Australian Transport Council

Urban Congestion Working Group

Australian Capital City Congestion Management Case Studies

May 2009

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Introduction

This document presents a number of case studies by Australian jurisdictions on interventions they have undertaken to alleviate urban congestion pressures across their transport systems. Good congestion interventions can lead to significant improvements in congestion management and economic, environmental and social savings.

When the Council of Australian Governments (COAG) considered the results of the 2006 Urban Congestion Review in April 2007, it identified the need to improve the quality of congestion information available to decision-makers. The Australian Transport Council (ATC) was tasked by COAG to pursue improvements in urban congestion data, modelling and performance information for decision-making. ATC's progress report to COAG (May 2008) confirmed information limitations as an impediment to sound decision-making on congestion interventions, briefly summarised selected current Australian congestion interventions and committed to prepare more detailed analyses of urban congestion initiatives. These are contained in this document.

The case studies are from New South Wales, Victoria, Western Australia, Queensland and South Australia. They present useful examples of ways in which urban congestion is being tackled and also illustrate the importance of the information-sharing process and the way in which jurisdictions can learn and benefit from each other's experience.

The case studies illustrate the diversity of urban congestion pressures facing jurisdictions. They amply demonstrate the key finding of COAG's Urban Congestion Review, that there is no single 'silver bullet' or 'one size fits all' solution to combat rising urban congestion pressures. Congestion must be managed by implementing packages of complementary measures specific to their location, rather than implementing measures in isolation.

Key lessons

The case studies are grouped by state and cover the background, process, results, conclusions and key lessons. To summarise:

- Flexible congestion interventions that are well-planned, meet local needs, are relevant to commuters and industry and actively consider integrated transport and land use issues, are more likely to deliver better outcomes;
- Interventions that are integrated across relevant transport modes, rather than operated independently, tend to be more attractive to users and also deliver better outcomes;
- Aligning relevant policies and operational procedures within and across levels of government will further deliver better outcomes from congestion interventions;
- Significant improvements in long-term congestion management may be achieved by integrating supply and demand-side measures;
- Adequate enforcement and compliance measures are required to enhance the long term value of some congestion intervention initiatives (such as T2 lanes); and
- Adequate evaluation of pre- and post-implementation (including monitoring, data collection, modelling and fine tuning of operations) will support targeted responses and facilitate adoption of positive measures into the future – measures that target customer/network outcomes rather than solely highway operational performance.

NSW Case studies

Infrastructure: Liverpool to Parramatta Transitway

Background

The proposal to develop a public transport corridor in South-Western Sydney was first considered some 30 years ago in the 1975 Parramatta Region Transport Study. The reservation of the Hoxton Park-Parramatta-West Baulkham Hills transport corridor was confirmed with gazettal of the Sydney Regional Environmental Plan No 18: Public Transport Corridors (SREP 18) for light rail, conventional bus or new technology systems. In 1997, the NSW Ministry of Transport (MoT) began investigating public transport options for low-density urban areas. Bus based systems were the most attractive and appeared suitable for the needs of Western Sydney.

In May 1998, the then NSW Minister for Transport and Minister for Roads announced the Government's commitment to build a 20 km transitway in South-Western Sydney between Liverpool and Parramatta via Hoxton Park. This included extension of the Hoxton Park to Parramatta route to Liverpool and creating priority conditions for transitway buses where the transitway intersects with major roads.

Bus transitways are intended to improve public transport outcomes in selected areas. The Liverpool to Parramatta Bus Transitway (LPT) is public infrastructure, built and owned by the State Government, and is the first of a planned network of rapid bus transitways for Western Sydney.

Process

The partner agencies for the LPT are the Roads and Traffic Authority (RTA) and the MoT. They shared in the construction costs on an eighty-five/fifteen per cent basis respectively. The purpose of the infrastructure was to provide quality public transport, initially by buses. The newly built sections of dedicated roadway were built to a standard that could be used by light rail (trams) if the demand increased enough in the future.

It included 20 km of new bus-only roadway (dedicated busway) with one lane in each direction, and 11 km of priority lanes for buses along existing or widened streets. There are 33 stations on each side of the transitway, plus the Liverpool and Parramatta termini.

Some results

<u>Travel Time Benefits</u>

A common misconception is that the LPT is used by people wanting to travel from Liverpool to Parramatta, or vice versa. The Cumberland heavy rail line, however, is available for that purpose. The LPT instead provides links to a series of intermediate destinations, including two TAFE colleges, a hospital, large shopping centres at Bonnyrigg and Prairiewood, Sydney's largest blue-collar employment zone at Smithfield/Wetherill Park, and the major hubs of Liverpool and Parramatta. It opens up a range of opportunities for people travelling further to connect to the rail network at these ends.

<u>Environmental Benefits</u>

On the LPT, buses are modern, air-conditioned and have to meet stringent emission performance standards. This helps reduce traffic pollution levels and improve local air quality. High vehicle standards ensure a comfortable ride for passengers.

<u>Benefit-Cost Analysis</u>

The 31 km LPT project cost taxpayers a total of $346 million to build. The Benefit Cost Ratio from the Environmental Impact Statement Report ranged from 1.1 to 1.7.

A post-project evaluation is currently underway.

