ACOLA Securing Australia's Future

Sustainable Urban Mobility

Social Study: Barriers and pathways to sustainable urban mobility in Australia

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Structure of the report

The report is in five parts.

Part 1 is an overview of key themes explored in the later sections of the report. It contains:

- A response to the brief.
- A review of the international evidence in relation to pathways towards sustainable mobility and the common features of urban regions in the developed world that can make the greatest claims to 'success'.
- A review of the state of play in transport planning capacity in Australian cities.
- A summary of the key trends and 'drivers' in urban travel patterns in Australia.

Part 2 provides details of the data collected on trends and 'drivers' in urban travel behaviour.

Part 3 explores the extensive international and Australian literature on community attitudes and other subjective factors in transport and planning decisions. This was written by Elizabeth Taylor.

Part 4 examines the 'planning deficit' and the 'democracy deficit' in Australian urban governance and considers means to improve metropolitan governance and institutional capacity within existing political structures. This was written by Andrew Cole.

Part 5 provides a summary of the barriers and pathways to more sustainable access and mobility in four generic locations: inner-city, established middle suburbs, new suburbs on the urban fringe, and regional towns.

Part 1: Overview

1. Response to the brief

Following the definitions given by the EWG, 'sustainable urban mobility' is taken to be affordable, reliable, low emission, secure, and resilient. However, the concept of 'sustainable mobility', as we will approach it, requires some elaboration

Urban planners have long made a distinction between 'accessibility' and 'mobility'. As the US researcher, Susan Handy, puts it:

> Accessibility is the potential for interaction, both social and economic. It is determined by the spatial distribution of potential destinations, the ease of reaching each destination, and the magnitude, quality, and character of the activities found there. …
>
> In contrast, mobility is the ability to travel, the potential for movement. It reflects the spatial structure of the transportation network and the level and quality of its service. …
>
> Mobility is not a sufficient condition, nor is it always a necessary condition for accessibility….
>
> The concept of accessibility acknowledges that the demand for travel is derived from the demand for activities. The concept of mobility ignores the derived nature of travel demand, focusing instead on the ability to travel, as though sheer movement were an end in itself. But, mobility is only the means: activities are the end, accessibility the key. (Handy 1994, pp. 5-6)

So, 'sustainability', in the context of urban transport, is best achieved through a complementary focus on land-use planning (to minimise trip numbers and lengths) and the provision of transport systems that deliver convenient opportunities for travel by the most environmentally and economically efficient and socially inclusive mode for any trip purpose.

The trajectory to an accessible city based on truly low-carbon, post-petroleum transport systems is likely to be considerably beyond the 25-year time horizon considered in this project. As Moriarty and Honnery (2013) and others have argued, the scale of the reductions in energy use required to meet the challenges of climate change and peak oil is unattainable under any scenario in which we attempt to maintain current levels of mobility, whatever technological innovations we might collectively conceive. The Australian city in 50 or 100 years from now is almost certain to be, by comparison, a low-mobility city, and so, although this is beyond the scope of contemporary political conversations, we need to begin the transition to more localised patterns of living if we are to maintain the social and economic fabric of a truly sustainable city.

Due to restraints on time, the study does not address issues of urban freight or of inter-city travel by air, road or rail.

2. Pathways to sustainable urban transport: understanding international 'success'

2.1. Urban transport 'policy packages and their impact

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

Two transport policy packages are commonly employed in western cities:

- First, cities can try to provide incentives for both cars and public transport by investing heavily in both freeways and metro systems and providing subsidised car parking in their central core or at major regional centres or transit nodes. Transport systems of this type are difficult to integrate and the outcome is generally a continued imbalance in mode share towards car travel but with greater subsidies required for each.
- Second, incentives are provided for cars while transit service declines. This policy package seldom explicitly pursued but is followed, de facto, in cities with no clearly agreed intermodal transport goals and where public and active transport is given little real priority in planning or investment.

Neither of these approaches appears useful for achieving energy efficiencies and greenhouse emission reductions. However, there is a third policy package, which is employed less frequently. This involves coordinated incentives for public and active transport and disincentives for car use, together with complementary policies for other physical and functional components of urban activity including housing and economic development from which appropriate mode-share targets can be established. Research points to the need for these complementary land-use policies to encourage the clustering of destinations around transport nodes as a first priority over increasing residential densities (Ewing and Cervero 2010).

The disincentives for cars include parking restrictions (a powerful motivator for decisions to avoid car travel in Australian cities) and the use of congestion as a travel demand tool. This latter measure is employed in Vancouver, where it is an explicit part of an effective long-range transport plan (GVRD 1993), and in Zurich, where traffic signals are set up to allow only small numbers of cars onto streets where trams have priority (Cervero 1998). More broadly, on the question of congestion, there is considerable evidence for the proposition that new road capacity simply creates new congestion, although this is still contested by traffic engineers (Downs 2004; SACTRA 1994). There is also evidence that increasing the relative speed of public transport travel over car travel leads to reductions in road traffic volumes (Mogridge 1997, 1990). In any case, the dynamic interaction between available road space and traffic volumes means that any hopes that congestion can be 'busted' are destined for disappointment.

This characterisation of urban transport policy packages is explained in detail in Vuchic's comprehensive text *Transportation for Livable Cities* (1999, pp.82-87 & pp. 239-248).

2.2. Evidence of 'success'

It is surprising how little rigorous analysis there has been of the results of this third package. However, good evidence is starting to emerge.

On economic value, there is support for the proposition that urban regions where priority is given to public and active transport pay a lower cost, as a proportion of their regional economy, on building and operating their transport systems (Kenworthy and Laube 2001). Such cities also appear to generate greater levels of economic productivity through agglomeration effects in their central core (Chatman and Noland 2011; Graham 2007; Melo et al. 2013; Vickerman 2008).

On the environmental impacts of this policy package, problems of data availability mean that it is not possible to compare urban regions on the extent to which their transport and land-use policies have reduced per capita car travel has been reduced in favour of more sustainable modes. However, it is possible to find data to compare cities on the basis of a slightly less rigorous definition of success: namely, 'mode shift away from the car to more sustainable modes'. On this definition, there is evidence of 'success' through consistent application of coordinated policy packages of car

disincentives and public and active transport incentives in Ottawa (Al-Dubikhi and Mees 2010), Vancouver (Stone 2013) and a number of cities in Europe.

German-speaking Europe provides some of the world's best examples of cities that are finding ways to challenge car dependence (Mees 2010b). Their success is measured in the shifts from cars to public and active transport across the urban region. For example, while car use is increasing in all European countries, the rate of increase is lowest in Switzerland. Within Switzerland, Canton of Zurich – with a population of 1.45 million spread over an area the size of metropolitan Melbourne – has the nation's lowest rate of car use: approximate mode shares for all trips in the Zurich region are 29% of trips by individual motorised transport, 52% by walking and cycling (mainly walking) and 18% by public transport[1]. There is also evidence of consistent application of policies that restrict car use and make alternatives more attractive in a number of European urban regions where car-use has appears to have grown relatively slowly across the whole agglomeration and has been reduced or stabilised in the city core (Bratzel 1999, p. 184).

A further common factor observed in these relatively successful cities appears to be the existence of strong public institutions for transit management that have:

- a strong focus on *'network planning'*
- long-term political and institutional credibility built on project achievements.

