Representatives Standing Committee on Environment and Heritage recommended that the FBT regime be reviewed to remove incentives for greater car use and to extend incentives to the use of other modes.[55]

There appears to be relatively little comprehensive Australian data on the extent to which company cars contribute to congestion. A survey of company car use found that, when the mean annual distance travelled by the overall vehicle fleet was 15,100 kms, so-called 'field cars' (ie those used by sales representatives and the like) travelled 33,838 kms and so-called 'management cars' travelled 20,510 kilometres, ie about a third more than for the fleet as a whole.[56] Some 70% of 'management cars' were driven for longer distances than the mean for the fleet. Data from the 2001 Household Travel Survey in Sydney indicates that drivers of company cars accounted for approximately 21% of total cars on the road during the morning peak period.[57]

Whilst there have been suggestions that company cars constitute a significant part of peak hour traffic, the information on the issue is relatively limited. It is difficult to prove or

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49 *US General Accounting Office (1993). Statement of Kenneth M. Mead, Director of Transportation.*

50 *Mass Transit, Federal Participation in Transit Benefits Programme – Statement of Kenneth M. Mead, Director of Transportation Issues to the United States General Accounting Office, 1993.*

51 *Online TDM Encyclopaedia, 'Fuel Taxes'. (Victorian Transport Policy Institute, 2006). Kennedy, D. and Wallis, I. (2006) also cite a range of Australian studies bearing out elasticities in this range.*

52 *HM Revenue and Customs (2006), p.5*

53 *Treasury (2005)*

54 *Productivity Commission (2005), p. 262*

55 *House of Representatives (2005), p.77*

56 *Schou, K (1982), p.777*

57 *NSW Transport and Population Data Centre (2006a)*

disprove that the use of company cars is a significant contributor to congestion. Given the scale of the congestion problem, and the number of inquiries that have recommended that the FBT treatment of company cars be addressed, this is surprising. The knowledge gap needs to be filled to enable more informed debate about this area of policy.

5.4.3 *Implications for Australian/AusLink Congestion Management*

Experience internationally shows that financial and taxation incentives have been successful in increasing public transport use/and or decreasing motor vehicle use.

Our findings indicate that the following measures to reduce congestion in Australia may warrant further consideration:

- Basing car ownership and road fees and charges on usage
- Providing tax incentives to public transport users, and/or adjusting tax incentives which favour road users.

Distance-based fees could encourage a minor reduction in the use of vehicles, and create a supportive climate for any move to a more explicit form of road pricing. Adopting distance-based insurance and registration fees, for example, could be a small step along this path (as insurance and registration costs make up a small percentage of overall car ownership and operating costs).[58]

The current FBT regime applying to transport lacks a clear policy focus. From an economic perspective, one would expect some form of equitable or 'neutral' treatment across modes.

The policy basis for the current FBT treatment of company cars (particularly the statutory formula provision) and car parking is worthy of review. It has been suggested that the FBT arrangements are designed principally to minimise compliance costs for taxpayers. Whilst this is a plausible policy rationale, the translation of that policy objective into a particular tax benefit seems anomalous, especially in light of:

- the substantial (and growing) cost of the benefit to government revenues;
- the economic cost of the congestion that the benefit contributes to; and
- the significant financial cost to government of upgrading the nation's road networks to deal with congestion.

In short, a change in FBT arrangements could alter the generalised cost of travel by company car by a few percent, resulting in a modest but worthwhile reduction in congestion. Likewise, providing taxation incentives (possibly in conjunction with the use of targeted workplace-based travel plans, or more broadly through FBT-type tax concessions for public transport use) has the potential to improve the relative attractiveness of public transport, with potential benefits for congestion reduction. Further work on these options is required to enable the cost-effectiveness of these type of measures to be properly assessed in relation to other congestion management tools (including other price-based tools).

58 *See NRMA (2006). For example, the Association's June 2006 Private Motoring Cost Schedule reports ownership and operating costs for approximately 450 vehicle types, based on a range of assumptions, principally the residual value of the vehicle after 5 years and average usage of 15,000 kilometres per annum (close to the national average). Weekly ownership and operating costs for medium size vehicles (typically with a 2-2.5l engine) range from $167.51 - $391.85. Weekly operating costs alone range from $71.54 – $116.51. Of this amount, registration costs represent around $6 – $10 per week.*

6 ALTERNATIVE MEANS OF PASSENGER TRANSPORT

This chapter assesses the use and effectiveness of public transport and non-motorised modes as means of managing congestion. Public transport includes heavy rail systems, buses, light rail and ferries. Walking and cycling measures fall into three broad categories: the provision of infrastructure such as pedestrian and bike paths and end-of-trip facilities (parking, lockers and showers).

6.1 Public Transport

6.1.1 Overview of Australian and International Experience

It is beyond the scope of this report to comment in detail on the range of public transport systems around the world. Suffice to say, almost all cities around the world have some system of public transport. The extent, type and integration of these systems varies widely. As a broad observation, public transport systems are more extensive in European and some (usually quite dense) Asian cities than in most North American and Australian cities.

The pattern of public transport systems in Australia broadly reflects the size and density of each city, and, perhaps more importantly, the period when each city expanded its reach. The older and larger cities tend to rely more on rail-based forms of public transport that were laid down in the early-mid twentieth century. Cities such as Brisbane (and the SE Queensland conurbation) and Perth that have grown strongly over the last 20-30 years, as well as the more recently developed parts of Sydney and Melbourne, rely more on bus systems.

As with several other congestion measures, the rationale for developing and operating public transport systems is driven by a range of public policy considerations. Congestion management is certainly one of those considerations. Social policy objectives, eg providing access to employment and services for those unable to drive or on limited incomes, and environmental objectives, eg improving air quality, are also important drivers of policy and investment in this area.

State governments contribute very substantial sums to support public transport systems.[59]

6.1.2 Assessment Against Evaluation Criteria

In assessing the impacts of public transport system improvements on road traffic volumes and conditions, the key consideration is the change in modal shares, or the proportion of total car trips that switch to public transport. This proportion depends on three component factors:

(A) The base ratio of public transport passenger: car driver mode share in the relevant corridor or area

(B) The proportionate increase in public transport trips in the relevant corridor (which depends primarily on the attractiveness of the improvement project)

(C) The 'diversion rate' (for car drivers), ie the proportion of new public transport trips which were previously made by a car driver.

The maximum proportionate effect on road traffic volumes will occur in situations where the public transport base mode share is high, the improvement project is a major/attractive scheme, and the diversion rate is relatively high.

[59] *For example, the 2006-07 budget papers for NSW, Victoria and Queensland suggest that these three states alone spend a total of approximately $5B per annum in operating support for public transport services, ie excluding capital payments.*

Other factors being equal, the impact of public transport improvements on road traffic volumes and congestion would be greatest for those situations for which public transport has the highest mode shares (ie. in the peak, to/from CBD): in large measure, these are the situations for which congestion levels are highest.

The impact of any public transport improvement scheme on total public transport patronage in the corridor concerned will depend on many factors, relating to the scheme itself, market characteristics, constraints on car travel etc. Work undertaken by BAH for the recent Victorian Competition and Efficiency Commission inquiry into urban congestion included an analysis of overseas evidence on the impact of public transport initiatives on public transport usage, diversion rates and traffic. This involved an examination of ten specific cases as well as broad analysis of initiatives in New Zealand, Europe, Norway and the United States.[60].

As a broad generalisation, in developed cities with reasonable 'base' levels of public transport service, it would be exceptional for any public transport improvement scheme to increase base patronage in the corridor/area affected by more than 50%. For more modest schemes (eg. priority measures, service frequency increases), typically increases are unlikely to be more than 25% on base patronage.

The key conclusions may be summarised as follows:

- Major urban public transport improvement schemes may substantially increase public transport patronage in the corridor/area directly affected by the scheme. Patronage increases in the order of 50% can be achieved by major schemes.
- Some (but typically a minority) of the new public transport passengers would otherwise have travelled as car drivers, and hence the scheme would reduce car traffic volumes on roads in the corridor. Such reductions, may, in theory, be up to 15%, but more typically a maximum of 5-10% in Australian city conditions (with relatively low PT base mode shares). These maximum reductions will dissipate rapidly away from the corridor most directly affected.
- In practice, observed reductions in road traffic volumes are likely to be less than this, and in most cases are too small to be identified/assessed with any confidence. This result arises because, particularly in congested urban areas, any temporary reduction in traffic volumes on selected routes is largely offset by the range of car traveller responses that occur in such situations (re-routing, changes in time of travel, trip redistribution, etc): the long-run equilibrium position on the road system appears little different from the previous equilibrium.
- Major public transport upgrades are most likely to be provided along corridors which are catering for population growth, ie with the aim of delaying or avoiding more serious traffic congestion.

Two additional points should be made here:

- Even if traffic congestion is not significantly reduced as a result of the public transport improvements, it should not be concluded that the road traffic benefits associated with the scheme are negligible: there will be benefits to car users that take advantage of the situation through re-routing, redistribution etc.
- While the evidence examined indicates that the 'carrot' of public transport improvements has on its own only limited effect in reducing congestion, the effectiveness of an integrated 'carrot plus stick' approach may be much greater. This is illustrated in the case (for example) of the London Congestion Charging scheme: there

60 *Booz Allen Hamilton (2006)*

the 'stick' of road pricing was accompanied by the 'carrot' of enhanced bus services, resulting in substantial and sustained reductions in congestion levels. Generally it would not be feasible to implement the 'stick' until the 'carrot' has sufficient capacity to cater for the anticipated diversions.

6.1.3 *Implications for Australian/AusLink Congestion Management*

Australian governments view the provision of public transport as an important means of managing congestion in Australian cities. Public transport is likely to become increasingly important, as Australian cities pursue land use plans aimed at increasing urban densities. In the absence of improvements in public transport (as well as other measures), the established parts of Australian cities (and the AusLink networks that traverse those areas) are likely to become increasingly congested.

Extensive development on the fringe of our capital cities ('urban sprawl'), as opposed to higher density development supported by public transport, is likely to see residential development extend along the inter-regional corridors, and probably lead to more widespread congestion along the 'outer' parts of the AusLink urban corridors. This is already occurring in some cities, leading to inter-governmental negotiations about upgrades to relevant sections of the AusLink network, and, more particularly, responsibility for funding those upgrades.

One challenge in improving public transport in these areas will be to ensure that road-based systems of public transport (whether they be bus or light rail) are provided with an environment where frequent and reliable services can be provided. This will not be easy. At a minimum, it will require extensive management of road space.

6.2 Walking and Cycling

6.2.1 *Overview of Australian and International Experience*

Cycling is a more established part of (northern) European life than in North America or Australia, with bicycle mode shares between 4-6% of all trips reported for the UK, Italy and France, and as high as 20-30% in Denmark and the Netherlands. [61] This is considerably higher than in Australia. Experience with walking and cycling measures is more widespread in Europe than in North America and Australia.[62] In northern European countries, where cycling is already widespread and the necessary infrastructure in place, much effort is now focussed on campaigns to promote cycling. Walking has also been promoted in a number of European cities.

Australian State and Territory governments have pursued a range of infrastructure, regulatory and marketing measures to encourage walking and cycling. Cycleways are included in the design of most new motorway projects. Other cycle paths – partly off-road and partly on-road - are being progressively developed. In some States (eg NSW and Queensland), modest programmes to install bike lockers and parking facilities at railway stations have been pursued for the last decade. Local councils are increasingly involved in these types of measures, perhaps unsurprisingly, given that the vast majority of urban roads, parks and centres are under the control of local government. Overall, though, these types of measures have not attracted large shares of the budgets of State and Federal transport agencies.

61 *Pucher and Buehler (2005)*

62 *UK Department for Transport (2004)*

6.3 Assessment Against Evaluation Criteria

European experience suggests that it is possible to secure bicycle mode splits of 5-10%. Even in North American cities, which arguably have more in common with Australian cities, examples exist (Toronto, Seattle, Boulder and San Francisco) of bicycle mode splits of 1-3%. However, it is unclear whether this percentage is for all trips, or whether it represents a journey to work share. Evidence exists to suggest that programmes aimed at encouraging cycling in some of those cities (Toronto, Boulder and San Francisco) have increased the mode share by between 75 and 100% over periods ranging from 6-10 years.[63]

6.3.1 Implications for Australian/AusLink Congestion Management

Data from Sydney suggest that a large proportion of trips involve short travel distances: more than a quarter of all trips are less than 2km in length, and, of those, 45% are by car. A further 25% of trips are over distances between 2km and 5km, and, of those, 73% are by car.[64] In some cases, these car trips will involve use of the AusLink and associated networks, particularly where those networks have a reasonable density of on/off ramps. Thus, those making essentially local trips will add to congestion on the arterial road networks.

On their own, walking and cycling initiatives are unlikely to have a significant impact on congestion. Trips by these modes tend to be over short distances. However, in concert with other measures - notably the provision of public transport, charges on car use, and the pursuit of suitable land use planning policies - walking and cycling initiatives could play a more significant, though complementary, role in managing congestion. The walking and cycling environment also can act as a constraint to public transport use, as most public transport trips start and finish with walking. If both of these are not safe and convenient, then the trip may not be made by public transport. Moreover, such measures have a range of other benefits, eg improvements in public health, that need to be considered in judging the overall attractiveness of investments in this area.

63 *Pucher et al (1999, Schneider et al (2005))*

64 *NSW Department of Planning (2005), p.35*

7 FREIGHT MANAGEMENT

Freight management refers to a broad range of measures aimed at:

- Improving supply chain management in order to minimise the demand for freight movements
- Encouraging use of transport networks at times when they are likely to be least congested
- Transporting freight (eg inter-modal containerised freight) by rail rather than road.

7.1 Overview of International and Australian Practice

Approaches to urban congestion can be divided into three groups - policies that focus on the vehicle, policies that deal with the network (the regulation of land and highways) and those that focus on demand management.

The key instruments either in place or emerging as increasingly relevant (albeit at varying levels of application and intensity) to freight management are:

- Licensing and regulation (eg. London Lorry Control Scheme, Australian states);
- Development of intermodal logistics centres – primarily in outer-urban areas of major cities (eg. Melbourne, Sydney and Brisbane);
- Freight routes - including curfews and restrictions associated with time of day, days of the week, specific locations and parts of the road network and vehicle size (eg. Netherlands, Dublin Port Tunnel[65], Alameda corridor in Los Angeles, Melbourne freight-only road, existing and proposed freight only-rail lines for Sydney); and
- Various adaptations of road pricing (eg. German truck toll, London congestion charge, Stockholm cordon charge trial, Los Angeles Pier Pass Scheme[66], the pricing scheme recommended in the report of the Freight Infrastructure Advisory Board and being considered by the NSW Government[67]).

From the review of various initiatives world-wide, the following important points emerge for policy makers:

- Whilst cities may vary in shape, size and population, the contribution of freight transport to congestion and other problems in urban areas is increasingly being recognised as a major challenge that needs significant remedial measures.
- National policies focused on urban goods transport are not the norm: most initiatives are being developed by local or regional authorities which can, *inter alia*, lead to fragmented, diverse and inconsistent policies impacting on the freight sector across jurisdictions in a

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65 *Dublin City Council (2006) notes that the 4.5km tunnel will be toll free for freight vehicles over 3.5 tonnes and for buses. Other vehicles will pay 12 Euros (presently a little under $20AUD) in peak periods and between 3 and 6 Euros at other times.*

66 *PierPass involves the use of a traffic mitigation fee (presently $50US per TEU for loaded containers entering or leaving the ports of Los Angeles and Longbeach during peak periods to cover various costs associated with the movement of containers at off-peak times. PierPASS (2006) reports that the scheme diverted some 2,500,000 peak day time truck trips during its first year of operation (July 2005 – July 2006). Approximately 30-35% of container cargo at the ports has moved during the new off-peak shifts associated with the scheme*

67 *Freight Infrastructure Advisory Board (2005), p.36. The Board has recommended that a freight infrastructure charge of $30 per TEU be applied to all import and export containers moving through Port Botany, fully rebated for all containers moved by rail and for containers moved by road during designated night-time off-peak hours. The charge is one of a number of measures aimed at increasing the proportion of containers moved by rail to/from Port Botany from around 20% at present to 40%.*

single country. This also has the potential for poor harmonisation between initiatives (and definitions and language) and poor and inconsistent enforcement.