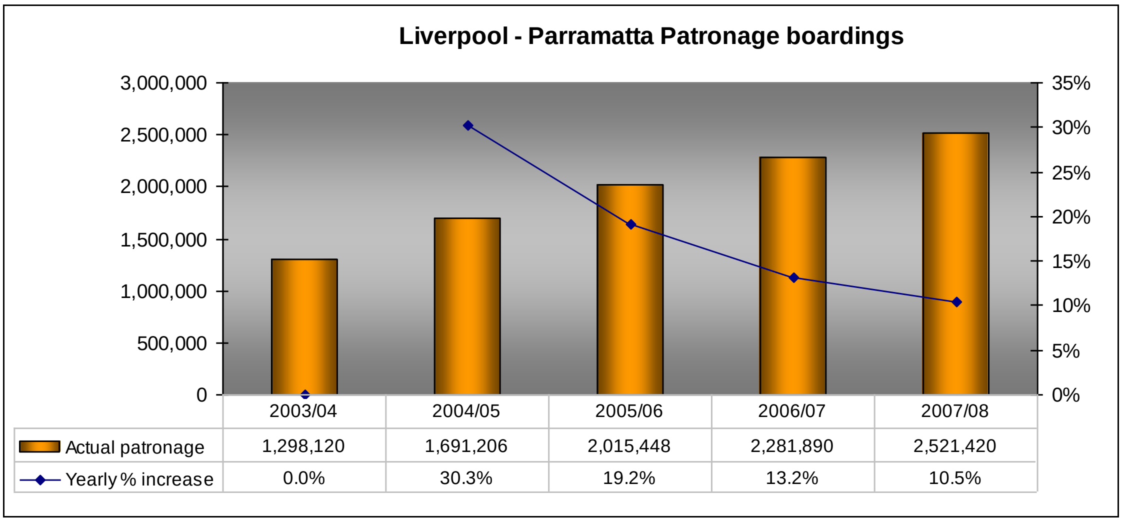
<u>Qualifications</u>

The NSW Auditor General's Audit Report 2005 stated that "*The LPT project is promising, but results to date are mixed*". This appeared to be related to the patronage falling short, at that time, of original annual projections (1.7 million passenger trips per year[1]).

The service has grown from 9,000 passengers in the month the T-way opened to almost 250,000 people per month (approximately 48,000 people per week). People who are choosing to travel on the Transitway are people who would need to travel by other means if the Transitway were not available.

Conclusions and key lessons

The graph below illustrates how the level of patronage has consistently increased each year since the LPT opened. The Transitway obviously well serves particular needs with passenger numbers continuing to rise, based on trends to-date (see graph below).



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[1] Auditor-General's Report Performance Audit Liverpool to Parramatta Bus Transitway 2005
For more information see http://www.t-way.nsw.gov.au/.
(On the graph below, the title should be Lpool-Parra patronage boardings PER YEAR)

The case study demonstrates that flexible, well planned interventions that meet local needs have the potential to deliver lower congestion levels. By incorporating flexibility into long-term planning, the corridor can be converted to a higher capacity transport mode in the future to meet possible increases in demand – dedicated bus lanes can be upgraded to light rail if necessary.

The case study reaffirms the growing evidence that dedicated busways (where buses do not compete with private vehicles) are highly valued by public transport travellers, making these measures effective in urban congestion management. The case study also highlights that interventions that are integrated with the broader transport system through connections with intermodal hubs and major centres tend to be more attractive to users.

Victorian Case studies

Congestion management: High Occupancy Vehicle Lane on the Eastern Freeway, Melbourne

Background

Eastern Freeway is a major east-west arterial road in the east of Melbourne. The High Occupancy Vehicle (HOV) lane (a T2 Transit lane) on the Eastern Freeway has been in operation for over fifteen years. The T2 lane extends over six kilometres from Burke Road to Alexandra Parade and operates in the inbound direction during the morning peak, between the hours of 7:00am and 9:30am.

The T2 lane was created through the re-allocation of an existing general purpose traffic lane and occupies the lane closest to the centre median. It is identified by signage and road markings and can be used by vehicles with two or more occupants, buses, taxis and motorcycles. However, route buses travelling to the city in the morning peak do not generally use the T2 lane as they are permitted to use the emergency lane on the Eastern Freeway.

Only one other transit lane has been installed in Melbourne, the northbound T2 lane in Hoddle Street.

Some results

<u>Travel Time Benefits</u>

A 2007 survey of the Eastern Freeway T2 transit lane found that vehicles in the T2 lane saved about 5 minutes (and up to 9 minutes at the height of the peak) compared to vehicles in the other lanes during the morning peak. Approximately 81% of vehicles permitted to use the T2 lane did so. Vehicles using the T2 lane saved on average 5 minutes and up to 9 minutes in the middle of the peak.

The T2 lane reduced the person time in the corridor by 8% on the morning of the survey (i.e. compared with the hypothetical scenario if there were no T2 lane that day). This is equivalent to a 64 person hour saving over the morning peak.

<u>Operational Issues</u>

Despite police enforcement of the T2 lane once a week, about 35% of vehicles observed in the T2 lane were private vehicles without any passengers. An automated occupancy detection system, possibly using infrared technology, could be implemented to replace manual enforcement and increase motorist compliance.

A separate study found that some of the reasons eligible motorists were not using the T2 lane were difficulty getting onto and out of the lane, no perceived time benefit, and safety concerns resulting from speed differentials between adjacent lanes. Motorists exiting the Eastern Freeway at Hoddle Street would also have to merge across multiple traffic lanes at the exit ramp.

Environmental Benefits

If the car occupancy for journey to work trips increases by 10% in Melbourne (from 1.08 to 1.19), up to 90,000 cars could be taken off the road during the peak periods. These estimates are based on 2006 Census data and assume that additional car occupants exclusively replace car drivers. In comparison, the number of public transport users for journey to work was approximately 200,000 in Melbourne in 2006.

A study commissioned by the Department of Premier and Cabinet in 2007 modelled potential strategies to reduce Greenhouse Gas Emissions. The modelling indicated that a 10% reduction in private vehicle use as a result of carpooling encouraged by transit lanes and information/education could be expected to reduce Victorian CO_2 equivalent emissions by 1% by 2050.

Benefit-Cost Analysis

N/A

Qualifications

The relative success of the Eastern Freeway T2 lane relies on the regular enforcement undertaken by Victoria Police.

The impact of the opening of EastLink on the benefits and motorist compliance of the T2 lane has not been measured.

Conclusions and key lessons

HOV lanes (such as T2 lanes) can be an effective tool in managing road congestion and reducing carbon emissions. The success of a HOV lane is dependent on many conditions, including the characteristics of the road (including frequency of access points), regular enforcement and implementation of the HOV lanes and at least three lanes available at points where there is recurring congestion. HOV lanes are most effective where they act as a queue jump/bypass facility; accordingly on managed freeways/motorways HOV lanes are typically installed on the entry ramps. Internationally, HOT (high occupancy + tolled single occupancy) lanes have proven more effective than HOV lanes, under certain conditions.