2.3. Network planning: the key to competitive public transport

Network planning is an approach to public transport planning that can successfully offer a competitive alternative to the car. Its purpose is to create maximum flexibility for travellers by making it easy to transfer between different services or modes. It provides a basis for cost-effective operations and for the use of least-cost planning methodologies to prioritise capital investment in rolling stock and infrastructure to maximise patronage growth (Mees 2010b; Nielsen and Lange 2005)

Public transport is increasingly called on to serve diverse objectives – ranging from providing mobility to the disadvantaged through to alleviating traffic congestion – while making efficient use of financial resources. The challenge for public transport seems daunting. It must cater for travellers with very different needs, ranging from peak-period access to the CBD to all-day access to local shops and community centres. It also needs to provide attractive service frequencies and operating hours for multiple destinations, while maintaining high occupancy rates. Some observers have argued that these trade-offs present an insoluble problem (Roth and Wynne 1982), but the public transport systems of a growing number of cities, including the three comparators used in this exercise, demonstrate that this is not the case.

The essence of public transport, reflected in its name, is carrying people with different trip origins and destinations in the same vehicle. These travellers can then be transported with lower economic and environmental costs than if they travelled separately. This is public transport's strength, but also its weakness, because people do not all have the same trip origins or destinations.

One approach to diverse travel patterns is to provide separate services for different markets: express buses and trains for peak commuters; regular buses for local trips along busy corridors; car-like para-transit for low-demand corridors and times. The problem with this approach is that the more public transport becomes tailor-made, the more it surrenders its environmental and economic advantages. A public transport system offering a direct service between every origin and destination would have low frequencies, low occupancies, high costs and high greenhouse emissions per passenger.

The alternative is networks (Mees 2010b; Nielsen and Lange 2005; Vuchic 2005). This approach enables 'anywhere-to-anywhere' travel while keeping occupancy rates high, by carrying different kinds of travellers on the same services. Transfers are integral to a public transport system that offers access to a large number of potential destinations at an affordable cost to the operator. Traditional public transport planning (in the English-speaking world, at least) has treated transfers as an

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1 Calculated from the average number of trips by each form of transport reported from the 2005 Transport Microcensus (Swiss Federal Statistics Office)

inconvenience to be avoided at all costs (Balcombe et al. 2005; DfT 2006), but the network approach makes them the building blocks of a multidestinational system.

US researchers have commented on the importance of transfers:

> Surveys asking what passengers …dislike about transit find that transferring is at or near the top of the list …(So, traditionally), transfers are avoided, but at the cost of limiting opportunities for travel to non-CBD destinations. In contrast, the multidestinational approach uses transfers to open travel paths to … destinations that are reachable in radial systems only by lengthy and circuitous travel (Thompson and Matoff 2003, p. 298).

Creating effective transfer-based public transport systems requires careful planning to ensure that the inconvenience is reduced to the minimum possible.

Four key elements underpin the creation of high-quality, transfer-based networks:

1. *A simple line structure*: simplicity makes the network easier for passengers to understand, and minimises the resources that an operator must provide.
2. *Stable line and operating patterns*: as well as being simple, a network must also be stable. The idea is to provide a consistent, high-quality service across the network all day, rather than operating different service types in peak, off-peak, night and weekend time periods. Regular feeder services to nodes on trunk routes are a key feature of successful networks, and the spacing of stops is also considered in the technical literature (Nielsen and Lange 2005).
3. *Convenient transfers*: easy transferring requires attention to timetables and physical facilities. 'Random' transfers are possible when all lines serving an interchange point operate frequently, generally every 10 minutes (6 departures per hour) or better. 'Timed' transfers are needed when services are less frequent, and the timetables for connecting lines must be coordinated (Mees 2010b, ch. 8; Nielsen and Lange 2005).
4. *Appropriate institutions and fare systems*: fare systems must allow free transfers. The pooling of fare revenues is essential for this; and to allow cross subsidies. Planning on a whole-of-system basis seems to require a single responsible regional agency. A combination of regional planning by a public agency and competitive tendering for services has achieved positive results in London, Copenhagen and Swedish cities. It has also been introduced for buses in Singapore (LTAS 2008, pp. 38-39).

Emerging research confirms that strategic organisational capacity to plan, coordinate, and implement network planning principles is an essential requirement for the achievement of sustained public transport improvements (Kumar and Agarwal 2013; Stone et al. 2014).

2.4. The role of 'choice'

Central to the mode shift achieved in exemplar cities and, more modestly, in the inner suburbs of Australian cities is the availability of multiple transport choices that allow citizens to complete a great variety of complex trip patterns without using a private car. This is recognised by European transit agencies and the major car companies, such as BMW, who are engaged in a fierce competition to be first with a 'platform' for a single 'smart-card' that provides access to public transport, bike hire and car share.

When alternatives are credible, the literature identifies a sizeable segment of the population for whom 'soft' marketing can be successfully used to encourage a transition in mode choice. However, this requirement is a significant obstacle in those parts of Australian cities where very few, if any, alternatives to the private car currently exist.

2.5. The 'sustainable' automobile

The automobile, as a technology that for its effective use requires the sole allocation of up to 30% or more of urban land, is fundamentally inconsistent with the environmental, social and economic rationales for a compact city form in which constrained amounts of public space is available for a

multiplicity of purposes. However, habits, convenience, perceptions of safety, and lack of alternatives all create demand for motorised 'self-directed vehicles'.

The emerging 'grey' technologies of 'driverless' cars, and use of social media and related applications to develop new ways to use existing car fleets (for example, Über and Bridj) have the potential for far-reaching, but as yet unknown changes in the way we use automobiles in our cities. The proponents are making great claims for the benefits of these new technologies, and sectoral interests such as taxi companies are already calling from protective regulation. Public policy responses will need to steer a path between these competing positions to ensure that new technologies do not undermine existing public transport networks in ways that increase social isolation for vulnerable members of the community, or further entrench existing spatial imbalance in access to alternatives to the car by offering new choices only in already rich inner-urban locations.

2.6. Pathways in Australian cities

The ABS Census data on responses to the 'mode for the journey to work' question gives a unique longitudinal perspective on changing travel behaviour in Australian cities from 1976 to 2011. Mees and Groenhart (2012b) conducted an extensive analysis of this data and offered some significant findings on overall trends and on variation between cities,

Selected findings from the Mees & Groenhart analysis of the ABS Census JTW data, 1976-2011