- The importance of the freight industry for economic activity and the implications of urban freight transport for congestion is not widely known, both within the community at large and within Government in many countries and cities – particularly, for example, in comparison to the effort to develop policies for urban passenger transport.
- Policy measures for urban freight transport are rarely subject to detailed ex-post evaluation, and little reliable and detailed planning data on current activity is readily available in most major cities.
- Management measures are frequently 'driven' by environmental and amenity concerns, eg night-time noise, rather than concerns about the impact of congestion on the economy.
- Many current policy measures are either short-term focused or site-specific (or both). The long term perspective is rarely evident in current policy formulation.
- For rail to be an attractive alternative for freight transport, a package of measures is required.
  - Infrastructure - to overcome bottlenecks and capacity problems and to avoid passenger services
  - Operational improvements – for example., loading and unloading
  - Pricing measures.
- There appears to be a role for incorporation of public-private partnerships in policy development, in part to successfully embrace the complexity of supply chain logistics. A key to successful policy implementation will include the integration of differing interests and perspectives from a wide range of stakeholders. For example, the evaluation of a time of day pricing initiative in New York and New Jersey found that, whilst there was some shift of truck traffic to outside the peak pricing period (like other drivers, to just before or just after the peak period), most carriers did not change their behaviour. Most respondents to a survey reported that customer requirements dictated their schedules.[68]
- Whilst there may be a role for the public sector in 'seeding' the development of urban intermodal terminals /logistics centres, successful integration into the private sector's supply chain (a prerequisite for success) requires commercial viability, which is best 'driven' by the private sector.
- Initiatives such as 'FreightSmart' which aim to improve co-ordination and reduce costs in the supply chain offer some potential; however environmental concerns around the operation of freight terminals and the hours of operation of various participants in the supply chain place material constraints on this means of managing congestion.
- Consolidation initiatives are clearly an emerging trend, particularly as they apply to city centre/CBD logistics: however, successful development of working and sustainable 'models' appears difficult. [69]

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68 *Holguin-Veras et al (2005)*

69 *US Department of Transportation (2006) refers to a successful trial (funded under the European Union's CIVITAS programme) of a freight consolidation centre in Bristol. The scheme consolidates various trucking services at a location outside the core retail area of the city and a single truck then makes consolidated deliveries into the retail area. The trial is reported to have reduced delivery vehicles in the Broadmead district by 65%. A similar system is in place in Marunouchi, Japan (OECD (2003)*

- The introduction of innovative 'packages' of policies, which include a wide spectrum of measures, from pricing instruments to establishment of 'environmental zones', to multi-user / use infrastructure and time-sharing, are being considered in many cities.

7.2 Assessment Against Evaluation Criteria

Our review of Australian and international experience identified limited information in the freight congestion management area. Therefore it is difficult to evaluate the effectiveness of and applicability of various congestion management measures against the framework. The following table presents some tentative conclusions in this regard.

Table 7.1 Assessment of Freight Congestion Management Measures

	Effectiveness	Cost Effectiveness	Compatibility with Other Objectives	Breadth of Application	Complementarity
Licensing and regulations	Has been used mainly to restrict truck movements for environmental and asset management reasons. Though this measure is not used to specifically target congestion in Australia, it has the potential to do so. The effectiveness of this measure is heavily reliant on enforcement.	No evidence available to evaluate conclusively	Although this measure does not specifically target congestion, it is arguably consistent with objectives to reduce the environmental and health impacts of transport.	Broadly applied across Australian and overseas jurisdictions.	Yes. Potential to implement in a package of complementary measures
Logistics and Supply Chain Initiatives	Can assist in shifting the movement of containers to non-peak periods. However, scope may be limited by local environmental concerns (eg hours of operation of terminals and traffic).	Likely to be quite high	Potential impacts on local amenity arising from late night/ early morning operations.	FreightSmart initiative in Victoria and exploration of similar initiatives by the RTA in NSW	Complementary with pricing initiatives
Freight centres	In general, observations from Europe suggest that freight centres need to be market based and commercial entities in order to be successful. Environmental concerns amongst local residents (eg hours of use) are likely to be a limiting factor	No evidence available to evaluate conclusively	Australian governments have planned the development of freight centres to improve the efficiency of freight movements. Freight centres are a key part of Australian Government strategies	No evidence available to evaluate conclusively, however freight centres are planned across Australia	Yes. Potential to implement in a package of complementary measures eg – freight centres and freight routes
Freight routes	No evidence available to evaluate conclusively, particularly in relation to induced demand and capacity of existing roads created by the diversion of freight traffic.	No evidence available to evaluate conclusively	No evidence available to evaluate conclusively. However, they are Intended to focus heavy vehicle movements where they have the least negative impacts (maintenance, noise, etc)	Freight only rail ines exist in some Australian capital cities. ARTC program aims to separate freight lines from passenger lines in Sydney. Examples of truck/bus only lanes exist in the UK and Southern California.	Yes. Potential to implement in a package of complementary measures
Demand management	The London congestion charge has reduced congestion by approximately 26-30% since its introduction 4 years ago. Los Angeles PierPASS Scheme has been successful in shifting a % of truck trips to off-peak periods	Mixed experience.	Likely to meet a variety of government objectives	There are few examples in Australia, However some success in Europe with the London congestion charge and the recent Stockholm trial	Yes. Potential to implement in a package of complementary measures

7.3 Implications for Australian/AusLink Congestion Management

The present contribution of freight transport to the overall congestion problem in Australia may be small, other than in limited areas. However, most observers expect continued economic growth for Australia and significant increases in port activity in our major cities

(eg container trades are forecast to more than triple over the next 30 years). This growth will generate additional heavy truck movements to/from the ports themselves. In addition, this economic growth will lead to significant volumes of 'down the line' freight transport activity for both heavy trucks and light commercial vehicles associated with distribution centres, warehouses, importers' and exporters' consolidation activities, land-side transhipping activities, container park activities, etc.

For example, projections by the Bureau of Transport and Regional Economics suggest that the distance travelled annually by freight vehicles in metropolitan areas will increase as follows over the period 2005 – 2020: light commercial vehicles - 90.0%, rigid trucks – 31.7% and articulated vehicles – 93.0%, compared to an average increase for all motor vehicles of 33.9%.[70] Overall, freight vehicle usage is projected to grow by around 79% from 22.0 billion kilometres travelled to 39.4 billion kilometres travelled over the same period. Freight vehicles' share of travel on metropolitan roads is expected to grow from 17.4% of total metropolitan kilometres travelled in 2005 to 23.3% in 2020.

Whilst a number of measures are in place (or being developed) to accommodate this growth, there are several implications in terms of congestion management and accommodating increased economic activity that may necessitate detailed consideration, including:

- Additional road and/or rail network capacity, though targeted to address freight needs and minimise the risk of inducing other traffic and disruption to passenger services.
- Increased road vehicle productivity – noting that this is somewhat limited due to the peculiarities of supply chain logistics. For example, vis-à-vis port traffic, the stevedores' focus is more on maximisation of handling equipment (cranes etc) utilisation than that of the vehicles being loaded / unloaded.
- Enhancements to road network performance via ICT initiatives and other measures (such as some of those being explored under the *FreightSmart* activities and those in place by VicRoads such as 'Alternative route' and 'Travel time' signage and real time information).
- Encouragement for freight movements to take place outside the peak period.
- Increased use of restrictions on access for heavy trucks at particular times of day (e.g. weekday commuter peak periods) and/or for specific locations/routes (eg. CBD and main arterials into the CBD).
- Recognition that the increased use of very large trucks 'after hours' on shuttle operations between urban terminals in key industrial areas may offer some amelioration (noting that this could be viewed as a 'competing model' to the development of urban rail freight shuttle services). However, local concerns about the amenity of such 'after hours' operations may well limit the extent to which such operations are taken up.
- Consideration of road pricing measures, which could vary in coverage from a London-type congestion charge to port-traffic focused schemes such as that now operating in Los Angeles or the scheme recommended for Port Botany by the Freight Infrastructure Advisory Board.
- Consideration of extending the functionality of the Intelligent Access Programme technology platform, which is a means of regulating heavy vehicle access via GPS technology, as a means for future road pricing initiatives.

70 *BTRE (2006), p. 63.*

- Increased focus on consolidation of cargoes, in particular Light Commercial Vehicle (LCV) freight required for distribution within the CBD and other built-up commercial areas.

In respect of port-related freight movements, a truly multi-modal approach is required to manage congestion. The report of the Freight Infrastructure Advisory Board[71] provides an example of such an approach. Its recommendations seek to address the wide range of considerations – infrastructure, land for inter-modal terminals, rail operations as well as customs and quarantine issues, and, importantly, pricing and funding – that need attention if the proportion of containers moved by rail is to increase.

Such an approach offers not only congestion management benefits; it will also assist in addressing labour supply and productivity issues that already affect the road transport industry. Of course, these issues are not confined to the trucking industry - many industries are concerned about the supply of skilled labour. However, it is particularly relevant in the context of a debate about congestion. The trucking industry has recently argued that labour shortages are such that immigration requirements need to be changed to allow more drivers to immigrate to Australia. Unless there is both some mode shift (where rail can genuinely offer an alternative to road), and unless congestion is managed (in relation to that part of the freight task that cannot plausibly be carried by rail), the economic costs of driver shortages and congested-induced productivity losses amongst truck drivers could be significant. Any increase in congestion will reduce the productivity of truck drivers (as each 'run' takes longer) and compound the impact of wider shortages in the number of truck drivers.

Freight-related congestion will also grow for other reasons beyond port growth. Population and economic growth in the established parts of our cities is likely to generate growth in freight traffic associated with retail activity, construction and local service industries. This growth in population and transport is likely to occur in precisely the areas where it will be difficult and costly to expand road and rail networks.

71 *Freight Infrastructure Advisory Board (2005)*

8 URBAN LAND USE PLANNING

Land use planning is being used increasingly with the objective of influencing travel patterns, particularly to reduce private vehicle use – vehicle kilometres travelled (VKT) - and increase public transport patronage. The key land use planning tools are:

- The density and location of development (residential, employment and for other purposes). These tools are most relevant at a metropolitan level; though, clearly, they need to be applied at a local level for metropolitan scale effects to occur.
- Designing new suburban development, urban centres and buildings so as to make the use of public transport, walking and cycling relatively more attractive than using a car. This class of measures includes elements such as street layout, permitting 'mixed use' development in particular centres, provision of facilities for pedestrians, and including pedestrian thoroughfares in new buildings.
- Complementary measures such as developer contributions and various forms of 'land value capture' to assist in funding transport (particularly public transport) infrastructure.
- The use of conditions on land use planning approvals to require the developer, land owner or occupier of a development to pursue certain initiatives, eg requiring employers in large developments to provide and encourage employee participation in a 'car-pooling' programme.

These tools are aimed at encouraging 'transit-oriented development'. Such development may take a variety of forms. The essential thesis, though, is that by increasing densities (to typically 3-10 times that of conventional suburban development) and permitting mixed uses in key locations well-served by public transport and facilities for walking and cycling, the following outcomes can be achieved:

- The need for travel can be reduced (eg where trips occur within a single centre rather than across a city), thus increasing the proportion of local (ie short-distance) trips.
- A larger number (and proportion) of people use public transport, walk or cycle for at least some of their trips.
- Travel movements can reach a sufficient density to improve the financial performance of public transport services, and, in turn, encourage public transport operators and governments to maintain and increase service quantity and quality, eg frequency, hours of operation, etc.

What is important is the change in the **application** of land use planning tools over the last 10-20 years. Previously, land use zoning and plans were used to separate 'incompatible' land uses and introduce controls that led to low density development. Whilst land use plans continue to operate in this manner, there is now a much wider use of these instruments to integrate land use with the transport network.

8.1 Overview of International and Australian Practice

Land use planning has been common in most countries for at least the last 50 years, and in some countries for much longer. State and local governments in Australia have developed and implemented land use plans since the mid–twentieth century, though there are earlier examples.

The literature points to a large number of examples where land use planning is being used overseas to pursue transport objectives.[72] A few case studies are mentioned here to illustrate a number of themes.

Toronto (with a metropolitan population of around 5 million) is widely recognised as a city that has successfully integrated land use with its transport system. The city has pursued land use planning policies since the 1940s as a means of focusing development into the CBD and 22 major centres located on its subway routes. High density development has been carefully planned around the public transport system, with the result that Greater Toronto recorded 210 public transport trips per capita per annum, the highest rate in North America.[73] Policies aimed at increasing CBD housing densities are reported to have reduced morning peak hour traffic flows by 100 vehicles for every 120 dwellings constructed.[74]

Vancouver (with a population of approximately 2 million) has applied land use planning policies since the early 1990s to encourage housing in its CBD and to direct commercial development away from the CBD to a number of centres on the city's expanding Skytrain network. Whilst there has been a 7% reduction in peak-hour private car volumes into the CBD, the planned development along the transit infrastructure has yet to occur.[75]

Australian experience in this area is generally in line with practice overseas. All States and Territories have a statutory basis for land use planning, and, in one form or another, all are pursuing metropolitan development strategies which are:

> *"typically designed to meet sustainable economic, environmental and social outcomes. Key elements common to the frameworks for major cities include: focussed urban development into activity centres in both existing and greenfield areas, urban expansion focussed on designated growth areas located on the edge of cities; a strong activity centres policy linked to improved radial and cross town public transport services; road upgrades with priority given to servicing growth areas and strategic flows (predominantly cross town and/or port access); development of freight hubs inland from ports and protection of road and rail access to key freight areas; management of road space to meet strategic objectives (PT and/or freight priority) and some initial steps to influence travel behaviour."*[76]

Implementation of these frameworks varies between and within governments. In most of the key areas relevant to delivery of the strategies – governance, strategic planning capability, budget processes, and project implementation arrangements – it appears governments have made improvements over past practice. However, significant opportunities for further improvement remain in all of these categories.[77] For example, some overseas cities intervene more actively in the land market around proposed transport nodes, thereby securing the increase in land value (amongst other benefits) arising from public investment in new transport links. [78]

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72 *See, for example, the material cited in Booz Allen Hamilton(2006c)*

73 *Newman and Kenworthy (1999). However, there is some doubt about this estimate of 210PT trips per capita: other Booz Allen data indicates a figure of around 150 PT trips per capita for the Greater Toronto area in 2005.*

74 *Nowland and Stewart (1991)*

75 *Booz Allen Hamilton (2006c), pp.40-41*

76 *Geoff Anson Consulting and InfraPlan (Aust), p.10*

77 *Geoff Anson Consulting and InfraPlan (Aust), pp.4-5*

78 *Booz Allen Hamilton (2006c), p.31*

8.2 Assessment Against Evaluation Criteria

Land use planning is an effective means of reducing overall use of private motor vehicles and increasing public transport usage. Various studies have found that doubling residential densities can reduce VKT by up to 20-30%.[79] Above about 30 dwellings per hectare, public transport is used more and becomes more cost effective.[80] Conversely, experience in Australian cities and overseas suggests that low density, car-oriented development leads to high levels of car use. For example, out-of-centre office parks in San Francisco had public transport mode shares of around 2%.[81] Similarly, public transport mode shares within suburban areas in Australian cities are typically in the range 2-5%.