Evaluation of the congestion impacts of interventions is a complicated exercise, with available indicators often representing project operational performance (eg. patronage, vehicle occupancy) rather than the impact of the project on accessibility or transport network congestion. A current Austroads project is developing accessibility measures (essentially an integration of transport and land use) which should assist this challenge.

The case study demonstrates the importance of enforcing compliance with relevant interventions to deliver lower congestion levels. It also reinforces that commuters must perceive a genuine benefit from congestion interventions before they will fully embrace the measures. In the case of the Eastern Freeway HOV lane, user safety concerns regarding access to the lane may have initially limited its effectiveness.

Travel management: Early Bird Ticket Initiative

Background

In the past three years, the Melbourne train system has experienced patronage growth of almost 40%. This has created significant pressure on the capacity of the system in peak travel periods. In response to these challenges, on 31 March 2008, the Victorian Government introduced the Early Bird travel initiative to Melbourne. Early Bird provides free early morning travel for commuters on all metropolitan train services when they arrive at their station before 7am. Early Bird was designed to provide commuters with more travel options and ease congestion on peak metropolitan train services.

Process

A trial of the Early Bird initiative took place from November 2007 to early 2008 on the Frankston and Sydenham lines. During this period, passengers on these lines only were provided with free train travel prior to 7am. The Frankston and Sydenham lines represented two of the busiest and highest growth lines on the Melbourne system. The success of the trial led to the full rollout on 31 March 2008.

Early Bird passengers are still required to be travelling on a valid ticket. The 10 x Early Bird Metcard is used for Early Bird travel and is valid for travel in Zone 1, Zone 2 and Zone 1+2 and entitles the holder to 10 free trips completed before 7am. Passengers must validate their Early Bird Metcard before commencing each journey. Early Bird tickets are available from premium stations only. If a train scheduled to arrive at a destination before 7am is delayed, the Early Bird ticket remains valid. However, if a train due to arrive at a destination before 7am is cancelled, passengers must ensure they have a valid ticket for any subsequent train that is caught, and this may involve purchasing a ticket if the next train is scheduled to arrive after 7am.

Some results

<u>Travel Time Benefits</u>

The objective of the initiative was to encourage those who could travel outside of peak times to do so. This potentially increases the capacity of the public transport system to carry more passengers during peak times and reduce congestion. The focus of the initiative was to shift the time of travel rather to reduce overall travel time.

<u>Benefit-Cost Analysis</u>

Analysis to quantify the number of passengers who have shifted behaviour is currently being undertaken using validations data from the ticketing system and intercept surveys conducted at train stations before 7am.

The results of the evaluation of the pilot study suggest that there is small but significant proportion of peak hour travellers who would shift to an earlier travel time in order to obtain a free or discounted ticket. It is expected that people would shift their travel by 30-45 minutes, but probably not much more than this. As such, the target population for the Early

Bird ticket are those people arriving at their destination station between 7am and 7:45am. It is possible that this will lead to a ‘chain reaction’ of people travelling earlier, as the space on the train freed up by people taking up the Early Bird ticket is filled by people travelling later in the peak period who travel slightly earlier to catch a less congested train.

Conclusions and key lessons

The Early Bird initiative in Melbourne has demonstrated that there is a proportion of the market willing to shift their time of travel to receive free travel. The exact size of this market portion is currently being estimated. Shifting only a small proportion of the peak traveller market can have a significant and positive impact on peak capacity management. This can be an effective short-term measure to mitigating peak hour urban and public transport congestion, while for example, effecting medium-term infrastructure and rolling stock solutions.

The case study is an example of the value of integrated supply and demand side measures.

TravelSmart: Travel behaviour change program - Travel planning in workplaces

Background

TravelSmart aims to reduce people's dependency on cars and encourage them to choose sustainable travel alternatives, such as walking, cycling or catching public transport. Since 2002, TravelSmart has delivered a variety of travel behaviour change projects—to individuals, organisations, communities and educational facilities. Ranging in size and scale, the Victorian program has already connected with nearly 700,000 Victorians.

Process

Victorian TravelSmart involves developing and implementing travel plans to encourage the use of more sustainable transport modes. Travel plans can be used in a variety of settings from primary school to TAFE campus, corporate workplace to community centre or precinct.

A travel plan involves identifying and implementing initiatives that create opportunities for people to choose more sustainable ways of travel. It is a simple process that guides the development of locally-relevant actions to encourage the use of more sustainable transport options and considers the way people currently travel and develops a strategic approach to changing travel behaviour. The travel plan development process grows and develops with time and in accordance with the changing circumstances of the site and the environment.

A travel plan follows a five step process and includes gathering information about how people travel, identifying the issues, barriers and opportunities for change, and coming up with actions to improve travel options.

Since 2002, TravelSmart has initiated workplace travel plans at over 110 sites across Victoria. The TravelSmart program for workplaces involves helping employers to reduce the financial and environmental impacts of how staff travels to, from and for, work.

A typical plan may look at actions to encourage use of different travel modes:

- walking, eg providing information on travel times between work-sites;
- cycling, eg installing end-of-trip facilities of secure bike racks and showers;
- public transport, eg providing access to public transport tickets for work-related travel;
- flexible ways of working eg establishing a working from home policy;
- carpooling, eg installing carpooling software and creating networks to encourage carpooling; and
- company car fleet options, eg policies around purchase of energy efficient vehicles, driver training and fleet operation.

A range of tools are provided to workplaces to help support changes in travel behaviour. These tools include, web-based incentive programs (WalkSmart and CycleSmart) that promote active travel; business case assessment tools to quantify the benefits of increasing sustainable travel to the workplace; and sustainable transport maps that highlight travel options by walking, cycling and public transport.

The plan incorporates analysis from a range of sources such as surveys, focus groups and workshops in order to clarify issues and identify the best approach forward. Travel plans are flexible and regularly evaluated to ensure they continue to reflect site-specific issues.

Baseline travel surveys are normally conducted via email, however in some instances paper surveys (or a combination of both) are required where all or some staff do not have access to email (for example within a hospital). Employers are able to request any alterations to the standard travel survey to better reflect the nature of their business. For example, an employer requiring the use of cars for daily work may choose to ask additional questions relating to the use of their fleet cars.