- The number of cars driven to work each day in Australia's capital cities has nearly doubled since 1976, from 2,027,990 to 3,942,167. Just under two-thirds of the increase is due to growth in the workforce; the remaining third is due to a shift away from more sustainable transport modes: public transport, walking and car-pooling.
- After two decades of rapid decline, public transport usage rates commenced a revival in 1996. The revival began slowly, but the five years to 2011 saw the biggest increase in public transport mode share seen since 1976. There has been a corresponding fall in the share of workers travelling by car, although this has been dampened by continuing declines in car-pooling. Adelaide, Canberra and Hobart have missed out on this public transport revival.
- The revival of public transport has occurred mainly on rail systems, which have recovered the ground lost during the two decades of decline to 1996. The share of workers travelling by train is now higher than at any time since 1976, and in Perth is three times as high as 35 years ago. Buses and (in Melbourne and Adelaide) trams have been less successful, with current usage rates still less than half those of 1976.
- Walking is the most sustainable of all travel modes, and makes a significant contribution to work travel in Hobart, Canberra and Sydney. Walking receives little support from policy makers, but despite this, walking rates increased in the decade leading up to the 2006 census. However, walking rates have declined since 2006 in all cities except Canberra and Perth, suggesting that a renewed policy effort is required to improve conditions for pedestrians.
- Cycling is of negligible importance as a travel mode for work trips in all cities except Canberra. It is not clear that increases in cycling have come at the expense of the car, since higher cycling rates are usually accompanied by lower walking rates.
- Despite the publicity devoted to its transport problems in recent years, Sydney is Australia's sustainable transport capital, with by far the lowest mode share for car driving, the highest share for public transport and above-average rates of walking. More cars are driven to work each day in Melbourne than Sydney, despite the latter's larger workforce. Public transport grew rapidly in the five years to 2011, reversing a decline over the previous five years. Despite this, the state's infrastructure advisory body is recommending that funding be redirected from rail to road, based on projections that the census data has shown to be erroneous.
- Melbourne has the second-highest public transport mode share, but the lowest rate of car pooling and below average rates of walking: as a result, car driving is higher than in Brisbane. Melbourne has experienced the fastest growth in public transport mode share of all seven

capitals since 1996, but had the most rapid decline in the two decades before then: because the earlier decline was much greater than the recent increase, Melbourne had the biggest decline in public transport usage, and the biggest rise in car driving, over the 35 years since 1976, except for Hobart.

- Brisbane has the second-lowest rate of car driving among the seven capitals, and has also experienced a revival of public transport over the last three censuses. However, the growth in public transport over the last five years has been slower than in Sydney, Melbourne and Perth: indeed, rail usage rates are now higher in Perth.
- Perth has had the most impressive turnaround in public transport of any capital city during the period covered by this study: it is the only city where public transport mode share is higher than in 1981. A concerted community campaign, backed by skilled planning and budgeting, has revived the city's rail system, which now carries more passengers than Brisbane's. This success suggests that Perth can be a model for other Australian cities, particularly Adelaide.

A key feature of this data is the accelerating revival in public transport use, and the observation that Perth, where transport-planning practice most closely matches that of the European and Canadian 'network planning' exemplars, has achieved the best growth rates.

As recommended in a recent review (Mees and Dodson 2011), continuation of these trends will require new approaches to transit planning to strengthen network-planning approaches and develop new methodologies to plan and deliver increased capacity on the European model. There are some encouraging signs of progress in this regard in Melbourne and Brisbane, but much stronger political and institutional direction is required.

Increased patronage does not require a corresponding linear increase in service supply as the following data (Stone 2011) comparing per capita service supply and trip-making rates in Melbourne, Sydney, Zurich and Munich clearly shows.

	Population (millions)	Land Area (km^2)	PT use (annual trips per capita)	PT 'supply' (service-km per capita)	PT efficiency (Trips/ service-km)
Melbourne	**4.05**	**2,200**	**116**	**35.4**	**3.3**
Munich	**2.5**	**5,470**	**241**	**34.8**	**~ 6**
Zurich	**1.45**	**1,850**	**399**	**53.8**	**7.4**

The enviable outcomes of transport and land-use planning practices in Vancouver and the European cities were achieved over a period of around 25 years. Three common stages can be identified in the political processes that supported the changes in policy direction in these cities, and in Perth (Bratzel 1999; Stone and Legacy 2013):

1. well-organised popular opposition to existing car-based transport policies;
2. a change in political leadership and in incumbency in important administrative positions relating to transport policy;
3. institutionalisation of new operational practice—this required the new political leaders to maintain and extend the mandate for new transport policies over sufficient time during which new practices could be established.

In Australian cities, as the automobile's 'promise of the freedom' continues to be eroded, it is not impossible to imagine that more of our cities and towns will follow this path. Emerging political entrepreneurs have only to look to the potential 'flashpoints' of parking, poor bus services, and the 'democratic deficit' in planning to find opportunities to start the processes of change.

3. Summary of key trends and 'drivers' in urban travel patterns

- Growing populations and declining 'levels of service' for public and active transport, together with strong community desire and institutional support for road-based travel have led to a large increase in car use in the last 40 years in all Australian urban centres and in regional towns.
- Car dependency has been further entrenched though the need for longer and more dispersed journeys due to changes in the spatial distribution of employment, retailing, recreational, education and health services destinations in relation to residential locations.
- Despite our car dependence, a large proportion of all trips remain short – with origins and destinations in the same or adjacent LGAs. Average trip lengths have increased over time, but are still relatively short at around 7.5 km
- Continued strength in CBD employment, changes in inner city demographics, fuel price rises and growing environmental awareness have each contributed to recent modest decreases in car-use for work trips and corresponding increases in public and active transport use. In some cities, these mode shifts have occurred with only marginal improvement in 'level of service' for non-car modes.
- Despite strong popular belief, the density gradient away from the core of Australian cities is remarkably slight. Densities in most middle and many outer suburban locations are currently high enough to support much improved levels of public transport service, particularly if these are delivered on the 'network' model.
- Economic studies identify jobs in the inner core of capital cities as the 'wealth generators' of the economy. However, the great majority of urban employment is found in the suburbs. In recent years, there has been significant growth in employment in health and education services in suburban locations. Improved planning for the concentration of the locations of public-sector employment of this type provides a clear opportunity to start the necessary 'clustering' of suburban destinations.
- Although congestion and travel times remain high during traditional weekday peak periods, suburban congestion is found increasingly during weekends when dispersed travel for multiple purposes is at its greatest.
- Significant numbers (up to 20%) of trips are 'chauffeuring' of children and older people. Significant proportions of peak period travel (up to 17%) for taking children to school.
- A growing spatial imbalance in sustainable mode choice is exacerbated by population growth and the location, via developer-led housing markets, of most new affordable housing on the urban fringe
- In combination, many of these factors are contributing to an erosion of the automobile's 'promise of freedom' and there are emerging changes in public attitudes to car-based mobility from which new political will can be forged.

Full sources and discussion of the data from which these patterns have been identified can be found in Part 2 of the report.

Part 2: Data and trends in urbanisation and travel in Australia

This section analyses trends in travel in Australian cities. Limits in the available data mean that detailed analysis is not possible for all areas.

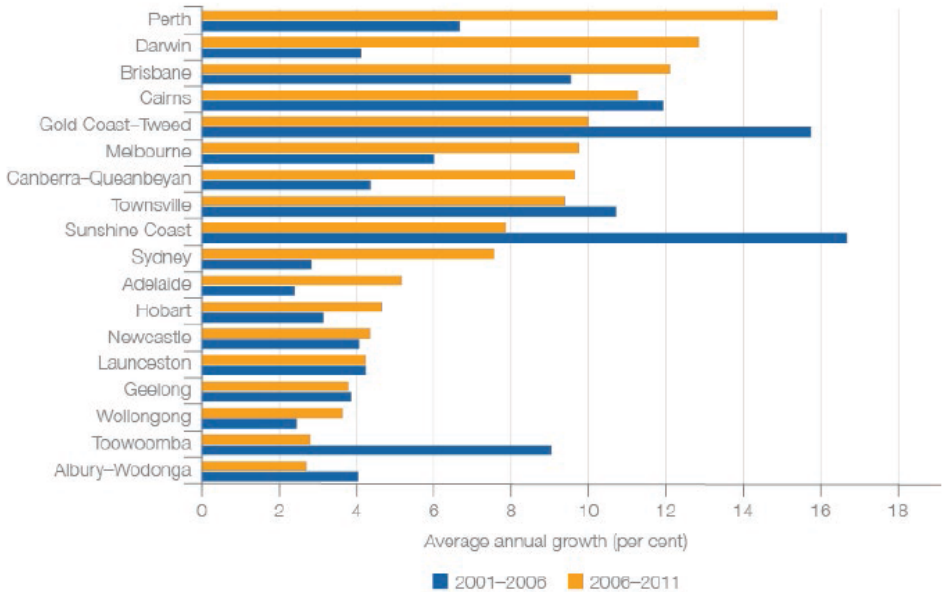
1. Population growth and changes in Australian cities

Australia has experienced a significant population increase over the last forty years with one of the highest growth rates in the OECD (Department of Infrastructure and Transport 2013b). In 1973, 8.8 million people lived in Australia's capital cities; by 2013, this figure had increased to 15.3 million people (ABS 2013a). The table below includes a breakdown of each city's population increase between 1973 and 2013 (ABS 2013a).

