REVIEW OF URBAN CONGESTION

TRENDS, IMPACTS AND SOLUTIONS

Report prepared for the

Council of Australian Governments

by the

Competition and Regulation Working Group

December 2006

Contents

Acknowledgement:

This Report was prepared by a Working Group comprising representatives from the Australian Government, State and Territory governments, and the Australian Local Government Association, under the direction of the COAG Competition and Regulation Working Group. The Department of Transport and Regional Services provided the Secretariat to the Review.

EXECUTIVE REPORT

Introduction

In February 2006 COAG committed to reducing current and projected urban transport congestion within existing jurisdictional responsibilities, with a focus on national freight corridors, and only examining local networks where they interact with and impact on these corridors. COAG commissioned a review to assist them in considering further actions at their first meeting in 2007, asking that the Review make findings on improving the economic performance of national urban corridors (the AusLink urban Network) and improving productivity outcomes from urban transport.

The terms of reference for the Review acknowledge the considerable and valuable work that has been undertaken, especially by States and Territories, in improving congestion management in Australia over recent years. This report builds on these gains and the lessons learned.

While the research undertaken for this Review demonstrates that Australia's response to congestion management is broadly comparable to overseas experience, it has also highlighted some important gaps in Australia's approach. All developed economies are struggling to address increasing road and rail congestion and are examining and adopting new approaches. As Australia's growth prospects are strongly geared to competitive international exports, and given our highly urbanised population, the imperative of lifting our response to the economic pressures imposed by urban congestion on key transport corridors is at least as great as for other developed economies.

It is clear from Australian and overseas experience, that there is no single 'silver bullet' solution to rising congestion pressures. This report outlines an approach that could deliver congestion management improvements to help Australia address forecast increases in congestion costs. It is based primarily on developing jurisdiction-specific packages of complementary initiatives, given the substantially different circumstances of each of Australia's capital cities. It is also based on governments jointly progressing specific issues of cross-jurisdictional importance should there be agreement to those issues.

While this Review focuses primarily on management measures to combat urban congestion, or how to get the best from a given stock of infrastructure, including under changing demand scenarios, it is important not to lose sight of the continuing need for coordinated investment by all jurisdictions in targeted transport infrastructure improvements. Infrastructure development and management measures should be seen as complementary elements in approaches to provide, manage and price transport infrastructure to maximise the productivity of urban transport networks, including through improved congestion management.

Methodology for the Review

The Review has been overseen by the COAG Competition and Regulation Working Group. The Review Secretariat undertook drafting tasks in conjunction with officials from State and Territory transport and planning agencies, as well as the Australian Local Government Association, especially through the Standing Committee on Transport's Urban Congestion Management Working Group. A number of projects and consultancies were commissioned to provide specialist advice on important issues, and these were managed by specific agencies.

The Review outputs comprise this Executive Report and an accompanying Information Paper. The latter provides additional supporting information, including summaries of the main findings from the specialist projects.

Urban Congestion - A National Issue

There is considerable shared interest across levels of government in more effectively tackling congestion pressures on the urban AusLink Network - both road and rail links. The economic performance of this Network, and access to and from the National Network, has important implications for all levels of government.

The costs of congestion on this Network are not quarantined to particular levels of government, specific user groups or locations, and affect broader transport networks. State and local economies are affected by congestion bottlenecks on the AusLink Network, as are Australia's national growth and international competitiveness, especially as our most important non-bulk ports are accessed via the national road and rail networks through our capital cities. Major urban congestion bottlenecks affect industrial performance. For example, for some capital cities almost a quarter of all urban heavy vehicle movements can occur during the combined morning and evening commuting peak periods[1], and while heavy vehicle operators endeavour to avoid travelling at these times where feasible, the observed phenomenon of 'peak spreading' (to which they are contributing) is gradually lengthening the time period when congested conditions affect freight operations.

Urban bottlenecks can affect the performance of non-urban networks and modal competition. For example, where passengers and freight share the same urban rail network, priority is accorded to passenger services particularly during peak periods to ensure the most efficient movement of large numbers of people. While this helps to ensure that commuters chose public transport rather than cars, thereby lessening congestion on the roads, it can also affect the performance of inter-regional rail freight services transiting urban areas. Urban road or rail bottlenecks consequently affect the supply chains for many rural and regional exports.

[1] Data provided from Queensland and South Australia.

Congestion affects services and the knowledge-based economy. Many road-based passenger trips affected by congestion are business-related and generate economic value. Also, by affecting the 'liveability' of cities, congestion can influence the attraction of skills-based industries and a skilled workforce.

Congestion on the urban AusLink Network (including the urban sections of inter-urban corridors) weakens the productivity of vital national and State infrastructure. The capital city nodes of Australia's land transport network are vital components of the whole network, and major urban bottlenecks can affect the productivity of investments made across major areas of the network. This includes investments outside of urban areas, as the value of investments in the inter-urban links of the AusLink Network is maximised when their urban connections function efficiently.

The sustained performance of the economy in recent years and urban growth along the key national transport corridors, have placed greater pressures on the efficient functioning of urban transport networks, especially their main arteries, to maintain Australia's international competitiveness.

Congestion pressures are forecast to rise appreciably. The Review commissioned the Bureau of Transport and Regional Economics to undertake an examination of likely traffic and congestion trends for the 15 years from 2005 to 2020. While the analysis is based on aggregate modelling, rather than on detailed network-based location-specific models, it provides 'order-of-magnitude' estimates of traffic growth and congestion costs.

The examination identified population and economic growth as fundamental drivers of traffic growth, and concluded that traffic levels in our cities will increase by some 37 per cent over the next 15 years. This will result in approximately as much traffic in absolute terms being added to the average city network in the next 15 years as was added in the past 15 years[2]. The examination goes on to estimate increases in congestion costs from extra travel time, increased unreliability, higher vehicle operating costs (especially fuel use) and poorer air quality. These estimates are based on the aggregate 'avoidable' (or excess) costs of congestion for Australia's capital cities under a 'business-as-usual' scenario. On this basis, the costs of congestion to Australia could more than double from $9.4 billion in 2005 to an estimated $20.4 billion annually in 2020. These forecasts reflect upper limit estimates of the potential gains available from an improved approach to congestion management. There are considerable variations in the congestion forecasts between capital cities due to the specific circumstances of each urban area, as shown in Table 1.

[2] 'Estimating Urban Traffic and Congestion Cost Trends for Australian Cities', Bureau of Transport and Regional Economics, October 2006, p: 9.

Table 1: Projected Avoidable Costs of Congestion in Capital Cities[3]

	2005 estimate	2020 estimate	2005-2020 growth
Sydney	$3.5 billion	$7.8 billion	123%
Melbourne	$3.0 billion	$6.1 billion	103%
Brisbane	$1.2 billion	$3.0 billion	150%
Perth	$900 million	$2.1 billion	133%
Adelaide	$600 million	$1.1 billion	83%
Canberra	$110 million	$200 million	82%
Hobart	$50 million	$70 million	40%
Darwin	$18 million	$35 million	94%
Total	**$9.4 billion**	**$20.4 billion**	**117%**

While the estimated costs of congestion are likely to grow appreciably if Australia's current response is not ramped up, the costs of remedial action are also growing. Infrastructure construction costs in major urban areas are already considerable. At the upper range, the cost of building new 4-6 lane motorways in the established parts of Australia's largest cities is close to $400 million per kilometre, and on their own, infrastructure developments will not solve congestion anyway in the longer-term.

While the most significant congestion bottlenecks are currently faced by eastern States, congestion costs are also forecast to rise appreciably in other jurisdictions from their current estimated levels (see Table 1). Moreover, experience in the eastern States suggests that severe impacts from rising congestion, especially on specific links, can materialise well within a decade, eg higher transport costs, volatile travel times, and environmental and social implications. The concentrated nature of major employment centres in Australian cities can also result in extreme pressures emerging rapidly on the road network in the inner urban areas where new infrastructure solutions are very expensive, especially when tunnels are involved. Experience has continually shown that it is highly desirable and beneficial to examine these problems in a timely way in order to implement a package of solutions sooner rather than later.

These projections show that there are substantial economic benefits available from accelerated action, based on the implementation of effective and rigorously assessed measures. Initiatives taken to improve congestion management will also deliver benefits beyond transport and the economy, eg containment of fuel use and transport emissions, as well as potential improvement in public amenity. Lower growth of urban transport fuel use from congestion containment and improved vehicle technologies could also provide a useful contribution to Australia's climate change response.

[3] Data drawn from 'Estimating Urban Traffic and Congestion Cost Trends for Australian Cities', Bureau of Transport and Regional Economics, October 2006, Table II.11, p108. The figures are drawn from aggregate modelling and would not be as accurate as those available from detailed network modelling.

All of these factors have implications for long-term growth, wider benefits to the community and revenue flows to all levels of government.

While it is widely recognised that it is not feasible to cater for urban traffic growth solely by building more transport infrastructure, further efforts need to be made to improve the effectiveness with which existing infrastructure is being used. This includes how effectively it is used currently, and how it may cope in the future under various possible land use and transport demand scenarios. The complex interactions of different elements of the urban transport network, and the impact on transport of land use and other factors which are the responsibility of different governments, mean more multi-faceted and integrated management responses are needed. Increased cooperation between levels of government would achieve better congestion management outcomes and assist with managing both existing and improved transport infrastructure more effectively to achieve higher productivity levels from road and rail networks.

Better Congestion Management - Examination of Measures

While congestion costs are forecast to rise appreciably, specific actions to reduce this growth have to be economically justifiable in order to warrant expenditure. This emphasises the importance of identifying the most economically effective congestion management measures. Consequently, the Review commissioned a number of specialised consultancies (referred to in following sections), each to examine the effectiveness of specific types of congestion management measures used internationally and in Australia. Additionally, an across-the-board examination of the range of measures was commissioned from Booz Allen Hamilton in order to provide a relative assessment of measures and to identify available and effective strategies and actions that could potentially be used more broadly[4]. This project drew on the more specific projects, where relevant, and was managed by the Australian Government Department of Transport and Regional Services.

The Booz Allen Hamilton assessment found that evaluation of Australian and overseas initiatives and projects was limited and that there has been very few evaluations of congestion management at a strategic or policy level. It also highlighted that the variety of circumstances in each city experiencing congestion is so broad that it is not possible to draw precise conclusions about the ability to transpose experience from one jurisdiction to another, and that the assessment process involves a degree of qualitative assessment and professional judgement. However, the study found that it is possible to draw general conclusions about the relative effectiveness and relevance of particular measures. Within this context, the assessment of urban congestion management measures has been undertaken against a number of criteria including: effectiveness, cost-effectiveness, suitability, breadth of Australian experience, transferability, longevity, lead times,

[4] 'Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management', Booz Allen Hamilton, October 2006. This study also drew on a number of other specialist consultancies and projects undertaken for the Review into congestion management tools. These covered: traffic management systems, freight operator behaviour change, role of public transport, and integrated transport and land use planning.

complementarity between measures, distributional aspects and applicability to the urban AusLink Network. The identification and assessment of specific projects are more detailed tasks beyond the scope of this Review.

The congestion management measures outlined in this section have been organised into six broad categories to provide a structure for their assessment and analysis. There is no implied ordering of priorities in the discussion of measures. An indicative timeframe, together with indications of the degree of complexity and potential benefits of measures, is provided later in this report at Figure 1. An important conclusion from the Booz Allen Hamilton study is that no single solution is able to address the range of factors contributing to urban congestion. Rather an integrated approach of complementary measures, tailored to the particular circumstances of each urban area, offers the best prospect of managing congestion[5].

Traffic Management Tools

These encompass supply-side measures based on gathering and using traffic information in real-time through appropriate Intelligent Transport Systems to increase infrastructure productivity, either through general improvements to the efficiency of traffic flow or by providing time and location-related priority for certain higher productivity road users, eg freight vehicles and public transport. Measures include: specific purpose lanes, managing motorway traffic entry and exit via traffic signals on ramps (ramp metering), variable speed limits, traveller information services, access management and incident management tools. In practice, these tools tend to be integrated within traffic management systems to meet specific needs.

As the AusLink urban Network includes both motorways (including freeways and tollways) and arterial routes that often have numerous at-grade intersections, two specialist consultancies into traffic management tools were commissioned for the Review. One related to traffic management systems for urban (including AusLink) freeways, was undertaken by an Australian Road Research Board consultancy and managed by VicRoads[6]. The other related to the use of such tools for the non-freeway links of the AusLink Network, was undertaken by Maunsell/AECOM and managed by the Department for Transport, Energy and Infrastructure, South Australia[7].

Currently, many of Australia's urban motorways cannot be actively managed in the same way that is possible for motorways that are fully equipped with appropriate Intelligent Transport Systems. As a consequence, in some cases, up to 25% of the operating capacity may currently be unavailable during substantial periods when full capacity is required, because of 'collapses' in flow volumes and speeds when traffic levels near

[5] 'Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management', Booz Allen Hamilton, October 2006, p: 50.
[6] 'Traffic Management Systems for Australian Urban Freeways', Australian Road Research Board, August 2006.
[7] 'AusLink Urban Arterial Road Network Congestion Review: Traffic Management Systems (Non-Freeways)', Maunsell/AECOM, September 2006.

design capacity[8]. The use of active traffic management tools and strategies that have been successfully adopted in a number of overseas economies, capable of managing a whole corridor or network in real-time, could 'tap into' much of this latent capacity and lift the productivity of significant portions of urban motorway systems. This approach could offer a short to medium-term opportunity to improve longer-term management of these systems and gain substantial increases in effective infrastructure capacity and transport productivity on suitable corridors.

Additional, albeit less substantial, gains are also possible through integrated use of traffic management tools, including through approaches to access management, on AusLink urban arterial systems. The lower potential gains are partly because Australian jurisdictions are already applying these tools and benefiting from their productivity and reliability improvements. However, as with motorways, integrated real-time management of entire corridors and networks offers opportunities for extracting greater productivity from existing and new infrastructure.

Freight, Commercial and Service Vehicle Management

The importance of efficient freight and logistics operations to the Australian economy; the negative consequences of congestion on freight and industry costs; and the increasing proportion of freight, commercial and service vehicle traffic experiencing congestion on urban roads, require priority to be given to a more integrated approach to the management of freight and commercial transport. This is especially the case as Australia's major non-bulk ports and terminals, situated in large urban areas, have a limited number of access routes for both road and rail. Explicit policy and management choices could be applied via traffic management systems to improve access by high productivity vehicles to particular links in the network during defined time periods, eg through use of truck priority lanes on entry ramps.

The urban light commercial vehicle sector particularly is growing strongly in terms of relative traffic levels and economic importance. This sector covers tasks such as freight distribution, services (eg, utilities, commercial and household maintenance and repairs), as well as business travel. Capital city light commercial vehicle traffic is forecast to grow by 90 per cent, 2005-2020, to comprise almost 20 per cent of total capital city vehicle traffic by 2020[9]. Additionally, there is considerable economic value generated by business travel by private car.

An examination was undertaken for the Review into opportunities to change urban supply chain behaviour so that more freight moves outside of peak congestion periods. This project was undertaken by a consortium headed by IMIS and was managed by the NSW Roads and Traffic Authority. The project demonstrated that there are operational, commercial and congestion benefits available from road freight avoiding - and avoiding

[8] 'Traffic Management Systems for Australian Urban Freeways', August 2006, pp: 5-9.
[9] 'Estimating Urban Traffic and Congestion Cost Trends for Australian Cities', Bureau of Transport and Regional Economics, October 2006, Table II.1, p: 67.

adding to - traffic congestion[10]. The project found that 'FreightSmart' opportunities could be facilitated by regulatory changes, eg to truck parking restrictions (involving local government, as well as jurisdictions), changes to operating hours for container depots, distribution centres or retail outlets, and other supply chain operational modifications. While FreightSmart actions may be of commercial benefit to specific freight operators, their overall congestion benefit is likely to be relatively modest. However, on particular routes and times, FreightSmart initiatives, implemented in conjunction with complementary actions, may deliver a useful congestion outcome for the broader community.

Nevertheless, improvements to congestion through commercial supply chain enhancements should not lessen the need for, or desirability of, governments proactively considering and, where appropriate, facilitating a longer-term shift in the proportion of inter-regional freight carried by rail, where this is commercially feasible. On some parts of the urban rail network freight movements have to compete with the passenger transport task, which is afforded priority (with positive impacts for road congestion reduction, including for road freight operators). In these situations, the longer term shift of freight from road to rail will ultimately be achieved through the development of dedicated freight lines and other measures to improve the efficiency and reliability of rail freight. In other urban areas, the rail freight system is separated from the rail passenger system and other measures to increase rail's freight share should be considered. Supporting strategies, such as improvements to enhance existing infrastructure capacity and good land use planning, such as the optimal location of inter-modal freight terminals, will also assist in improving rail's competitiveness. The flexibility of road freight in urban distribution means that it is unlikely that rail will make significant inroads into shorter-distance intra-urban freight movements

Passenger Travel Demand Management: Non-Price

Non-price demand management tools are not directed exclusively at congestion reduction, but are aimed more broadly at changing people's travel choices and/or travel patterns to achieve social, environmental and economic outcomes. Most of these measures are voluntary in nature (such as travel planning and information or awareness campaigns aimed at householders, schools and workplaces) but a minority (such as parking restraints) are mandatory and act as a direct deterrent to car use. They may entail shifts to alternative modes (including public transport, cycling and walking), alternative use of existing modes (such as encouragement of multiple occupancy car travel), as well as changes to patterns of travel (including timing and route selection).