The travel survey asks staff about their travel for an entire week so that any variability in travel can be accounted for. The survey takes staff around three to five minutes to complete, with response rates typically averaging around 50 percent.

The survey has two purposes:

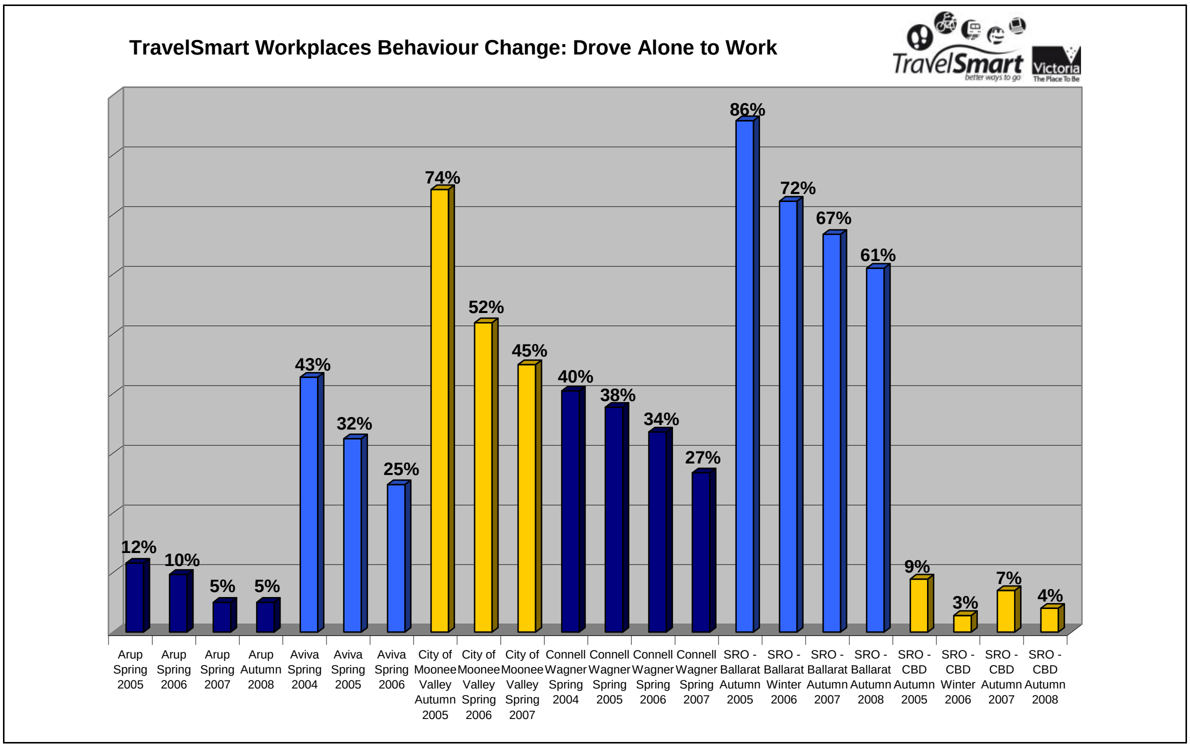
- to inform the development of strategies and actions to help support changes in people travel behaviour; and
- to evaluate changes in travel patterns of the workplace over time.

Annual follow-up surveys are undertaken in order to monitor the changes in travel behaviour and results analysed, and incorporated back into the travel planning process.

Some results

Mode Shift Benefits

The implementation of travel plans have achieved measured car trip reductions of 5-15% and as much as a 33% reduction for some sites. The chart below shows a sample of current workplaces that have been engaged in TravelSmart for at least three years.



Environmental Benefits

Travel plans produce many benefits. They help reduce the impact of travel on the environment but also make good business sense. They can cut traffic congestion around a local area and help people save money on travel by identifying more efficient use of the car whether for commuting, school runs or in-work travel.

Benefit-Cost Analysis and Travel time benefits

A benefit-cost analysis for the overall TravelSmart program has been undertaken, including estimates of travel time benefits but values specific to workplaces are not available.

Qualifications

No specific qualifications.

Conclusions and key lessons

The outcomes achieved through TravelSmart Workplaces demonstrate that engagement through the travel planning approach achieves sustained reductions in single occupancy car travel. This has been achieved across inner metropolitan, outer metropolitan and regional workplaces, confirming that TravelSmart is an important tool to help mitigate urban congestion.

The case study indicates that systematic evaluation could help gauge the extent of the impact of TravelSmart programs upon urban congestion.

Queensland Case studies

TravelSmart: Riverside Expressway Transport Investigation and Network Analysis

Background

The closure of Brisbane City's Riverside Expressway between 17 October and 20 October 2006, due to a hairline crack in the Ann Street on-ramp, provided a unique insight into the capacity of greater Brisbane's transport system to respond to a major incident or infrastructure failure.

The Captain Cook Bridge/Riverside Expressway carries approximately 150,000 vehicles per day, which is about 180,000 people movements. Over 600 scheduled bus services also use the Riverside Expressway both ways on a typical weekday (about 18,000 people movements).

By coincidence, a large scale voluntary travel behaviour program (TravelSmart) had just been completed in 70,000 northern suburbs households before the Riverside Expressway closure.

Process

Queensland Transport undertook the Riverside Expressway Transport Investigation and Network Analysis (RETINA), which reviewed data from a variety of sources collected during and after the Riverside Expressway closure event.

The road network analysis was primarily based on traffic data from counters maintained by Main Roads and Brisbane City Council (BCC). Analysis of Main Roads' traffic data was based on a comparison of data collected on 18 October 2006 with the average Wednesday traffic data for October 2006. Analysis of BCC traffic data was based on a comparison of data collected during the week of the closure with data collected in the same week in 2004 and 2005.

To provide a more complete understanding of total mode choice change public transport ticket data was counted and a travel survey of over 2,000 households in the Brisbane Statistical Division was carried out.