City	Actual increase in population: 1973-2013 (millions)	% increase in population: 1973-2013
Melbourne	1.66	62%
Sydney	1.68	54%
Brisbane	1.24	124%
Perth	1.19	152%
Adelaide	0.38	42.6%
Hobart	0.06	36%
Canberra	0.21	120%
Darwin	0.09	191%

There has also been significant growth in regional cities in recent years, particularly in the five-year period between 2006 and 2011, and in coastal areas. The chart below, from the Commonwealth's *State of Australian Cities* report (2013b), shows that population growth rates have slowed in the major capitals, but accelerated in regional cities.

Figure 2-2 Population growth by major city, July 2001–June 2006 and July 2006–June 2011



1.1. Spatial distribution of population growth

Over the last decade, the greatest population growth has occurred in the outer suburbs of the capital cities, especially in Melbourne, where populations in LGAs in the outer west, north and south have doubled since 2002 and are still experiencing among the highest rates of growth in the country.

The small LGAs of central Melbourne and Sydney have also seen rapid growth. In the established middle suburbs, only Blacktown and Parramatta in Sydney and Stirling in Perth have a place among the rapidly growing locations. On this point, analysis by Grattan Institute (Kelly et al. 2011) has shown that Sydney has had a more even spread of new housing construction across the urban region than has Melbourne (the zones used in the Grattan analysis refer to average house prices and broadly align with distance from the CBD).

SA3s WITH LARGEST AND FASTEST POPULATION GROWTH IN 2012-2013

		ERP AT 30 JUNE		CHANGE	
		2012r	2013p	2012r-2013p	
National rank & SA3(a)	GCCSA	no.	no.	no.	%
	LARGEST GROWTH				
1 Melbourne City	Greater Melbourne	105 402	116 431	11 029	10.5
2 Wyndham	Greater Melbourne	183 715	194 587	10 872	5.9
3 Whittlesea - Wallan	Greater Melbourne	182 920	193 078	10 158	5.6
4 Wanneroo	Greater Perth	169 835	178 460	8 625	5.1
5 Casey - South	Greater Melbourne	137 806	144 537	6 731	4.9
6 Stirling	Greater Perth	197 817	204 028	6 211	3.1
7 Melton - Bacchus Marsh	Greater Melbourne	134 046	139 938	5 892	4.4
8 Rockingham	Greater Perth	115 068	120 859	5 791	5.0
9 Swan	Greater Perth	113 964	119 066	5 102	4.5
10 Tullamarine - Broadmeadows	Greater Melbourne	141 705	146 787	5 082	3.6
11 Ormeau - Oxenford	Rest of Qld	102 058	106 996	4 938	4.8
12 Townsville	Rest of Qld	184 617	189 287	4 670	2.5
13 Parramatta	Greater Sydney	133 933	138 596	4 663	3.5
14 Sydney Inner City	Greater Sydney	193 029	197 396	4 367	2.3
15 Mandurah	Greater Perth	91 753	96 118	4 365	4.8
16 Gosnells	Greater Perth	116 939	121 252	4 313	3.7
17 Gungahlin	Australian Capital Territory	52 800	57 051	4 251	8.1
18 Armadale	Greater Perth	69 567	73 725	4 158	6.0
19 Cockburn	Greater Perth	96 866	100 888	4 022	4.2
20 Cardinia	Greater Melbourne	80 346	84 234	3 888	4.8

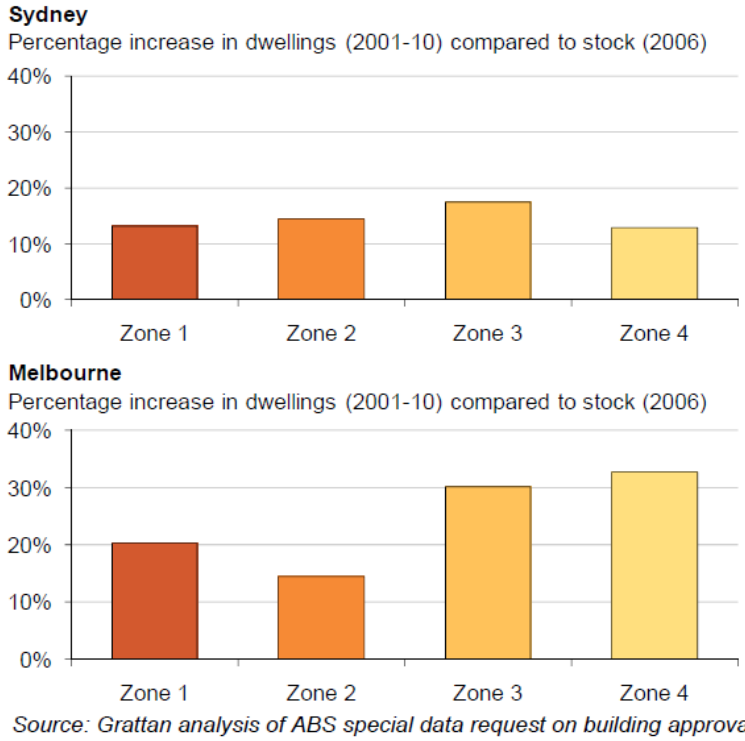
(ABS 2013a)