Whilst land use policies can reduce VKT and increase public transport usage, the circumstances of each city are likely to determine whether this translates into a reduction in congestion. In general, though, land-use related reductions in overall VKT should be expected to reduce the spread, if not the intensity, of congestion on the road network.

8.3 Implications for Australian/AusLink Congestion Management

Land use planning is likely to remain an important element in the congestion management policies of all Australian cities. To varying degrees, all State and Territory governments are looking to consolidate development around transport nodes. Such policies have the potential to minimise future growth in demand on the AusLink networks.

However, the impact of these polices will only become apparent over time. This is because of the 'inertia' of the built form of our cities. The vast majority of Australia's capital cities is already built. Whilst there are no doubt variations between cities, new dwelling construction averages only 1-1.5% of existing stock per annum. That being the case, current State and Territory policies that aim to consolidate development around transport nodes will take some time to bear fruit. This is not to say that such policies should not be pursued. The alternative would be to pursue policies of dispersed, car-based development that would make the challenge of managing congestion more difficult than would otherwise be the case.

The pursuit of these policies is likely to be particularly important in minimising congestion in the established parts of Australian cities, ie the areas where the AusLink network typically connects to major ports. However, it is likely that such policies will also be important to minimise growth in cross-regional traffic and thereby protect the performance of other parts of the urban AusLink network, for example those around the outskirts of Australian cities.

79 *Booz Allen Hamilton (2006c), p.6*

80 *Booz Allen Hamilton (2006c), p.31*

81 *Cervero (1986)*

9 CONSOLIDATED ASSESSMENT OF MEASURES, IMPLICATIONS FOR THE AUSLINK NETWORK AND MANAGEMENT OF CONGESTION IN AUSTRALIA

This chapter seeks to draw a series of conclusions from international (and Australian) experience with various congestion management measures, and, in turn, to provide some observations as to where Australian governments might direct future congestion management efforts. The chapter addresses:

- the relative effectiveness of various measures
- issues surrounding the acceptability of congestion management
- the need to pursue congestion management as a package of complementary measures, and
- implementation issues.

As a general comment, Australia appears to be neither particularly well ahead nor well behind international practice in this area. Like other cities overseas, Australian cities are using, experimenting with and adapting a range of congestion management tools. In some areas, eg the use of household travel behaviour change measures, Australia is at the forefront of international experience. In other areas, eg workplace travel behaviour change measures and the use of pricing measures, experience in Australia is less advanced than that in some other countries. In that sense, there are some 'gaps' between international and Australian practices.

There is clearly a danger in drawing general conclusions about these matters. Different measures may work or not work, depending on their design and application, and the circumstances in which the measure operates (notably the presence of complementary measures). However, it is in the nature of this type of assignment that certain generalisations have to be made. Governments are seeking guidance about the most promising means of managing congestion.

Table 9.1 on the following page provides a broad assessment of the various measures against the criteria mentioned in section 2.5. Appendix 2 provides some further detail in relation to the effectiveness and cost-effectiveness assessment of the measures.

9.1 Effectiveness

As the range and depth of evaluation material (particularly post-completion evaluations) is relatively limited, it is difficult to be conclusive about the effectiveness of particular measures. It is not possible to say with any precision that a particular measure is likely to offer a particular level of congestion reduction, or that the reduction can be achieved for a given cost. Appendix 2 provides a relative qualitative assessment of the effectiveness and cost-effectiveness of various congestion management measures.

With the potential exception of pricing measures (both road pricing and the pricing of parking) and (in some cases) traffic management systems (TMS), there do not appear to be any 'silver bullet' solutions to the challenge of congestion. This is perhaps not unexpected. If such solutions existed, they would have been used before now. What differentiates both TMS and pricing from the other measures is that they are 'new solutions', ie they have emerged relatively recently, partly as a result of developments in technology.

Table 9.1: Qualitative Assessment of Measures Against Evaluation Criteria

Policy Area/Measure	Effectiveness	Cost Effectiveness	Suitability	Breadth of Australian Exp.	Transferability	Longevity	Lead Times	Complementarity	Distributional Impacts	Applicability to AusLink Network
A. ROAD SUPPLY MANAGEMENT										
A1. Road Space Re-allocation	M	M	M	M	H	H	Short	H	H	L/M
A2. Road Capacity Enhancement	M	M	L	L/M	M	L/M	Short	L	L	M/H
B. ROAD DEMAND MANAGEMENT – NON-PRICE MEASURES										
B1. Travel Demand Modification	M/H	M/H	L/M	L	L	M	Short-Medium	M	L	M
B2. Travel Planning	L/M	L/M	M	M	L	L	Short	M	H	L/M
B3. Travel Substitution	L	M	M	L	M	M	Short	L	L	L/M
B4. Administrative Measures	M	M	M	L	L	L/M	Short	M	M	L/M
C. ROAD DEMAND MANAGEMENT – PRICE MEASURES										
C1. Road Use Charging	H	M/H	M	M	M/H	M	Long	M/H	L	H
C2. Parking Pricing/ Supply Policies	M/H	M/H	M	H	H	M/H	Medium	M/H	M	M
C3. Taxation Measures	M	M	M	L	L	L/M	Medium	L	M	M/H
D. ALTERNATIVE PASSENGER TRANSPORT										
D1. PT System/ Service Enhancements	M	L/M	M/H	H	H	M	Medium - Long	H	H	M
D2. Walking/Cycling	L/M	L/M	H	M/H	H	M	Short	L/M	H	L
E. FREIGHT MANAGEMENT										
E1. Freight Management	L/M	L/M	L/M	L	L/M	M	M	M	M	M/H
F. URBAN LAND USE PLANNING										
F1. Urban Land Use/ Planning Policies	L	M	M/H	H	M/H	H	Very Long	M	L/M	M

***Note**: For each criterion, L stands for 'Low', 'M' stands for medium, and 'H' stands for High. 'H' ranks more highly than 'M' or 'L'. This is readily understandable in most cases. In the case of the 'Distributional Impact' criterion. the ranking reflects the extent of any adverse distributional impacts: 'H' reflects low adverse impacts, 'L' reflects high adverse impacts.*

Whilst there are very few examples of pricing measures in practice, particularly in the form of large scale projects, those that have been introduced have been closely scrutinised in *ex-ante* and *ex-post* evaluations. The results suggest that well-designed pricing regimes can effectively reduce congestion (expressed as delay time) to a significant degree (typically 30+%). Moreover, experience with the London cordon charge suggests that the reductions in traffic volumes and congestion are enduring and without any substantial negative flow-on or distributional effects.

Again, while the practical evidence is so far limited, it appears that pricing is pivotal to 'locking in' the benefits from other congestion management measures. Pricing can be adjusted to minimise the risk that the success of other congestion measures is eroded through induced traffic. For example, the road user charges in Singapore are reviewed and adjusted every six months to achieve particular congestion (travel speed) outcomes.

Australia has been at the forefront of tollway development. However, existing toll regimes are driven by the need to finance the roads themselves, rather than as a congestion management tool. There may be some scope to re-negotiate the tollway concession deeds to change the existing toll structures towards some form of peak-period pricing; however, the legal and commercial complexities of such negotiations would be significant.

Whilst there is debate around distributional issues, economic theory indicates that appropriate pricing of services should maximise overall economic welfare. It is used throughout the economy to manage demand for a scarce resource. All other infrastructure-related services – water, gas, electricity and telecommunications - are priced, and the latter two are priced differentially on a peak and off-peak basis. Indeed, within the transport sector, public transport fares are commonly priced on that basis. That being the case, one can argue that a move to some form of congestion-pricing on roads is not a 'radical' step, but is consistent with approaches widely used elsewhere in the economy.

The other broad area of pricing and taxation that has featured in transport debates over recent years concerns the FBT treatment of company cars. As noted earlier, given the range of inquiries that have addressed this matter, it is strange that an authorative piece of research has not been commissioned to conclusively answer the threshold question as to whether the fringe benefit for company cars and those acquired through 'salary sacrifice' arrangements contributes to congestion, or the extent to which similar public transport concessions could reduce congestion. Such a study could also address issues of mode neutrality, revenue implications for the Australian and State governments, and economic costs and benefits to business and the community which may arise from any change in exemptions versus the economic costs and benefits of congestion attributable to this measure.

Beyond pricing, the only other type of measure that looks as though it may offer a significant reduction in congestion (at least in the short term) lies in the application of advanced traffic management systems to freeways and major roads. Like pricing, the range of experience with TMS, is not broad (though it is broader than for pricing), and the evidence is promising. Therefore we would support the wider investigation and application of such measures on the AusLink and associated networks, but subject to some cautions.

Firstly, depending on the configuration of the network, some measures, eg ramp metering, may have limited application. Secondly, there remains a question as to congestion impacts on that part of the urban road network away from the 'managed corridors' – the traffic using the AusLink network has to enter and leave a TMS managed corridor at some point. This would seem to be a particular challenge in and around the denser parts of our cities and ports. Moreover, TMS measures such as the use of 'clearways' and the co-ordination of traffic signals have already been used extensively in Australian cities to improve traffic flows. It is arguable, therefore, whether, away from the freeway network, such measures can offer much further in the way of congestion management benefits. Finally, unlike pricing measures (the effectiveness of which can be maintained over time through price changes), TMS measures only offer a 'once off' (though very useful) congestion reduction impact.

Other measures reviewed as part of this assignment can also make a contribution to the management of congestion. However, as a general observation, their effectiveness in reducing congestion (at least as stand-alone measures) is likely to be rather less than that for the two measures mentioned above. Context is critical though, and in particular instances, measures such as work-based travel behaviour change can contribute substantially to the task of minimising congestion. For example, the relevance of public transport will be greater in capital city CBDs than in suburban locations. Equally, parking controls, especially controls on the supply and cost of parking, could, if set more strictly than has been the case to date, have a more significant effect than suggested above. If parking levies were substantially increased, in both size and coverage, they could provide a 'second-best' alternative to other road pricing measures.

Three types of measure – the provision of public transport, more proactive freight management strategies, and appropriate land use planning - need to be pursued consistently over time. The population and economies of Australian cities will grow significantly over

the next 20-30 years, and there is a choice as to how this growth will be accommodated. Australian governments are all pursuing policies to consolidate new development, particularly around nodes well-supported by public transport. To paraphrase the author Primo Levi, "If not this form of growth, then what?" Alternative paths of urbanisation based on dispersed development and limited public transport would almost certainly result in greater traffic volumes, and (potentially) more congestion than will be the case under current policy settings. Moreover, they would require significant outlays on new road construction, even allowing for the fact that, per unit of pavement, roads are cheaper to build in 'greenfield' locations than in 'brownfield' locations.

This is not to say that the task will be easy or that urban consolidation will not itself add to congestion in some areas. The dispersed and diverse nature of urban travel will require the application of complementary measures to manage that congestion. In particular, if consolidation continues to be pursued, **substantial** investment in public transport will be required, along with a significant re-allocation and management of existing road space to ensure that road-based public transport services can operate in a manner that makes them attractive to users. These measures are vital, given that, even in established areas, a majority of trips are presently made by car.[82]

As intra-urban freight movements increase along with growth in urban populations, more proactive freight management strategies will be important, including measures to facilitate freight movement outside the peak period. As the economy grows and the absolute volume of international trade increases, managing congestion around the ports will also be a priority. Measures to alleviate congestion around ports include longer operating hours, minimising restrictions on off-peak vehicle movements, development of dedicated rail freight lines, and/or targeted freight-specific multimodal infrastructure developments.

The effectiveness of various measures (or packages of measures) is unlikely to remain constant over time. For a number of reasons, particular measures will have a 'life' where they offer some congestion reduction. After that, their effectiveness is likely to diminish for two reasons.

Firstly, and most importantly, population and economic growth in our capital cities will increase the demand for travel. With population growth rates in major urban areas ranging from 1-2% per annum, demand on the AusLink and associated networks will grow. Moreover, as all Australian cities are pursuing 'urban consolidation' strategies to varying degrees, it is possible that growth pressures on those sections of the AusLink network in the established parts of our major cities will be higher than in other areas. In several instances, these are precisely the network segments that are close to and serve Australia's major ports.

Secondly, travel patterns are likely to adjust to the increased capacity 'created' by demand management measures, ie as users of the AusLink and other networks adjust their behaviour to minimise their generalised cost of travel. In short, the transport system will adjust and evolve towards an equilibrium that takes up some if not all of the gains arising from congestion management. The level of this equilibrium is affected by the quality of alternatives.

This is not to say that congestion management measures, including public transport and behavioural change programmes, should not be pursued. Rather, it is meant to highlight that the challenge of managing congestion will remain with Australia for the long-term.

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82 *For example, data for Sydney from the NSW Transport and Population Data Centre (2006b) shows that car driver and car passenger trips constitute around 50 – 60% of trips in established Statistical Local Areas, compared to an average for the Greater Sydney Metropolitan Area of 72% Examples include Marrickville (48%), Leichhardt (50%), Burwood (57%), Strathfield (60%) and Auburn (62%).*

9.2 Acceptability

Australian governments have been applying a range of congestion management measures for some time, and continue to expand the range of measures in use.

These measures are increasingly accepted by the broader community. Having said that, it is arguable the measures have been applied in a way where they have not imposed too much 'pain' on travellers. For example, parking levies have been applied in confined areas and set at fairly modest levels, certainly well below the level and coverage at which they would need to be set to bring about a significant reduction in congestion. In such circumstances, it is perhaps unsurprising if the measures are generally, if not universally, accepted.

It is also the case that congestion management measures will not be welcomed by all. For example, limits on the provision of on-site parking have prompted adverse reactions from developers claiming that the limits make the affected development uneconomic. In some cases, such concerns have led to a 'winding back' of the relevant land use planning controls. In other cases, bus priority measures have been removed in response to community concerns about their impact on car users.

These examples highlight the conundrum that, until measures start to have an impact on behaviour, they are unlikely to elicit much concern. It is precisely when the measures start to 'bite' (and assuming the measures are well-targeted), that issues of acceptability can arise. However, to borrow a phrase, it is likely to be a case of "No pain, no gain." Just as maintaining personal health requires some disciplined behaviour to ensure longer-term gains, so too congestion management will require the disciplined application of public policy to secure and maintain broader economic benefits. In short, since congestion management involves constraining or otherwise shaping people's behaviour, it is unlikely to be 'easy'. It will almost inevitably involve extensive public debate. This highlights the need to promote the benefits of congestion management and provide viable alternatives to the use of the car. It also emphasises that a 'carrot and stick' approach is necessary to successfully manage change.

However, if the circumstances are right, major congestion management initiatives can be introduced. The London congestion charge is a prime example of this. It illustrates a number of lessons that need to be applied if congestion management measures are to be accepted by the public. These lessons appear to be:

- A broad cross-section of the population needs to perceive congestion as being such a significant problem that it requires attention
- Champions who will advocate for change and action are needed
- Any measures need to be targeted to fix a specific problem – poorly focused measures will have unintended consequences that impose unnecessary costs and undermine support for the measure(s). Equally, there need to be clear 'winners' from congestion management, ie those who will advocate for the measure when the almost inevitable opposition to a measure emerges. This highlights the need to carefully consider options and assess their potential effectiveness in particular situations.
- Congestion management needs to be pursued via a package of complementary measures – alternative, less congesting, means of meeting individuals' needs must be available.
- Pricing needs to be promoted as part of a broader transport strategy, eg based around maintaining and improving the efficiency of the transport network and economic competitiveness.
- Consultation and communication is important, especially in introducing contentious measures, both to ensure the measures are well-targeted and to minimise adverse reactions.