Some results

<u>Travel Time Benefits</u>

The closure of the Riverside Expressway had a major impact on the city road network with traffic increases of between 10 and 20 per cent on the major arterials within one kilometre of the CBD. The Gateway Motorway and some eastern arterial roads were also affected while most roads outside the CBD's one kilometre radius generally experienced little impact.

The traffic counter data showed that during the closure there was:

- Very little change in traffic north of the Brisbane River;
- A significant increase in traffic south of the river;
- A significant increase in traffic within the Brisbane CBD; and
- A lessening of the effects of the impact the further away one was from the CBD.

Community Survey findings indicate that actual mode change during the closure was approximately 15 per cent and that affected commuters modified their travel behaviour in the following ways:

- About 50 per cent changed route;
- About 40 per cent change their time of travel (most earlier);
- About 10 per cent changed destination or chose not to make a planned trip; and
- About 15 per cent changed the mode of transport.

Overall, residents of Brisbane North were much more likely to change mode during the closure (21 per cent compared with 14 per cent for the Brisbane Statistical Division) with those who had participated in TravelSmart having a 27 per cent mode shift (almost twice the Brisbane Statistical Division average).

Environmental Benefits

The RETINA study indicated that people can and will change their travel behaviour if they have a reason and the opportunity. During the closure, public transport patronage increased by approximately eight per cent, with the majority moving to train. A shift from private motor vehicles to other modes such as public transport, cycling and walking can have positive impacts in terms of greenhouse gas emission savings.

Benefit-Cost Analysis

Whilst not quantified as part of the RETINA analysis, an assessment of the potential benefits in fostering mode shift away from private vehicle use was seen as a key outcome from the Riverside Expressway closure. Subsequent analysis may be possible if desired.

Qualifications

While only 29 per cent of people in Greater Brisbane reported any affect on them during the closure, public transport and traffic management systems (including the people who run them) were operating in excess of normal capacity at levels which could not be maintained over longer term.

A broad cross section of the major corridors in Brisbane was included in the analysis and provides an accurate but not complete picture of traffic volumes and network changes during the closure. Unfortunately, some Brisbane City Council data, particularly in and around the CBD, was incomplete.

Conclusions and key lessons

Although the closure of the Riverside Expressway was a significant media and public event that caused disruption to a number of people's travel plans, only 29 per cent of people in Greater Brisbane reported any effect on them – either positive or negative. TravelSmart had a major influence in helping Brisbane North residents choose trip alternatives, with only 14 per cent of people in this area affected by the closure and they were more likely to switch modes.

The case study highlights that people will change their travel behaviour if they have a reason and opportunity to do so. Evidence suggests that people engaged in travel behaviour programs such as TravelSmart are more likely to switch transport modes than those that were not.

A Network Approach to Traffic Signal Management – Indooroopilly Pilot

Background

Both the Brisbane City Council and the Department of Main Roads have the responsibility for the management of important components of the Brisbane road network and have made significant investments in intelligent transport systems (ITS) to manage their respective operations.

Within the greater Brisbane area there is up to 7,000km of road network that includes:

- In the excess of 1,400 signalised intersections;
- More than 100km of motorway; and
- Tidal flow, traffic surveillance cameras, passenger information and tunnel systems.

Historically Main Roads developed STREAMS as its ITS platform and transport management system, and Council developed BLISS. A Memorandum of Agreement (MOA) was signed between Main Roads and Council in 2007, which provides a direction to converge to single ITS platform for road based applications in Brisbane. However, it has been recognised that optimising operations at a network level is key to obtaining better outcomes for road users.

Process

Amongst the aims of the pilot a key aim was to demonstrate the benefits that can be achieved from the removal of system boundaries that currently exist between STREAMS and BLISS.

Additionally, the pilot and the work undertaken to implement and evaluate it was also used as a test-bed to develop processes to identify and resolve areas of conflict between State and Council network policies and operational procedures.

The pilot operated over an area centred on Indooroopilly Shopping Centre and incorporates the major commuter corridors along Moggill Road and Coonan Street. A total of 13 signalised intersections were selected for the trial.

To remove the operational and technology boundaries and treat the corridor as one, an aligned operational strategy was developed jointly by Council and Main Roads.

Some Results

<u>Travel Time Benefits</u>
Travel time reductions from 0% to 13% across weekday peak periods and between 9% and 17% at weekends.

Environmental Benefits
A reduction in carbon emissions of approximately 3800 tonnes per year, equating to a 10% overall reduction.

Benefit-Cost Analysis
A rapid Benefit-Cost Analysis indicates a BCR of 20:1. This is appropriate considering the relatively low cost of the pilot and the significant travel time benefits reported.

Conclusion and key lessons

The pilot demonstrates the potential benefits gained for motorists by operating the Brisbane road network as a single network. Adopting a network approach to traffic management can be achieved through identifying and resolving areas of conflict between policies and operational procedures between stakeholders when managing the planning and implementation of congestion interventions.

The case study also demonstrates the benefits to commuters of improvements to the management of existing infrastructure. Lower congestion impacts can be achieved by examining existing traffic management systems to create an aligned operational strategy.

Western Australia Case studies

Perth CBD mobility and access

Background

The Perth Parking Policy, Central Area Transit (CAT) and Free Transit Zone (FTZ) initiatives are all part of an integrated approach to managing urban congestion, access and mobility within Central Perth (Perth CBD and surrounds).

Since 1999, the Perth Parking Policy and Perth Parking Management Act have given the State Government the ability to influence Central City parking and hence urban congestion outcomes. The Act creates an area called the Perth Parking Management Area (PPMA). Within this area there is a requirement to licence all parking except private residential; and new developments must conform to the Policy or have an explicit exemption granted by the Minister. Importantly the Act also requires that revenue raised through the tax only be spent within the PPMA on matters that give effect to the Policy.

To date, the revenue raised has been used to fund the free Central Area Transit (CAT) bus system and the Perth Free Transit Zone (FTZ). These initiatives collectively represent an example of a 'virtuous policy and service delivery cycle' which has clearly contributed to lower traffic volumes on City streets with lower levels of congestion than would have been the case without their influence.