LOCAL GOVERNMENT AREAS WITH LARGEST POPULATION CHANGES

National rank(a)	LGA	Part of state/territory	ERP at 30 June 1998 no.	ERP at 30 June 2002r no.	ERP at 30 June 2003p no.	Change 1998–2003p %(b)	Change 2002–03p no.	Change 2002–03p %
		LARGEST INCREASES IN 2002–03						
1	Brisbane (C)	Brisbane	850 543	917 576	938 384	2.0	20 808	2.3
2	Gold Coast (C)	Qld Balance	381 367	439 374	455 473	3.6	16 099	3.7
3	Casey (C)	Melbourne	159 855	191 035	201 913	4.8	10 878	5.7
4	Wyndham (C)	Melbourne	80 296	92 313	99 611	4.4	7 298	7.9
5	Melton (S)	Melbourne	42 846	58 580	65 507	8.9	6 927	11.8
6	Pine Rivers (S)	Brisbane	112 356	127 570	133 778	3.6	6 208	4.9
7	Wanneroo (C)	Perth	72 688	88 274	93 819	5.2	5 545	6.3
8	Maroochy (S)	Qld Balance	116 057	131 530	136 461	3.3	4 931	3.7
9	Sydney (C)	Sydney	63 061	75 451	79 912	4.9	4 461	5.9
10	Hume (C)	Melbourne	125 409	139 913	144 314	2.8	4 401	3.1
11	Melbourne (C)	Melbourne	43 099	53 786	58 031	6.1	4 245	7.9
12	Redland (S)	Brisbane	107 697	120 494	124 683	3.0	4 189	3.5
13	Baulkham Hills (A)	Sydney	130 574	150 430	154 496	3.4	4 066	2.7
14	Caloundra (C)	Qld Balance	69 964	78 879	82 905	3.5	4 026	5.1
15	Caboolture (S)	Qld Balance	107 657	117 296	121 135	2.4	3 839	3.3
16	Mandurah (C)	WA Balance	44 131	50 772	54 356	4.3	3 584	7.1
17	Blacktown (C)	Sydney	249 296	269 855	273 267	1.9	3 412	1.3
18	Whittlesea (C)	Melbourne	110 456	120 506	123 397	2.2	2 891	2.4
19	Cairns (C)	Qld Balance	114 830	119 378	122 192	1.3	2 814	2.4
20	Cardinia (S)	Melbourne	44 016	48 602	51 290	3.1	2 688	5.5

(ABS 2004, p. 10)

Figure 13 – Comparison of Stock and Supply for Sydney and Melbourne



Source: Grattan analysis of ABS special data request on building approvals.

(Kelly et al. 2011, p. 28)

1.2 Forecast population growth to 2040

The accurate prediction of demographic patterns over 30-year time horizons has proved difficult in the past; however, there is general agreement among demographers that further rapid growth in the population of all capital cities is likely up to and beyond 2040. ABS projections are based on trends over the past decade and the following assumptions (2013b):

- Fertility rates in a range between an increase to 2.0 babies per woman and a decline to 1.6 babies per woman by 2026, and then remaining constant.
- An ageing population because of sustained low fertility, combined with increasing life expectancy.
- Net overseas migration will increase to between 200,000 and 280,000 people per year by 2020-21 and remain constant thereafter.

At the upper end of predictions in relation to the ageing of the Australian population under these scenarios, the ABS also anticipates:

- increases in the median age of the Australian population (from 37 years in 2012 up to 40.5 years by 2040);
- a doubling in the number of people aged 65 and over, from 3.2 million people (14 per cent of the population) in 2012 to 6.8 million (20 per cent) by 2040;
- a threefold increase in the number of people aged 85 years (to 1.2 million people).

Urban region	2012 actual (Millions)	2040 low-end forecast (Millions)	2040 high-end forecast (Millions)	% increase (low-end)	% increase (high-end)
Perth	1.9	3.4	4.4	80.0%	131.1%
Brisbane	2.2	3.3	4.0	48.2%	80.5%
ACT	0.35	0.52	0.66	39.9%	74.9%
Darwin	0.13	0.16	0.21	21.9%	57.2%
Melbourne	4.2	6.4	7.2	52.1%	72.4%
Sydney	4.6	6.8	7.0	47.8%	51.1%
Hobart	0.22	0.22	0.29	8.1%	32.4%
Adelaide	1.3	1.6	1.8	26.0%	39.4%

(ABS 2013b)

2. Density

The question of density is central to debates over transport policy in Australian cities. At the heart of many arguments for policies to support increased supply of roads and parking spaces is the belief that no alternatives are possible: Australian suburbs are simply too low density for public and active transport to play a larger role in the modal mix. A typical presentation of data used to support this belief is found in the following table that compares the 'densities' of LGAs in Melbourne.

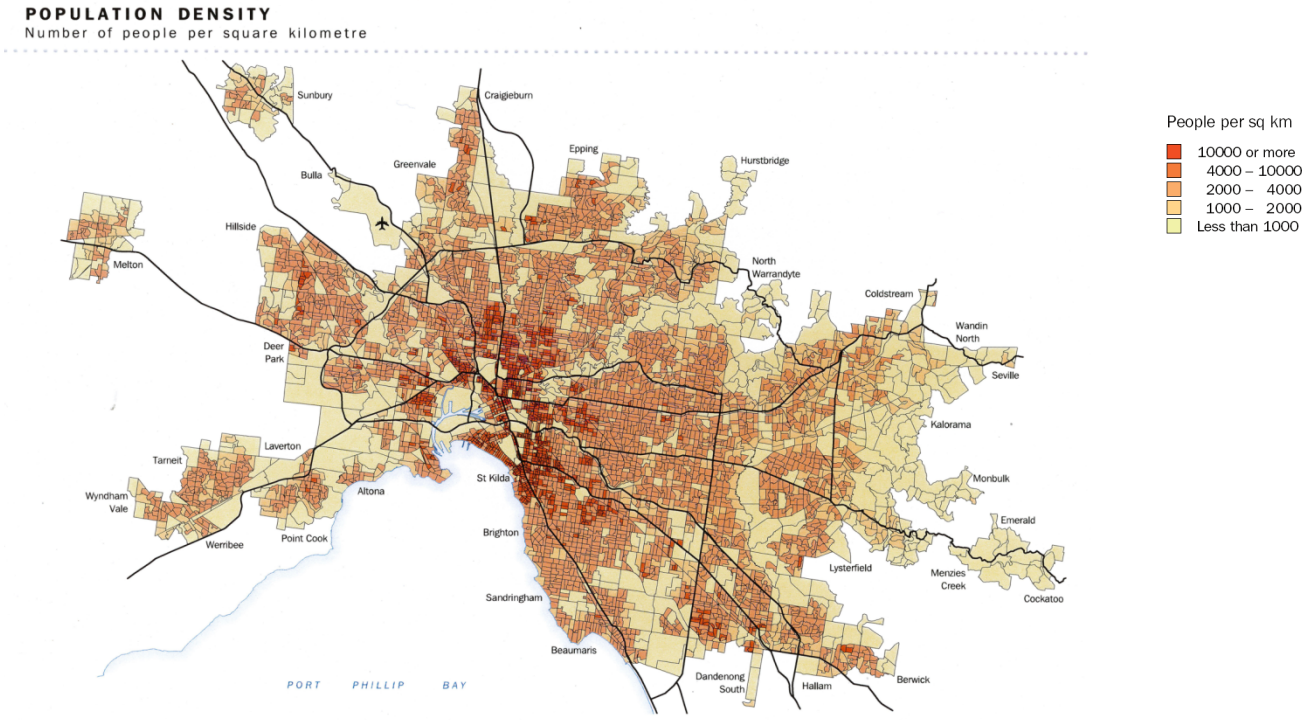
	Municipality	Area (square kilometres)	Estimated Resident Population, June 2001	Population Density (population per km²)
	Melbourne	36.1	57,248	1,586
	Port Phillip	20.7	84,615	4,088
	Yarra	19.5	70,128	3,596
	Total	**76.3**	**211,991**	**2,778**
	Boroondara	60.2	161,810	2,688
	Darebin	53.5	130,649	2,442
	Glen Eira	38.7	125,988	3,256
	Maribyrnong	31.2	61,329	1,966
	Moonee Valley	44.3	112,973	2,550
	Moreland	50.9	137,677	2,705
	Stonnington	25.6	93,703	3,660
	Total	**304.4**	**824,129**	**2,707**
	Banyule	62.6	119,380	1,907
	Bayside	37	92,287	2,494
	Brimbank	123.4	166,802	1,351.7
	Greater Dandenong	129.7	132,096	1,019
	Hobsons Bay	64.4	84,372	1,310
	Kingston	91.1	135,773	1,490
	Knox	113.9	147,801	1,298
	Manningham	113.3	116,055	1,024
	Maroondah	61.4	100,172	1,632
	Monash	81.5	164,647	2,020
	Whitehorse	64.3	147,600	2,296
	Total	**942.6**	**1,406,985**	**1,493**
	Cardinia	1,281.60	47,006	37
	Casey	409.9	182,863	446
	Frankston	129.6	115,203	889
	Hume	503.8	137,391	273
	Melton	527.6	54,953	104
	Mornington Peninsula	723.6	130,404	180
	Nillumbik	430.4	60,718	141
	Whittlesea	489.8	118,764	243
	Wyndham	542.1	88,133	163
	Yarra Ranges	2,471.60	144,125	58
	Total	**7,510.00**	**1,079,560**	**144**
REA		**8,833.30**	**3,522,665**	**399**