Changing people's travel behaviour to avoid periods of high congestion can assist congestion management. However, as most of these measures are voluntary in nature with varying impacts, the potential congestion gains of these measures for the AusLink Network and other key arterial routes is likely to be relatively modest. The impact will depend significantly on city-specific characteristics. As these measures can be implemented at low costs compared with infrastructure alternatives, and if packaged with

[10] 'FreightSmart Study', IMIS, October 2006.

complementary measures, eg public transport enhancements to provide synergies, they may be relatively cost-effective. Targeting significant peak-time travel generators, such as major workplaces[11], in conjunction with the increased use of parking restraints, appears to offer greater potential benefits.

Public Transport

A paper examining the role of public transport in congestion management was developed for the Review by the NSW Ministry of Transport. It drew on work previously undertaken (and updated for the purposes of this Review) by Booz Allen and Hamilton for the Victorian Competition and Efficiency Commission's inquiry into congestion management, other available international and Australian evidence, and information on current public transport initiatives supplied by jurisdictions.

The paper highlights that jurisdictions recognise the important role of public transport in managing congestion, and are committed to the provision of effective public transport systems for a range of social, economic and environmental reasons. While public transport use in Australian cities is low relative to car use (at around 10 per cent of the total city transport task in passenger kilometre terms), the following table illustrates that for particular purposes, locations and times (such as journeying to work in CBD locations), it does provide a viable alternative to the car and thus plays a role in reducing congestion.

Table 2: Journey to Work Data: Proportion of Trips by Public Transport for Australian Capital Cities 2001[12]

	Sydney	**Melb**	**Brisbane**	**Perth**	**Adelaide**	**Canberra**	**Hobart**	**Darwin**
CBD	72%	60.5%	56.6%	47.7%	30.2%	12.5%	14.1%	6.1%
Metro Area	22%	12.7%	12.6%	9.0%	8.8%	6.6%	6.0%	3.7%

Information gathered for this Review indicates that jurisdictions are making considerable investments in, and undertaking a range of enhancements to, their public transport systems. The available evidence drawn from local and overseas experience is that public transport enhancements can increase public transport patronage, help to ensure that congestion does not worsen, and have a greater marginal impact on congestion relative to other measures, such as promoting walking and cycling or travel substitution.

However, the evidence also suggests that the effect of public transport initiatives, by themselves, in reducing congestion is generally small. Their impact is greatest when part of an integrated package which includes measures such as: supportive land use policies,

[11] 'Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management', Booz Allen Hamilton, October 2006, p: 16.

[12] 'The Role of Public Transport in Urban Congestion Management', NSW Ministry of Transport, October 2006, p: 6.

restraints on car use, traffic management measures, simplified fares and integrated ticketing, high levels of reliability and potentially tax incentives.

Integrated Transport and Land Use Planning

Land use decisions have significant implications for passenger and freight movements in urban areas because they determine where and how people and goods need to travel to access employment, services and markets. When transport and land use decision-making and implementation are poorly integrated, people and goods have to travel longer distances between origin and destination, and congestion will be exacerbated. If the land use impacts of new transport infrastructure investments are not properly assessed (and, conversely, if the transport impacts of land use developments are not properly assessed) then it is possible that unforeseen patterns of traffic growth will emerge and erode the expected benefits of these investments. States and Territories have major land use responsibilities and have also established frameworks under which urban land developers contribute towards the delivery of certain infrastructure, services and amenities that are required as a result of development. Local government's role varies between jurisdictions. It can play the leading role in land use decision-making, and in operational terms, local government also plays a leading role in implementing land use decisions.

A specialist consultancy was undertaken for the Review into the potential for improved implementation of integrated transport and land use planning to improve congestion outcomes[13]. It found that while States, Territories and local governments have long and generally positive experience with integrated transport and land use planning for specific sites, areas and corridors, including in many cases the management of associated developer contributions, there is room to improve.

There are several areas where improvements could be made. These include: establishing cross-jurisdictional coordination mechanisms, setting complementary transport and land use objectives for particular corridors, consistent and better application of 'user-pays' principles to new urban developments that capitalise on the access afforded by transport networks (eg, where intensified urban development is proposed adjacent to transport links that are already congested for developer contributions to be used to support improved public transport services, as well as infrastructure enhancements) and making full use of the analytical tools (such as computer-based 'accessibility modelling' tools) that can model the range of possible transport and land use interactions catalysed by new projects.

The profound and long-lasting effects of both good and bad spatial planning decisions make improvements to this area of practice as important as any in the range of congestion management measures explored in this Review. Without infringing on recognised jurisdictional responsibilities, AusLink corridor strategies for Australia's capital cities do present the opportunity to improve integrated transport and land use planning outcomes

[13] 'Integrated Transport and Land Use Planning for Urban National Corridors', Geoff Anson Consulting and InfraPlan (Aust), November 2006. The consultancy was managed by the Australian Government Department of Transport and Regional Services.

for key national links, and the possibility of learnings being applied later across other parts of urban networks.

Road Demand Management - Charges, Levies, Taxes, Infrastructure and Service Pricing

These measures include: area-based charges for vehicles entering and travelling within a defined area, select route charging (including toll roads and high occupancy/toll lanes), parking policies to restrain the level of parking and hence traffic movements, as well as financial and taxation measures that operate as an incentive for travellers to use modes, or travel at times, that reduce congestion pressures.

International and Australian experience gathered for the Review through the Booz Allen Hamilton study indicates that pricing measures stand out as the most effective option for alleviating congestion and improving the efficiency and productivity of the transport network (at least when delivered as part of a total policy package of complementary measures). They can provide a 'carrot' to encourage travel in less congested times of day or less congesting modes, and a 'stick' for those travelling when the costs of travel, including congestion costs, are highest. Price-based measures also have the advantage of 'locking in' gains from non-price congestion management measures because they can reduce the 'induced demand' effect[14]. However, development of substantial price-based schemes would require long lead times and a major investment of effort in gaining community acceptance.

Those price-based measures with the primary purpose of reducing congestion when and where it occurs are most effective. For example, the London area-based pricing scheme implemented in 2003 has achieved sustained improvements, including reduced traffic delays of 30-50 per cent, reduced overall travel times by around half this percentage, improved journey reliability, improved efficiency of distribution of goods and services, and improved city amenity[15].

The Booz Allen Hamilton study also concluded that parking policies should be considered as one of the principal policy measures for congestion management in Australian cities, with the potential to operate as a proxy alternative for direct pricing[16]. For such policies to be effective, they would need to combine pricing, restrictions on the supply of parking places, introduce complementary measures, and be applied on an integrated basis across key economic activity zones. It is also important to address equity issues, eg impact on local multi-purpose trips, in any consideration of parking strategies.

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[14] A consequence of supply-side measures, including new infrastructure, is the 'induced demand' effect, where improved travel conditions generate additional traffic, eroding the size and longevity of the original benefits for existing travellers.

[15] 'Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management', Booz Allen Hamilton, October 2006, p: 18. Central London Congestion Charging: Impacts Monitoring, Third Annual Monitoring Report, Transport for London, April 2005.

[16] 'Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management', Booz Allen Hamilton, October 2006, pp: 24-28.

Other financial and taxation measures could have some impact on travel demand. The less these discriminate on the basis of time and location of travel, and user groups (eg, private car users, public transport users, freight operators), the less effective they may be from a congestion management perspective. However, it is feasible to target these measures to deliver outcomes consistent with other congestion management measures based on time and location. For example, it has been found that when public transport tax incentives are provided through employee benefit programmes, eg in the USA, it is possible to target journey to work travel with the potential to influence modal shift from private to public transport[17]. The congestion impact of taxes and charges imposed by governments warrants further consideration.

There is a range of complexities to greater use of price-based measures, including: introduction of complementary measures, especially convenient, reliable and competitive public transport alternatives to car use; city transport and land use patterns; and community acceptance. These factors mean that possible implementation of these measures, as with the other measures outlined in this section, would be specific to individual jurisdictions. However, given the potential benefits of price-based measures, they warrant further detailed investigation.

Other Policy and Regulatory Issues

In complex urban environments, government policies beyond the transport sector can have an influential but unintended impact on transport operations and potentially on congestion at particular times and locations. While trade-offs need to be made between transport and non-transport objectives, issues that could have a high potential impact on congestion should be analysed, and where it is feasible and cost-effective to do so, the relevant issues should be addressed.

Figure 1 outlines very broadly indicative lead times and scale of benefits for a range of congestion management measures.

[17] 'Tax Incentives for Public Transport Users,' NSW Ministry of Transport, Ernst & Young, August 2006, pp: 22-25.

FIGURE 1: INDICATIVE LEAD TIMES, BENEFITS AND COMPLEXITIES OF CONGESTION MANAGEMENT MEASURES

COMPLEXITY OF MEASURE IN ADDRESSING CONGESTION

	SHORT TERM (1-3 years)	MEDIUM TERM (3-10 years)	LONG TERM (> 10 Years)
· HIGH	· TMS (eg contra flow lanes, ramp metering)	· Integrated network parking strategy · TMS: integrated network-wide or corridor deployment	· Integrated congestion management strategy, incorporating congestion charging strategy · Dedicated freight infrastructure · Integrated transport and land use planning
· MEDIUM	· Supply chain demonstration projects	· Peak period variable tolling · Location-specific parking restraints · New PT infrastructure (eg rapid transit bus) · Freight behaviour change/supply chain realignment · PT Enhancements (eg HOV lanes, priority access)	· Congestion based charging strategy including leveraging existing pricing mechanisms (eg parking space levies) · Development of intermodal freight terminals.
· LOW	· Public Transport services (eg electronic ticketing/integrated ticketing systems, real time travel information) · Development of national performance indicators · Technology enhancements to rail infrastructure (eg., improved train control systems) · Non-price travel demand measures to encourage cycling/walking	· Network analysis based on TMS generated data to provide real time information-based management of networks · Non-price travel demand measures (eg. work place based initiatives) · Urban logistics analysis (eg freight modelling) · Development of data and information systems	· Expansion of PT supply (services-based)

BENEFITS (IMPACT OF MEASURES)

Current Institutional Framework

There are some core parts of the current land transport infrastructure institutional framework which are pertinent to taking forward the outcomes of this Review within current jurisdictional responsibilities. These include: the AusLink planning framework, State and Territory urban and land transport infrastructure planning frameworks, and the National Guidelines for Transport System Management.

AusLink Planning Framework

The AusLink National Network and its connections to the broader transport network are the focus of the Australian Government's land transport infrastructure planning and funding responsibility. As part of AusLink planning processes, States, Territories and the Australian Government are developing cooperative strategies for the defined urban corridors of the National Network. A corridor strategy is intended to be a statement of the shared objectives and strategic priorities of the Australian and State and Territory Governments for the long-term (20-25 year) development of the AusLink Network to meet AusLink network objectives. Corridor strategies aim to provide guidance to decision-makers and project proponents formulating network initiatives with a view to informing development of the next and subsequent National Land Transport Plans (the current five-year National Land Transport Plan covers the period 2004-05 to 2008-09). Corridor strategies may identify congestion management priorities, if and where relevant to the corridor's future needs. Once the corridor strategies are complete they will be provided to COAG, which has requested them by 30 June 2007. The strategic priorities identified in each of the strategies will provide a basis for the Australian and State/Territory Governments to negotiate project funding priorities for future infrastructure development.

The major benefit of AusLink corridor planning mechanisms for this Review is that they provide an agreed and long-term inter-jurisdictional framework which assists in identifying the physical location of some of the major congestion pressure points for the coming two decades and developing appropriate responses. Accordingly they could help identify the aggregate scope of the congestion management task facing each corridor, and provide a starting point and 'real-world' context for the location and design of warranted congestion management projects and policies. This will complement the forecasts of the aggregate avoidable costs of congestion provided in this Review by providing more specific indications of congestion pressures on the National Network.

The major benefits for AusLink corridor planning from this Review is that it identifies the current range of congestion management measures available to address the needs identified through the corridor strategies; moreover, it has the potential to provide substantial improvements to the development and deployment of complementary supply and demand-side congestion management measures in Australia. Combined and adjusted as required to deal with needs that will change over time, these measures could be applied to both existing and new infrastructure on the AusLink Network, so

as to increase infrastructure productivity, capture greater value from investments, and consequently potentially defer the need for some infrastructure projects.

State and Territory Planning Frameworks

As the urban AusLink Network provides transport links that are critical to the effective functioning of the economy and cities, and meet other national and State priorities, the Australian Government, States and Territories share a joint interest in, and responsibility for, the urban AusLink Network. States and Territories also have responsibility for a broader network and for overall metropolitan land use and transport planning and operations. States and Territories each have their own planning, decision-making and implementation frameworks and objectives for metropolitan development, including transport infrastructure development. They are the principal asset owners of the urban National Network, have land use planning responsibilities and powers, responsibility for overall road traffic management, and responsibility for urban passenger and freight rail systems.

While AusLink provides the core mechanism for respective governments to cooperate in identifying and addressing major congestion bottlenecks on the National Network, all governments need to work together to ensure that developments and transport operations on and off the National Network complement each other.

National Guidelines for Transport System Management in Australia

The National Guidelines are a cooperative and consistent framework to assist and guide transport planning and decision-making across Australia. They represent a nationally agreed approach and complement and add to current processes in place in many jurisdictions. The National Guidelines have been endorsed by the Australian Transport Council, and at its meeting in February 2006, COAG agreed that the Guidelines should be adopted for the assessment of all new road and rail initiatives.

Transport decision-making is complex with competing objectives, trade-offs, constraints, uncertainty, multiple options, and quantifiable and unquantifiable impacts. Consequently, the National Guidelines provide an agreed national decision support system in order to achieve high-level transport system objectives. A key feature of the National Guidelines is that they consider the full range of potential solutions or options, moving beyond a focus solely on infrastructure and single mode solutions to multi-modal and technology and management-based solutions.

The National Guidelines extend the general planning and appraisal approach detailed for inter-urban road and rail infrastructure initiatives to urban transport[18]. While many of the general principles of planning and appraisal apply equally to a broad range of urban and non-urban activities, urban transport initiatives raise some additional issues. For example, the analysis of public transport initiatives involves complex interactions, both within the public transport sector and to other aspects of urban transport (e.g.

[18] The second edition of the Guidelines will be released in January 2007. It extends the content of the first edition to include urban transport, and provides updated and improved information based on experience with adoption of the first edition and feedback received from users. It will replace the first edition in accordance with the COAG decision.

improvements in bus services and their relationship to other modes of public transport and private car use).

These characteristics ensure that the National Guidelines are highly relevant to assisting with assessment of the range of potential solutions to congestion-related needs, in order to identify the most effective packages of solutions. Many of the potential measures considered in this Review will ultimately require the detailed analysis of options, their interactions with other transport activities and interactions across networks, prior to any consideration of potential funding of projects. The National Guidelines should be used to provide elements of a planning methodology able to generate congestion management proposals for AusLink corridors.

Findings

Drawing on the evidence gained through the specialist consultancies, and the expertise of jurisdictions involved in the Review, the following findings are made in order to improve the economic performance of national urban corridors and improve productivity outcomes from urban transport.

- While there are some influential underlying causes of congestion growth affecting most Australian capital cities (notably population and income growth, and their interaction in a semi-constrained urban environment), each city has a unique set of circumstances and a unique configuration of national urban corridors, and congestion responses need to be tailored to each city. However, there are also a number of issues of cross-jurisdictional impact and importance, where cooperative joint action by governments is warranted and would deliver more effective outcomes than separate actions by individual governments.

- Improvement in Australia's response to managing growth in urban congestion costs, including on national urban corridors, is warranted and achievable; economically, socially and environmentally. There is an opportunity to lift Australia's congestion management capabilities and deliver the next wave of congestion management improvements.

- There is no easy 'silver bullet' solution to the forecast growth in Australia's urban congestion, including on national urban corridors. The most effective responses will entail the packaging of measures for specific urban corridors and networks with each measure supporting others to provide higher benefits. Packages should incorporate a number of complementary supply and demand-side measures (including both 'carrots' and 'sticks'); and short, medium and long-term elements, with the flexibility for elements' timing to be adjusted in response to changes in need over time.

- While the principal focus of this Review is on congestion management measures, it is important not to lose sight of the broader context of the continuing need for investment in targeted transport infrastructure improvements. Infrastructure and management improvements should be seen as complementary elements in approaches to provide, manage and price transport infrastructure to maximise the productivity of urban transport networks.

- A consequence of supply-side measures, including new infrastructure, is the 'induced demand' effect, where improved travel conditions generate additional traffic, eroding the size and longevity of the original benefits for existing travellers. The importance of targeted new infrastructure means that measures to manage the 'induced demand' effect should be included in any package. The most effective measure in this regard would be an appropriate form of congestion-related pricing; however, broader jurisdictional priorities would need to be considered.

- While congestion is manifested on particular sections of road or rail, it has a range of causes not related solely to the adequacy of congested links of the transport network. A broader approach, which addresses demand drivers as well as the capacity of transport infrastructure, is needed to ensure that congestion is not simply shifted from one location or time of day to another.