Process

Central Perth and the PPMA is an area is composed of the Central Business District (CBD) and immediately adjacent localities of East and West Perth and Northbridge. This small area of 825 hectares contains 15 % of the region's employment (125,000 jobs), is a major retail centre and is home to approximately 11,000 residents.

Central Perth also lies at the confluence of the Region's major highway and secondary road system. Cross region road traffic mixes with traffic destined for CBD, as both have to use the same road system, bridges and tunnel which serve and pass directly through the City. This creates a double load on the regional transport system, commuters to Central Perth and commuters to other employment locations across the Region.

From the early 1990's there was increasing realisation that over reliance on the private car for central Perth access and mobility was not viable in the longer term as this would lead to unacceptable traffic and congestion. This led to the creation of a set of interrelated legislative and policy measures, the Perth Parking Policy and the Perth Parking Management Act, that support the delivery of two free public transport initiatives, the Central Area Transit (CAT) bus system and the Perth Free Transit Zone (FTZ).

The Act creates a power for the State Government to influence at the strategic level the supply and management of public parking in a defined area of Central Perth called the Perth Parking Management Area (PPMA), and to influence at the specific site level the supply and management of parking in new office and commercial buildings, via the application of the Perth Parking Policy, a land use planning instrument.

The Act also creates licensing, taxing and compliance powers that ensure conformity to the Policy and Act. The Act's licensing and taxation powers have created a revenue stream that in 2008/09 will raise approximately $10 million. The Act requires that this money be expended within the area from which it is raised to give effect to the Perth Parking Policy (e.g. FTZ and CAT).

The requirement to licence parking and pay a small tax has resulted in the existing supply being better managed. About 10% of the 63,000 spaces that exist have been taken out of use as a result. The licensing system provides a basis for the compliance and enforcement of the Act and Policy. It also is now generating useful data as to the supply and location of parking across Central Perth that is of particular use for modelling.

Some Results

In 10 years, use of the CAT and FTZ has risen from about 5 million trips per year to 12 million, and every week an estimated 3000 short car trips of 2 km or less are eliminated from within Central Perth. A 'park once and use public transport or walk' culture has been created, thereby reducing congestion within the City Centre.

The association or link between the Perth Parking Policy, and to central Perth's popular, highly visible, free public transport services, the FTZ and the CAT, is real in three ways:

- significant amounts of parking in the City of Perth had been required to support central city internal car journeys for which the free public transport services are an effective alternative;
- the free public transport services link city-edge parking facilities to employment, shopping and recreation destinations; and
- the Act requires that the funds raised from the parking tax be expended to give effect to the Perth Parking Policy and the Policy specifically refers to the CAT and FTZ as ways of achieving the broader "balanced transport objectives of the Policy.

Perth Parking Policy

The Policy is both a land use planning tool and a statement of intent and aspiration by the State Government and the City of Perth. The Policy effectively changes the approach to parking provision and management in Central Perth from the previous predict and provide model, to a model in which the establishment and use of parking is determined within the context of the Regional transport strategy's desired outcomes: modal shift, increased car occupancy rates and limiting social and environmental impacts.

During 2007/2008 the Department of Planning and Infrastructure undertook a strategic review of the operation and achievements of the Policy. Although no performance indicators were established when the Perth Parking Policy was developed, this review concluded that the Policy had generally been effective in meeting its objectives. In particular, new developments within central Perth are now supplied with less parking than occurred in the past and this parking has been better managed.

FTZ

The Perth FTZ has been operating since 1989. Within a defined area around the CBD any person is allowed to board any regular scheduled bus or train service and travel without charge within that area. This service provides approximately 4.4 million trips per year, 4.1 million on buses and over 300,000 on trains. After the introduction of the parking tax in 1999 the boundaries of the FTZ were expanded to include all the area covered by the parking licence tax.

CAT

The FTZ is complemented by a city circulator service, called the Perth Central Area Transit Service (CAT). This service is based on a stylish, innovative, purpose-built city bus dedicated exclusively to three specific CAT routes within the Central Perth. The buses are complemented by their own set of easily identified stops. In addition to providing an effective alternative to car travel within Central Perth, the CAT system demonstrates the capabilities of a best practice 21st century city bus transit system, thereby raising the profile of public transport within the community generally.

CAT services are free-of-charge for workers, shoppers, visitors, tourists and everyone who needs to move around the city area throughout the day and weekend nights. Approximately 7.6 million people use the CAT system every year.

Year & passengers carried in millions				
	1997	**2000**	**2004**	**2008**
Central Area Transit	3.5	4.1	6.1	7.6
Free Transit Zone	no data	3.0	3.4	4.4
Total		**7.1**	**9.5**	**12.0**

The CAT system has three peaks, the traditional morning and afternoon peaks plus a third two way peak between 11:30 and 14:00. During the midday lunch period. Central City workers move out to the areas immediately surrounding the CBD and workers based on the city edge move into the CBD.

Qualifications

Although data is not readily available in a form which isolates the individual contribution of these measures as a part of broader set transport and planning policies, it is apparent that dependence on the private car for movement within the Central Perth has been reduced during their operation.

Anecdotally, the Perth Parking Policy, FTZ and CAT have considerably reduced central city congestion, delays, and pollution, however further work is necessary to aid consistent monitoring and assessment of the policy, and to quantify the actual benefits of reduction of high levels of vehicular traffic that otherwise may have resulted, including benefits on noise, severance and road safety for pedestrians, cyclists and motorists.

Similarly, since their introduction, the economic performance of the city centre in terms of employment and retail has also been strong, however the contribution of these mechanisms as an enabling force to supporting this economic growth requires further analysis.

Conclusions and key lessons

Perth's experience demonstrates a key finding of the COAG Urban Congestion Review, that implementing packages of complementary measures delivers better congestion outcomes. Parking regulation is most successful when introduced as part of a complementary package of measures, including alternative travel modes (e.g. free public transport). This set of mutually supporting and reinforcing measures has profoundly changed the way people move around the Perth CBD and immediately adjacent areas.

The combination of the *Perth Parking Management Act* with the revenue stream that is hypothecated to support the policy creates a powerful tool. These initiatives have brought about genuine modal shift of short trips that would otherwise have been made by car, less congestion and less demand for parking provision in new developments. Dependence on the private car for movement within Central Perth has been reduced and a "park once and use public transport or walk" culture has been created.