source: Australian Bureau of Statistics 2001.

Population 'densities' in Melbourne LGAs (AIUS 2006, *Environmental Indicators for Metropolitan Melbourne: Bulletin No.* 6, Australian Institute for Urban Studies & City of Melbourne)

On face value, this data appears to make a strong case for the impossibility of improvements to public transport in the outer suburbs. However, as Paul Mees warned, density comparison needs to be made on "a consistent and rigorous basis", and that failure to do so will "produce results that are at best meaningless, and at worst downright misleading" (2009). Here, the obvious inconsistency is the extent of non-urban land within the boundaries of the LGAs. The Australian Bureau of Statistics, in the maps produced for its Social Atlas series, takes a more consistent approach to comparisons of residential density. The Melbourne map (below) shows the very shallow 'density gradient', and the large stretches of middle and outer suburbs in which residential densities are sufficient, even under the deterministic assumptions of Newman & Kenworthy (1999).

A full discussion of the use and abuse of national and international density data in transport debates can be found in Paul Mees' clearly argued critiques (for example, Mees 2010b). This analysis shows that, while the task of providing effective and affordable public transport is made easier by increasing residential densities, it is not necessary to re-build our suburbs before we can begin to change our transport patterns. And, in the major cities of North America and Australia, residential densities – calculated on a consistent basis – are a weak determinant of transport mode choice (Stone and Mees 2010).



Residential densities in Melbourne by urbanised 'collector district' (ABS (2006), *Melbourne: a Social Atlas,* Australian Bureau of Statistics, Canberra, p. 12)

A second significant issue in density analysis is the propensity for commentators to slip from prescriptions of 'required' densities, expressed, as Newman & Kenworthy do, in terms of concentrations of jobs and residents within a defined area, to using these same numbers as a 'necessary' threshold for residential density alone. As Ewing & Cervero (2010) have shown, it is concentration of destinations, including employment locations, rather than concentration of dwellings that most strongly influences travel behaviour.

The focus on residential densities in the transport debate only serves to obscure this need to consolidate 'destinations'. Residential development requires only a small proportion of total urban land, but policies for the consolidation of industrial and commercial land are not part of the current planning agenda, even when this agenda is framed under the rubric of the 'compact city'.

Residential density is, perhaps, more important in creating conditions for higher rates of active transport modes. However, it cannot be seen as a simple recipe for success. As the recent work for the Heart Foundation shows, there are many issues of design and structure that influence travel behaviour at any given density (Udell et al. 2014).

3. Patterns of urbanisation in Australia

Unlike Europe and North America, Australian cities have been suburban from the first. These suburbs grew into the rural hinterlands with the coming of the railways and the trams, and the new movements in international architecture and town-planning of the late 19th and early 20th centuries. After World War II, Australian cities experienced dramatic changes in their form largely due to rapid population and economic growth, investment in housing and the 'emergence of the car as the primary mode of transport' (Australian Government 2010). The share of public transport use fell from 70 per cent after WWII to about 10 per cent of all travel by 1980 (BITRE 2013b). The result was a complete change in the way cities were "planned, funded and managed" (p. 17).

As manufacturing industries burgeoned in the post-World War II period, the major cities gained major new suburban centres for jobs and housing such as Dandenong and Parramatta in Melbourne and Sydney. As with housing, this trend of spatial dispersion was underpinned by growing car ownership and investments in the road networks and car-based retail and service centres. Suburbanisation and greater mobility enabled by the car resulted in increasingly complex commuting and other travel patterns (Rawnsley and Spiller 2012; Stimson 2011).

The sheer pace of suburbanisation (for example the Sydney suburbs of Blacktown and Sutherland increased in population by 589% and 282% respectively between 1949 and 1961) meant that local institutional processes could not keep pace with this suburban growth spurt (Dodson 2012). Infrastructure often lagged behind the development of the subdivision and residents were left with unsealed roads and poor public transport.

The economic liberalisation of 1980s and 1990s saw major contributions to spatial shifts in Australia's cities. Policies such as import tariff reductions, financial deregulation, the rationalisation and/or privatisation of former government instrumentalities as well as greater international competition and knowledge-intensive, service-based industries producing a greater share of national production led to the relative decline of manufacturing (Stimson 2011). Manufacturing industries with a large presence in the suburbs employed increasingly fewer people and important concentrations of knowledge sector jobs in fields such as finance and business formed in central areas. Coupled with a 're-discovery' of inner-suburbs, through a process of gentrification, this led to increasing activity in formerly moribund central business districts (CBDs) and surrounding areas (Scott 2011; Stimson 2011). Locating these knowledge-sector jobs centrally allowed firms to attract the largest pool of high-skilled workers, facilitated by the rail and road networks which made these centres highly accessible compared to other locations in the wider metropolitan area (Department of Transport 2012).

These centralised employment markets are prized as the 'wealth generators' of Australian cities:

> The combined central business districts of Sydney and Melbourne alone – 7.1 square kilometres – generate nearly 10% of the value of goods and services produced in all of Australia, three times that produced by the agricultural sector (Kelly et al. 2014).

Despite this, employment in Australian cities is largely located in the suburbs. Even in the cities with the largest centralised employment markets (Sydney, Adelaide and Hobart), only around 20% of jobs are located in the CBD and surrounding locations (Stone and Mees 2011); and in Brisbane, the city with the most dispersed job market, only 13% of employment is found in the centre.

Many of the large employment markets that are strongly represented in the suburbs of Australian cities grew strongly in the decade to 2011. Among these, 'health and social assistance' and 'education and training' grew by 44% and 37% respectively, against an overall growth of 26% in total job numbers.

In most cities, planning policies to encourage the location of employment in suburban district centres have been part of metropolitan strategies since the 1950s, but only in Sydney have these been applied with any consistency, and even there, with only limited success. And, in Melbourne, the compact-city orientation of the 'transport and land-use integration' doctrine was turned on its head in the 1990s,

when the ... Plan adopted this phrase to describe the development of road-based logistics employment nodes along a planned orbital freeway. And, the past creation of car-oriented employment clusters at Monash and Chadstone continue today with plans for the East Werribee Employment Precinct (www.mpa.vic.gov.au/east_werribee) at a location 25 km from the CBD and with no rapid transit connections.