- People and industry do voluntarily adjust their behaviour to avoid congestion or adapt to it, eg by adjusting travel times, and accordingly accrue benefits by avoiding the most congested periods. However, there are limitations to the extent of 'natural adjustments' and behavioural changes need to be reinforced and supported. There are also costs for many individuals and industry players who are constrained in their travel times to peak periods.

- An incremental and sustained approach to ramping up Australia's approach to managing congestion is likely to be the most effective way forward. This will be dynamic and will evolve as challenges change on each urban Auslink corridor. It will involve careful monitoring so that new measures are introduced or modified as required in line with changes in demand, build on the tangible achievements and lessons of earlier measures, and constitute a sustained congestion management strategy implemented over an extended timeframe.

- Improvements to the integration of national corridors with adjoining networks, passenger and freight systems, and better management of local, cross-urban and through-urban traffic flows, can be achieved by appropriate packages of measures. These could include: robust land use planning decisions, coordinated infrastructure planning and development, and other congestion management measures. Decisions on time and location-based priority for higher value traffic would also be important. Available evidence suggests that appropriate pricing mechanisms could also play an important role as part of a broader approach to traffic and congestion management.

- There is a dearth of sound Australian *ex-ante* and *ex-post* evaluations of individual congestion management measures. There are also serious gaps in congestion-related data and performance information. These weaknesses need to be resolved in order to understand objectively how individual measures and broader policies are progressing, and the improvements they are achieving. This is essential to underpin successful congestion management efforts.

A Cooperative National Response - Way Forward

The way forward proposed by this Review involves two streams of activity. First and primarily, the development of jurisdiction-specific packages of complementary actions, drawn from the specific action strategies outlined in the following section. Second, the joint progression of a number of agreed issues of cross-jurisdictional impact and importance. There are three elements involved in this approach:

- **principles** which should be applied to the processes for both translating action strategies into jurisdiction-specific packages and developing broader cross-jurisdictional initiatives;

- **action strategies** drawn primarily from the high level examination of congestion management measures undertaken by the Review. These provide the foundation of initiatives that could form part of jurisdiction-specific reform packages. A number of the action strategies could be more suited to being progressed through cooperative cross-jurisdictional effort should there be agreement to the issues; and

- effective use of the **current land transport infrastructure planning and decision-making framework** to ensure that outcomes from this Review and any subsequent decisions by COAG are integrated with other relevant initiatives, especially those relating to the urban AusLink Network. This would maximise the likelihood of implementing substantial improvements to the economic performance of the AusLink and interrelated networks.

Principles

Three key principles should apply to the development of initiatives from this Review.

Suitability of Measures - each jurisdiction retains the prerogative to determine how it responds to the elements proposed below, based on its congestion challenges, extent and nature of current initiatives, and specific urban context. This will require supporting data and research to identify local needs and which measures best suit which situations.

Integration - it is important that each jurisdiction's response forms an integrated package of complementary elements within the jurisdiction in order to maximise its effectiveness. Integration of elements is important across transport modes and over time, involving short, medium and longer-term actions. Additionally, integrated packages should identify different 'suites' of supply and demand-side actions for differing land use, travel demand and congestion scenarios, ie. packages should be dynamic and designed from the outset with an inherent flexibility that allows jurisdictions to implement different actions with minimal lead-time delay in response to changing community and industry needs.

Adherence to Inter-Jurisdictional Responsibilities - COAG's decision of February 2006 identifies that any actions to reduce congestion growth from this Review will adhere to the current division of jurisdictional responsibilities. This includes joint responsibility for the AusLink Network and State responsibility for urban public transport and the remaining urban network.

Action Strategies

A number of specific actions are outlined below. These are provided for consideration by jurisdictions in the development of their packages (in consultation with local government where appropriate). It could be appropriate for jurisdictions to cooperatively progress specific actions of potentially cross-jurisdictional importance, should jurisdictions agree to such an approach. The actions have been informed substantially by the specialist consultancies and projects commissioned for the Review, and expert advice provided by agencies involved in the Review. While each action has the potential to contribute to congestion management, their major contribution will derive from their integration in jurisdiction-specific packages of complementary actions. This approach could deliver substantial improvements to the economic performance of national urban corridors and adjoining links, and improve productivity outcomes from urban transport. The action strategies are aimed at enhancing national productivity growth and achievement of social objectives within current jurisdictional responsibilities.

Traffic Management

The gathering and use of real-time information on traffic flows through appropriate detection equipment is fundamental to building 'intelligence' into infrastructure and improving the efficiency and reliability of national corridors. Improved use of appropriate traffic management tools, integrated into systems capable of actively managing a whole corridor or network on a real-time basis, offers an early to medium-term and cost-effective opportunity to gain substantial increases in infrastructure and transport productivity, business efficiency, reliability and community benefits. This is especially the case with systems aimed at improving motorway performance. Gains are also possible from deploying traffic management systems on a whole-of-corridor/network basis on urban arterial routes. A key issue is to make explicit policy and management choices about time-based priority access to particular routes where economically justified, eg to higher productivity vehicles in order to ensure that infrastructure is used to its maximum economic potential.

1) Ensure that relevant projects on AusLink urban corridors and adjoining links incorporate appropriate information-gathering and congestion management technologies and system capability to ensure that the corridor can be managed effectively and safely into the future to maximise economic performance.

2) Examine, assess and apply traffic management systems for AusLink urban **motorways** and adjoining links on the basis of a whole-of-corridor/network management approach.

3) Examine, assess and apply traffic management systems for AusLink urban **arterial routes** and adjoining links on the basis of a whole-of-corridor/network management approach.

4) Deploy urban traffic management systems relating to AusLink corridors (including adjoining links) in a coordinated fashion that optimises the performance and productivity outcomes obtained from existing transport infrastructure under changing demand and congestion conditions, and considering the impact on the surrounding network, for example by affording appropriate priority to specified types of user at certain times where economically justified, eg public transport and freight vehicles.

5) Prepare management plans for each AusLink corridor which ensure traffic management systems are integrated (across modes, over time, and with adjoining links), and operate to achieve agreed network/corridor objectives. Ensure that plans account for and support integrated transport/land use objectives for the corridor (see action strategy [14]) by explicitly allowing for the adjustment of existing management measures, or the accelerated introduction of new measures, if and when this may be required in response to a range of congestion scenarios, as these unfold over time.

Freight, Commercial and Service Vehicle Management

Congestion affects the efficiency of freight and other commercial vehicles, and hence competitiveness and economic growth. The economic importance of freight movements suggests that they should be accorded greater priority on nominated critical freight routes (see action strategy [4]) and that road-reliant supply chains should be managed to reduce the impact of congestion on operations, where commercially feasible. Growth in freight and service vehicle traffic, especially light commercial vehicles, will also have an increasing impact on congestion. Consequently, measures to reduce the impact of these movements on congestion need to be accorded a higher priority. Initiatives relating to supply chain and service vehicle management should be driven, to the greatest extent possible, by industry parties and existing industry-based fora, given their potential commercial spin-offs. However, appropriate facilitation by public agencies may be required in the initial stages.

6) Assess the potential contribution of supply chain realignments towards alleviating peak congestion on specific highly congested AusLink freight corridors, in cooperation with beneficiary industry parties, through process mapping and case studies.

7) Undertake appropriate supply chain realignment demonstration projects relating to specific highly congested AusLink freight corridors in partnership with industry, and incorporate lessons within industry information and education programmes. Assess and manage accordingly specific constraints to supply chain realignment (and the cost-effectiveness of remedial action).

8) Encourage major generators and receivers of freight vehicle traffic using AusLink urban corridors to develop and implement plans to minimise impacts of their operations on congestion in order to improve transport infrastructure and industry productivity where commercially feasible, in conjunction with appropriate supply chain partners and industry organisations, eg through modifying logistics practices to contain transport movements or avoid peak

period congestion.

9) Encourage major generators and receivers of service vehicle traffic using AusLink urban corridors to minimise impacts of their operations on congestion in order to improve transport infrastructure and industry productivity where commercially feasible, in conjunction with appropriate commercial partners and industry organisations, eg through modifying operations to contain transport movements.

10) Target increased use of rail for carriage of appropriate freight through urban areas. Examples include: freight transiting urban areas on AusLink corridors and associated networks; and facilitating greater use of rail for freight transfers, such as port to container parks and centralised distribution points. Examine ways of achieving dedicated rail freight access to ports and terminals, supporting the 24-hour scheduling and operation of these facilities, and otherwise improving rail efficiency, eg by improving signalling arrangements.

Passenger Travel Demand Management (Non-Price)

Changing people's travel behaviour to avoid periods of high congestion can improve congestion management. The most effective and practicable options are likely to be those that target major peak-time trip generators, such as major workplaces, as well as measures which directly restrict car travel, eg. parking restraints. To lead to sustainable improvements, there needs to be viable alternatives to peak hour single occupancy car travel on routes of strategic importance.

11) Develop and implement location-specific travel plans in association with major passenger trip generators reliant on access to the AusLink Network, including shopping centres, hospitals, universities, schools, business parks, major government offices, other large workplaces and transport terminals and interchanges. These plans should also encourage the adoption of more flexible working arrangements to reduce and spread peak demands on AusLink corridors.

Public Transport

Improved public transport services can have a positive impact on congestion, especially if introduced as part of an integrated package. Importantly, public transport provides an alternative to private vehicle use for certain trips and destinations, and transport infrastructure planning needs to accommodate a positive and expanding role for efficient public transport services given forecast increases in urban passenger movements.

12) Recognise and cost the public transport enhancements necessary to provide viable travel alternatives in congested corridors, and ensure the overall feasibility and effectiveness of proposed schemes.

13) Continue to enhance public transport systems through measures such as bus priority, simplified fare systems, integrated ticketing, behaviour change

initiatives and supportive parking, taxation and pricing policies.

Integrated Transport and Land Use Planning

Improvements to transport and land use planning will have a positive long-term impact on congestion pressures, by containing the distances needing to be travelled by private vehicle to access goods, services, employment and markets. While this cannot be an overnight solution due to the 'inertia' of already built urban forms, better transport and land use planning will deliver sustainable benefits over time, not least by reinforcing more immediate congestion management measures.

State and Territory frameworks for urban land developer contributions towards the delivery of infrastructure, services and amenities required as a result of development, vary in their application. However, growing congestion in capital cities provides the rationale for these frameworks to be examined, and if appropriate, modified with a view to developer contributions targeting the improvement of major urban transport corridors.

14) Develop, through an iterative process, joint strategic objectives for integrated transport and land use planning that are consistent with the principal roles of each urban AusLink corridor, and use these to guide future developments along the corridor, recognising States' and local government's principal role in land use planning decisions. Use scenario-based planning to formulate management packages that can be implemented in response to the range of possible urban development and travel demand outcomes for each AusLink corridor, ensuring adherence to joint transport and land use planning objectives under different demand scenarios.

15) Monitor urban development along national urban corridors to test the associated transport impacts against strategic transport and land use objectives. Link monitoring to corridor management plans (see action strategy [5]) so that new congestion management measures can be fast-tracked, or existing measures modified, if it appears that any agreed corridor productivity and efficiency objectives may be compromised by the travel demand effects of land use outcomes.

16) Consider opportunities to maximise the use of new analytical tools in modelling and assessing the transport and land use interactions of new projects.

17) Examine emerging opportunities for developer contributions to address improvement needs on major urban corridors arising from significant land use developments.

Road Demand Management - Charges, Levies, Taxes, Infrastructure and Service Pricing

Against a background of forecast strong congestion growth, price-based measures implemented overseas have demonstrated that they can moderate demand and both

maximise and 'lock in' the benefits of other measures by slowing the erosion of performance improvements that might otherwise occur as a result of induced demand. The success of price-based measures is also very dependent on a range of complementary measures, especially convenient, reliable and competitive public transport alternatives.

Taxation measures would have some impact on travel demand but the issues of effectiveness, cost-effectiveness and practicability in meeting congestion management and fiscal objectives are complex and need further analysis.

18) Develop options to augment existing parking restraints and charges as a congestion management measure. This approach should cover: rigorous modelling and assessment of options; impacts on congestion and local amenity; consideration of land use issues; use of generated funding for alternative transport choices; and social and environmental impacts.

19) Agree to develop principles and analyse options for variable tolling regimes as a potential congestion management measure, allowing for toll variation according to level of road usage, time of day and/or class of vehicle. The principles should be applied to all new toll roads on the AusLink urban Network and possibly on existing toll roads depending on current commercial arrangements.

20) Consider the costs, benefits and any other feasibility issues for developing congestion pricing mechanisms applicable to a specific corridor or network, and suitable for Australian conditions. Consideration should include an assessment of whether, and when, such a policy is warranted given implementation of other measures proposed as a result of this Review. The approach should cover: rigorous modelling and assessment of options; impacts on congestion and local amenity; consideration of land use issues; use of generated funding for alternative transport choices; and social and environmental impacts. Pilot projects should also be considered.

21) Investigate the impact of relevant financial and taxation measures on urban congestion (eg, FBT, stamp duty, payroll tax and fuel excise) and issues related to how they can best be designed to meet congestion reduction objectives, including cost-effectiveness.

<u>Data and Monitoring</u>

A soundly-based approach to lifting Australia's congestion management capabilities must be underpinned by a better understanding of traffic and congestion trends, and improved assessment of individual projects.

22) Bureau of Transport and Regional Economics and jurisdictions to continue to refine and improve urban travel and congestion data and forecasts, including for jurisdiction-level network modelling and urban freight movements.

23) Enhance and introduce national performance indicators and measures to enable the detailed monitoring of the performance of the urban AusLink Network, and measurement of the impacts of initiatives introduced to improve performance.

Develop road performance indicators through the current joint SCOT/Austroads project on National Performance Indicators for Network Operations. Investigate the applicability of these indicators to rail and public transport.

24) Establish rigorous pre and post-implementation assessment and evaluation methodologies for congestion management initiatives, including public transport, at project and policy levels, especially through adoption of the National Guidelines for Transport System Management in Australia. Ensure required data are collected.

Other Policy and Regulatory Issues

Where non-transport objectives and practices are identified as potentially having a major unintended impact that exacerbates congestion, it may be useful to analyse options to address these impacts where net benefits for the community and business can be achieved.

25) Undertake analysis, on an 'as required' basis, of policy, regulatory and other practices outside of the transport sector, not otherwise addressed in this package, which are identified as potentially adding to congestion pressures. Where the assessment indicates it is feasible and cost-effective to do so, address the relevant issues and implement changes.

Current Planning and Decision-Making Framework

As outlined in the earlier section on the current institutional framework, there are several critical inter-jurisdictional initiatives that could provide useful vehicles to progress further the outcomes of this Review. Most notably, the AusLink planning and decision-making framework (including corridor strategies and the development of the next National Land Transport Plan) and the National Guidelines for Transport System Management in Australia, provide accepted and timely mechanisms that could facilitate a way forward, in conjunction with State and Territory planning and decision-making frameworks. Accordingly, there would be value now in drawing closer linkages between the Review and these other national initiatives.

Conclusion - Next Steps

Australia has a sound record in congestion management. The research commissioned for this Review has demonstrated that Australia's response to congestion pressures, largely through State and Territory strategies and programmes, is broadly comparable to overseas experience, other than several important gaps in Australia's approach. However, all developed economies are examining and adopting new approaches in the face of forecast rising congestion costs. Moreover, given Australia's highly urbanised society and reliance on international trade, there is no room for complacency.

There is no single 'silver bullet' solution to rising congestion pressures. There is a need to develop and implement jurisdiction-specific packages of complementary initiatives, given the substantially different contexts of each of Australia's capital cities. There could also be value in cooperation to progress issues of potential cross-jurisdictional impact and importance.

The AusLink planning and decision-making framework, the National Guidelines for Transport System Management in Australia, and State and Territory infrastructure and land use frameworks provide existing mechanisms to assist with bringing the various elements of the Review together and facilitating a way forward. They provide a robust framework that will facilitate governments identifying major congestion priorities on the urban National Network, assessing the contribution of congestion management measures, and assessing the best way forward, looking beyond individual projects to the benefits of integrated approaches and packages of initiatives.

Accordingly, subject to COAG's endorsement of this Review report, appropriate next steps could include:

- each jurisdiction developing a proposed package of corridor and location-specific congestion management initiatives relating to the urban AusLink Network, drawing from the action strategies and adhering to the principles set out in this report. This process to be guided by a template to ensure consistency and adequacy of supporting information etc;

- jurisdictions individually progressing their proposed packages with the Australian Government in the context of the AusLink planning and decision-making framework and the National Guidelines for Transport System Management in Australia;

- jurisdictions jointly progressing specific issues (to be agreed) of potential cross-jurisdictional impact and importance; and

- COAG receiving regular reports on progress, including from jurisdictions on the development and subsequent implementation of their packages, commencing at the end of 2007.

INFORMATION PAPER

1) Introduction - Urban Congestion: A National Issue

In February 2006 COAG committed to reducing current and projected urban transport congestion within existing jurisdictional responsibilities with a focus on national freight corridors and only examining local networks where they interact with, and impact on, these corridors. COAG commissioned a review to assist them in considering further actions at their first meeting in 2007, asking that the Review make findings on improving the economic performance of national urban corridors (the AusLink urban Network) and improving productivity outcomes from urban transport. The Terms of Reference for the Review are at Appendix 1. This Information Paper together with the Executive Report is the principal output of the Review. A number of associated consultancies were also undertaken to provide specialist technical input to help address key issues from the terms of reference[19]. Brief summaries of the each of the projects undertaken for the Review are at Appendix II.