- Distributional considerations are likely to bear on the acceptability of various congestion management measures. For example, without complementary measures such as a viable public transport network, road pricing schemes may (but not necessarily will) have socially regressive outcomes. Unless these matters are addressed up front, they may act as a barrier to the uptake of initiatives that, in other respects, are an effective means of addressing congestion.

9.3 Packaging of Complementary Measures

Applying measures in a complementary manner is essential in some cases, and supportive in others. Complementary action both maximises the likelihood that particular measures will work effectively, and minimises the risk of a public or market backlash to a particular measure. This will increase the chance that the more challenging and arguably more effective measures, ie those where there is sufficient 'stick' to affect behaviour, will be enduring and not unravelled.

The need for complementary measures appears to be particularly important where road pricing schemes are to be introduced. Travellers who might otherwise drive a car will need a viable alternative transport option (usually in the form of public transport) if the congestion management benefits of the pricing scheme are not to be compromised. Conceptually, this is analogous to the 'viable alternative route' policy that exists in some jurisdictions in relation to the provision of tollways.[83]

9.4 Implementation Issues

Developing and implementing an agenda for congestion management in Australia raises a number of implementation issues. Some go to the design and timeframe for introducing the measures. Others relate to the effectiveness of past (and current) processes for appraising transport policies and investments. Still others relate to inter-governmental matters.

Some measures will have long lead times, either because they will take some time to develop and introduce (eg two to five years for a congestion road pricing project depending on complexity, five to ten years for an infrastructure project) or because it will be some time before their full effect becomes apparent, eg land use planning. This needs to be recognised when considering how best to improve Australian approaches to congestion management. Delay in agreeing a package of measures will have economic and other consequences for Australian cities and the nation.

Our cities have evolved over decades to their present form, based largely around patterns of land use that are slow to change and around particular policies for pricing transport. They operate in a particular manner, and individuals and firms have accordingly made locational, investment and other decisions based on those factors. Moving to new forms of congestion management is likely to raise a number of transitional and adjustment issues, eg whether some measures need to be phased in. These will need to be carefully considered during the development and application of new measures, both to minimise the risk of unintended economic and social consequences, and to minimise the risk of initiatives losing public and government support.

This assignment has highlighted the dearth of sound *ex-ante* and *ex-post* evaluations of congestion management measures, both locally and internationally. This weakness is not confined to the assessment of congestion management measures; it is a problem confronting the transport sector generally. Major capital investments, the traditional supply-side

83 *NSW Premier's Department (2005), p.7 and p.28. This report on the provision of motorways proposed a policy "that requires that there is an arterial road available as an alternative route to the toll road".*

approach to addressing transport problems such as congestion, are rarely evaluated in a rigorous manner after the event.

The transport sector is almost certainly not alone in this regard. Similar issues arise in other areas of public policy. Nevertheless, the relative absence of post-completion evaluations, and the somewhat limited sharing of experience, highlights a weakness in Australian transport planning practice. As a result of this information gap, there is a greater risk of pursuing poorly-targeted, ineffective congestion management measures than would otherwise be the case. Congestion will remain a problem for all Australian governments, and it would be regrettable if a similar review in, say, ten years time reached similar conclusions.

The National Guidelines for Transport System Management provide a basis for improving this area of transport practice. COAG adopted the guidelines in February 2006. However, of itself, adoption of the guidelines is not enough to bring about the change in practice that is required. Other agreements and processes, perhaps overseen by the Australian Transport Council, the Standing Committee on Transport and other working groups, will need to be put in place. Co-operative processes established to oversee the AusLink programme and the National Land Transport Plan could assist in this regard.

The fact that COAG initiated this Review indicates that congestion is a problem requiring inter-governmental attention. It therefore is reasonable to conclude that, wherever congestion in Australian cities is affecting national economic outcomes, congestion management needs to be pursued by all relevant jurisdictions. In particular, it would seem appropriate to use the Review outcomes to shape future versions of the National Land Transport Plan. Demand management measures such as those considered in this report can be considered alongside infrastructure improvements to manage the potential negative impacts of congestion on the AusLink and associated networks. Moreover 'infrastructure improvements' need not necessarily take the form of major new links; such improvements can take the form of 'incremental' additions to existing links, eg public transport lanes, truck only lanes, minor upgrades associated with the use of TMS.

9.5 Concluding Comments

Congestion is and will remain a significant problem for the Australian economy and Australian governments. Management of congestion to date has largely been characterised by 'supply-side' solutions, primarily involving the construction of new motorways. This was necessary to establish a modern, world-class system of road links in our cities. However, these new links are already congested (or soon will be) in several cases, as a result of population and economic growth and/or induced traffic.

Building new motorways (or upgrading existing links) is likely to prove increasingly difficult. Apart from environmental considerations, the cost of construction will present a major hurdle to the development of new road links. For example, recent road proposals such as the Rivercity Motorway in Brisbane and the proposed extension of the M4 in Sydney suggest that the cost of building new 4-6 lane motorways in the established parts of our cities (where congestion is often greatest) are in the order of $400M per kilometre, based on tunnelled construction.[84] By comparison, the M7 motorway around Sydney's fringe cost approximately $50M per kilometre, excluding land costs. Whilst such links have often been developed as privately-financed tollways, there is evidence to suggest that, given the level of costs mentioned above, future motorway development will often require significant public

[84] *Rivercity Motorway Management Limited (2006), p.22 and p.32. Rivercity Motorway capital cost is estimated to be $2.003B (excluding distributions and net interest and excluding $0.235B in development and financing costs and $0.183B in reserves) for a 4.8km 4 lane tunnel and approximately 1km of surface road. M4 East(medium-length tunnel option) estimated to cost $1.8B for an approximately 4.5km, 6 lane tunnel.*

sector support. However, other demands on the public sector, eg as a result of increasing health and income support costs, could limit the scope for governments to invest in large infrastructure projects.

In this context, managing congestion makes considerable economic and financial sense. It makes sense because it enables governments to maximise the benefit from existing transport investments. Arguably, it also makes sense given the uncertain implications of recent and prospective increases in the price of fuel on trends in motor vehicle usage over the medium/long term. In such circumstances, some have suggested that it is not necessary (at this time) to pursue measures such as road pricing.

This may be so. However, it would be a mistake to put too much weight on this argument. As noted above, population and economic activity are likely to drive continuing increases in travel demand. In addition, any move towards more fuel efficient vehicles will tend to offset the impact of fuel price increases. Indeed, should fuel prices fall, driving would become relatively more attractive, with an attendant risk of added congestion. In any event, experience in Europe (where motor vehicle usage remains high notwithstanding much higher fuel prices than those in Australia) also demonstrates that economies can adjust to high fuel costs. Finally, the real price of motor vehicles has been falling for several decades, and is likely to continue to fall in a very competitive world car market. This will also tend to hold up the demand for, and usage of, cars.

In short, governments will need to introduce and make more effective use of a range of complimentary management measures. As noted above, such an approach is likely to be both more affordable and more economically efficient than major investments in new infrastructure.

Whilst public opinion on the matter remains unclear, congestion in the larger Australian cities is at (or close to) a level where road pricing merits detailed consideration. Other states could also begin looking at this issue as part of their long term planning. Cities such as Stockholm, San Francisco, Manchester and Auckland, with populations similar to or smaller than most Australian capital cities, have taken this step.

As noted earlier, pricing mechanisms are an increasingly proven means of effectively managing congestion. Developments in technology in the last 3-5 years now allow more cost-effective pricing solutions to be used than was the case in cities such as London. In short, the limiting factor to the introduction (or more widespread use) of pricing measures is one of acceptability. However, acceptability may be built over time: in the pre-implementation period through community engagement; through solid planning and the inclusion of complementary measures in the full congestion management package; and through the realisation of travel time savings and reliability benefits in the post-implementation phase. The specific impact of these measures on the urban AusLink network will depend on the individual circumstances of each city.

There is also value in better establishing the comparative congestion impacts and cost-effectiveness of the different types of pricing mechanisms (including taxation and other financial incentives) through further research and investigation so that the broader impact of governments' policies can be fully taken into account and/or addressed through appropriate offsetting actions.

As pricing measures are now being established and have some track record in reducing congestion, it would seem appropriate that future changes/upgrades to the AusLink network would include consideration of pricing and other demand and supply management measures as part of the appraisal of alternatives. This is consistent with the requirements of the National Guidelines on Transport System Management.

However, whilst pricing, charging and taxation are promising means of addressing congestion, they need to form part of a broader package of measures. Urban congestion

occurs as a result of many factors bearing on the travel choices of millions of individuals. It would therefore be surprising if a single solution was able to effectively address the disparate choices of all those participants in the urban transport environment. Instead, an integrated approach of complementary measures, tailored to the particular circumstances of each urban area, offers the best prospect of managing congestion. As in other areas of public policy, carefully considered and targeted measures are likely to be the most effective and enduring means of addressing the congestion challenge.

Appendix 1 – Examples of Australian Congestion Management Policies

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: A1 – PT/HOV PRIORITIES			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD	▸ Waterworks Rd Bus Priority/HOV (T2) Project (1996). Included 8km route, with signal priorities, AVL, RTI	▸ Not known	▸ Extension of bus/HOV priority policies
	▸ Kelvin Grove HOV (T2) peak period lane (2.1km).	▸	▸
	▸ Lutwyche Road HOV (T3) lane, AM peak (1.9 km)	▸	▸
	▸ The Pacific Motorway has some Transit Lanes (T2) 24 hour	▸	▸
NSW	▸ More than 75kms of bus lanes in the Greater Metropolitan Area (GMA). Also network of Transit lanes (T2 and T3), usually operating in peak period/peak direction only.		▸ Propose further bus priority measures (using infrastructure and electronic technologies) to reduce bus travel times and improve reliability. Bus priority initiatives include: bus only lanes, bus bays, bus advance signals; bus lane cameras; distinctive (red) colouring of bus lanes; transit lanes; T-way bus routes; and a PT priority traffic signal system. ▸ Unsworth Review of Bus Services recommended the designation of 16 strategic corridors in the GMA. It is proposed to implement technology and infrastructure treatments on these corridors under the Public Transport Information and Priority System (PTIPS), in order to improve bus service reliability and average bus travel speeds. PTIPS enables signal cycles to be adjusted to improve service reliability, and enables services to keep to time. Economic evaluation work to date indicates very high BCR values (over 10.0) for schemes on the first 10 of these corridors.
	▸ Split/Military Rd Transit Lane (1974). Allowed usage by buses, taxes, motorcycles, 3 + vehicles	▸ Time savings in peak: buses 11mins, carpools up to 10-20 mins relative to other cars. Average car occupancy increased 1.43 to 1.49 (52% increase in car pooling)	▸ Ongoing RTA policy re provision of transit lanes (T2 and T3).
	▸ Victoria Rd Transit Lane (1976). Allowed buses and 3+ vehicles	▸ Bus time savings up to 34% in AM peak. Ave car occupancy increased by 10%	▸
	▸ Warringah Freeway Transit Lane (1979)	▸	▸
	▸ Sydney Harbour Bridge Bus Lane/Gore Hill Freeway (1992)	▸ Bus patronage in corridor increased 23% (1994). The Harbour Bridge Bus Lane carries over 14,000 people (average bus occupancy >40) in the peak hour, compared with less than 2,000 people per lane in other lanes.	▸
	▸ Glebe Island Bridge/W Corridor Improvements (1995)	▸ Bus patronage in corridor increased 10%	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: A1 – PT/HOV PRIORITIES			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
VIC	▸ Johnston St Bus Lane (1980): 1.6 kms, peak period/peak direction (part of tidal flow operation)	▸ Significant reductions in travel time mean and variability. Reported AM peak patronage increase of 13% (but some service increases)	▸ Policy to provide bus/tram priorities on key routes, including use of AVM system to allow traffic signal priorities
	▸ Eastern Freeway Transit Lane (1992). Freeway emergency lane used by buses, taxis and 2+ vehicles in AM peak, approx 3 kms.	▸ Reported AM peak patronage increase of 10%	▸ MTP policy is to provide more HOV/transit lanes on major routes
SA	▸ Main North Road Bus Priority	▸ Investigated T2 bus lanes, reversible lanes, bus priority at intersections and mid block along Main North Road - conclusion was that bus priority at intersections only justified measure, others had too many negative aspects	▸ Investigation of bus priority measures along arterial roads currently underway
	▸ TransitWays Master Plan	▸ Development of suite of bus lanes and bus priority measures across the metropolitan area	▸ On hold pending finalisation of extensive changes to metro bus services and bus/ rail coordination
	▸ Anzac Highway T2 transit lanes	▸ Investigation confirmed feasibility and recommended more detailed concept planning proceed	▸ Concept planning for implementation of T2 transit lanes underway.
WA	▸ Adelaide Terrace/Causeway Bus Lane (800 meters)	▸ Saving 7 mins in bus travel times	▸ Bus priority lane (AM peak) on South Street (Roe Highway - Kwinana Freeway)

APPENDIX 1 EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: A2 – ROAD CAPACITY & OPERATIONS ENHANCEMENTS

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	▸ Gateway Bridge variable speed limit signs – to increase vehicle safety during strong winds	▸	▸ STC proposes extension of variable speed limits, ramp metering (with truck/PT priorities), incident management measures and traveller information initiatives ▸ 'Multi-modal Intelligent Transport Systems Strategy for Queensland' identifies range of measures to improve traffic flows and incident response
	▸ Coronation Drive reversible lanes	▸	
	▸ Ramp metering at selected freeway entrances (Pacific Motorway)	▸	
	▸ Various initiatives to provide improved information on road and traffic conditions - VMS displaying incident management and safety related info - Internet site with info on road/traffic conditions - special phone number to receive info on current traffic conditions and incidents as they occur - media reports on traffic conditions and incidents as they occur	▸	
	▸ Brisbane recently updated its automated signal coordination systems on state controlled roads in SEQ, and is now using the latest (STREAMS) system.	▸	
	▸ Sunshine Coast traffic signal coordination - 14 signalised routes	▸ Resulted in 20% decrease in travel times (Dia 2004)	
	▸ Brisbane has co-located the state and BCC traffic control centres and is rapidly moving towards one fully integrated LG and State system. Elsewhere the centres are already operating under one system from the one location.	▸	▸
NSW	▸ IRIS (Incident Reporting Internet Service) provides a 24 hr web-based information service, designed for radio stations	▸	▸ Extension of 'reversible lane' measures ▸ Improvements in signal coordination through the SCATS system
	▸ Extensive TMS measures, including: SCATS (traffic signal coordination), CCTV cameras, VMS. Transport Management Centre manages traffic following road incidents and provides real time road/traffic reports to the media and public	▸	
VIC	▸ Freeway ramp metering - on Monash, Eastern Freeways: trucks are given priority at some metered ramps	▸	▸ Policies to rapidly clear accident/incident sites, to minimise congestion effects ▸ MTP proposes expansion of peak hour clearways, through kerbside parking restrictions
	▸ Provision of travel information on the internet, updated every 10 mins, for major freeways and major destinations. Also traffic alerts and roadworks information	▸	
	▸ En-route driver information on freeways re travel times	▸	