Many authors (Burke and Stone 2014; Currie et al. 2007; Dodson and Sipe 2008; Rawnsley and Spiller 2012) have noted the negative impacts of Australia's pattern of suburbanisation on housing and employment choice and wider measures of social equity. Changes in housing affordability have meant that potential home buyers with average incomes are being compelled to move further and further away from the CBD and, consequently, employment opportunities diminish (Rawnsley and Spiller 2012). The result is high levels of 'oil and mortgage vulnerability' and steadily increasing spatial inequity in Australian cities.

Travel patterns and mode choices in Australian cities since the 1950s might be seen as an inevitable consequence of these changes in urban form and structure, however, few governments or transport authorities made any real attempts to create new public transport services to meet the new demands, or to locate jobs and services around transport nodes.

4. Travel patterns in Australian cities

Passenger travel in all Australian capital cities, in both private vehicles and by public transport, increased nine-fold between 1945 and 2010 (BITRE 2013b). This increase can largely be attributed to increased car use. In 2013, private vehicles accounted for about 169 billion passenger kilometres across the eight capital cities which equates to 89.6% of motorised travel (BITRE 2013c). In this section, we consider three types of journeys that are contributing to increased car use in our major cities: journey to work, weekend travel and chauffeuring (giving lifts to dependents).

4.1 Journey to work

While journey to work data is becoming less important for transport planning purposes due to growth in travel for other purposes (Banister and Berechman 2000), it provides the basis for insight into travel trends in Australia's major cities. Journey to work data is important for two reasons: "work journeys are longer than other trips, and are more concentrated in time, so they are the major factor behind peak-hour traffic volumes" and "there is much better data available for this kind of trip than for others" (Mees et al. 2008). By way of illustrating Mees' first point, the table below (reproduced from BITRE 2013c) contains a breakdown of public transport use for the journey to work as opposed to over the whole day.

Table 1: Commute and all-day mode share estimates for urban mass transit, 2011

Task	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra	8 capitals
Mass transit commute share (% of motorised JTW trips)	24.9	17.5	15.8	10.4	13.6	7.1	5.6	8.4	17.9
Mass transit all-day share (% of all motorised pkm)	13.6	11.0	8.6	6.1	7.1	3.6	6.0	4.3	10.3

Note: 'Mass transit all-day share' values include specific allowances for *all* bus travel pkm (on both route and private buses).
Sources: ABS (2012), BITRE (2014) and BITRE estimates (see Table 6).

Mees and Groenhart (2012a) made an extensive study of the JTW data from the answers to questions on mode choice from the Australian Census, 1976 to 2011. All data in the following section is taken from that work.

Between 1976 and 1996 there was a massive increase in car use in all Australian cities for the journey to work, as illustrated below.

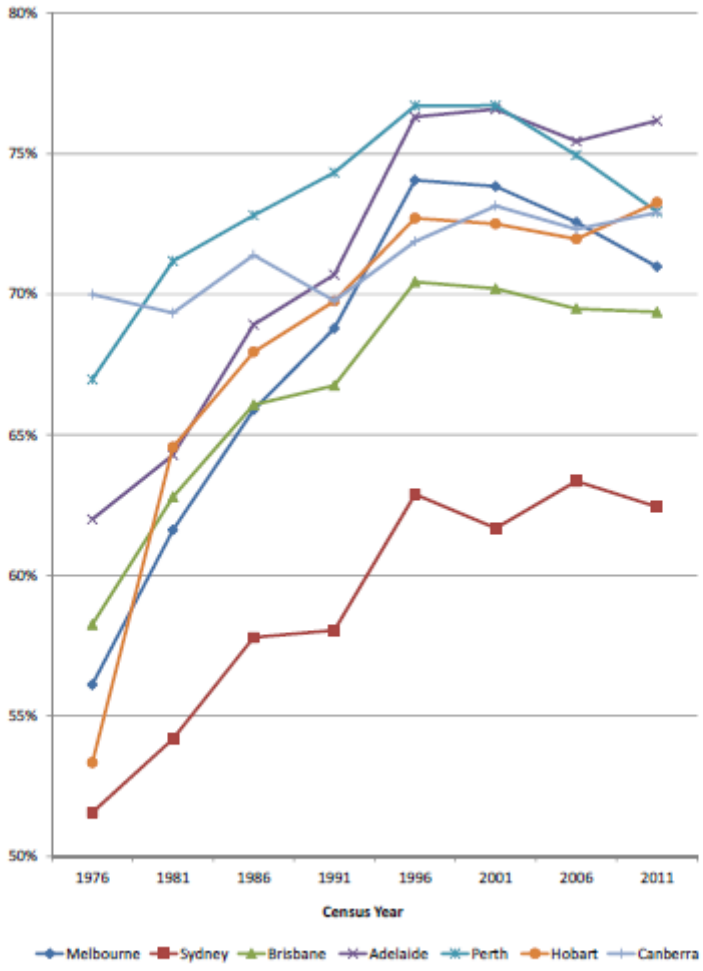


Figure 2: **Mode share for car drivers**

Since 1996, car use has declined for Melbourne, Perth and Brisbane. It has remained constant for Adelaide, Canberra and Sydney, and increased for Adelaide and Hobart.

During the same period public transport use declined dramatically in all cities and showed signs of recovery after 1996.

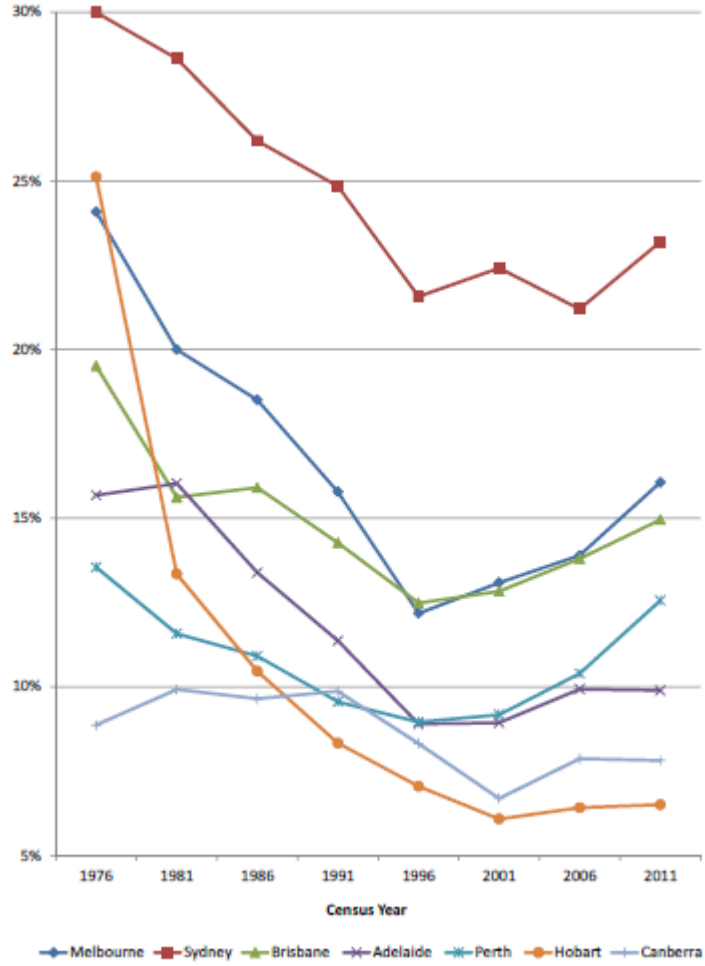


Figure 4: Mode share for public transport (all types)

The largest increases in public transport use since the 1996 can be seen in Melbourne and Perth where use has almost returned to the 1976 level. The smaller cities (Hobart, Canberra and Adelaide) showed small increases which levelled off after 2006. Brisbane and Sydney showed more modest increases, but Sydney still has the highest use of public transport of any of the capital cities by a wide margin.