The complex interactions of urban transport networks mean that it is not feasible to examine how to improve the congestion performance of the urban AusLink Network in isolation from the functioning of broader urban transport networks. This is recognised in the Review terms of reference through the concept of 'interacting networks'. These are considered to be links which either feed considerable traffic onto or off the AusLink Network, or provide important alternative or supporting links.

What is Congestion?

While there is no standard definition of congestion, engineers quantify it in terms of volume versus capacity, or in the percentage of time traffic spends at various 'levels of service' that rank traffic density and speed. Economists, on the other hand, compare observed congestion with an "efficient level", defined as the congestion that would still remain, even if road users were required to pay for the additional delays they impose on other road users.

Congestion generally occurs when demand for travel exceeds the optimal carrying capacity of transport infrastructure at specific locations and times of the day. More than half of all congestion is recurring congestion, which is demand-related and generally occurs on a daily basis. Non-recurring congestion usually arises from:

- Accidents and breakdowns
- Extreme weather conditions, such as heavy rain, fog and wind
- Construction or maintenance activities
- Special events
- Poorly phased and/or uncoordinated traffic signals.

[19] The consultancies covered the following issues: Estimating Urban Traffic and Congestion Cost Trends for Australian Cities; Data Deficiencies; Assessment of International Experience and Lessons for Australia; Infrastructure and Service Pricing; Traffic Management Systems; Transport and Land Use Planning; Freight Travel Behaviour Change; and Public Transport.

Urban Congestion - Major Characteristics

There are three important characteristics of urban congestion which provide a practical policy context for implementing COAG's decision to reduce projected urban congestion growth.

Congestion is a complex issue requiring increasingly complex responses. While congestion is manifested on particular sections of road or rail, it has a range of causes not related solely to the capacity of congested links of the transport network. Causes range from immediate, location-specific triggers (eg traffic volumes at particular intersections) to underlying drivers and influences (eg economic growth, land use patterns and people's travel preferences). These need to be understood carefully to ensure that policy prescriptions are effective. While strategic investments in infrastructure will continue to be required to tackle major congestion points on urban networks, these investments will need to be complemented with measures that target how effectively both new and existing infrastructure is being used. More multi-faceted and integrated management responses need to be developed and implemented. However, these call for greater cooperation between agencies and governments if they are to be successful. Unless a broader transport network and inter-jurisdictional approach is adopted, the risk is that congestion might be simply shifted from one location, time of day, or sphere of responsibility, to another, or the remedy is short lived. Without such an inter-jurisdictional approach, there is risk of duplication of effort and non-adoption of worthwhile measures.

A certain level of urban congestion is natural and unavoidable. Congestion is an outcome, reflected in urban transport networks, of the economic and social interactions generated by urban living. A certain level of congestion is a by-product of growing cities and growing urban economies – it would be prohibitively costly (and impossible) to abolish congestion, whether by suppressing travel or by expanding infrastructure capacity. Consequently, a useful way of viewing congestion is that it 'may not so much impose net losses as much as it reduces overall gains'[20]. To attempt to reduce congestion below a certain level would either impact on growth and access, or require a substantial increase in urban transport infrastructure supply to cater for peak demands. Consequently, the congestion cost forecasts presented in Section 2 are based on economic costs in excess of efficient levels of congestion, not all congestion, and hence provide an upper boundary of the benefits that could be gained by effective congestion management measures.

The effects of urban congestion extend beyond the urban areas. Australian capital cities generate significant interregional and interstate passenger and freight travel, and are important focal points on the national road and rail networks. Congestion in urban areas can affect the performance of the non-urban interstate networks as well as shape travel behaviour and characteristics beyond the urban areas particularly in relation to the freight task. In the case of freight rail, priority on the urban rail network is given to passenger rail in major urban centres which can affect freight rail reliability by up to 50%[21]. Urban congestion combined with restricted access to the urban rail network

[20] (ECMT/OECD Joint Transport Research Centre (2006), draft report of a Working Group on "Tackling Congestion in Large Urban Areas", Paris).
[21] DOTARS North-South Rail Corridor Study, 2006

at peak periods are major constraints to rail achieving greater modal shares in Australia and are a contributing factor to the growth in the road freight task nationally.

Urban Congestion - Benefits of a Cooperative Response

Economic Growth

Congestion costs are not quarantined to particular levels of government, particular groups of people or specific locations/routes. This is especially the case with its economic impacts. There have been three key drivers behind rising urban congestion levels in Australia: economic growth, population growth and increasing urbanisation.

Australia has experienced sustained economic growth from 2003 to 2005 on average at 3.1% per year**,** compared with the average of 2.6% per year for all OECD Member countries.[22] In terms of GDP per capita, Australia currently ranks 8th among all OECD countries, having overtaken all G7 countries except the USA (OECD 2006). This has placed increased pressure on Australia's transport system to meet international demand for its resources, products and services. Australia's estimated population in 2004 was just over 20.1 million, an increase of 1.2% over the previous year and an increase of 12% over the past decade.[23] The problem of urban congestion management has been exacerbated by the growing urbanisation of Australian society, which has added to the pace of meeting the demands for people and freight movements in Australian cities.

Taxable income can be used as a national progress indicator and provides a slightly different perspective to GDP. Over the last ten years income generated in Australian metropolitan areas has contributed nearly 72% of gross Australian Taxable Income; hence their efficient functioning represents a key contributor to Australia's economic performance (BTRE 2006). Congestion bottlenecks on major city transport arteries affect State and regional economies, as well as the national economy. This has implications for long-term growth and revenue flows to all levels of government.

The economic impact of congestion is not restricted to freight; the relative 'liveability' factor of cities has implications for attracting skilled labour to urban areas to improve knowledge-based industries.

International Trade

Australia's growth is heavily dependent on international trade and the efficient functioning of its transport networks, especially in its capital cities. Australia's principal containerised terminals and air freight terminals which are a vital component of the economy are situated primarily in capital cities. Urban congestion contributes to the total transport costs for non-bulk commodities imported and exported through urban areas. This results in a relatively high cost of freight distribution being attributable to movement through congested areas. Unlike most other OECD economies, Australia's capital cities account for the transport of virtually all non-bulk

[22] (International Growth Comparison Table, Treasury)
[23] (ABS 2006 yr book Australia, pg.104)

commodities engaged in international trade, with most manufactured exports being produced in or near metropolitan areas, and reaching ports by road (OECD 2006). The efficiency of urban transport systems can also impact directly on the supply chains of regional and rural exports destined for capital city ports.

A recent European Conference of Ministers of Transport report concluded that "transportation costs create a significant wedge between prices of domestic and foreign goods, and between prices of different foreign goods in home markets. The size of this wedge differs greatly across countries, depending on their distance to markets, level of development, commodity composition of trade and market size" (ECMT 2006). For Australia, international trade in non-bulk commodities is at the higher end of this wedge; substantial distance to markets coupled with diseconomies of scale derived from small domestic markets. This places substantial pressure on ensuring that costs of doing business in Australia, including transport costs, are kept to a minimum to offset the relative disadvantages of distance, domestic market scale and commodity composition. Reducing transport costs in urban areas by better managing urban congestion has an important role to play in this regard.

Infrastructure Productivity

The increasing demands being placed on Australia's infrastructure (transport, water, sewerage, telecommunications) and the rising costs of new infrastructure (especially in cities) necessitate substantial efforts to lift the productivity of existing infrastructure use. Congestion is the major factor reducing the productivity of urban transport infrastructure and the industries using it. However, as outlined in this paper, congestion pressures can be more effectively managed and greater value extracted from investments in urban transport. A more targeted approach to the active management of urban networks building on current measures has the potential to increase the efficiency of use of these networks, particularly during both peak and inter-peak periods.

Continuing to add to the stock of infrastructure to meet forecast demand for transport in urban areas will remain an important option. However, it may not represent the best long term option without also taking advantage of non-infrastructure based measures. For rail, infrastructure provision remains a central priority to address the conflict between rail passenger and rail freight access to urban networks. Environmental concerns, land constraints, and construction costs are focusing greater attention on improved management of the existing stock of infrastructure to improve efficiency of its use.

Further, the potential benefits from improving inter-urban networks under AusLink may be increased through improving the efficiency of the urban sections of the AusLink Network.

Broader Benefits

There are broader public policy benefits to be accrued from a more cooperative and expansive approach to urban congestion management. Initiatives taken to improve congestion management will also deliver benefits beyond transport and the economy. For example, less time spent in congested and stop-start conditions will reduce fuel

use and emissions. Improving Australia's management of congestion will provide international credibility for our efforts to address the negative impact of transport on the environment. Other measures such as walking and cycling, as alternative to car use, will have positive health benefits.

Increasing Cost of Congestion and Remedial Action

While the estimated costs of congestion under a 'business as usual' scenario are projected to double over the next 15 years, the cost of undertaking remedial action to contain these costs is likely to increase. It would be more cost-effective to take action to lift Australia's congestion management capabilities sooner rather than later.

Improving the productivity and efficiency of the urban AusLink Network requires higher levels of cooperation across all levels of government. The complex interactions of different elements of the urban transport network and the impact on transport of land use and other cross-sectoral decisions, which are the responsibilities of different governments, mean greater cooperation between governments and their agencies would assist in underpinning a more effective approach to congestion management. This is not an easy task and early action would deliver more timely benefits.

2) Causes, Trends and Impacts of Urban Traffic Growth and Congestion

This section draws heavily from the Bureau of Transport and Regional Economics (BTRE) report *Estimating Urban Traffic and Congestion Cost Trends for Australian Cities* commissioned for this Review. The BTRE report adopts an aggregate methodology for estimating the avoidable costs of congestion. The report recognises that while estimates are far from definitive, they serve the purpose of enabling 'order of magnitude' estimates of aggregate costs to be undertaken and to provide an overall appreciation of the extent of congestion in Australian capital cities.

Factors influencing the growth in urban travel

Travel in Australia's urban areas has grown ten-fold over the last 60 years and is expected to grow by another 37% between 2005 and 2020. Key factors contributing to this growth are:

- Population growth – Capital city population growth is predicted to increase by 16% between 2005 and 2020.
- Economic growth – The capital city freight task is predicted to increase by 56% and employment is predicted to increase by about 18% between 2005 and 2020. Employment growth is considered especially likely to increase travel in peak periods.
- Structural changes in the economy – Structural changes (including demographics and industry developments) are expected to contribute to changes in transport patterns which are anticipated to result in additional growth in the road freight task.
- Income growth – Australian Bureau of Statistics (ABS) data indicates that higher income groups tend to spend more on travel, suggesting that income growth will lead to greater personal travel, at least over the next 15 years.

Growth in urban passenger travel

The primary drivers of urban passenger growth are expected to be population growth and the growth in personal disposable income. Modal share has levelled out over the last 30 years but the total vehicle kilometres travelled have steadily increased reflecting increased disposable income and car ownership. Urban passenger growth rates are expected to slow somewhat due to the declining growth in car travel. This is expected as travel growth resulting from increases in disposable income reaches saturation point by 2020. Irrespective of this, cars will continue to be the largest component of the traffic stream, and are estimated to grow by 24% over the period 2005-20. Buses, motorcycles and bicycles are projected to continue to be a small part of the passenger-carrying traffic stream.

Public transport, though generally an important component of peak travel in many city centres (CBDs) and has had reasonably strong growth, represents around 10% of the total urban passenger task (in passenger kilometre terms). Urban passenger rail

travel is expected to increase by 32% between 2005 and 2020 although its modal share is predicted to remain stable at 6% compared to 90% for cars.

Growth in urban freight and commercial travel

The forecast slowing in capital city growth rates of urban passenger travel contrasts with the accelerating growth in the freight task, albeit from a comparatively low base. The BTRE estimates the urban road freight task will grow by 56% by 2020. Unlike the urban passenger task, growth in the urban freight task is showing no signs of abating.

Light commercial vehicle travel is predicted to grow by 90% by 2020. This very large growth rate reflects the transport consequences of economic growth, increased disposable income and structural changes in the economy, such as growth in services.

Freight rail modal share has been declining for decades because of improved road and truck design, urban rail network congestion, urban network priority for passenger rail and the growing demand for on-time local pick up and delivery.

While estimates of the urban rail freight component of total freight growth are unavailable, the nationwide freight rail task is expected to grow by 38%.

Aggregate travel growth in Australian capital cities

The BTRE estimates that the same absolute volume of traffic will be added to capital city roads in the next 15 years as was added in the past 15 years. Projected increases in total vehicle travel in the capital cities by 2020 are shown in Table 1.

Table 1: Projected Increase in Total Metropolitan Vehicle Travel, 2005-2020

	2005-2020 Growth
Sydney	38%
Melbourne	33%
Brisbane	46%
Perth	44%
Adelaide	27%
Canberra	29%
Hobart	13%
Darwin	40%
Total	**37%**

The last 15 years has seen increasing congestion problems on capital city road networks but the effects of congestion have been moderated by three factors:

1. Significant additions to capacity in many cities.
2. Increasing operational efficiency (such as signal coordination)
3. Peak spreading.

None of these factors will cease operating in the next 15 years. The challenge is to extend existing approaches to congestion management by introducing additional measures that may provide decision-makers with a much richer range of tools to complement current practice and allow them to deal with more complex congestion issues.

Current and future costs of congestion

The BTRE approach to estimating congestion costs is one of aggregate modelling. This provides broad estimates of the scale of congestion at the city level but it is certainly not as accurate as location-specific network models. The estimates should therefore be considered as 'order of magnitude'. The estimates provided are based on 'avoidable costs', that is costs which can, in principle, be avoided by effective congestion management measures.

While economic growth contributes to increased traffic growth and increased personal mobility, it does have negative outcomes. This is especially true when growth of the magnitude outlined above occurs within the confines of the semi-constrained networks that the metropolitan areas represent. High levels of traffic and traffic growth lead to significant levels of urban congestion – especially in peak travel periods – which impose considerable direct and indirect costs on capital city residents and industry. The costs include: lengthening average journey times, more variable trip times, higher vehicle engine operating costs, increased fuel consumption and increased air pollution.

The BTRE study estimates that the avoidable costs of congestion are expected to double by 2020 from about $9.4 billion in 2005 to $20.4 billion in 2020 under a "business-as-usual" scenario. While this is based on growth rates forecast for the Australian economy, this projected increase in congestion costs should not be interpreted as a BTRE forecast of the likely cost of congestion to GDP.

Table 2: Projected Avoidable Costs of Congestion

Component	2005 estimate	2020 estimate
Private travel time costs (trip delay and travel time variability)	$3.4 billion	$7.5 billion
Business time costs (trip delay plus variability)	$3.6 billion	$8.9 billion
Additional vehicle operating costs	$1.2 billion	$2.4 billion
Additional air pollution damage costs	$1.1 billion	$1.5 billion
Total	**$9.4 billion**	**$20.4 billion**

While all the capital cities are forecast to experience significant increases in congestion costs these increases vary greatly because of the specific circumstances of each city. Table 3 shows congestion costs by capital city. Overall, these estimates demonstrate that urban congestion costs are likely to increase appreciably over the coming 15 years. It is possible to contain this growth in costs through implementation

of effective congestion management measures. The onus is then on identifying which measures, and combination of measures, are likely to be most effective in the task.

Table 3: Projected Avoidable Costs of Congestion in Capital Cities

	2005 estimate	**2020 estimate**	**2005-2020 growth**
Sydney	$3.5 billion	$7.8 billion	123%
Melbourne	$3.0 billion	$6.1 billion	103%
Brisbane	$1.2 billion	$3.0 billion	150%
Perth	$900 million	$2.1 billion	133%
Adelaide	$600 million	$1.1 billion	83%
Canberra	$110 million	$200 million	82%
Hobart	$50 million	$70 million	40%
Darwin	$18 million	$35 million	94%
Total	**$9.4 billion**	**$20.4 billion**	**117%**

3) Developing a National Response – Existing Framework

This section covers a number of aspects surrounding institutional and international approaches that should be considered when developing a national response to rising congestion pressures. These include:

- Australian Government responsibilities - AusLink;
- State and Territory Government responsibilities;
- Local Government responsibilities;
- National Guidelines for Transport System Management in Australia;
- Austroads; and
- International approaches.

Responsibility for transport in Australia is spread across the three levels of government. In practice, each level of government makes direct and indirect contributions to urban transport through a variety of policy, regulatory, infrastructure provision, funding and operational mechanisms. The Australian Constitution establishes the jurisdictional basis for the operation, regulation, and administration of transport. As established by the Constitution, the Australian Government has jurisdiction over international and interstate transport. States and Territories have responsibility over intrastate transport. Local government responsibility for transport activities varies from jurisdiction to jurisdiction.

Australian Government Responsibilities

The Australian Government has limited responsibility in urban transport matters. To a large extent its responsibilities are based on its view of the 'national interest' consistent with the Constitution. The main area relates to AusLink and its provision for infrastructure funding of road and rail as part of the National Network.

The Australian Government also has responsibility for airport operations under lease arrangements with the private sector. Under the Airports Act 1996, airport lessees are required to produce a long term master plan (20 years) for the development of the site, including its impact on the surrounding area.