The case study also highlights that public perceptions of congestion interventions can determine a measure's effectiveness. The complementary congestion measures instituted in the Perth CBD (i.e. free inner city public transport funded by hypothecation of parking tax revenue) are highly visible, easily accessible and of a high quality to encourage modal shift.

South Australian Case studies

Traffic management: Optimisation of Traffic Signal Coordination in Adelaide

Background

The vast majority of road travel in metropolitan Adelaide occurs on urban arterial roads generally laid out in a grid pattern with a few major radial routes emanating from the central business district. The dominant method of traffic control is intersection traffic signals, which are all managed using an adapted version of the Sydney Coordinated Adaptive Traffic System (SCATS), which was rolled out in Adelaide during the 1980s and early 1990s. Once SCATS had been installed in an area, any review and improvement to its operation was generally limited to ensuring new traffic signal sites operated satisfactorily.

The roles and functions of the various arterial roads comprising the network have been better defined, and the Strategic Routes and Freight Routes are now published in the Planning Strategy for Metropolitan Adelaide. The advent of these route definitions instigated the commencement of a program to review SCATS operations to ensure traffic signal coordination better aligned with the road's strategic importance. This work commenced in 2002 with the objective of improving travel times, also recognising that much of the SCATS settings were dated and traffic volumes had grown and patterns changed.

Process

The selection of routes was based on the defined route functions, with a high focus on strategic and freight routes. The link lengths chosen for coordination vary and are based on experience with SCATS operations. Previous experience has indicated link lengths that are too long can exhibit timing changes that are too severe at the extremities of the link, given the dynamic nature of SCATS operations at the site and link level.

The work to review and optimise SCATS operations was structured into three levels of effort to focus the more rigorous and time consuming work on the more strategic routes. Isolated intersections receive the lower level of review.

Modelling tools used are SCATES for modelling linking and phasing options and assessing economic benefits, and LINKVIEW, which graphically shows traffic progression bands and allows checking and adjustment of signal offset timings. The TRANSYT 12 model is being introduced with a view to replacing SCATES.

The highest level of effort involves before and after travel time measurement, modelling using SCATES / TRANSYT 12 and LINKVIEW, and fine tuning operations from field observations. The second level involves LINKVIEW modelling and limited field data collection, and the third level involved checking site operations only. Accident records are also reviewed.

Some Results

Travel time benefits

Route	Length	Reduction in travel time		
		AM Peak	Business Hrs	PM Peak
South Rd, Wingfield	1.8 km	30.7%	n/a	9.9%
Grand Junction Rd, Gepps Cross	3.7 km	18.4%	13.7%	13.6%
Glen Osmond Rd	4 km	7.8%	12.8%	24.4%
O'Connell St, North Adelaide	1.7 km	21.5%	43%	20.7%
Main North Road, Prospect	3 km	4.8%	11.8%	2.1%
Brighton & Tapleys Hill Rd, Glenelg	2.5 km	16.5%	2.4%	28.5%
Brighton Rd, Brighton	4.7km	9.5%	6%	12.1%

Peak periods are 07:00 – 09:00 and 16:00 – 18:00. The peak period improvements are the average for both directions of travel. Generally, but not always, the improvement is greater for the peak direction, with a smaller improvement for the counter-peak direction.

Improvements to the South Road route involved raising the maximum cycle time from 120 to 150 seconds. The Brighton Road route involved a routine to clear traffic through intersections downstream of a railway level crossing after being released from the level crossing closure.

Often minor infrastructure improvement needs are identified and recommended. These have included additional turning lanes, bus stop relocation or indentation, installation of mast arms and turn bans.

Environmental Benefits

The Department for Transport, Energy and Infrastructure (DTEI) has been working with the Transport Systems Centre (University of South Australia) on assessing the greenhouse gas emissions savings from improving traffic signal coordination. This has involved the use of a vehicle with highly accurate continuous fuel consumption measurement and sophisticated emissions models. Work to date indicates emissions savings of between 1.4 and 5% of carbon dioxide equivalents.

Benefit-Cost analysis

BCR's of greater than 50 can be achieved, given the relatively low costs of evaluation and system changes.

Qualifications

Additional benefits or costs associated with side road traffic delays were not included in the measured analysis. It is considered that the impact of changes to the total delay (and emissions) for vehicles on the side roads would not significantly change the total savings as most of the side roads are relatively minor and not generally coordinated to adjacent traffic signals on the side road. Nevertheless it is recognised that delays for side road traffic are likely to have increased in some cases due to longer waiting times.

The sample sizes are generally relatively small, being reliant on floating car data collection. An inherent issue is that during the height of the peak periods, the number of runs achievable is limited by the longer time taken due to congestion. This may bias the peak period improvements to the shoulders of the peak periods. The above results are therefore approximate but indicate the magnitude of improvements that can be made.

Conclusions and key lessons

The program clearly shows that there was a real need to review and optimise traffic signal coordination, and align the operation of SCATS to the arterial road network's strategic, freight and other routes. The work also highlights the value of minor infrastructure improvements with potentially high relative benefits.

The case study demonstrates the benefits to commuters of improvements to the management of existing infrastructure. Reduced travel times can be achieved by optimising existing traffic management systems.

TravelSmart - South Australia's TravelSmart Households in the West

Background

South Australia's component of the National Travel Behaviour Change Program, "TravelSmart Households in the West" (THITW), was a large-scale sustainable travel behaviour change project in Adelaide's western suburbs.

Process

It was determined at the outset that to effectively promote sustainable travel behaviour change the project needed to involve direct and personal contact with a large proportion of the community. As such, much of this project was about having personalised conversations that genuinely engaged people. From May 2005 to December 2006 the project made direct, personal contact with over 22,101 households and engaged them with personalised conversations about travel. The focus was on participants' consideration of, and most desirably their commitment to try, options other than total reliance on cars for their personal transport. The conversations were designed to encourage participants to identify and solve a problem in getting around Adelaide and helped them to explore options that had a clear personal benefit. These solutions included substituting car trips with other options, using the car smarter and more efficiently, reducing the distances travelled by car, and removing the need for some journeys.