APPENDIX 1 EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: A2 – ROAD CAPACITY & OPERATIONS ENHANCEMENTS			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
	and conditions		
SA	▸ Clearways policy mainstream part of development and operation of metropolitan arterial road system	▸ Examined the merit of introducing 12 hour clearways along main arterial roads but temporal distribution of traffic found not to provide sufficient warrant.	▸ Propose to expand and upgrade Clearway system in response to traffic demands
	▸ TSM measures confined to ACTS (SCATS) (traffic signal coordination) and CCTV cameras and reversible flow control on Southern Expressway. Norwood Trafffic Control Centre manages traffic flows (24/7), road incidents and provides real time road/traffic reports to the media and public	▸ ACTS continuously monitored and evaluation of reducing all red times indicated that significant savings in delay could be achieved.	▸ Improvements in ACTS traffic signal coordination by regularly implementing upgrades to the SCATS system and continuous improvement of signal phasing, etc VMS in South Eastern Freeway through Heysen Tunnel and Southern Expressway.
	▸ Southern Expressway operates as a reversible flow road (inbound to city in morning and outbound in afternoon and evening)	▸ Traffic demand on Southern Expressway in line with estimates with reduced demand on Main South Road and Lonsdale Road.	▸ Possible duplication in future to conventional 4 lane expressway in response to increased demand
	▸ Flagstaff Road reversible lanes	▸ AM and PM peak traffic flows smoothly with minimum delays and improved road safety	▸ Possibility of expanding concept to other suitable arterial roads.
WA	▸	▸	▸ Extension of SCATS traffic control system (metro area) ▸ CCTV coverage on road network to assist T. Mgt ▸ Real-time traveller information in MRWA website (using CCTV) ▸ Limited Vehicle detection/monitoring capacity on Mitchell Freeway (inner section)

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: B1/B4 – OTHER NON-PRICE DEMAND MANAGEMENT MEASURES			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD	▸ State government has flexible working arrangements ▸ Schools are able to stagger start times but few have chosen to do so	▸ ▸	▸ ▸
NSW	▸ Newtown (Sydney) car share club introduced (2003)	▸ Club members reduced private vehicle VKT by 55% (Lane 2004).	▸ Increasing vehicle occupancy (for cars, PT and overall) is a key element in increasing the capacity of existing transport infrastructure and managing congestion. Relevant policy measures include car pooling, bus and HOV priority lanes.
	▸ RTA promotes flexible working hours for RTA staff and staff in other organisations.	▸	▸
	▸ RTA promotes car pooling via its website.	▸	▸
VIC	▸ Flexible hours allowed in many government agencies and major businesses	▸ No formal monitoring; but peak spreading over last 20 years suggests increases in this practice, with corresponding decongestion benefits	▸
SA	▸ 1987 study (Household Activity Travel Simulator) of the preparedness of households with school children to adjust activity patterns of HH members to accommodate varying school start/finish times to encourage ride sharing and peak spreading.	▸ Study found that households with students would change their travel behaviour if school start/ finish times were more than 30 minutes and that there would be political resistance unless the community had a clear perception that such changes were necessary.	▸ Included under the TravelSmart umbrella of measures.

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: B2 – TRAVEL PLANNING			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD	• TravelSmart implementation continuing	•	• Ongoing implementation of TBC programmes, including TravelSmart Communities, Walk-to-Work day and the 'Share the Road' campaign. • BCC Active Transport programme focuses on TBC programmes for communities, workplaces and schools.
NSW	• DoP has recently completed a TravelSmart Households pilot programme in two suburbs in Sydney and the Central Coast involving 3000 households. A TravelSmart School Travel Planning project is currently underway.	•	• Sydney's Metropolitan Strategy recognises the importance of TBC programmes targeted at households, schools, and centres and other locations which generate travel.
	• In late 2001, RTA consolidated its office staff to new offices in Parramatta and Blacktown. The main (Parramatta) site had minimal on-site parking and relatively high parking charges for all-day parking at sites in the vicinity. An extensive 'mobility management' programme was initiated to inform staff about travel options to the new office sites.	• A before/after survey found an increase in the PT (mainly train) mode share after the relocation to the Parramatta site: the PT share increased from 43% to 59%, while the private vehicle share reduced from 54% to 38%. An opinion survey after the relocation found that most staff felt they had been well informed about their transport options; there was little change in attitudes towards PT; but a significant increase in PT use. It was concluded that "providing specific sustainable transport information to people accessing specific sites can make a difference in influencing their transport choices and travel arrangements" (RTA 'Mobility Management – A Case Study').	•
VIC	• Substantial ongoing TravelSmart programmes •	• •	• MOTC policy document provides increased funding for TravelSmart programmes • Policy to encourage car pooling, including HOV lanes
SA	• Substantial ongoing TravelSmart programmes under GGAP programmes (schools, workplaces and community)	• Pilot TravelSmart SA Travel Behaviour Change Pilot evaluated by BAH and found to have little impact on amount of car travel but significant shift to public transport	• TravelSmart programmes (workplace, school and community) being offered to approx 68,000 people in western region as first stage of GGAP programmes
WA	•	•	• TravelSmart programmes being offered to 158, 000 people in nine metro area communities (cost $4m)

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: B3– TRAVEL SUBSTITUTION			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD	▸ State government authorities allow teleworking; but it has not been strongly promoted to date	▸	▸
NSW	▸ NSW Govt provides guidance to employers on home-based work arrangements such as telecommuting; and a number of NSW agencies such as Department of Environment and Conservation allow employees to Telework from home. The RTA operates telecentres for staff at Penrith, Parramatta and North Gosford and provides assistance and advice on teleworking to business and government.	▸	▸
	▸ A Teleworking Pilot Project was undertaken by RTA in 1993/94, involving 77 teleworkers over a 6 month trial period. Most of the teleworkers chose to work from a home office, although alternatives (satellite office, mobile office) were available.	▸ The main findings of the pilot project, in terms of impacts on travel patterns, were: - Teleworkers reduced their trips on teleworking days by around 50% compared with 'normal' working days (without significant increases in travel by other family members) - Teleworker travel by PT fell by 93%, while travel by car fell by 25%. - Distance travelled by teleworkers on teleworking days reduced by 79%, time spent travelling by 75% and average trip lengths by 55%. - Most of the teleworkers' travel reductions occurred in the two peak periods. ▸ The pilot project concluded that "teleworking can reduce demand for travel and provide productivity benefits and increased worker satisfaction". It notes that its findings are broadly consistent with the result of similar studies overseas.	▸
	▸ A further RTA teleworking pilot project took place for 6 months in 1998/99, focusing on the feasibility and merits of establishing telecentres as an alternative to home-based teleworking arrangements. The telecentre site was the existing RTA office at West Gosford.	▸ It was found that on average teleworkers worked for one day per week at the telecentre. On those days teleworkers: - reduced their travel time from 3 hours 15 mins per day to 2 hours 45 mins, a saving of 84% - reduced their travel distance by 159 kms per day (88%) - avoided travelling on the main transport corridor (F3 Freeway) at peak periods - reduced their overall amount of car travel by 43% relative to normal commuting patterns (although 98% of telecentre workers used their car to access the telecentre, whereas 70% of them usually	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: B3– TRAVEL SUBSTITUTION			
		commuted by train) - either experienced no change in travel costs (because of holding periodical rail passes), or reduced their travel costs.	
VIC	▸ Technology developments appear to be encouraging: - more small businesses operating from home-based offices - increase in 'occasional' working from home by white collar workers	▸ 2001 census indicated increase of 0.9% in proportion of working population working from home, relative to 1996	▸ Vic Teleworking Strategy under development: this will identify the infrastructure and services required to facilitate teleworking
SA	▸ State government authorities allow voluntary teleworking/ working from home as part of public sector enterprise bargaining agreement in pursuit of work/life balance programmes (OHS&W)	▸ Monitoring take-up indicated that 15% employees work from home or work flexibly - particularly women with children	▸ SA Government committed to improving work/ life balance in public sector and as a model for private sector so actively encourages different work styles (ie working from home, part time work, job sharing, etc) particularly for older workers and women.

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: C1 – ROAD USE CHARGING

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	▸ Logan Motorway toll route - tolls based on repayment of infrastructure costs, not for congestion management ▸ Gateway Bridge toll route - tolls on similar basis	▸ ▸	▸ Logan Motorway/Gateway Bridge to have increased capacity and conversion to electronic tolling only ▸ River City Motorway tolled tunnel being built
NSW	▸ A number of toll routes (M2, M4, M5, M7, Cross City Tunnel, Lane Cove Tunnel - opening in early 2007- and Sydney Harbour Tunnel) in and on the approaches to Sydney. In all cases these are provided by the private sector under franchise arrangements, with toll revenues used to finance the investments (not for demand management purposes). ▸ Electronic tolling methods are used (as an option in some cases) or compulsory in some cases (with the provision for next day payment by other means, Interoperability exists between routes and providers.	▸	▸ The NSW Government agreed with the Parry Inquiry recommendation to: *"Following consultation with the community and stakeholders, consider implementing electronic road pricing (ERP) within the next 5-10 years as a means of effectively signalling to the community the external costs of road use – congestion, pollution, road wear and tear and accidents."* ▸ It also agreed with the Inquiry recommendation that: *"Any implementation of road use pricing must be accompanied by rationalisation of the current taxation of motorists."* ▸ In regard to the Parry Inquiry recommendation to: *"In the intervening period, take steps to facilitate the introduction of ERP, such introducing of two-way tolling and harmonising tolls across existing and new tolled arterials"*, the Government states that this recommendation would be assessed by DIPNR and RTA.
VIC	▸ City Link toll route (private funding/operation)	▸	▸ East Link route will be tolled on completion (private funding/operation)
SA	▸ Port River Expressway bridge tolls	▸ Feasibility of tolling examined as part of private sector due diligence for possibility of PPP scheme - traffic volumes and estimated growth shown to be insufficient to generate enough revenue to achieve hurdle rate of return for project funding. Legislation passed by Parliament allowing tolls to be levied.	▸ State Government policy commitment in 2006 election not to introduce tolls on roads.

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: C2 – PARKING POLICIES

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	▸ Most local government parking codes require the provision of 1.5 or more off-street car spaces/dwelling	▸	▸ STC considering several parking supply and pricing initiatives. These include adjusting parking standards to reflect PT service levels at different centres ▸ TransLink is developing park and ride facilities progressively at a number of stations on the Brisbane rail network and stops on the Brisbane busway network. These facilities are being provided with improved facilities and security.
	▸ Amended Brisbane CBD parking requirement in 1995 to allow a maximum of 1 car per 250 sq m of GFA or a max of 1 space per 25 sqm 'site area', whichever gives the lower no of spaces	▸	
NSW	▸ From 1971 the amount of on-site parking in new developments in CBD strictly limited: contributions required to new parking developments in peripheral locations.	▸ Expected peripheral parking not developed: pressure for more CBD spaces	▸
	▸ More recently, because of developer & State Govt pressure, permits given to a number of large developments in CBD with much more parking than allowed by parking Code	▸ Some developers claim cannot be competitive if adequate parking not allowed, and developments will not proceed without it.	▸ Propose to implement more restrictive car parking policies through the current review of RTA 'Guide to Traffic Generating Developments'. In particular, the review proposes an accessibility-based methodology, which will restrict parking in centres in the light of their PT accessibility. This approach will be given statutory weight through the Metropolitan Parking Strategy (under development).
	▸ From 1992, parking space levy on commercial parking in CBD and North Sydney. Extended to 4 other centres in 2000.. Levy is designed to discourage private car use and generate funds for PT improvements. Current annual levy (indexed each year) is $900 per space in CBD and North Sydney, and $450 in the other 4 centres.	▸ Review of Parking Space Levy report prepared, but not yet released ▸ Journey to Work data indicate slight increase in public transport mode share from 1991 to 2001 for 5 of the 6 centres (ranging from 1% to 5%), compared to 4 other selected centres all with declines in PT mode share (ranging from 7% to 2%) for the same period. Car mode share across all 6 parking space levy centres has dropped (on average by almost 4%) for the same period.	▸ This proposed policy will have flow-on implications for on-street parking policy and management (through time restrictions, pricing policies and resident parking schemes). The overall outcome is expected to be less private vehicle travel, especially between centres and along development corridors, together with higher PT usage on upgraded PT priority corridors.
VIC	▸ Melbourne CBD Parking Levy introduced Jan 06. Charge is now $400 pa/space on long-stay parking, to increase to $800 pa from Jan 07	▸ No monitoring/evaluation to date (Treasury evaluation scheduled after 3 years operation)	▸
	▸ Inner area LGAs place tight restrictions on non-residential parking. MCC area has residents parking scheme (but not extended to new dwellings that increase residential density), with parking meters for non-residents	▸ New MCC policies led to reduction of 27% in vehicle permits issued 2004-2005	▸
SA	▸ Parking Policy Planning Guidelines – issued by Planning SA with parking space guidelines for wide range of land uses; forms basis of development assessments by Councils	▸ Guidelines developed after extensive study of interstate and overseas practice plus Council experience – represents a Best Practice guide	▸ Planning SA propose to review guidelines periodically and update.
	▸ Adelaide City Council Traffic Management Study specifies parking restrictions in City (CBD) with majority	▸ City of Adelaide Traffic Management Study carried out jointly with Council and State government with	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: C2 – PARKING POLICIES

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
	required in off-street parking stations and restricted parking in residential areas of City designated for local residents (parking sticker scheme)	extensive community input (also covers walking and cycling)	

Policy Area: C3/C4 – FINANCIAL/TAXATION MEASURES

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	Queensland Fuel Subsidy Scheme (QFSS) - pays fuel subsidy of 8.354c/litre to retailers and bulk fuel users. Costs to Qld government were $532M in 2005/06. Qld is the only state with such a scheme.	No formal evaluation: *Prima facie,* subsidy will result in more road traffic and greater congestion than otherwise (effect likely to be c 1% additional traffic volumes)	STC considers mechanisms to encourage car insurance industry to offer schemes with premiums based on distance travelled STC considers review of vehicle registration scheme based on fuel efficiency rather than cylinder capacity
	Qld public sector provides payroll deduction service for purchase of Citytrain rail passes.		
NSW			The NSW Government accepted the recommendation of the Parry Inquiry that it should: *"undertake a joint review with the Federal Government of taxation, expenditure and other policies that are detrimental to public transport compared with private transport."* To date the first stage of a study (E&Y) regarding making commuter fares a tax-deductible expense has been completed; the second stage is under way.
VIC	Stamp duty on vehicle transfers		
	Animal vehicle registration charges		
SA	Previous study (1980s) into replacement of registration/ licensing fees by fuel levy: this work was abandoned as fuel franchise levy was ruled invalid by the High Court (R Travers Morgan)		
	Stamp duty on vehicle transfers		
	Provides employers with discounted public transport tickets for bulk purchases for on-selling to employees.		Government and unions seeking dispensation from ATO to allow salary packaging of public transport fares.