Under the Motor Vehicle Standards Act 1989, the Australian Government requires all vehicles to meet national safety and environmental standards. This applies to all imported and locally manufactured vehicles.

The ***AusLink*** programme has provided the basis for the Australian and State Governments to agree a defined National Network of important national road and rail infrastructure links as well as their intermodal connections. The AusLink Network supports national economic growth by developing sustainable transport solutions that:

- increase its efficiency and infrastructure handling capacity;
- improve its safety and security;
- improve the productivity of its nationally strategic and export-oriented freight corridors;
- improve the reliability of travel on interstate and interregional corridors; and

- are consistent with viable, long-term economic and social outcomes, and with the obligation to current and future generations to sustain the environment.

As part of AusLink planning processes, States, Territories and the Australian Government are developing cooperative strategies for the defined urban corridors of the National Network. A corridor strategy is intended to be a statement of the shared objectives and strategic priorities of the Australian and State/Territory governments for the long-term (20 year) development of the AusLink Network to meet AusLink network objectives. Each corridor strategy is aimed at identifying agreed corridor strategic priorities to guide project proponents. Corridor strategies may include congestion management priorities if and where relevant to the corridor's future needs. COAG has requested that all corridor strategies be finalised by 30 June 2007.

The major benefit of AusLink corridor planning mechanisms for this Review is that they provide the basis for an agreed and long-term inter-jurisdictional framework which identifies key congestion-related problems that are forecast to impact the urban AusLink Network. In addition, they are mapping out where congestion management measures are considered most appropriate to respond to these problems, including alongside, or as components of, infrastructure development solutions.

Accordingly, AusLink urban corridor strategies will identify the locations where congestion management measures could be applied on the capital city sections of the AusLink Network. This will complement the forecasts of the aggregate avoidable social costs of congestion provided in Section 2 of this report by providing more specific indications of congestion pressures on the National Network.

The major benefit for AusLink from this Review is that it identifies the current range of congestion management measures available to address the needs identified through the corridor strategies, as well as proposing a cooperative approach to improve the development and deployment of these measures. The measures could be applied to both existing and new infrastructure on the AusLink Network, to capture greater value from investments from all levels of government.

One of the conclusions of this report is that supply-enhancing measures alone (both infrastructure developments and traffic management systems) are not capable of fulfilling COAG's intention to reduce congestion growth on the AusLink Network, due to the expected increase in traffic levels and the induced traffic effect of supply-enhancing measures. Approaches which better manage rising traffic demands on the AusLink Network and interacting networks will be essential.

State/Territory Government Responsibilities

State and Territory governments have jurisdiction over intrastate transport and prime responsibility for the coordination of investment in urban transport infrastructure within the context of their land use and transport planning provisions. State and Territory governments play a major role in building and managing roads, rail lines, cycleways, public transport and other passenger transport infrastructure.

Typically, State and Territory governments determine the types of public transport services provided including their routes and frequency, regulate and coordinate public

transport services between modes and operators, tender out some services to private operators and manage integrated ticketing systems. Many public transport services in Australia are directly operated by State government-owned agencies. Public transport is also an important arm of social policy through instruments such as fare concessions, transport for people unable to drive and provision of services to facilitate access.

State governments set the rules for operators in the provision of passenger transport services. For example, governments issue licences for the right to provide taxi and bus services, determine maximum fares, set safety regulations and administer road rules.

Local government Responsibilities

Local governments play a considerable role in transport through their administration of land use regulations, funding of local roads and, in some cases, provision of local public transport. The main areas of local government activity in urban transport are:

- designing, constructing, funding and managing local roads;
- land use planning and regulation, including access on local roads;
- shaping transport options through measures such as parking controls;
- providing transport related infrastructure such as car parking areas, bus/rail interchanges, pedestrian access and cycleways; and
- participating in travel demand management and behaviour change programs.

Broader Transport Networks and Objectives

The States and Territories, along with local governments, have responsibility for a broad network of roads and railways that provide access linking all residences and facilities. This broad network is complex and interlinked with the AusLink Network which cannot be effectively considered in isolation. The wider network provides links and access on and off the AusLink Network and alternative links which impact the volume of traffic. Most actions which address congestion will have impacts across a broader network rather than on the AusLink Network alone. These network congestion impacts will need to be considered in the choice of congestion measures as they provide incentives for jurisdictions to act, over and above the specific benefits to the AusLink Network.

Each capital city has specific circumstances which impact on the type and extent of the package of measures required to address congestion. This includes:

- how the AusLink Network interacts with the broader road and rail network;
- the extent of the congestion problem;
- the local institutional and regulatory arrangements;
- the nature and extent of existing measures which impact the level and distribution of traffic; and
- the capacity of public transport alternatives to private vehicle travel.

State/Territory and local governments also have a broad range of transport objectives in addition to congestion management, including:

- providing road, cycle and pedestrian access to residences and facilities;
- economic development;
- safety;

- local amenity/liveability;
- environmental impact; and
- accessibility.

In many instances, positive congestion outcomes are aligned with improvements to the other objectives. Hence, the complexity of the issues to be considered requires careful design and packaging of measures to ameliorate negative impacts and ensure they are dominated by net improvements. Broad institutional and community support is unlikely to be achieved unless there is an understanding of significant broad-based transport and other benefits that outweigh any negative impacts.

The National Guidelines for Transport System Management in Australia

The Guidelines provide a consistent framework and processes, methods and tools to assist and guide transport planning and decision-making across Australia. The Guidelines were endorsed by the Australian Transport Council in November 2004, and have been revised since to also include the appraisal of urban transport initiatives. At its meeting in February 2006, COAG agreed that the Guidelines should be adopted for the assessment of all new road and rail initiatives.

The Guidelines are based on a Transport System Management Framework (the Framework). The Framework is a decision support system to achieve high-level transport system objectives. Decision-making in transport is complex with competing objectives, trade-offs, constraints, uncertainty, multiple options, and quantifiable and unquantifiable impacts. The Framework directs all actions towards achieving transport system objectives.

A key feature of the Framework is that it considers the full range of potential solutions or options, moving beyond the narrow focus on infrastructure and single-mode solutions. The Framework comprises eight phases:

- Objective setting;
- Policy choices;
- System planning;
- Identification of initiatives;
- Appraisal and business case;
- Prioritisation and program development;
- Program delivery; and
- Performance review.

The Guidelines extends the general planning and appraisal approach detailed for inter-urban road and rail infrastructure initiatives to urban transport. While many of the general principles of planning and appraisal apply equally to a broad range of urban and non-urban activities, urban transport initiatives raise some additional issues. The planning and appraisal of urban transport initiatives also requires a sound understanding of the functioning of urban networks and likely substitution effects arising from time savings and other factors. For example, the analysis of road infrastructure initiatives that will benefit private car users as well as public transport users (e.g. through the incorporation of a dedicated bus only lane) depends on accurate estimates of time savings and traffic movements from traffic flow models. In

addition, some road initiatives, such as the deployment of advanced traffic management systems, are relevant to urban networks only. For these reasons, the discussion on urban transport covers urban traffic models that can generate estimates of likely benefits for use in the appraisal approach.

Many of the potential measures considered as part of this Review will require detailed analysis of the options available, their interactions with other transport activities and interactions across networks. The Guidelines represent a nationally agreed approach for such analysis as they complement and add to current processes in place in many jurisdictions.

Austroads

Austroads is the association of Australian and New Zealand road transport and traffic authorities. Austroads members are the six Australian state and two territory road transport and traffic authorities, the Australian Department of Transport and Regional Services (DOTARS), the Australian Local Government Association (ALGA), and Transit New Zealand. Austroads' purpose is to contribute to the achievement of improved Australian and New Zealand transport related outcomes.

The Austroads Network Operations Programme is directly involved in undertaking projects relevant to urban congestion, including the development of National Performance Indicators for Network Operations, Incident Management, Traveller Information, and Network Modelling. Much of this has been used as input to the current Review.

Australasian Railways Association (ARA)

The ARA is a member-based association that represents the interests of the rail sector in Australia and New Zealand. The fundamental purpose of the ARA is to create an environment that will permit the Australasian rail industry to prosper.

The ARA has established two companies to address, in a unified approach, issues such as the standardization of rail practices across Australia, and rail skills shortages. The two companies are: the Code Management Company (CMC) and the Rail Skills and Careers Council (RSCC). The CMC manages the production of Rules, Codes of Practice, Standards and more recently the creation of Guidelines whereas the RSCC focuses on the human resources of rail, overseeing the efficient development of projects such as the Attraction and Retention Research Project, the Graduate Program and the School Based TAFE and Employment program.

In addition, the ARA assists its members by providing relevant information on a wide range of topics affecting the rail industry including: Rail Research, Communications, Safety and Infrastructure. The ARA is also actively involved in the development of rail industry policy to ensure the industry's views are represented when decisions that affect it are being made.

International Approaches

Congestion is not a new phenomenon. Congestion management approaches have evolved over time. The traditional transport planning model has been 'predict and provide', with solutions to transport congestion being predominantly supply based. Demand management has been a more recent policy development to complement supply side adjustments as approaches to handle congestion. Many countries are at different stages of this evolutionary congestion management process.

In 2007, the theme of the inaugural European Conference of Ministers for Transport (ECMT) International Transport Forum will be mitigating congestion and other obstacles to efficient transport. It will provide Transport Ministers with the opportunity to discuss a topic of global strategic importance, and signifies the high priority that many countries place on tackling transport congestion and enhancing the operation of transport systems. The following section provides a small number of country overviews to illustrate different national approaches.

United Kingdom:

The current national transport objectives and performance targets in the United Kingdom (UK) are set out in a 10-year transport plan. The UK Government controls and administers national transport programs and funds. It provides a funding allocation to local governments each year to meet their transport needs. The national government has also enacted legislation to enable local authorities to introduce road tolls, user charges and parking levies. Planning Policy Guidance legislation provides overall national land-use policy. The national government approves Local Transport Plans.

The UK Department of Transport anticipates a 30 per cent increase in road traffic (compared to 2000 levels) by 2015 (National Statistics 2004). In July 2004 the UK Government released a White Paper entitled 'The Future of Transport – a network for 2030'.[24] The White Paper sets out a fully integrated strategy across all transport modes to position the UK's transport network to meet the challenges of a growing economy and the increasing demand for travel, and to make a contribution to achieving environmental objectives. Congestion alleviation, both intra-urban and inter-urban, and improvement of the transport system are central to the UK Government's national transport policy agenda.

Key elements of the plan include a program of targeted infrastructure development, active traffic management of motorways and highways, and promoting alternatives to car use through travel planning initiatives aimed at schools, workplaces and householders. The plan also encompasses additional support for new public transport initiatives (especially where these are linked to congestion reduction through price-based travel demand initiatives), and working cooperatively with local governments to enhance the impact of walking and cycling initiatives (eg. through demonstration projects, the provision of infrastructure and facilities, and travel planning). The plans also target facilitating the continuing development of a competitive and efficient

[24] Department of Transport (July 2004), *The Future of Transport: a network for 2030*, United Kingdom.

freight sector (including assessing freight modal-shift programs alongside other freight-management options, and encouraging local authorities to better coordinate freight-related regulations). Engagement with local and regional authorities to improve transport outcomes is an important aspect of the plan.

The White Paper concluded that programs to promote alternatives to car use, improvements to traffic management and the supply of well-targeted additional capacity, will improve the performance of the transport system. However, such measures would not be enough on their own to prevent congestion spreading to longer periods each day and to more roads, thereby imposing increasing costs on road-users, business and the broader community. A step change in the quality of service provided to road users would require some form of road user charging. Accordingly, the Government established the Transport Innovation Fund to provide financial incentives for local and regional authorities to pilot congestion charging schemes and other pricing-related productivity initiatives. The UK Government will invest £290m in 2008-09 in the Transport Innovation Fund, increasing to £2550 million per annum by 2014-15. A number of studies have been undertaken, or are underway, on the feasibility of road user pricing and the link with national productivity improvements.

Underpinning this strategy, the UK Government sets objectives and performance targets for transport outcomes seen as key national priorities. The Government also announced it would develop measures of delay, severity (time spent below a threshold speed), and reliability of journey times so it can track performance against congestion ratings for key routes.

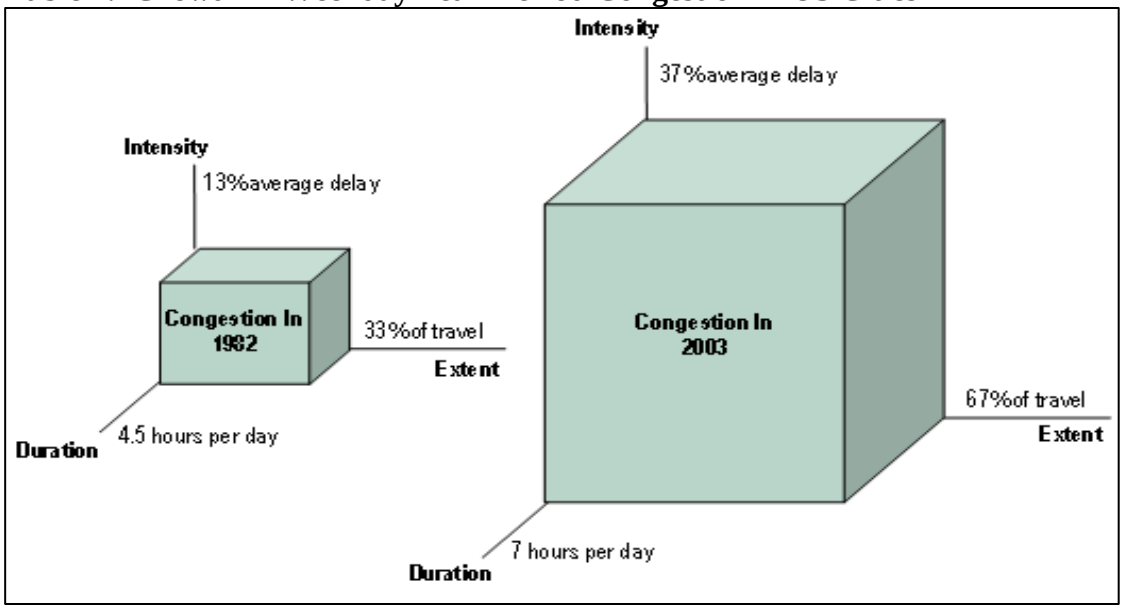
United States of America:

In the United States (US), responsibility for urban transport and congestion management is shared by three levels of government. Over time, the US Government has become increasingly engaged in urban transport issues. The 2005 *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) provides the legislative basis for national government funding urban transport infrastructure projects and other transport improvement projects. Congestion management systems encompassing targeted infrastructure, traffic management systems and/or travel demand programs are a requirement of national funding provisions.

Congestion, both intra- and inter-urban, is a significant and growing problem in the US. Table 4 below indicates the growth in congestion over the weekday peak period congestion over the last 20 years in the largest US cities. Tackling congestion is therefore a priority for the US Government and in May 2006, the US Government released a *National Strategy to Reduce Congestion on America's Transportation Networ*k (DOT 2006b). Americans spend 3.7 billion hours and 2.3 billion gallons of fuel each year in traffic jams. Congestion is estimated to cost America US$200 billion a year and this figure is forecast to grow rapidly.[25]

[25] Department of Transportation (May 2006b), *National Strategy to Reduce Congestion on America's Transportation Network*, USA.

Table 4: Growth in Weekday Peak-Period Congestion in US Cities



Source: Texas Transport Institute cited in *Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation* (2005), prepared for the Federal Highway Administration prepared by Cambridge Systematics, Inc. and the Texas Transport Institute

A key element of the strategy includes the formation of Urban Partnership Agreements which will focus on larger metropolitan areas. It will call for new variable pricing programs designed to spread traffic flows throughout the day and to get more throughput from existing highways. Agreements will also promote responsive bus systems, expedite highway construction projects, and establish commitments with major employers to facilitate teleworking and flexible working hours and teleworking. Other congestion priorities will be to encourage states to open their transportation infrastructure to private investment, promote the adoption of ITS solutions and reduce impediments/bottlenecks to the efficient movement of freight, especially at key gateways[26].

Canada

In Canada, the Federal government assists the Provincial and local governments in funding the urban transport network. Whilst the Federal Government provides funding assistance and policy direction to the National Transportation System, the responsibility for the management of the major urban routes rests with the Provincial governments with cooperation with local government. In Vancouver, Toronto and Montreal where metropolitan areas consist of a number of individual municipalities, regional governments have been established which assist in managing and funding regional transport networks.

Canada is the most trade-dependant country in the G-8. Transportation is the third largest sector of economic activity in Canada and maintaining an efficient transportation network is fundamental to its economy. A 2006 *Cost of Urban Congestion in Canada*[27] study found that recurrent congestion in urban areas cost

[26] Department of Transportation (May 2006b), *National Strategy to Reduce Congestion on America's Transportation Network*, USA.
[27] Transport Canada (2006), *The Cost of Urban Congestion in Canada, Ontario.*

Canadians between $2.3 billion and $3.7 billion per year ($CAN2002). For this reason, the Canadian Government has identified urban transportation as an important federal issue.

A key program is the Canada Strategic Investment Fund (CSIF) which has been allocated $4 billion since 2001 to provide investment in municipal infrastructure. Urban transit projects have been the target of about 40% and highway projects another 20% of total spending. This program and other initiatives provide funding for intelligent transportation systems deployments research development projects, transportation planning and modal integration initiatives.