Engaged households were offered tools, which were carefully selected to support their decision making process, which included local activity guides, journey planners and maps showing walking, cycling and public transport routes.

Evaluation involved a three year tracking program. Distinguishing features of the rigorous, independent evaluation were:

- Establishment of a longitudinal panel (a consistent group of households from which data was collected across the duration of the project);
- Use of a control group; and
- Two survey methods to produce objective revealed behaviour.

Household travel behaviour change was measured using pocket-size Global Positioning System (GPS) data logging devices. Software was designed to convert GPS-logged data into travel mode. This can be deduced with high accuracy from trip information recorded by the GPS (i.e. speed and route of travel) provided there is adequate Geographic Information System (GIS) information about the area and adequate information about the GPS user (e.g. regular trips made, car or bike ownership).

The easiest mode to identify is walking, because of the consistently low speeds for the entire trip, or segment of a trip. Rail trips are also simple to identify because the trip route will coincide with rail lines which are not on the street network. Bus trips are identified based on average speed, with the trip being along a bus route for its entirety and showing deceleration near at least two bus stops along the trip. Bike trips are identified by examining the maximum speed, average speed and acceleration. Remaining trips should then be trips by car, considering maximum speed and acceleration, and the trip segment remains on the road network.

Three waves of GPS data were collected – before, during and after the application of TravelSmart. As GPS monitoring had not been applied on this scale before and software had not previously been developed frequent odometer readings were collected as a back-up to account for any uncertainty regarding the GPS data. Eight waves of vehicle odometers readings were collected – again before, during and after the project.

Some results

Travel Time Benefits

THITW participants showed a decrease in car use, a larger increase in bus use than the non-participants, an increase in rail trips, a smaller decrease in bike trips and a large increase in walk trips. Despite the uptake of slower modes THITW participants decreased their total travel time (all modes) significantly and by an average of around 20 minutes per day, while non-participants increased their travel time per day significantly by around 18 minutes per day overall, and as much as 26 minutes on weekdays. Travel time benefits have not been assessed as they relate to the network.

Environmental Benefits

Reduction in vehicle kilometres was the key outcome measure for this project. Results included 18% reduction in vehicle kilometres travelled (VKT) for participants or 86,000,000 kilometres. Overall decrease in car travel for participants on weekdays may have been as much as 24 kilometres per household per day, which represents a decrease of about 22% in weekday car kilometres.

Change in travel mode was a secondary measure. THITW participants showed highly significant increases in number of bus trips, especially on weekdays. Public transport patronage increased over 6% in the target region while other areas of metropolitan Adelaide showed growth of less than 2%.

Interestingly, the people in the control group, those who did not participate in the THITW project, actually showed an increase in their car use by 6%. Consequently, if the THITW project had not been introduced and participants increased their VKT at the same rate as non-participants, the daily increase in travel that would have been expected for the entire region is 918,870kms. Instead, as the participants reversed a trend, the actual net increase was only 375,180kms per day.

Estimated abatement achieved during the Kyoto Reporting Period 2008-2012:

- Reduction of 432,000,000 vehicle kilometres; and
- Abatement of 137,703 tonnes of Greenhouse Gas (CO2-e).

Local air quality benefits have not been calculated.

Benefit-Cost Analysis

The project exceeded financial goals in that total cost of $22.94 per tonne of GHG abatement was cheaper than originally estimated and contracted with the Australian Government.

Benefit/Cost assessment of these types of programs is complex. A preliminary economic assessment indicates a Benefit Cost Ratio of around 6.9.

This has assumed that:

- Road safety savings associated with serious injury and facilities are projected at $3,000,000;
- Environmental (GHG) benefits as above;
- The observed 18 % reduction in vehicle kilometres conservatively reduces to zero at a uniform rate over five years; and
- A discount rate of 6%.

Other potential benefits not included in the preliminary assessment include: net benefits to households from their changed behaviour (fuel cost savings, vehicle operating costs, savings against additional public transport costs, time costs etc) and indirect environmental benefits.

Total petrol savings to the household sector were estimated to exceed $11.6 million based on average fuel prices over the project term.

Qualifications

THITW was not designed as a congestion measure even though one of its aims was to reduce the total VKT in the target area. VKT reductions achieved should translate to a reduced traffic count on roads in these suburbs. However, DTEI was unable to obtain an analysis of full data sets relating to traffic in the broader Adelaide and target area. The limited traffic counts analysed for the area made it difficult to draw any conclusions.

The GPS data obtained was deemed to be more than 99% reliable and an adequate sample size ensured a high degree of statistical validity. The 1,166 household sample size used for the odometer surveys was not sufficient to produce a result that was statistically significant with 90% confidence.

The GPS/GIS software considered only 5 different modes of transport – walk trips, bicycle, private vehicle (car), public bus or tram (bus) and by rail (train). The software cannot yet determine accurately whether a car trip is as a car driver or a car passenger so does not allow for car-pooling (ridesharing) to be measured.

Corroboratory evidence was collected in the form of public transport patronage data and petrol prices. It was found that petrol price changes did not lead to changes in public transport patronage. However, some changes in VKT appear to have some association with changes in petrol prices.

Continuing long term monitoring of the impacts of THITW commenced in October 2007 and will be undertaken until the end of 2012.

Conclusions and key lessons

The project has had a positive effect in reducing both the average number of trips per day and the average distance travelled daily by participants, while there is evidence that non-participants actually increased their daily travel. This reduction has included a significant reduction in car travel, which is by far the most dominant mode of transport in the Adelaide region.

South Australia's Tackling Climate Change Strategy outlines the future directions for the TravelSmart program which calls for an expansion of the programs delivery capabilities. This behaviour change approach can be expanded and applied, with contextual modifications to travel and transport across metropolitan and regional centres. The approach also has the capacity to be replicated in situations where human behaviour change is a desired outcome e.g. reducing water or energy usage.

The case study also demonstrates the value of sound measurement and evaluation, which in this case has indicated impressive congestion, environmental and economic outcomes.