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: D1 – PT ENHANCEMENTS

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	▸ Gold Coast Railway - Stage 1 (1996)	▸ Patronage c 1.2 million pa. Main competing bus company lost c 1/3 of passengers. No discernable effects on parallel road route (Pacific Highway) *[MR pursuing]*	▸ Policies summarised in Integrated Regional Transport Plan for SEQ (1997), Transport 2007 (2001), Smart Travel Choices Green Paper (2006), TransLink Network Plan and SEQ Infrastructure Plan and Programme (2005). ▸ IRTP target to increase PT trips from 7% to 10.5% of all trips by 2011
	▸ Brisbane SE Busway (2001)	▸ Total busway patronage (2002) c 34,000/weekday. Within first year, bus patronage in corridor increased c 60%-70% on 'core' busway routes, c 7% on 'non-core' routes. Various figures on modal shifts: 31% of passengers were previous car users (CSS 2002); or 26% of passengers previously drove a car for the trip. By June 2005, patronage growth on core services increased to 124% (2.7 million passengers pa), including 19% increase 2003/04-2004/05.	▸ SEQIPP proposes major capital and service improvements for rail, busway and general bus services. This Includes: - extensions of the busway network - additional quality bus corridors and bus/transit lanes - various rail line upgrades/duplications - extension of Gold Coast Railway - new rail passenger rollingstock - station upgrades - new, accessible buses ▸ STC proposes range of service quality and information provision improvements ▸ Policy of substantial PT subsidies to continue
	▸ Inner Northern Busway (Stage 1 2004, Stage 2 under construction).	▸ In the first 6 months of operation, an extra 84,000 passengers were carried on on the 'core' INB services.	
	▸ Brisbane CBD Bus Service Upgrading (1993). City distributor service upgraded (new midi-buses, new livery), then made free	▸ New vehicles/livery resulted a 58% patronage increase, removal of fares in c. 50% increase	
	▸ SEQ integrated fares and ticketing system (July 2004): fully integrated system introduced, smartcard ticketing to be introduced in 2006/07	▸ Results for the first year indicate patronage increase of c 9.9%, revenue increases of following introduction of the integrated system. Detailed evaluation is in progress to assess the quantitative and qualitative impacts of the integration policy *[Further details - MR/MCS??]*	
	▸ Roaming' bus service trial, Rangeville, Toowoomba (July 2005). Demand-responsive service using computerised scheduling methods.	▸ Patronage c 270 bookings/week by Oct 05	
	▸ Highgate Hill Hail and Ride(1994) - new local hail and ride service using minibuses	▸ Good patronage levels in first week (with free trial vouchers) - subsequent results not known	
	▸ Regional bus service restructure (1995-98) - redesign, rationalisation and expansion of services in Qld regional centres following new contracts involving major increases in service levels	▸ Patronage increase 94/95-98/99 in range of 17% to 107%; average 24%, or 44% excluding Gold Coast. Elasticities not able to be derived (lack of service level data). Based on trip increases to achieve MSL standards, elasticities in range 0 to 8.	
NSW	▸ Liverpool - Parramatta Transitway (2003)	▸ Patronage c 1.6M pa (2004), with 56% growth in bus patronage in corridor: 9% of new passengers previously car drivers (c 100 car trips/day). Patronage has further increased to c 5 million pa (mid 2006): it is now the fastest growing PT service in NSW.	▸ Major programmes of ongoing PT infrastructure and service improvements, including the following ▸ Establishment of a network of 43 strategic bus corridors, 15 contract regions, improved planning processes, implementation of bus priority measures along strategic

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: D1 – PT ENHANCEMENTS

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
			corridors and introduction of new contracting/funding arrangements enabling gov't to directly purchase service kms and buses and providing for greater equity in fares and concessions between private and government operators. ▸ Extension to rail and bus networks to better connect centres
	▸ Terrey Hills - SYD, CBD Express Bus Services (1992-): initially 3 services/day, increased to 14	▸ Service well loaded; claimed that a substantial proportion of users switched from car	▸ Increasing rail capacity and reliability through the Rail Clearways programme (c. $1.5B over 6 years)
	▸ Penrith Minibus Services (1993). Mini/midi buses with frequencies at least doubled, more in evenings/weekends	After 6 months overall patronage increase c 40%, but only 6% in peaks. This increase was not sustained, in part due to expansion of station car park capacity.	▸ Epping to Chatswood rail Line (c.$2.2B capital cost)– due for completion in 2008, it will provide additional capacity to/from the City.
	▸ New City Rail timetable (September 2005).	▸ More than 90,000 additional customers use the service each week, including an additional 24,000 passengers a week to/from the CBD.	▸ Extension of existing bus and road networks to serve SW and NW growth areas ▸ Investigation into alternative ways of increasing PT capacities
	▸ Since 1995, 22 transport interchanges and 17 new or expanded car parks have been built to make it easier to use public transport	▸	▸ New buses – Over the next 4 years, 505 new State Transit Authority buses will be provided, including 250 ultra low emission Euro-5 diesel buses and 255 compressed natural gas buses for heavily trafficked inner city areas.
	▸ The Parramatta transport interchange opened in 1996 ,providing commuters with enhanced access to both rail and bus services.	▸	▸ Under new contracting and funding arrangements, the government also now directly invests in private buses, allowing continued replacement of older buses and the ability to respond to the need for increased capacity (such as on popular Mbus routes), with al new buses air conditioned and with low floor access. ▸ Improving PT integration by introducing integrated ticketing (Tcard) for all services by 2008 ▸ PT fare policies that offer substantial off-peak discounts (on rail), as a means of encouraging peak spreading. ▸ Improvements to PT operational management
VIC	▸ Sandringham Rail Service Improvements (1992): increased frequencies, reduced running times, cleaner trains	▸ Patronage growth c 38% within 2 months. Estimated car traffic reduction of 1400 trips/day if all additional passengers previously travelled by car	▸ Policies set out in Melbourne 2030 (2002), Linking Melbourne: Metropolitan Transport Plan (2004), and Meeting Our Transport Challenges (2006)
	▸ SmartBus Pilot Project (2002). Major route upgrading and service increases, with real-time information	▸ Two years after opening, patronage increases of 18%, 32%. (No questions asked re previous modes). Post-evaluation gave BCR approx 3.0: 60% of benefits to existing users, 17% to 'decongestion'	▸ Target to increase PT share of motorised trips in MEL from 11% (2002) to 20% (2020) ▸ Ongoing policy of PT subsidisation (covering around two-thirds of gross costs)
	▸ Information and Marketing Campaigns (1997), Met Bus and Yarra Trams - stop timetables, letterbox marketing/ information and newspaper advertising	▸ Short-term patronage increases of 6% - 7%	▸ MOTC gives high priority to PT improvements, including: - Broadmeadows - Craigeburn electrification

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: D1 – PT ENHANCEMENTS

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
	▸ National Bus Service Restructure (1994-95) - major redesign and restructure of services in Doncaster area following NBC take-over of ex PTC services (1993), involving increased hours of operation and service level increase c.20% in 94/95	▸ Major uncertainty about patronage impacts because of lack of reliable 'before' data. ▸ Estimates of patronage change from 1993 (prior to take-over) to 95/96 are between no change/slight decline and increase of c.20% (!) ▸ NBC figures indicate patronage growth 6 months after restructure of 26% on midi/minibus services, 15% on city freeway services, 10% on city all-stop services ▸ Since maximum level in 95/96, patronage declined c.9% in 2 years to 97/98. ▸ Most likely interpretation appears to be: - 'before' patronage artificially depressed because services allowed to run down - new operator plus restructuring and service expansion increased patronage by 10-20% from previous (depressed) levels; - current patronage probably higher than in 'no change' situation in part because of additional service	- Dandenong rail corridor capacity expansion - Redevelopment of Flinders St, Spencer St and North Melbourne stations ▸ Improved system access, including tram stop design and facilities ▸ Enhanced integration of PT modes ▸ Introduced high-quality, high frequency cross-town bus network for non-CBD travel ▸ Enhanced, integrated marketing, through Metlink ▸ Improved PT passenger information, including RTI at stops and web-based trip planning facility ▸ Improved fares and ticketing systems
	▸ Croydon-Knox city LoRider Service (1994) – upgraded with midi-buses at increased frequencies.	▸ Over 10% patronage increase in first month with some further increase thereafter – implies a low service elasticity (0.1 to 0.2). Weekday frequency subsequently reduced to 20 mins in response to patronage decline.	
	▸ Sandringham Bus Frequency improvement – doubling of Sandringham – Southland bus service to provide better connections with trains and regional shopping centre.	▸ Patronage increase c 40% implying service elasticity c 0.4 (data quality uncertain).	
SA	▸ NE O-Bahn (1986-89). 13kms guided busway	▸ Increased corridor bus patronage by at least 50%. Approx 40% (peak/off-peak) of new passengers were previously car drivers: this represents c 1000 car trip reduction in AM peak. Direct traffic counts indicated an effective traffic reduction of c 200 vehicles in AM peak: this represented up to 10% of AM peak inbound road traffic. However, the 'official' monitoring surveys concluded that "traffic volumes changes were minimal". One travel time survey indicated a saving of 1.5mins (6%) for AM peak inbound car travel. A post evaluation estimated BCR at approx 0.8 (at 7% discount rate).	▸ 10 year investment plan/programme to improve metro PT services to achieve SA Strategic Plan target to double the use of PT to 10% of weekday travel by 2018
	▸ Metropolitan train, bus, light rail services including Circle Line, Bee Line, City Loop bus services along with Council operated community bus services. Bus services operated under contract by private sector and train and light rail services operated by (public operator) TransAdelaide.	▸ Bus contracts contain key performance indicators and sanctions, penalties and performance bonuses. Performance of the PT system continually monitored for effectiveness and upgraded to meet emerging customer demands	▸ As above with the 10 year investment plan plus proposed PT system enhancements (SIPSA) include: - Extending light rail line to North Terrace - Develop key train/bus interchanges - Upgrade stops and stations

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: D1 – PT ENHANCEMENTS

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
			- Investigation of metro rail electrification - Investigation of Noarlunga line extension to Seaford - Enhanced personal safety/security measuresall aimed at achieving the SASP target for PT.
	▸ Introduction of some 23 Go Zones. These are portions of route where a service is scheduled at least every 15 minutes during the peaks and daytime on weekdays, and every 30 minutes on weekends and at night (until 10 pm). Stops are painted red and supplied with timetables to indicate that a high level of service is provided. In some cases services already satisfied the frequency requirements, in other cases small frequency improvements were introduced.	▸ Go Zones increased patronage in their respective route groups by between 0 and 60%.	▸ Another ten Go zones are proposed for introduction later in 2006.
	▸ Since 2000 many service improvements, both in terms of frequency and in network structure, have been made.	▸ Apart from recent patronage increases due to increasing fuel prices, much of the patronage increase can be attributed to service improvements. An analysis of individual route groups comparing 2000 with 2005 indicates the following: - On routes with substantial service improvements, patronage increased by an average +28%, varying from +9% to +76%. - On routes with minor service improvements, patronage increased by +8%, varying from -3% to +26%. - On routes with no service changes, patronage declined by -0.5%, varying from -34% to +15%. - On routes with service decreases, patronage declined by -19%, varying from -5% to -36%.	▸ Further service improvements are proposed for late 2006, mainly funded by intelligent redesign of the network.
	▸ Differential peak/off-peak fares adopted (following various studies)	▸	▸
	▸ TransitLink services (1992-94): high quality, limited stop bus services in major corridors	▸ Patronage increases in range 19% to 34% (peak and off-peak). 33% (peak)/42% (off-peak) of new bus traffic were ex car drivers. This represents c 50-100 car driver trips per peak period in the average corridor: the effects on traffic volumes and speeds would be barely discernable	
	▸ Marion Access Service (1998) – new direct service Happy Valley-Marion Shopping Centre, replacing previous services requiring a transfer, reduced travel time from 45 to 25 mins.	▸ After 2 months operation, service carried c 650 passengers/week. Around 40% were new public transport trips ; approx 2/3 of new users would otherwise have used a car. ▸	▸
	▸ Mawson Lakes rail/ bus passenger interchange serving burgeoning development on the northern sector of	▸ In accordance with the SASP and Planning Strategy. Now been operating for six months, but not at capacity	▸ Proposal to substantially change rail services and feeder bus services in 2007.

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: D1 – PT ENHANCEMENTS			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
	Adelaide	levels expected because only minor bus/train changes implemented to date.	
	▸ Since 2000 some six new park'n'ride facilities have been established, on the rail system, the O-Bahn, and on long bus routes.	▸ In several cases these facilities have operated at capacity almost since their establishment.	▸ Further park'n'ride facilities are planned when funding is available.
	▸ Glenelg Light Rail service (electrified)	▸ Replacement of 75 year old trams with Bombardier Flexity light rail service fully DDA compliant	Extension of light rail service to CBD and possibly North Adelaide plus investigation of replacement of heavy rail service in North Western corridor (to Port Adelaide) with light rail service as part of TOD scheme.
			▸ CCTV installation on trains/buses and at stations ▸ Secured parking at key stations
WA	▸ Perth N Suburbs Railway (1993). 29kms railway, with feeder buses and extensive P&R	▸ Total patronage c 32,000/day. Increase in total PT patronage in N Suburbs estimated at 6% in AM peak, 20% over whole day. Sample survey indicated at 64% of NSR users were ex bus, 24% ex car drivers, 1% ex car passengers (but some doubt on validity of results). Maximum reduction in traffic volumes on parallel freeway estimated at c 1500 cars/2 hour AM peak (c half a lane): minimum reduction said to be 3% of daily freeway trips	▸ State government giving priority to PT system, especially rail improvements, including the following ▸ Extension of N Suburbs Railway to Clarkson ▸ New spur line to Thornlie, off the Armadale line ▸ 'Building Better Stations Programme' to upgrade existing rail stations ▸ Purchase of new rail cars (Oct 2004 onwards)
	▸ Perth Circle route (1998-99)	▸ Route carried 2.5 million passengers pa (1998-99): 15%-20% of patronage was new PT trips	▸ CCTV installation on trains/buses and at stations ▸ Secured parking at key stations
	▸ Perth Service restructure (1997-99) – services progressively redesigned and expanded in each contract area – simplified direct route structure; same route structure at all periods; consistent clock-face frequencies; most service increases outside peaks.	▸ Midland area: patronage increase 20-25%, service increase c 40%, service elasticity c 0.5 to 0.65. Canning area: patronage increase 20-30%, service increase c 65%, service elasticity 0.3 to 0.4. Most patronage response occurred in first 12 months, but increases continued into years 2 and 3.	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES

Policy Area: D2 – WALKING/CYCLING

State	Implementation of Measures to Date	Overview of Evaluation Extent and Findings	Current/Future Policy Proposals
QLD	▸ Reduction of local street speed limits to 50km/hr in Qld, in order to reduce pedestrian and cyclist accidents (1999)	▸ 18% reduction in fatal crashes on SEQ local streets since scheme implementation (NRTC, 2001).	▸ Qld Govt has published Queensland Cycle Strategy (QCS) and Action Plan for Pedestrians. ▸ STC report encourages walking/cycling, through TBC programmes, including Walk-to-Work day and 'Share the Road' campaign ▸ SEQ IPP includes construction of priority sections of the sub-regional cycle network, CBD pedestrian/cycle bridges and the Pacific Motorway Bikeway ▸ BCC Pedestrian and Cycling Strategy sets out actions linked into its Transport Plan outcomes and includes proposals for bikeway/shared path construction. These are being accompanied by education and awareness programmes. ▸ BCC proposes the establishment of a large public bicycle parking facility and end-of-trip service centre near King George Square
	▸ Integrated Regional Cycle Network Plan for SEQ.	▸	
	▸ Goodwill Bridge (cycling pedestrian only) over Brisbane River constructed.	▸	
	▸ Green Bridge (cycling pedestrian and PT only) is under construction.	▸	
	▸ Policies to support cycling and pedestrian infrastructure are in place.	▸	
NSW	▸ Promotion of active transport programmes, such as NSW Bike Week, and ‘'Walk Safely to School Day’	▸	▸ NSW Government endorsed the Australian National Cycling Strategy 2005-2010, in 2005. ▸ Propose improvements to local/regional walking and cycling infrastructure, consistent with the 'Planning Guidelines for Walking and Cycling' ▸ The Sustainable Energy Development Authority (SEDA) promotes the benefits of energy-efficient transport. NSW Health policy emphasises the health benefits of active transport modes (walking/cycling). ▸ In 2006/07, RTA has a direct funding allocation of $7.2M for cycle infrastructure, education and promotion activities: $3.3M of this is allocated to 91 local bicycle projects, and is matched dollar-for-dollar by local councils.
	▸ RTA has statewide programmes to provide pedestrian networks, and to provide pedestrian facilities on state roads.	▸	
	▸ RTA funds councils 50/50 to develop Pedestrian Access and Mobility Plans, and to install pedestrian infrastructure identified in these Plans.	▸	
	▸ Cycle routes and facilities in the inner Sydney suburbs have been progressively improved over some years. The SHB cycleway was improved in 1992 and the Anzac Bridge Cycleway opened in 1995: these schemes helped to leverage the subsequent construction of local cycle route links and cycle-friendly traffic calming schemes by local councils in inner areas.	▸ In the period 2002-2005, there was a c 40% increase in the weekday number of cyclists using major routes between inner Sydney suburbs and the CBD. It would be expected that many of these cyclists would otherwise have commuted by car.	
	▸ From 1996 to 2005, the lengths of cycleway facilities of various types in NSW increased 129%, from 1500 km to 3432 km.	▸	
	▸ Bicycle lockers (approx.500)installed at various locations around rail network over last 5-8 years.	▸ Variable utilisation. Low in some areas and quite high in others, eg Woy Woy	▸
	▸ NSW BikePlan 2010 (1990) proposed an off-road shared-path network wherever possible in Sydney. It includes a further 450 kms of cycleway for future construction.	▸ Cycle ownership by Sydney households increased 85% from 1991 (0.8 M) to 2004 (1.45M). In 2003, Sydney cyclists made 124,000 trips on an average weekday, some 45% more than in 2000: growth in weekend cycling over this period was even greater. For journeys to work, between 1996 and 2001 there	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: D2 – WALKING/CYCLING			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
		was c 61% increase in the number of cycle commuters in inner Sydney. ▸ RTA policy is that, for roads identified as regional cycling routes, when major pavement maintenance is undertaken, simultaneous improvements for safer cycling are provided (eg. shoulder sealing, signage, marking of wide kerbside lanes).	
VIC	▸ ▸	▸ ▸	▸ MOTC paper includes Local Area Access Programme, which supports the use of walking/cycling modes ▸ MTP policy is to promote greater use of walking and cycling for short trips ▸ M2030 requires planning and building controls to be amended so that end-of-trip facilities for bicycles are provided in commercial buildings
SA	▸ Establishment of Adelaide Bicycle Network and other measures to encourage cycling as part of the State Bicycle Strategy (package of measures including bike lanes on arterial roads, bike paths, education and promotion - including Tour Down Under elite cycling event)	▸ Several studies undertaken to assess effectiveness of implementation of State Bicycle Strategy which found that the package of measures (ie network development, education, promotion) very effective in increasing cycling use - Tour Down Under very successful in raising awareness and encouraging use reinforced by the Share the Road campaign	▸ Proposals (SIPSA) to develop and implement walking and cycling plans, so as to create a connected network - cycle lanes included as standard feature on all new and upgraded arterial roads
	▸ Safe Routes to School and Walk with Care programmes to encourage walking by school children and older persons respectively.	▸ Performance of both programmes monitored annually as part of the budget process	▸ Incorporated within the TravelSmart SA programmes
	▸ Developed a Walking Strategy for metro Adelaide	▸	▸ Proposals (SIPSA) to develop and implement walking and cycling plans, so as to create a connected network - includes Walking School Bus as part of TravelSmart schools programmes
WA	▸ Establishment of Perth Bicycle Network and other measures to encourage cycling	▸ Number of cyclists using Perth Bicycle Network has more than doubled over 5 years	▸ Expansion of the Principal "Shared Path" network
	▸ 'Cycling Ahead' programmes	▸	▸ Expansion of 'on-road' cycle facilities

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: E – ROAD FREIGHT			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD	▸ Logan Motorway night-time heavy vehicles toll removal. This current trial (Feb 05 - Dec 06) has the objective of shifting heavy vehicles to the motorway at night, to address community concerns	▸	▸ STC proposes some truck priority initiatives ▸ SEQ Regional Plan proposes development of a regional freight network plan, including freight interchange facilities: current work includes management and protection of priority freight routes
	▸ Also current trial of ANPR technology to investigate truck travel patterns in this part of the BNE network and to assess the impacts of the above trial	▸	
	▸ Truck lanes to bypass queues at ramp metering locations onto Pacific Motorway	▸ Only minor effects - lane usage less than anticipated	
NSW	▸ Mass limits applied to various roads ▸ Limitation on long (>12.5m) trucks using Botany Rd since June 2005 ▸	▸ ▸	▸ Policy to encourage use of rail for metro area freight: includes separation of passenger and freight networks, improve existing freight only lines and development of new rail connections for freight-intensive areas ▸ To facilitate zonings that encourage clustering of freight activities into freight precincts ▸ Development of Intermodal logistics facilities to move more containers on rail and improve the distribution of goods throughout the Sydney Metropolitan area. ▸ Relocation of general cargo and car stevedoring from Port Jackson to Port Kembla as existing leases expire.
VIC	▸ Various vehicle regulations and access restrictions affecting trucks	▸	▸ MTP proposes improvements to rail links in vicinity of the Port of Melbourne, in part to encourage a shift of Port traffic from road to rail
SA	▸ HVAF and PBS address heavy vehicle access and policy issues that support the SASP and SIPSA. Also relevant are DTEI/NTC publications and NTC 'Twice the Task Project' (see www.transport.sa.gov.au/freight/road/vehicle_configuration/heavy_vehicle_access_framework and www.ntc.gov.au)	▸ Implementation of national transport reforms and improvements for heavy vehicle operation	▸ Policy SASP to facilitate increased exports and SIPSA to enhance existing priority strategic freight routes (throughout SA) in order to maximise productivity of road freight, assist economic development and minimise adverse community impacts of road freight. Development of Level 1, 2, 3, 4 PBS road freight networks to support the safe operation of high productivity road freight vehicles. Implementation of COAG and ATC national transport reform agenda.
	▸ Restricted Access Vehicle policy that governs the operation of heavy freight vehicles in SA	▸ Implementation of national transport reforms and improvements for heavy vehicle operation	▸ Policy (SIPSA) to develop Intermodal facilities in the northern metro area, and possibly other locations
	▸ Higher Mass Limits , B-triples, Controlled Access Bus, Oversize/ Overmass gazetted road networks	▸ Implementation of national transport reforms and improvements for heavy vehicle operation	▸ Policy SASP to facilitate increased exports and SIPSA to enhance existing priority strategic freight routes (throughout SA) in order to maximise productivity of road freight, assist economic development and minimise adverse community impacts of road freight. Development of Level 1, 2, 3, 4 PBS road freight networks to support the safe operation of high productivity road freight

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: E – ROAD FREIGHT			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
			vehicles. Implementation of COAG and ATC national transport reform agenda.
	▸ Compliance and Enforcement legislation passed by SA Parliament to govern the operation of heavy vehicles within the State bases on "chain of responsibility" principles along the supply chain.	▸ Nationally uniform legislation endorsed by ATC and COAG and implemented by jurisdictions	▸
	▸ Intelligent Access Project (IAP) - uses telematics to monitor compliance of heavy vehicles with conditions of access and operation on the road network (location, travel time, driving hours)	▸ Voluntary adoption by transport industry promoted by Australian, State and Territory Governments and road agencies as a "smart" compliance tool	▸ Progressive adoption by industry as a more efficient compliance tool and fleet management facility.
	▸ State Government policy to encourage the switching of freight from road to rail where economically justified.	▸	▸
WA	▸ Measures to encourage switch of freight from road to rail	▸ Rail mode share of land-based container movements to/from Fremantle Port has increased from <3% to about 5% over 18 months	▸

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: F1 – LAND USE PLANNING			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
QLD			• The SEQ Regional Plan supports Transit Orientated Developments that provide employment opportunities and higher density residential areas; Principal Activity Centres that provide concentrations of employment and retail shopping; all of which are key nodes in the PT system. It further supports a range of other activity centres that specialise in an activity (for example, education and employment excluding retail) all of which have good connectivity to the PT network. • SEQ Regional Plan – policies include: - Densification of specific activities (employment, residential, specialist, as appropriate) around transport nodes - Development targeting specific areas of the region with self-containment of employment being a key objective. • Land use policies include provision of cycle-friendly and pedestrian-friendly environments (eg. as supported in the 'Cycle Notes' technical publications).
NSW			• 'Sydney Metropolitan Strategy - a City of Cities' (Dec 2005) is intended to influence congestion by improving LU/ transport integration The eight key elements are: stronger cities within the metro areas, strong global economic corridor, contain Sydney's foot-print, more jobs in W Sydney, focus on major centres, fair access to jobs and services, connected centres, and better connected and stronger regions. • The NSW Govt 'Integrating Land Use and Transport' policy planning package (Sept 2001) includes guidelines on 'Improving Transport Choice', relating to implementation of integrated land use and transport policies. • Part of the policy is to encourage 'transit oriented development' (TOD) patterns, ie. to locate new developments in areas of good accessibility and where there is adequate infrastructure capacity (transport and other services). • A major overhaul of the NSW planning system was announced in 2004, in order to support implementation of the Metropolitan Strategy and deliver sustainable

APPENDIX 1: EXAMPLES OF AUSTRALIAN CONGESTION MANAGEMENT POLICIES			
Policy Area: F1 – LAND USE PLANNING			
State	**Implementation of Measures to Date**	**Overview of Evaluation Extent and Findings**	**Current/Future Policy Proposals**
			development policies. The reforms focused on strategic planning for growth areas, simplified planning controls, improved development assessment processes, and greater funding flexibility. • NSW Office Accommodation Reform Programme (DPWS) includes strategies to reduce accommodation costs by locating offices outside Sydney CBD in areas with adequate PT access.
VIC	•	•	• Refer MOTC policy paper, Melbourne 2030 • Melbourne 2030 policies include: - change in LU policies to encourage increased population destinies - encouragement of activity centres as transit cities served by the PPTN
	•	•	
SA	• Planning Strategy (Metro, Outer Metro and Country and Regional) statement of Government land use and development policy that governs land use planning and development under the Development Act. Integrated land use, transport, human services, economic development, etc strategy updated every 5 years. Translates the objectives and strategies in SA Strategic Plan into development plans for land use and transport	• Mandated annual report to Parliament by Premier on the progress achieved by Government agencies in meeting Planning Strategy targets and outcomes.	• Planning Strategy implements SA Strategic Plan requirements to develop and implement strategies and incentives to promote developments concentrated along transport corridors that encourage alternative forms of transport such as PT, cycling and walking that encourage social cohesiveness, equity, social justice, economic development and environmental sustainability. Implemented via the Strategic Infrastructure Plan for SA.
	• SA Strategic Plan and Strategic Infrastructure Plan form the framework for all other planning within the State	• Progress in achieving SASP targets reported annually to Parliament by Premier	• Refer SA Strategic Plan and Planning Strategy (see www.stateplan.sa.gov.au)
WA	•	•	• Perth 2030 urban strategic plan focuses on development in/around activity centres - which are connected by the PPTN and fed by local PT services. The strategy aims to manage congestion by making jobs, community services and other activities more accessible, particularly by walking, cycling and PT modes

Appendix 2 – Summary of Policy/Measure Performance

APPENDIX 2: SUMMARY OF POLICY/MEASURE PERFORMANCE				
Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
GENERAL ROAD TRAFFIC CONGESTION POLICIES				
1. Area Road Use Charging	Primary objective to reduce congestion and enhance transport system efficiency. [Initial focus on CBD/peak periods; long-term may extend throughout metro area].	H	H/M	▸ **Comp measures:** Maybe reduce other motorist charges. Need to enhance PT capacity and quality. Desirable to increase flexibility of work and school hours (refer 4.1). ▸ **Impacts:** Positive effects on modal transfer, environmental and safety objectives. Potential distributional and boundary impacts – to be addressed in planning/design stage. ▸ **Comments:** Important issue is use of revenues.
2. Parking	2.1 Public parking restraint measures (supply/pricing, on and off-street, publicly-owned and privately-owned spaces). [Policy to focus primarily on long-stay (commuter) parking; to be coordinated across metro area.]	M	H	▸ **Comp measures:** Need to enhance PT capacity and quality. To be effective needs to be part of integrated parking policies (refer 2.2, 2.3, 2.4). ▸ **Impacts:** Positive effects on modal transfer, environmental and safety objectives. ▸ **Comments:** Needs to cover both publicly and privately-owned spaces if to be effective. Effectiveness depends on coordinated implementation of policy 2.2 in particular. Importance and design of these measures in reducing congestion influenced by whether policy 1 is also pursued.
	2.2 Private non-residential parking (existing) regulation. [Policy likely to involve levy on existing spaces in business etc premises, so that costs passed on to employees.]	H	M	▸ **Comp measures:** As per 2.1 ▸ **Impacts:** As per 2.1 ▸ **Comments:** Needs to be coordinated with measure 2.1 in overall parking policies. Levies need to be set high in order to shift demand. Potential alternative to road use charging.,
	2.3 Parking space standards in new developments. [Policy involves setting maximum parking space standards for new business/commercial premises, with standards varying according to access levels by alternative modes, especially PT.]	M (long-term only)	M	▸ **Comp measures:** To be effective needs to be part of integrated parking policies (refer 2.1, 2.2, 2.4). ▸ **Impacts:** Positive effects (over longer term) on modal transfer, environmental and safety objectives. ▸ **Comments:** Decongestion effects will only develop slowly as new/expanded premises are built.
	2.4 Park and Ride policies. [Provision of parking spaces adjacent to selected train/tram/bus stops in middle/outer areas, together with high quality PT services to CBD and other major suburban centres. Primarily targeted at commuters.]	M/L	M	▸ **Comp measures:** High quality PT services to/from selected sites (may be dedicated services, but most likely to be general-use services). To be part of overall integrated parking policies (refer 2.1, 2.2, 2.3) and PT policies. ▸ **Impacts:** Positive effects on modal transfer, environmental and safety objectives.