Transport Canada is in the process of developing its fourth successive three-year Sustainable Transportation Strategy. The strategy outlines principles for sustainable development and performance measures. It is also responsible for transport components of the National Climate Change Strategy.

In its 2006/07 budget, the Canadian Government announced a decision to offer tax incentives for public transport costs.[28] From 1 July 2006, transit users are able to claim a tax credit for public transit use on their income tax return. Travellers who purchase the new monthly pass will be entitled to a federal income tax credit of 15.25% on the value of their passes. The projected cost of the program is $370M (CAD) per annum, with this amount being funded from a re-allocation of resources within the Canadian Government's climate change program. The tax credit is aimed at reducing congestion and to address environmental concerns.

4) Congestion Management Tools and Interventions

This section highlights the congestion management tools and approaches that are likely to be most effective at tackling congestion temporally, spatially and across modes. It draws heavily on the report assessing international experience and lessons for Australia undertaken for the review by Booz Allen Hamilton and other specialist reports undertaken for this Review. This section analyses the key tools which, individually and in combination, could form the basis of the next wave of successful congestion management approaches in Australia.

The tools (or combination of tools) considered the most successful include those that improve the reliability of travel, increase the capacity of available infrastructure and the efficiency of moving goods and people from one point to another to meet economic, social and environmental objectives of governments, industry and community.

There are a wide range of possible tools available to influence congestion outcomes, falling into seven broad categories: road supply management, non-price travel demand management, price-based travel demand management, alternative passenger transport, freight management, urban land-use planning and infrastructure development. Table 5 outlines these measures in more detail.

[28] Further information available at http://www.cra-arc.gc.ca/newsroom/releases/2006/june/nr060619-e.html

Both the Booz Allen Hamilton study and the draft Victorian Competition and Efficiency Commission report on urban congestion indicate there is a significant lack of locally and internationally based *ex-ante* and *ex-post* evaluations of transport interventions. The Booz Allen Hamilton assessment found that evaluation of Australian and overseas initiatives and projects were limited, and that there have been very few evaluations of congestion management at a strategic or policy level. It also highlighted that the variety of circumstances in each city experiencing congestion is so broad that it was not possible to draw precise conclusions about the ability to transpose experience from one jurisdiction to another, and that the assessment process involves a degree of qualitative assessment and professional judgement. However, the study found that it is possible to draw general conclusions about the relative effectiveness and relevance of particular measures.

In addition, the means to monitor and assess changes in the intensity and the spread of congestion and the impact of congestion on efficiency, reliability and productivity has also been limited. Nevertheless, there is sufficient information to draw some general conclusions about the utility of measures from a congestion management perspective. Within this context, the assessment of urban congestion management measures has been undertaken against a number of criteria including: effectiveness, cost-effectiveness, suitability, breadth of Australian experience, transferability, longevity, lead times, complementarity between measures, distributional impacts and applicability to the urban AusLink network.

Table 5 – Congestion Management Measures/Interventions

Infrastructure Development
New freeways and arterial roads – infrastructure investment to expand capacity ***New passenger rail lines and services*** – infrastructure investment and provision of additional services ***Public transport or freight-based infrastructure enhancements*** - bus rapid transport systems, dedicated rail freight infrastructure ***Extension of existing capacity*** - additional general purpose lanes, dedicated priority lanes/lines.
Road Supply Management
Road Space Re-Allocation - Public transport/High Occupancy Vehicle (HOV) priority lanes, freight priority lanes, Clearways ***Road Capacity Enhancement through intelligent traffic management systems*** - ramp metering to improve traffic flow on freeways by managing access, variable speed control systems, en-route information, incident management systems; traffic signal coordination and PT prioritisation. ***Active management*** – increased use of ITS to provide for data/analysis for greater intelligence on networks ***Access management*** – programs to increase road capacity by addressing the location and design of street and driveway connections to arterial roads as well as subdivision and site design.
Freight Management
Regulations - access, vehicle capacity and standards and the extent to which these impact on congestion ***Supply chain logistics strategies*** - freight behaviour change initiatives ***Targeted infrastructure development*** - opportunities for modal shift for intermediate rail freight services, freight-only road access or priority
Travel Demand Management – Non Price
Travel Planning – awareness campaigns; household, workplace, and school travel plans, car pooling ***Travel Demand Modification*** - staggered/flexible work or school hours ***Administrative Measures*** - trip reduction ordinances (primarily targeted at developers), Transport Management Associations (voluntary activity-centre based travel planning groups) ***Travel Substitution*** - telework centres, e-work programs.
Alternative Passenger Transport
Public Transport Enhancements – major service expansions, service level improvements, service quality improvements, service integration, information and marketing, fares/ticketing policy ***Walking and Cycling Initiatives*** – new infrastructure, end-of-trip facilities (eg. showers, bike lockers at the workplace), information on cycle network.
Urban Land Use Planning
Transit-oriented development – development patterns and activities focused on PT and mixed uses to reduce average trip length and car mode share ***Access and land-use strategies for major pieces of infrastructure*** (i.e. coordinated corridor planning).
Travel Demand Management - Price Measures
Road Use Charging - congestion charging schemes (area, cordon, link-based) ***Selected Route Charging*** - toll roads, variable tolling (varies by time of day and/or vehicle type), high occupancy toll lanes (payment for use of under-utilised HOV lanes) ***Taxation and Pricing Incentives/Disincentives*** – tax concessions for public transport commuting expenses (eg. personal tax deductions, fringe benefit tax concessions, employer incentives). ***Parking Pricing/Supply Measures*** - parking charges and fees (eg. parking space levies, direct parking charges), parking controls (eg. by time of day and/or by vehicle type, parking caps, regulation of parking supply in new developments).

Infrastructure Development

Concept: Planning and provision of road and rail infrastructure to address strategic network needs to enhance the capacity and efficiency of urban transport in contributing to governments' economic, social and environmental objectives.

Australian Experience: In 2004-05, all governments in Australia spent $8.8 billion on road related infrastructure. Of this, Australian Government expenditure amounted to $1.8m billion, while state/territory and local governments spent $3.5 billion and $2.9 billion, respectively. In addition, the States provide funding for public transport infrastructure and services, as well as state urban rail networks. Through Auslink, the Australian Government will develop a single integrated network of road and rail linkages of strategic national importance. Over the first five years of AusLink, more than $15.0 billion will be invested in road and rail infrastructure projects, including around $2 billion being invested in rail infrastructure improvements.

Potential for Congestion Management: Targeted infrastructure development remains an important element of congestion management. However, the cost of infrastructure in highly built-up areas is significant. For example, the costs of building new 4-6 lane motorways in the established parts of Australia's major cities are up to $400m per kilometre. In addition, increasing environment concerns surrounding urban congestion together with greater focus on community issues such as the liveability of cities has generated more attention on non-infrastructure type solutions. This has increased the attractiveness of other congestion management measures to augment the efficiency of existing infrastructure.

Traffic Management

Concept: Traffic Management Systems have the capacity to reduce the occurrence and severity of congestion on motorway and arterial links through any or all of the following techniques:

- Signalising motorway on-ramps so as to control the rate at which vehicles merge with the main motorway traffic stream (ramp metering);
- Providing priority access to the motorway for certain classes of vehicles, such as buses and trucks, at both metered on-ramps and unmetered ramps where queues may delay the special classes of vehicles;
- Adjusting lane speeds (variable speed limits) supported by variable message signs;
- Providing auxiliary lanes to physically separate multiple entry and exit movements from the main flow;
- Restricting certain classes of users to specific lanes (eg. HOV, freight, buses);
- Generally pursuing opportunities to provide priority to specific users;
- Hard shoulder utilisation;
- Providing real time traffic information to users; and
- Controlling the spacing and types of access to the motorway/arterial road (access management).

These tools, which rely on intelligent data collection and analysis using an integrated system of in-road detectors, video detection and/or satellite vehicle tracking, enable motorway performance to be monitored and managed in real time. Data can also be used to improve operators' understanding of the dynamics of motorway congestion, including how it is spreading both temporally and spatially, and its impact on the efficiency, reliability and productivity of the road system. This information then becomes an essential input to operational and strategic planning. Many of these tools, or their derivatives, have application and are also being applied to urban arterials.

International Experience: The United States and Europe are leading the world in the active management of urban motorways. The integrated application of these tools has enabled vehicle-carrying capacity during peak periods to be maintained at 2,100 vehicles per lane per hour on some actively managed US urban motorway links. The benefits of access management to improve traffic flow performance and accident reduction are recognised overseas and access management is increasingly being implemented by road authorities in the US and Canada. US studies show that individual access management measures can increase lane capacity by as much as 36% and reduce accidents by 50%.

Australian Experience: Newer Australian motorway links have been equipped with some of the instrumentation that can contribute to the achievement of higher levels of performance. Links of this type in Sydney include the Westlink M7, Eastern Distributor and M5 East (regularly carrying up to 2,200 vehicles per lane per hour during the eastbound AM peak period), the Melbourne motorways and the Ipswich Motorway in Brisbane. On some older and unmanaged motorway links in Australian cities, however, vehicle throughput can fall to 1,600-1,700 vehicles per lane per hour due to the increasingly frequent occurrence of peak congestion-related flow breakdowns.

Preventing the congestion-generated collapse of motorways' functionality has the potential to contribute to a 20-25% productivity improvement together with a significant improvement in reliability, with the highest gains achievable through (a) the integrated, whole-of-network application of active management techniques and (b) the packaging of management measures with pricing and/or infrastructure improvements that modify travel demand and remove traffic bottlenecks. Australia has led the way with the development and application of several technologies in the general field of Intelligent Transport Systems, the most notable of which is the Sydney Co-ordinated Adaptive Traffic System (SCATS). While these technologies have improved traffic flow, they have also contributed to the generation of data on traffic movements to lift the intelligence on networks that can enhance active traffic management over time.

In these situations the following range of positive benefit/cost ratios (BCR) may be obtainable (ARRB 2006; BAH 2006):

- Ramp metering: BCR values of up to 15.0;
- Variable speed limits and lane control measures: BCR values of 4.7 to 11.4; and
- Public transport priority measures: BCR values of 4.0 to 7.0.

The highest BCRs would be expected (a) when instrumentation was able to be provided as a single package, ideally during the construction of a motorway (i.e. without requiring extensive civil construction due to retrofitting), and (b) in locations where property and access requirements were relatively unconstrained.

Indicative costs per kilometre have been estimated to range between approximately $0.6 million and $1.8 million per kilometre for urban motorways based on a motorway of 3-4 lanes in each direction, and a further $90,000 per kilometre annually for maintenance costs. This estimate covers investment in four areas – provision for emergency services access, full instrumentation to enable active traffic management, detection and response capability for incident management, and traveller information. The planning and delivery lead time required to implement this type of approach on existing motorway systems would be at least two years from the point of funding approval.

It should be noted that these cost estimates do not, however, cover any major civil works (such as widening the shoulder of the road and/or increasing the length and width of on-ramps) that might be required before motorway infrastructure could fully support the installation and operation of active management tools. These costs would need to be borne in mind when considering the installation of ramp-metering, with particular attention to local property values, and the spacing of interchanges on older motorways. Active management of the Sydney motorway network could be constrained by the limited capacity of the city's surface routes to absorb traffic 'backed-up' from metered ramps, as well as by the need to align the contractual interests of the various tollway operators who have a stake in the operation of the network. Other constraints could include current contractual arrangements with toll operators and the use of tunnels as part of the network.

Potential for Congestion Management: International and Australian experience demonstrates that traffic management tools can deliver significant efficiency, reliability and productivity gains on existing infrastructure where this of a suitable design to support active management. The best prospects relate to the tools designed to manage urban motorways (including National Network links).

The application of these measures on a route basis needs to take account of their potential impact on access roads to the motorway and other urban roads in the immediate vicinity of the actively managed motorway, and the potential to transfer the congestion avoided on the motorway to these surrounding roads. This emphasises the need to assess their application on a corridor and network basis rather than on a route-specific basis, including the option to incorporate priority access arrangements for high-productivity vehicles (eg. public transport and freight).

The ability to extract additional benefits through traffic management systems for urban arterial road systems (including National Network links) are less clear cut, partly because Australian jurisdictions are already actively applying these tools and benefiting from significant productivity and efficiency improvements as a result (eg., the extensive use of clearways). However, some gains should still be realised by taking a corridor / network management approach to the application of both arterial road and motorway management tools and access management measures. Building additional intelligence into the entire urban road system, along the lines of the traffic

control and performance monitoring tools available for motorway systems, will facilitate operational and strategic planning at the corridor and network levels into the future.

Performance management systems have the capacity to generate real time reporting of travel times and travel conditions across all modes. Such real time information will assist travellers in making informed choices about their preferred method and time of travel.

Freight Management Initiatives

Concept: Freight operations in capital cities can be facilitated by road based traffic management systems, behaviour change programmes and greater use of efficient rail systems. Freight behaviour change projects highlight the significant costs on the road freight sector of regulatory restrictions (eg. curfews and access controls) and supply chain blockages (eg., operating hours of terminals, ports and container parks) that have the effect of constraining freight movements toward peak periods. While there are sometimes trade-offs with local amenity, these restrictions reduce the freight sector's ability to take advantage of efficiency and productivity gains derived from moving freight in less congested periods. For rail, constraints on access to urban rail networks have the effect of reducing the reliability of interstate rail freight to the advantage of road freight. The cost imposts of these regulations and existing rail infrastructure capacity limitations highlight a potential role for dedicated freight strategies for the capital cities.

International Experience: There are only a few examples internationally of specific congestion-related urban freight management strategies, although measures to generally improve transport efficiency, eg traffic management systems, also improve freight productivity. However, the impact of congestion on freight and national competitiveness is increasingly being recognised. The US has recently released a White Paper assessing freight bottlenecks on highways, including urban freeways (DOT 2006b). This paper will inform the future development of freight transport policy options and programs by the US Department of Transport. The US Federal Highway Administration has now introduced some truck-only freight lanes for high volume freight routes and reduced tolls for trucks outside the peak period to facilitate efficient freight flows and reduce the impact on passenger traffic. As these are relatively new initiatives, information on the costs and impacts of these measures is not readily available.

In the UK and other parts the European Union, urban freight logistics centres are being established to minimise freight movements by consolidating freight deliveries. City logistics involves establishing a logistical centre on the city's outskirts in close proximity to an urban centre's principal freight routes (road, rail, airport and/or seaport) and setting up new partnerships of cooperation between all those involved in the logistics chain in delivering and receiving goods in city centres. Located away from potential conflict areas such as residential neighbourhoods, these centres are not restricted by curfews or other such operational constraints. Through coordinating of freight delivery, these centres can offer significant reductions in vehicle kilometres and truck numbers in urban centres. In one example in Germany, city logistics

centres have resulted in a 70% reduction in vehicle kilometres travelled and an 11% reduction in the number of trucks in urban centres. These savings have resulted in reduced costs for all the companies involved and increased productivity per delivery.

Australian Experience: In Australia, the importance of freight to the Australian economy and the negative impacts of congestion on freight costs highlight the importance of an active multimodal freight management strategy. Congestion around Australia's urban ports and on key access routes is a particular concern.

Freight behaviour change initiatives have been investigated through the FreightSmart project as part of the Review. It identified several initiatives that could be introduced to improve freight flows in urban areas.

Rail freight mode share for non-bulk freight as a proportion of all non-bulk freight has been steadily declining. Rail freight's competitiveness and efficiency has been eroded as a result of historical under funding and ageing of rail infrastructure, multiple rail operators and design standards across the network and the competing requirements of passenger and freight on the urban rail network. This decline has been accentuated by improvements to road and vehicle design and increased vehicle affordability placing increased demand on the road network. Where passenger and freight movements share the same network, rail freight access can be highly constrained by priority being given to urban passenger rail services which in turn affects the overall competitiveness and efficiency of freight movements on urban and interstate rail. At the same time, it needs to be recognised that policies affording passenger priority on the rail network have positive impacts on congestion by ensuring a more effective public transport system that provides a viable alternative to car travel, particularly during congested peak periods.

Potential for Congestion Management: In the short-term to medium-term, opportunities to move freight outside peak periods have shown potential to impact on congestion, free up capacity for other road users, and improve freight productivity by reducing costs. The FreightSmart supply chain process mapping study undertaken for this Review highlighted the benefits possible from freight behaviour change initiatives. FreightSmart focuses on facilitating the re-timing of road freight movements outside the peak period through engaging freight receivers and forwarders in a collaborative effort to re-engineer receival, dispatch and delivery processes. While the overall congestion benefits of FreightSmart initiatives are likely to be modest, they may deliver a useful congestion outcome for the broader community through their impact on particular routes at particular times. Such initiatives could be implemented within a 12-18 month timeframe.

Long term, strategically targeted initiatives to improve the efficiency of freight rail through urban areas could significantly improve rail transport's competitiveness and reduce congestion on high trafficked road freight routes, particularly around ports.

In the short to medium term there is potential to improve the interaction between freight and passenger rail through technology improvements to infrastructure (such as introducing improved train control signalling). However in the longer term the increased movement of freight by rail will be best achieved through the development of dedicated freight lines in situations where rail passenger and freight compete for

access to the same network and by providing sufficient inter-modal terminal capacity at strategic locations.

Travel Demand Management – Non-Price

Concept: Travel Demand Management (TDM) includes any intervention designed to modify travel behaviour that results in a reduction in the adverse impacts of travel to achieve more economically, socially and environmentally desirable outcomes. Many countries are pursuing non-price travel demand measures. International and Australian experience suggests that those measures which directly restrict car use are more effective than voluntary measures in supporting congestion management objectives. Measures include: parking restraints, travel planning (household, school and workplace initiatives), targeted travel information and awareness campaigns, travel management associations, ride-sharing/car pooling schemes and use of alternative modes such as cycling and walking, Flexible working hours, staggered school hours and e-work opportunities can also influence travel behaviour,

International Experience: Often travel demand management schemes are not aimed specifically at congestion reduction and therefore there is limited information on their congestion impacts. Overseas, workplace travel planning and awareness campaigns are the most commonly employed tools. In the UK, reductions in car travel of 5% have been typically achieved as a result of voluntary workplace travel campaigns. In the US, voluntary community-driven travel initiatives (i.e. local travel management associations and car-pooling initiatives) have achieved similar reductions in travel amongst participants but scheme coverage is limited. Walking and cycling as alternatives to car travel have a much greater impact in Europe than in most other countries. The results of school-based travel planning initiatives have been mixed. Parking strategies have also had mixed success with congestion outcomes reflecting the extent to which governments have control over the total parking supply. In London, parking is not an effective congestion management tool, but in Zurich and Berne results have been more positive.

Australian Experience: There has been limited roll-out of TDM in Australia, mainly on a localised basis. There is evidence to suggest that household travel planning measures and information campaigns may achieve reductions in vehicle kilometres travelled up to 5%[29]. In Australia, walking and cycling mode share is relatively low and therefore cycling/walking initiatives have a limited impact on congestion. Australian evidence indicates that parking arrangements can potentially have a significant impact on peak period car use. A 2003 Australian Bureau of Statistics survey highlights the influence that parking arrangements can have on travel behaviour. It indicated that 29 percent of people who travelled by public transport did so because of parking difficulties. Parking policies are also discussed under price-based travel demand measures below.

As most measures are not aimed specifically at congestion reduction, their travel impacts are likely to be occur during both peak and inter-peak periods or in particular

[29] Independent studies indicate the actual results may be lower than official evaluations. This would tally with international experience.

locations, and hence the impact on congestion impact is reduced. Detailed analysis of Australian experience with TDM is the subject of a separate report to COAG on *Collaborative Action on Climate Change Travel Demand Management.*

Potential for Congestion Management: Travel behaviour change initiatives impact on the transport task in different ways and these options need to be assessed as part of a broader suit of measures, including road pricing. For example, while walking and cycling currently makes only a small contribution to congestion reduction, its congestion-reduction potential can be enhanced when combined with deterrents on car use. The impact of targeted workplace initiatives is concentrated during the traditional peak period and therefore such measures offer some scope for improved congestion management. Such initiatives are more common in other countries, including the US, UK and Canada than they are in Australia. There is also significant potential for parking measures to play a greater role in congestion management.

In contrast, the congestion-reduction scope of school and some household initiatives may be constrained by the diversity of trip patterns involved. There is limited evidence of flexible working hour provisions and e-work arrangements being facilitated by international or Australian governments for congestion management purposes. Community take-up of flexible working arrangements and other forms of work and school patterns depends on a broad range of factors. This raises some practical difficulties associated with pursuing changes to work and school hours and the encouragement of e-work provisions in any systematic way as a congestion management strategy.

Public Transport

Concept: Public transport is an integral element of congestion management strategies through its capacity to move large numbers of people across urban areas. It can contribute substantially to the productivity of the transport network, particularly for travel during peak periods to major employment/commercial centres.

International Experience: European cities with higher population densities have traditionally placed greater emphasis on providing mass transit systems as the road infrastructure in these cities is not able to sustain the levels of car ownership and use that Australian roads support. Many of these cities are increasingly dealing with growing suburbanisation, the resulting need to travel from low density suburbs to more centralised employment /commercial centres, and an increase in car traffic and congestion. The evidence indicates that public transport enhancements and increased public transport patronage have not necessarily translated to a decline in car use. However where there has been success in bringing about a fall in the proportion of trips by car through a switch to public transport, this has been through a mix of investment in public transport, land use policies, parking restrictions and traffic management measures, such as London's congestion charge. Key lessons from the international experience include balancing investment in public transport with restraints on car use, making public transport use easy through simplified fares, integrated ticketing, passenger information and high levels of reliability, and effective land use policies.

Australian Experience: In Australia, public transport mode share is very location and time-specific. In outer less densely populated areas where public transport is available, public transport mode shares may be as little as 2%. However, on selected (often congested) key corridors servicing the central business district (CBD) or other key centres of economic activity, public transport mode share for journey to work trips is generally much higher (eg. ranging from 30-72% for travel to the CBD for Australia's five largest capital cities), and makes a substantial contribution to congestion management. These higher mode shares reflect the overall attractiveness (travel time, reliability and cost advantages) of public transport in certain circumstances.

As with the international experience, available evidence indicates that while public transport improvement schemes may increase public transport patronage in the corridors/areas affected (with increases of 50% or more being achieved for major schemes but increases of not more than 25% typical of more modest schemes), they will generally have only a marginal effect on reducing traffic congestion. Essentially, this is because even large percentage increases in public transport use (currently averaging about 10 percent of total urban passenger kilometres) will have only limited impact on the total number of cars trips and hence on area wide congestion. In addition, 'induced' additional road traffic, replacing those car users who switch to public transport, will tend in the longer term to reduce 'decongestion' benefits for those routes where significantly improved public transport services are provided.

Notwithstanding this, Australian jurisdictions are pursuing a range of public transport enhancements in support of specific social, environmental and economic objectives, including congestion management. Initiatives underway include major bus service improvements and the use of bus priority measures, rail infrastructure upgrades and reliability improvements, providing integrated ticketing and real-time passenger information, and parking measures. Upward trends in patronage for key locations across jurisdictions suggest that these enhancements, in combination with rising fuel prices, are increasing the attractiveness of public transport and its viability as an alternative to the car.

Potential for Congestion Management: Jurisdictions recognise the key role that public transport plays in congestion management and in ensuring that congestion problems do not worsen, particularly at peak times for travel to major employment/commercial centres. In response to growing travel demand, a range of initiatives is underway across Australian capital cities to enhance public transport services and their attractiveness as a viable alternative to the car. In particular, the benefits of enhanced bus services (such as greater flexibility, less cost, less lead time required etc) as opposed to alternative infrastructure options are increasingly being recognised.

As the evidence indicates, the impact of public transport on congestion management will be greatest when part of an integrated package which includes measures such as: supportive land use policies; restraints on car use; traffic management measures; simplified fares and integrated ticketing; and high levels of reliability. In this regard, consideration of other congestion management measures also needs to recognise and cost the need for any additional public transport capacity that will be required to off-set constraints on car use.

Urban Land Use Planning

Concept: Land use planning seeks to influence growth and development of cities in ways that are socially, economically and environmentally sustainable. By varying aspects of urban development such as the type, density and pattern/layout of development and by varying accessibility of development to transport networks, planners can influence travel behaviour and patterns. For example, low development densities and the segregation of land use activity types tends to encourage automobile use as it makes public transport, cycling and walking less convenient - activities are often widely dispersed and cannot be easily reached by a single public transport trip or a short walk or cycle ride.

When transport and land use decision-making and implementation are poorly integrated, urban congestion may be exacerbated on sections of the transport network as a result of people and goods being required to travel longer distances between origin and destinations. In addition, the attractiveness of alterative travel modes such as public transport, walking, and cycling are diminished in terms of practicality and economic competitiveness to private road transport. Integrated land use and transport planning is increasingly being promoted to achieve compatibility between land use and transport objectives.

International Experience: The planning and development of cities around the world reflect social/cultural, economic and political values which vary from nation to nation. European cities tend to be more compact and dense conurbations encouraging greater use of public transport, cycling and walking, whereas North American cities tend to be lower density suburban conurbations primarily focussed on the automobile for mobility. There is however a growing trend in urban planning in North America towards "smart growth" which, modelled on European cities, involves higher density development, is more centre-orientated, supportive of public transport and pedestrians and has a greater mix of housing, commercial and retail uses. Essentially, this is premised on the willingness of households to trade-off less living space in return for the benefits of more closely-spaced living and travelling.

In Europe the potential benefits from integrated land use transportation planning have been recognised for decades. Research in the Netherlands has shown that varying the location of 15% of urban activities in a city could achieve a decrease in car kilometres traveled of approximately 10% and an increase in public transport use by about 10%. The research also indicated that when combined with redirecting existing transport investment towards public transport, car use could be further decreased by 5% and public transport use increased by 40%. European studies also suggest that policies to increase higher density, mixed use development are less effective than land use policies that prevent large segregated retail and leisure developments.[30]

Whilst integrated planning offers potential benefits to assist in managing traffic growth, European and North American experience has shown that a common obstacle to effective integrated planning outcomes is a lack of clarity on objectives between

[30] "Integrated Transport and Land Use Planning for Urban National Corridors", Geoff Anson Consulting/InfraPlan, November 2006, Pg 38-39

levels of government and coordinated implementation across jurisdictions. Effective integrated planning involves a high level of agreement between different levels of government on the outcomes sought, the mechanisms to develop strategies and how the system should be managed. Implementation then occurs in various ways and with varying degrees of autonomy.

Australian Experience: Post World War II urban development patterns in Australia have been characterised by large, low density, segregated uses which are often located at considerable distances from each other. As a result, Australian cities have some of the lowest urban densities in the developed world and are highly reliant on the automobile for mobility.

Land use planning is undertaken at the State/Territory and local government levels with individual jurisdictions tailoring land use development policies to address local needs. The size of local government areas generally means that urban transport networks or individual transport corridors can cross multiple land use jurisdictions increasing the complexity of interaction by land use and transport planning. In operational terms, local government plays a leading role in implementing land use decisions.

The States/Territories and local governments have extensive experience in planning which is reflected in their planning instruments and strategies. Almost all Australian cities have adopted aspects of 'smart growth' land use policies that aim to promote increased urban densities, limit expansion at the urban periphery and maximise existing and future infrastructure investments, including transport. Most capital cities have metropolitan strategies which include principles and policy objectives directing the future development of land use and transportation networks that are intended to be socially, economically and environmentally sustainable. However, these strategies tend to lack sufficient detail at the corridor/sub-regional level to provide guidance on managing the competing land use and transport interests and requirements.

Most States/Territories also have established frameworks for developers to provide for, or contribute to the funding of certain infrastructure, services and amenities that are required as a result of land use development. Whilst these frameworks vary between States/Territories, they generally focus on the provision of some local and regional infrastructure rather than major urban transport corridors.

The level of urban growth and congestion experienced by cities influences the range and extent of controls being implemented. Although planning responses vary between cities reflecting local situations and requirements, the Geoff Anson study commissioned for the Review indicates that there are many examples of good planning practices from which to guide planning practitioners that can assist in shaping travel patterns and behaviour through land use planning. The study, however, also identified shortcomings resulting from limited availability of information particularly relating to urban freight travel behaviour and the need for governments to better correlate their land use and transport objectives on major corridors and interacting links.

Potential for Congestion Management: Urban congestion cannot be addressed holistically without considering the combined interaction of transport and land use

policies. The benefits of congestion management could be increased if packaged with land use planning and investment policies related to the provision of compatible urban development and public transport. Integrated land use and transport planning can provide for a coordinated approach to achieve these aims.

A framework for linking land use and transport planning on major urban corridors exists under the AusLink bilateral agreements. Under these agreements, the Commonwealth and State/Territory governments share joint responsibility to avoid development unduly impacting on the performance of the AusLink National Network. Corridor strategies are currently being developed for each urban AusLink Network corridor that are intended to outline the shared objectives and strategic priorities for the long-term management and development of the AusLink Network. The establishment of strategic land use objectives for these corridors consistent with the proposed AusLink corridor strategies could serve to guide future developments affecting the national urban corridors to positively influence travel behaviour.

Establishing mechanisms to monitor development consistent with these objectives could also provide feedback to planning practitioners and decision-makers on planning and policy effectiveness. Improved understanding of the interactions between land use and transport, a greater understanding of transportation issues including urban freight behaviour and an appreciation of the AusLink processes can lead to improved decision making. Effective inter-agency cooperation and information sharing is viewed as a cornerstone in the integrated planning approach which needs to be continuously maintained and improved.

Growing urban congestion on major urban corridors also provides opportunities to re-examine the role and involvement of developer contributions on major urban corridors. This could include short-term support for public transport service improvements as well as longer-term incremental contributions towards AusLink road and rail infrastructure.

Effective integrated land use and transport planning cannot address urban congestion on its own. However, it can provide a significant contribution to the performance of transportation networks when combined with other congestion management measures. Whilst land use planning is a tool to support transport objectives such as minimising congestion, it is a long-term tool, where outcomes occur gradually.

Travel Demand Management – Financial Measures

Concept: Financial measures include pricing and charging for use of transport activities, taxation and monetary incentives. Pricing access to transport infrastructure and services provides a clear signal to transport users for their demand for transport activities and has the potential to improve management of travel demand. There is a range of price-based measures which have the potential to change travel behaviour, including area based charging schemes, variable tolling, and combined parking restrictions/charging measures. Congestion management strategies which incorporate a congestion pricing mechanism show a clear and direct relationship to congestion reduction, as well as efficiency, productivity and reliability gains. Other financial

measures include taxation and monetary based incentives such as travel-based subsidies.

International Experience: While the number of area based congestion charging schemes is still small (London, Singapore, several schemes in Italy[31], and the recently lapsed trial in Stockholm[32]), these schemes have demonstrated an impressive record of success, including:

- 20% reductions in traffic volumes sustained over time;
- 30-50% reduction in traffic delays within the areas covered;
- significantly improved levels of service for the network in terms of efficiency, reliability and productivity, with public transport and freight logistics being the major beneficiaries;
- improved viability of public transport enhancements;
- growing business support and community acceptance;
- affordability (schemes can be cost neutral and earn revenue for other transport improvements); and
- net economic benefits (business/cost ratios for the total package in the range of 1.0-3.0 reported).

Variable tolling (tolls varied according to time of day, distance travelled and/or vehicle type) are increasingly being trialled and used in a number of overseas countries (particularly the US). The US has recently re-launched its Value Pricing Pilot Program to encourage greater use of peak-period tolling. Singapore also applies variable charges to its radial routes. These are adjusted periodically according to speed benchmarks.

A number of overseas countries have in place financial and taxation incentives to encourage the use of public transport. Some countries treat public transport commuting expenses as a personal expense. Taxation incentives (i.e. tax deductibility/credit of public transport costs or fringe benefit tax-equivalent concessions or exemptions) are generally offered by northern European countries and Canada. Limited taxation incentives are available in the USA and UK for employer-sponsored public transport initiatives. Some governments (particularly at the local and regional government level) have also provided direct financial support to employers to introduce public transport initiatives for their employees.

A UK study (BAH 2006) indicates that financial incentives can increase the effectiveness of work-based travel plans, contributing another 3-5 % reduction in car use on top of the 5% reduction achieved without financial incentives. Other international evidence suggests that financial incentives do not always have a uniform effect. A 1993 US study showed that the impact of financial incentives was greatest for public transport oriented CBD travel. Information on the costs of these measures or their specific congestion-impacts is generally not available.

[31] The Italian distance-based zonal schemes were not covered by the Booz Allen Hamilton report.

[32] A referendum on the six month trial was held in Stockholm recently. A small majority of eligible voters voted to continue the scheme. However, resistance to the scheme is still maintained amongst citizens outside the charging zone, who were ineligible to vote. The city council was defeated in government elections. The incoming local government has indicated a willingness to respect the outcome of the referendum.

Following the success of the London charging scheme, the UK Government is considering the introduction of variable road use charging.

Australian Experience: Australian experience in managing urban travel demand through the use of financial measures is relatively limited, and is mostly confined to the use of parking charges and levies and differential public transport fares. For example, the introduction of a parking space levy in Sydney, Perth and Melbourne represents the first steps by Australian jurisdictions to use parking policy as a more active and comprehensive demand management tool. The BAH study found that the Sydney Parking Space Levy contributed only 10-15% of typical commuter parking costs, and hence under 5% of generalised costs of commuter trips. It noted that the levies are likely to result in a small (2-3% at most) reduction of commuter traffic attracted to the areas concerned.

Several jurisdictions have introduced tolls for contributing to infrastructure provision, but these tolls are generally not varied to influence the pattern of travel across the day.

The Australian Government does not offer personal taxation incentives to encourage public transport use. Public transport infrastructure and services are the responsibility of state and local governments. However, an issue in the Australian context is the availability of a fringe benefit tax (FBT) concession for salary-sacrificed private motor vehicles. The lack of information on the temporal and spatial impacts of this measure makes it difficult to make an informed judgement on the extent to which the FBT concession contributes to congestion. However, data from the 2001 Household Travel Survey in Sydney, indicating that drivers of company cars account for approximately 21% of total cars on the road during the morning peak period, indicates that this is an issue requiring further consideration (NSW Transport and Population Data Centre, 2006).

Sydney, Melbourne and Brisbane have privately funded tolled motorways. However the tolls collected are for the purpose of contributing to the cost recovery of capital and operational costs made by the private motorway consortiums rather than for congestion management.