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Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
				▸ **Comments:** Policy already implemented in several Australian cities to considerable degree. Further implementation needs to carefully consider impacts on car travel (in congested situations) and use of PT feeder services.
3. Financial and Taxation Measures	3.1 Financial measures, relating primarily to commuter travel, that encourage use of alternatives to single-occupant cars. Closely related to workplace travel plans (4.2.2). Measures include: car/van-pool allowances, 'cashing out' of parking subsidies; subsidies to PT tickets.	M/L (dependent on level of incentive, availability of public transport, and breadth of coverage)	M/L (dependent on how well this measure is targeted)	▸ **Comp measures**: Over-lapping with workplace travel plans (4.2.2). Effectiveness increased if accompanied by alternative mode 'carrots' (eg. improved PT) and traffic restraint 'sticks'. ▸ **Impacts:** Direct impact in reducing peak car travel, with flow-on environmental and safety benefits ▸ **Comments:** Some of these measures may be warranted as better aligning price signals with costs across different modes; others may distort this alignment.
	3.2 Taxation measures, relating to relative costs of private car use and alternative modes for commuter travel. [Measures include: taxation on employer-funded car and parking provision: tax deductibility of commuting expenses].	M/L (dependent on level of incentive, availability of public transport, and breadth of coverage)	M/L (dependent on how well this measure is targeted)	▸ **Comp measures:** ▸ **Impacts:** Some direct impacts in modifying peak period modal choice and hence congestion levels, with flow-on environmental and safety benefits. ▸ **Comments:** Some of these measures may be warranted as better aligning price signals with costs across different modes. Change in FBT arrangements worthy of further research.
	3.3 Taxation measures, that modify relative costs of private car use and alternative modes, for all travel. [Measures include: taxes on car purchase; taxes on car ownership; fuel taxes.]	M/L	L	▸ **Comp measures:** Fuel taxes need to be considered in conjunction with direct road-use charging (1). ▸ **Impacts:** Impacts on peak traffic levels and congestion likely to be minimal unless large increases in tax levels. ▸ **Comments:** No clear rationale for increasing taxes on car purchase/ownership; preferred emphasis would be for any increases to relate to car usage.
4.1 Travel Demand Modification Policies	4.1.1 Modification of school hours. [Policy to focus on modification of school hours for some/all schools to avoid road traffic peaks, particularly AM peak.]	M (but unlikely to be feasible)	M?	▸ **Comp measures:** Complementary to road use charging (1). ▸ **Impacts:** Peak spreading should improve transport system efficiency, including better use of PT resources. ▸ **Comments:** Need and effectiveness may be reduced if school travel plans are implemented (4.2.3). Measure is likely to be controversial.
	4.1.2 Modification of working hours. [Policy to focus on staggered working hours (outside peak traffic periods), more flexible hours and modified working week (eg. 4 * 10 hours).]	H/M (but unlikely to be feasible on a broad scale)	H/M?	▸ **Comp measures:** Complementary to road use charging (1). Augmentation of PT services before/after 'conventional' peak periods. ▸ **Impacts:** Peak spreading would improve transport system efficiency, including better use of PT resources.

APPENDIX 2: SUMMARY OF POLICY/MEASURE PERFORMANCE				
Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
				▸ **Comments:** Needs to be considered along with workplace travel plans (4.2.2). Likely to need controversial regulation/incentives to achieve effective implementation.
4.2 Travel Planning	4.2.1 Household-based (personalised) travel planning. [Policy involves use of direct marketing/information approaches to encourage individuals/households to modify their travel behaviour, focusing on reduction in car use and increase in use of alternative modes. Being implemented as TravelSmart in various States]	L	L/M (effects may be leveraged by complementary measures)	▸ **Comp measures:** Intrinsic component is improved marketing/information on PT, walking and cycling modes, tailored to individual needs. Comp measures include enhancement of PT services and walking/cycling facilities. ▸ **Impacts:** To date, road traffic impacts have been mainly outside peak periods, hence limited effects on congestion. Positive effects on modal transfer, environmental and safety objectives. ▸ **Comments:** Main focus of 'TravelSmart' programmes to date in Australia has been on reducing VKT, rather than congestion. Offers other benefits, eg health.
	4.2.2 Workplace-based travel plans (including ride-sharing measures). [Travel plans adopted by employers relating to a particular work-site (or possibly group of adjacent work sites). Measures may include car/van pooling, shuttle buses connecting with PT services, cycle facilities, teleworking, parking restraint measures etc.]	M (dependent on breadth of coverage)	M/L (cost of widespread implementation may be prohibitive)	▸ **Comp measures:** To make plans most effective, desirable comp measures include traffic restraint 'sticks' (road pricing, parking restraint etc) and alternative mode 'carrots' (improved PT, walking and cycling facilities etc). ▸ **Impacts:** May reduce peak car travel to/from site by up to 30%, if accompanied by comp measures. Hence positive effects on modal transfer, environmental and safety objectives. ▸ **Comments:** Needs to be considered along with modified working hours (4.1.2). May need regulation/incentives to achieve effective implementation on large-scale desirable.
	4.2.3 School/college-based travel plans. [Travel plans adopted by schools/colleges focused on reducing car use and improving safety and health/fitness. Measures may include road safety enhancements, cycle and pedestrian training, 'walking bus' schemes, and marketing to parents/ children.]	L/M (context-specific – measures targeted at cross-city travel may be more effective)	L/M	▸ **Comp measures:** Intrinsic measure components as noted. Desirable comp measures are principally improved PT and walking/cycling facilities. ▸ **Impacts:** May reduce peak car travel to/from site by up to 20%-30%. Hence positive effects on modal transfer and environmental objectives. Particular impacts on health and safety objectives. ▸ **Comments:** Needs to be considered along with modified school hours (4.1.2). May need regulation to achieve effective implementation on large scale.
	4.2.4 Travel awareness campaigns. [General (mass) marketing/ information campaigns to raise public awareness of the undesirable effects of road traffic growth, to influence attitudes and to change travel behaviour. Measures may include mass media advertising and community-based awareness-raising.]	L (could leverage other policy initiatives)	M/L (greater impact if leveraging other policy initiatives)	▸ **Comp measures:** Desirably improved PT and walking/cycling facilities, including improved information (refer 4.2.1). ▸ **Impacts:** Very limited evidence. More likely to be effective in reducing general traffic volumes (VKT) rather than peak period congestion in particular. ▸ **Comments:** Complementary to other Travel Planning (4.2) policy measures.
	4.2.5 Car clubs. [Club members able to hire cars by the hour from a number of local 'depots' throughout the area;	L	L	▸ **Comp measures:** ▸ **Impacts:** Main impacts likely to be on 'second' car ownership and on discretionary trip modes, hence on off-peak travel.

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Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
	and hence likely to reduce car ownership and car use levels.]			▸ **Comments:** Measure largely unproven in Australian metro conditions. May need regulation/incentives to achieve wide-scale implementation.
4.3 Administrative Measures	4.3.1 Transportation Management Associations (TMAs). [Voluntary bodies, usually involving private businesses or cooperatives, which manage TDM measures covering an area or group of businesses.]	Refer 4.2.2	Refer 4.2.2	▸ **Comp measures:** Refer 4.2.2 ▸ **Impacts:** Refer 4.2.2 ▸ **Comments:** Effectively an organisation for managing workplace-based travel plans on a large (area/centre-wide) scale. Hence may particularly benefit from scale economies, especially in case of smaller businesses.
	4.3.2 Trip Reduction Ordinances (TROs). [Regulatory mechanisms requiring land users (owners, businesses, developers) to comply with trip level or trip reduction limits. Effectively involves compulsion and regulation of workplace travel plans (4.2.2).]	M	M/L	▸ **Comp measures:** Desirably improvements in alternative modes, including additional PT service capacity and improved quality. ▸ **Impacts:** Could substantially reduce peak period car travel (depending on details of regulations), with corresponding modal transfer, environmental and safety benefits. ▸ **Comments:** Had some success in USA (particularly California) in reducing car travel to/from work-places; but difficult to administer, strongly opposed by employers, and now largely abandoned.
8. Road Infrastructure Expansion	[All types of schemes to provide additional road infrastructure in metro/urban areas, in order to increase road network capacity for road traffic in general and hence reduce congestion.]	H/M (dependent on network impacts and extent of induced trips)	L/M (costs can be considerable in some cases)	▸ **Comp measures:** Benefits of policy enhanced by road-use charging policies with economic efficiency objectives (1). ▸ **Impacts:** Overall traffic volumes may increase but travel conditions improve: net effects on environment, safety and sustainability unclear in general. May be local adverse land use/social/community impacts (land and property acquisition). ▸ **Comments:** To the extent this measure may be adopted, desirable to pursue a 'balanced network' strategy, having regard to the capacity and quality of alternative modes. Likely to result in very limited new road capacity in inner urban areas and on radial routes, more in outer areas and for orbital movements. Costs can be very high (c.$400M per kilometre in established areas).
10. Road Space Reallocation	10.1 Public transport (on-road) priority measures. [Include dedicated lanes, signal priority measures, PT-only streets, PT gates, PT preferential turns and use of road-space for stop enhancements.]	M (dependent on extent to which the attractiveness of PT travel is improved).	M	▸ **Comp measures:** Depending on measure, to be workable may need road infrastructure expansion/capacity enhancement, parking restraint (to allow lane for other traffic). ▸ **Impacts:** 'Minimalist' measures (enabling trams/buses to jump traffic queues) may have minimal impacts on traffic capacity and congestion. "Maximalist' measures may substantially reduce capacity for general traffic resulting in increased congestion fro remaining private traffic. ▸ **Comments:** In general, such measures are likely to have either little impact on general traffic congestion, or an adverse impact (increased congestion): while 'maximalist' measures may result in a significant mode shift form car to PT, this is unlikely to be sufficient to reduce congestion given the reduction in general road capacity.

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Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
	10.2 Public transport and high-occupancy vehicle priority measures. [As for 10.1, but HOVs also allowed to take advantage of priority measures. A variety of 'HOV' definitions may be used, eg. cars with 2+ persons, commercial vehicles, taxis.]	M (dependent on extent to which the attractiveness of PT travel is improved).	M	▸ **Comp measures:** As for 10.1 ▸ **Impacts:** As for 10.1 ▸ **Comments:** Refer 10.1 Generally HOV measures would have less adverse impact on general congestion than would PT-only priority measures, as HOV measures tend to match the supply of road-space better with the demand. However, impacts of 'maximalist' measures on overall general traffic congestion are still likely to be adverse.
	10.3 'Traffic calming' policies. [Policies to restrain the volume and speed of road traffic on particular streets/local areas, designed to improve conditions and safety for pedestrians, cyclists and local residents. Usually (but not necessarily) applied to local streets in residential areas. Measures may include speed humps, chicanes, road narrowing etc.]	L	L	▸ **Comp measures:** Walking/cycling enhancements (5) ▸ **Impacts"** If applied on a substantial scale, likely to increase traffic volumes on main road (un-calmed) network, thus increasing peak period congestion. But may produce substantial improvements in environment, amenity and safety on local road networks. ▸ **Comments:** In general, not an effective measure to tackle general congestion; but has merits in terms of other transport-related objectives.
5. Walking and Cycling Enhancements	[Comprises three groups of 'carrot' measures to enhance the attractiveness of walking/cycling modes and thus encourage people to switch from motorised (car) travel: - Infrastructure provision (eg. cycle lanes, pedestrian areas) - Regulatory measures (eg. traffic speed restrictions) - Information and marketing campaigns (eg. cycle route maps, cycle training courses).]	M/L	L/M (can be enhanced in combination with stick measures)	▸ **Comp measures:** Measures may be an important component of travel plans (4.2). Impacts increased if combined with various 'stick' measures (road-use pricing, parking restraints etc). ▸ **Impacts:** Impacts on peak road traffic volumes and congestion likely to be small. However, other benefits are likely from these measures (health, social, sustainability). ▸ **Comments:** In 2001, walking/cycling accounted for 4% of Melbourne total journeys to work, and a lower proportion of commuter person kms. However, the share of journeys to school would be substantially higher.
7. Public Transport Enhancement	[Covers full range of types of improvements to PT services that are designed to increase PT usage and to encourage car drivers to switch to PT. Measures include major service expansion, service level improvements, service quality enhancements, improved system accessibility, fares/ticketing arrangements, passenger information and marketing.]	M	L/M (can be enhanced in combination with stick measures)	▸ **Comp measures:** Impacts increased if combined with various 'stick' measures (eg. road use pricing, parking restraints etc). ▸ **Impacts:** Major PT improvement schemes may attract up to 10%-15% of car drivers in corridors directly impacted; but much of vacated road capacity will be filled by re-routed and induced traffic, limiting congestion relief. Likely to be small environmental and safety benefits. **Comments:** Main benefits of PT enhancement schemes are typically to existing users, rather than through attraction of car traffic. However, 'decongestion' benefits are not insignificant, and will be enhanced if measures accompanied by 'stick' policies.
6 Information &	[Covers the application of new information and	L (in short term)	L/M	▸ **Comp measures:** Such policies are being pursued by governments and private

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Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
Communication Technologies	communication technologies to offer alternatives to and reduce the need for physical travel. Types of policy measures include: development of telework centres; development of e-work programmes; promotion of e-commerce and e-services.]			sector organisations for a range of reasons, of which reducing the need to travel is only one. The implementation of effective travel substitution policies is dependent on the development of the appropriate technologies. **Impacts:** In the shorter-term (<10 years), impacts on peak period traffic levels, and hence congestion, are likely to be small; although in the longer term (say 20-30 years plus) they may be much greater. **Comments:** The priority that should be given by Government to these policies depends on many factors other than transport/congestion considerations. Moves towards more economically-efficient transport pricing would tend to increase peak period prices, which would help encourage the development of travel substitution policies.
12.1Freight Transport Policies – Road Freight Management	[Covers road and freight-specific policies designed to reduce the adverse congestion and other impacts of freight transport on the metropolitan/urban road networks. Measures include: access regulation (routes/ areas and times); loading/parking regulations; planning and zoning policies; vehicle capacities and standards; distribution facilities; and information technology. Excludes measures covered elsewhere that would apply to all traffic categories.]	L/M	M/L (context-specific)	**Comp measures:** Road freight movements also affected by 'generic' road management measures (1, 4, 8, 9). **Impacts:** Any impacts on congestion are likely to be very small on a metropolitan-wide scale, given the small contribution of HGVs to peak period traffic volumes; impacts may be significant on a few routes heavily used by HGVs. May be positive environmental impacts in some cases (eg. through access regulations) **Comments:** Potential for local resistance to permit late night truck access into noise-sensitive areas.
12.2 Freight Transport Policies – Modal Switching to Rail	[Covers 'carrot' (and 'stick'?) policies focused on attracting current urban road freight (HGV) movements to the rail system. Measures include: rail infrastructure investment, rail efficiency improvements and cost reduction measures etc??]	M	L/M (may have significant economic benefit over the long term)	**Comp measures:** Rail 'carrot' measures will be most effective if accompanied by road 'stick' measures: some of these may be freight-specific (as in 12.1), others will be 'generic' road management measures (1, 4, 8, 9). **Impacts** As above, these policy measures are likely to have only very small impacts on congestion on a metropolitan-wide scale, but may have more pronounced aspects on some key freight routes (especially relating to port traffic). Transfers to rail are also likely to provide environmental and safety benefits. **Comments:** Work to date suggests that feasible rail freight 'carrot' measures on their own are likely to have very limited effects on mode shift: they would need to be accompanied by 'stick' measures to produce significant mode transfers impacting on congestion. Integrate approaches, eg those recommended in the 'Brereton report' likely to be most effective.

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Policy Area	**Measure/Description**	**Decongestion Performance Ratings**		**Complementary Measures, Other Major Impacts, Comments**
		Effectiveness	**Cost-effectiveness/ Economic Efficiency**	
11. Land Use Planning Policies	[Covers a range of urban land use/planning policies that may influence travel patterns and in particular reduce the level of road travel (VKT) and hence potentially congestion. Key policy measures are: - increased residential densities - greater focusing of residence and jobs in the Principal Activity Centres - reinforcement of metropolitan Urban Growth Boundary - implementation of urban design principles for retail and commercial areas to promote pedestrian activity and PT use.]	L (in short term); H/M (in long term)	M	▸ **Comp measures:** These measures need to be complemented by a range of 'carrot' measures to enhance PT, walking and cycling modes (eg. 5, 7, 10). ▸ **Impacts:** Only small impacts on road traffic and congestion in short term (<10 years). In longer term (20 to 30+ years), may have substantial impacts on travel patterns and hence on congestion: this is expected to support environmental, health, safety and sustainability objectives. ▸ **Comments:** Particularly difficult to evaluate the cost-effectiveness and economic efficiency of these policies in terms of congestion impacts; but also important to recognize other impacts.

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