Potential for Congestion Management: International and Australian experience gathered for the Review through the Booz Allen Hamilton study indicates that pricing measures stand out as the most effective option for alleviating congestion and improving the efficiency and productivity of the transport network (at least when delivered as part of a total policy package). Area congestion charging schemes are well suited to tackle the spatial and temporal impacts of congestion in a targeted manner. However, they also have the potential to have significant negative distributional impacts. For this reason, congestion charging is rarely implemented in isolation from other complementary measures that are necessary to ameliorate these impacts and maintain accessibility (eg. particularly, but not limited to, public transport enhancements). The extent of distributional impacts is often related to the particular circumstances of the city.

Area congestion charging schemes are complex initiatives and the planning and execution lead times for such projects are consequently lengthy (five to ten years), involving strategic network planning, options identification, feasibility assessment,

whole-of-government and inter-governmental negotiations, stakeholder engagement, development of implementation plans and procurement of services, etc.

There may be scope within Australia to make greater use of variable tolling on a peak demand basis, where tolled motorway links are already embraced by the motoring community. Through adaptive use of "e-tolling" technology already in use in many jurisdictions, varying motorway tolls according to time of day and/or type of user would be relatively inexpensive to implement in a technical sense.

However, this outcome would not be achievable without extensive and potentially costly negotiations in situations where different tollway contracts are held by a number of different commercial concessionaires. To be acceptable to affected parties in this case, adjustments would have to be implemented on a revenue-neutral basis. Where this meant substantial increase to peak-hour tolls, changes might not achieve a necessary threshold of public acceptability.

Variable tolling may impose the least disruption to existing tolling arrangements. Prices could be adjusted on a revenue neutral basis providing the basis for more efficient use of the network and facilitating re-timing of trips. However, like area congestion charging, the distributional impacts would need to be carefully considered. A disadvantage of this option is that it focuses more on route management rather than corridor or network management of congestion. Complementary measures may be necessary to support variable tolling objectives.

Parking strategies also offer potential to reduce congestion. If applied on an integrated basis across key economic activity zones, combining parking restrictions with pricing charges can reduce congestion where, and at times, when it is most serious (i.e. at popular destinations and on access routes to such centres during the commuter peak). An integrated congestion-targeted parking strategy has several advantages: potential lead times of 2-3 years, relatively inexpensive to implement with existing parking areas and provides a revenue stream for public transport enhancements.

To be successful in Australia, the buy-in of local government would be an important pre-requisite, as would attractive and affordable public transport alternatives. The Parking Space Levies implemented by some Australian jurisdictions provide a useful platform for the genesis of a parking-based congestion charging strategy.

Taxation and financial incentives can influence passenger mode shift. The effectiveness of such incentives varies depending on the level of incentive and the availability and convenience of public transport and other transport alternatives. There are many permutations of taxation and financial incentives and no one particular model has been adopted internationally. The use of taxation measures on a temporal and spatial basis requires specific programs to be effective in reducing urban congestion, such as the employer benefit programs introduced in the USA to target public transport users (Ernst and Young 2006). Given the scale of congestion and the magnitude of future costs of congestion to the Australian community, further investigation of the congestion impact of different kinds of taxation and financial measures may be warranted, including the relative costs and benefits. This would provide a basis for informed decision-making about the most appropriate options.

Overall Assessment of the Gaps and the Opportunities

All of the available tools need to be considered in the broader context of government policy objectives and priorities, as well as the trade-offs that may be required to meet competing or overlapping policy objectives. Policy choices about the most appropriate congestion management interventions will be influenced by:

- demonstrated effectiveness in improving the performance of the transport system (including strategically important freight corridors), and the sustainability of those improvements over time;
- cost-effectiveness relative to other possible options;
- compatibility with other government objectives;
- likely distributional impacts of particular measures, including the extent to which any negative consequences can be ameliorated with careful planning and implementation, or by combining with other complementary measures;
- planning and implementation lead times;
- existing programmes/measures already in place; and
- local context (eg. the severity of congestion, the configuration of the transport network, the availability of alternative transport choices, industry structure, demographic factors such as settlement and employment patterns, and the physical geography of a city).

Many tools have multiple objectives; not just to manage congestion. Measures targeted specifically at congestion reduction are more cost-effective than those with multiple objectives. The most effective congestion management strategies combine "sticks and carrots". The relative combination of these sticks and carrots varies considerably according to local circumstances and the policy priorities of individual governments. Generally the more severe the congestion, the more multi-faceted and integrated is the response.

Road supply management tools, especially for motorways, and congestion targeted pricing measures offer highly effective means of achieving medium and long-term sustainable gains in moderating traffic growth and reducing congestion. Active freight management also has considerable potential to reduce freight costs with flow on benefits to the economy. A key to the success of these tools is a strategic land use planning strategy that avoids generating excessive travel to access goods, services, employment and markets.

Price-based signals provide the clearest signal to manage travel demand. Price-based measures also have the advantage of 'locking in' gains from non-price congestion management measures because they impact on the induced traffic effect. Those price-based measures with the primary purpose of reducing congestion when and where it occurs are most effective.

Direct congestion-targeted charging measures are generally considered more efficient and cost-effective than broadly-based taxation measures at specifically reducing congestion. Revenue from these charges can also be hypothecated to providing alternative transport choices (such as public transport enhancements), thus making the relationship between the charge and transport improvements transparent.

The high impact measures identified above also have the largest distributional impacts. Many countries have used complementary measures to ameliorate these impacts, improve system performance and maximise economic and social benefits. The extent of distributional impacts is also related to the particular circumstances of cities.

Positive environmental outcomes are expected from all the proposed congestion management actions as many environmental impacts are in proportion to the distance of motor vehicle travel and fuel use. Actions which remove short car trips will have a greater impact on air emissions as these are much higher during the 'cold start' or the first few minutes of travel. Actions which reduce congestion solely by increasing effective capacity of roads will have mixed impacts as the smoother travel will reduce air emissions but the greater capacity may increase travel distance and greenhouse emissions.

Overall, the assessment indicates that measure to manage congestion are most effectively employed when combined in complementary packages, which incorporate both 'carrots' and 'sticks' to modify individual and business behaviours. Such packages should incorporate measures which deliver more immediate benefits, as well as these which provide longer-term reinforcing actions.

While the assessment of the available tools highlights those with particular merit, more detailed analysis of the ***specific application*** of these tools is required. The analysis contained in this report is not intended to replace the normal transport planning and appraisal processes of jurisdictions, but is aimed at providing sufficient information to enable jurisdictions to make informed choices about the merits of measures worthy of further consideration.

APPENDIX I – COAG URBAN CONGESTION REVIEW TERMS OF REFERENCE

States and Territories, as the principal level of government involved with planning, developing and managing urban transport systems, are undertaking numerous initiatives and some studies to combat urban congestion (see Annex A). The Australian Government is constructively involved with jurisdictions in tackling infrastructure bottlenecks on urban sections of the AusLink national network. All levels of government are also cooperating in the Standing Committee on Transport (SCOT) Urban Congestion Management Working Group, due to report to the Australian Transport Council (ATC) in November 2005. The review should build on this work. The proposed COAG review would complement and extend these initiatives with the aim of enhancing national productivity growth and achievement of social objectives within current jurisdictional responsibilities.

The joint review will examine the major causes of Australia's urban congestion, including traffic growth and management, to develop a coherent and cooperative framework for governments to address this problem for COAG's consideration.

The review will make findings on improving the economic performance of national urban corridors and improving productivity outcomes from urban transport. While the focus is on national corridors, the review will need to examine local networks where they interact with, and impact on, national corridors.

1. The review will examine the main current and emerging causes, trends and impacts of urban traffic growth and congestion due to freight and passenger transport.

2. The review will not duplicate and where appropriate will draw on existing studies. The review also will identify any deficiencies in information and make recommendations regarding the collection and sharing of nationally consistent data.

3. The review will examine and assess the key characteristics and impact of successful urban congestion management approaches and initiatives in Australia and overseas. This examination may include, but not be limited to, improved infrastructure planning, regulation, travel behaviour change incentives including charges, levies and taxes, infrastructure and service pricing, land use planning and institutional coordination across tiers of government. In particular, the review will focus on:
   a) better integration of national corridors and adjoining local networks and systems;
   b) better interaction and management of passenger and freight systems/flows;
   c) better management of local, cross-urban and through-urban flows;
   d) improved implementation of integrated land use and transport planning, to protect performance of national corridors and improve productivity over the long-term; and
   e) improved options for demand management and other travel behaviour change initiatives.

4. The review will be oversighted by a joint Commonwealth, state and local government steering committee.

The review should be completed for COAG consideration by December 2006.

APPENDIX II – OVERVIEW OF PROJECT REPORTS

A series of consultancies /projects were commissioned by the CRWG to assist with the Review. These projects were managed jointly by the Secretariat and by jurisdictions. They were designed to assist with the identification and assessment of options in order to develop a suite of measures for consideration by COAG in progressing a national approach to urban congestion management.

Projects 4 & 5 - Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies, and Infrastructure and Service Pricing in Travel Demand Management

Following the work that it did for the Victorian Competition and Efficiency Commission inquiry into urban congestion, Booz Allen Hamilton was engaged to provide an overview of successful congestion management approaches and examine the role of charging, taxes, levies, and infrastructure and service pricing in travel demand management.

The report describes the available congestion management tools, examines their cost-effectiveness, highlights the key attributes of successful international and Australian congestion management approaches, their broader applicability to the urban AusLink network, and considers any distributional impacts.

The report identifies that road supply management tools, congestion targeted financial measures, parking-based travel demand measures, urban freight strategies and integrated transport and land-use planning, offer potential for making medium and long term sustainable gains in moderating traffic growth and reducing congestion. However more detailed analysis of the specific application of these tools is required.

Project 6a - Traffic Management Systems: Motorway

VicRoads commissioned ARRB to undertake a project on the potential role of Traffic Management Systems (TMS) to reduce urban congestion. TMS include tools that can be controlled via data links to prevent flow breakdowns. They include ramp metering, variable speed limits, lane control, en-route and pre-journey information systems. Road space can also be managed. Measures include High-Occupancy Vehicle (HOV) lanes, High Occupancy Tolled (HOT) lanes, freight lanes, narrower lanes and car-only lanes, express lanes, reversible and contraflow lanes, and the use of motorway shoulder or emergency lanes. Finally, network intelligence is the asset generated by enhancing historic and real-time data/information to cover all aspects of using, operating and improving a transport network. This measure leads to a more effectively planned, managed and integrated transport network.

Traffic growth will see some urban motorways operating at their full capacity for the entire working day within ten years or less. Managed tools require an extensive network of data gathering sensors to monitor the operation of the network. Many Australian motorways currently have limited data gathering capability and tools are operated independently of each other rather than on a system wide basis. Without key data, motorway congestion has largely remained unnoticed and untreated. The bulk

of management effort currently goes towards managing incidents and breakdowns, which are the source of 20% of congestion causes.

Project 6b - Traffic Management Systems: Non Motorway

SA and WA commissioned Maunsell Aecom to examine the potential application of TMS to non motorway situations. This study examined:

a) Integration of national corridors and adjoining local networks and systems;
b) Interaction and management of passenger and freight systems/flows; and
c) Better management of local, cross-urban and through-urban flows

The study identified supply side congestion management measures including, the capacity of road space, the efficiency of operations, managing incidents and roadworks. It found that investigating alternative technologies and alternative types of traffic management was crucial to Australia.

To identify the most appropriate technologies the report developed an evaluation framework. An international literature review identified three groups of technology, which were evaluated on their applicability to the Australian context, and whether they applied to urban arterial roads. The evaluation framework presented and applied in the consultancy report should be used as a tool to make a first selection of traffic management tools that are likely to provide the largest net benefits if applied in Australia, including:

- Managed Elements and Integration of Traffic Management Systems for Urban Arterial Roads;
- Managing the Allocation of the Road Space; and
- Network Intelligence and dynamic En-route Information.

The next stage is to identify whether they were cost effective. It was found that a significant proportion of the measures required more evidence to draw firm conclusions on whether they are cost effective in tackling congestion on urban arterial roads. The study also found post-project evaluation should be undertaken on schemes implemented in Australian to determine their successfulness.

Project 7 – Integrated Land Use/Transport Planning

The study of integrated land use and transportation planning commissioned for this Review identified that there are many examples of good integrated planning in Australia. However, there are also sufficient examples of barriers to effective integrated planning to suggest there is scope for improved planning processes and implementation in order to reduce urban congestion. The study suggests a focus on addressing systemic barriers to improved planning in order to reduce the likelihood of poor decisions contributing to urban congestion. These initiatives involve the development of:

- joint strategic land use objectives to guide future developments affecting national urban corridors;

- consistent mechanisms for monitoring of major land use developments affecting national urban corridors to identify consistency of development in meeting strategic land use and transport objectives;
- information sharing networks for land use and transport planning practitioners for encouraging best practice in integrated planning;
- improved modelling and economic analysis of inter and intraregional urban freight travel behaviour;
- re-examination of the application of development levies to contribute to the funding of transportation systems; and
- assessment tools that support the evaluation of land use and transport interaction.

A key underlining element of the initiatives is the need to maintain effective agency-to-agency processes and professional networks. Effective integrated land use and transport planning cannot address urban congestion on its own. However, it can provide a significant contribution to the performance of transportation networks when combined with other congestion management measures. Whilst land use planning is a tool to support transport objectives such as minimising congestion, it is a long-term tool, where outcomes occur gradually.

Project 8 - FreightSmart

NSW Roads and Traffic Authority commissioned a study on the movement of freight in urban centres. The study focused on constraints imposed by various factors which could contribute to urban congestion by increasing the number and length of freight trips made during peak congestion periods. The FreightSmart study commissioned as part of the congestion Review undertook a number of case studies to identify constraints at several nodes along the shipping container, food distribution, and building material supply chains that result in a significant percentage of urban freight movements being made in peak periods. These constraints include:

- Limited, and differing, hours of operation of supply nodes (container parks, retail outlets, distribution centres) causing truck trips to be concentrated in peak periods.
- Parking restrictions and traffic management adjacent to the freight drop locations, requiring smaller trucks for deliveries and multiple trips later in the day to service freight demands.
- Enforcement of business period truck parking restrictions, causing some truck trips to shift to peak periods.
- Environmental protection orders such as night time restrictions on freight vehicle operations limiting hours for deliveries.
- Freight vehicle configurations in existing fleets limiting efficient freight movement and causing increased trips.
- Planning controls including restrictions on locations of freight facilities, causing smaller trucks for deliveries and multiple trips later in the day to service freight demands.
- Development constraints including limits on the size of truck docks at retail outlets, causing additional truck travel to move products through the manufacturing-warehouse-consumer chain.

'FreightSmart' focuses on facilitating the re-timing of freight movements outside the peak period through engaging and coordinating freight receivers and forwarders in a collaborative effort to re-engineer receiving, dispatch and delivery processes. The case studies demonstrate that changing urban supply change behaviour so more freight moves outside of peak congestion periods is feasible and desirable. This could be facilitated by changes to operating hours for container depots and retail outlets, and other operational modifications. Such measures provide a very high economic return, both in terms of benefits to general road users and freight operators, given the very low investment costs to implement.

The 'FreightSmart' project also highlights the significant costs on the freight sector of regulatory restrictions such as night-time curfews, parking and access controls. Whilst intended to mitigate negative externalities of freight movements and facilities on the local community, these restrictions reduce the freight sector's ability to take advantage of efficiency and productivity gains derived from moving freight in less congested periods. Supply chain mapping processes provide an evaluation tool to measure the benefits, costs and impacts of proposed supply chain modifications. However, further investigation is required to determine the level of community acceptance to amenity trade-offs between increased night-time noise and daytime congestion reduction. The cost imposts of these regulations highlight a potential role for dedicated freight strategies for the capital cities.

Project 9 - The Role of Public Transport in Urban Congestion Management

The NSW Ministry of Transport prepared a report on "The role of public transport in urban congestion management". The aim of the paper was to research and analyse the potential for public transport (PT) initiatives to alleviate congestion pressures on the urban National Network, including any indicative costs and benefits.

The report examined overseas and Australia's experience in increasing PT patronage, mode share and /or reducing traffic volume, highlighted PT initiative and reforms currently planned or underway in Australia, and identified opportunities for further research and strategies to induce travel behaviour change.

The report found improvements in PT have been successful in increasing public transport patronage, but this has not necessarily resulted in an overall decline in car use. Without supporting measures PT enhancements by themselves, will generally have a marginal impact on reducing traffic congestion over the long run. Available evidence indicates that the impact of public transport initiatives on congestion management is greatest when part of an integrated package, which includes measures such as supportive land use policies, restraints on car use, traffic management measures, simplified fares, integrated ticketing, high levels of reliability and taxation and financial incentives.

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BTRE	Bureau of Transport and Regional Economics
OECD	Organisation for Economic Co-operation and Development
ECMT	European Conference of Ministers of Transport
Treasury	Australian Government The Treasury
COAG	Council of Australian Governments
SCOT	Standing Committee on Transport
DOTARS	Department of Transport and Regional Services
ATC	Australian Transport Council
ALGA	Australian Local Government Association
DFT	UK Department of Transport
DOT	US Department of Transport
TDM	Travel Demand Management
BAH	Booz Allen Hamilton

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