Reasons posited in the literature for these changes include demographic changes such as growth in CBD employment and inner-city gentrification, rising petrol prices and growing environmental awareness, and in Melbourne, at least, government analysts accept that most new passengers were coming to the public transport for reasons external to the management of the system itself (Gaymer and Kinnear 2009)

Walking, in the journey to work, is three times as popular as cycling in Australia's capital cities. Between 1996 and 2006, walking as a journey to work mode increased in all cities and particularly in Hobart as illustrated below (p. 17). However, between 2006 and 2011 there has been no increase or a decrease in all cities except Perth (0.1% increase) although all still have rates of walking above their 1996 level (p. 17).

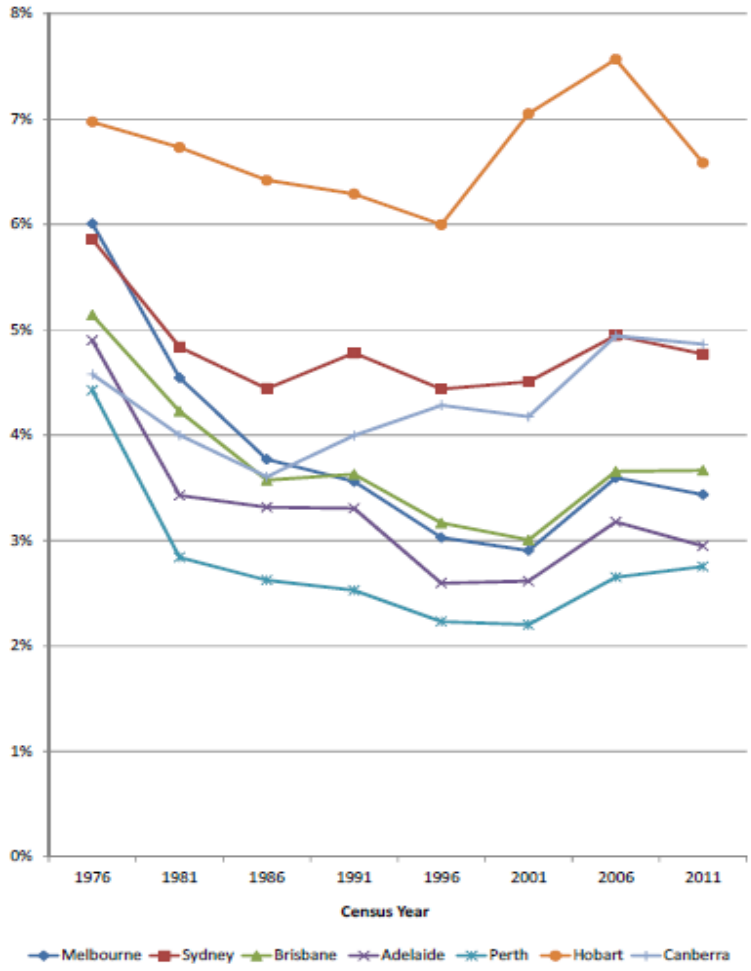


***Figure 7*: Mode share for walking**

The decline in walking since 2006 is surprising given the increase in population in inner-city areas between 2006 and 2011. Mees and Groenhart attribute this decrease to construction of inner-city precincts such as Docklands and Southbank in Melbourne or the New Acton development in Canberra which provide "poor environments for pedestrians, with wide arterial roads and major barriers to movement on foot".

Cycling began from a low base in 1976 and, although it has steadily increased in all cities, except Adelaide, it still accounts for less than 2% of journeys to work in all cities except Canberra. Since 1996, Sydney, Melbourne, Brisbane and Perth have seen slight increases in cycling as a mode of transport to work while Hobart has experienced a slight decline. In 1976, Adelaide had levels of cycling over 2% but this declined sharply between 1991 and 1996 and despite a slight increase in 2006 is now just over 1%. As these figures show, while there is great enthusiasm for cycling as a mode of transport, it accounts for a tiny proportion of all work trips.

Greater average distances between home and work and compulsory helmet legislation have been suggested as explanations for the fall in 'blue-collar' cycling for work trips. The increase in cycling since 1996 can also be attributed to higher inner-city populations, more employment in the inner city, and an improvement in cycling infrastructure.

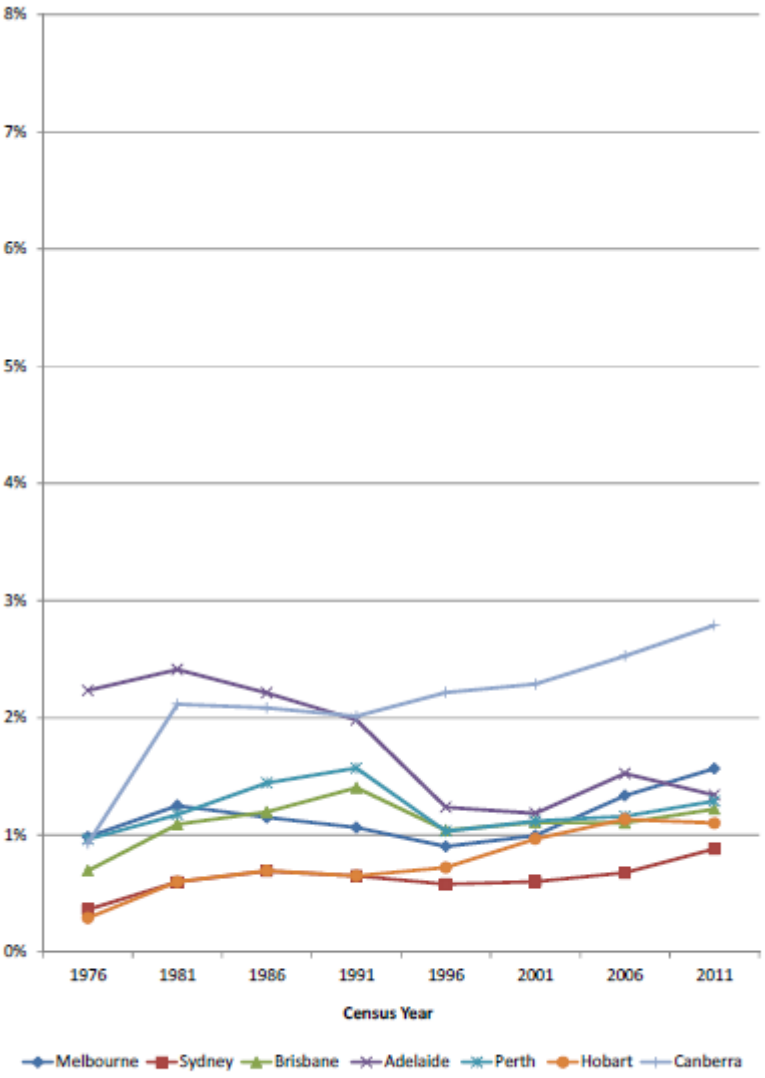


***Figure 8*: Mode share for cycling**

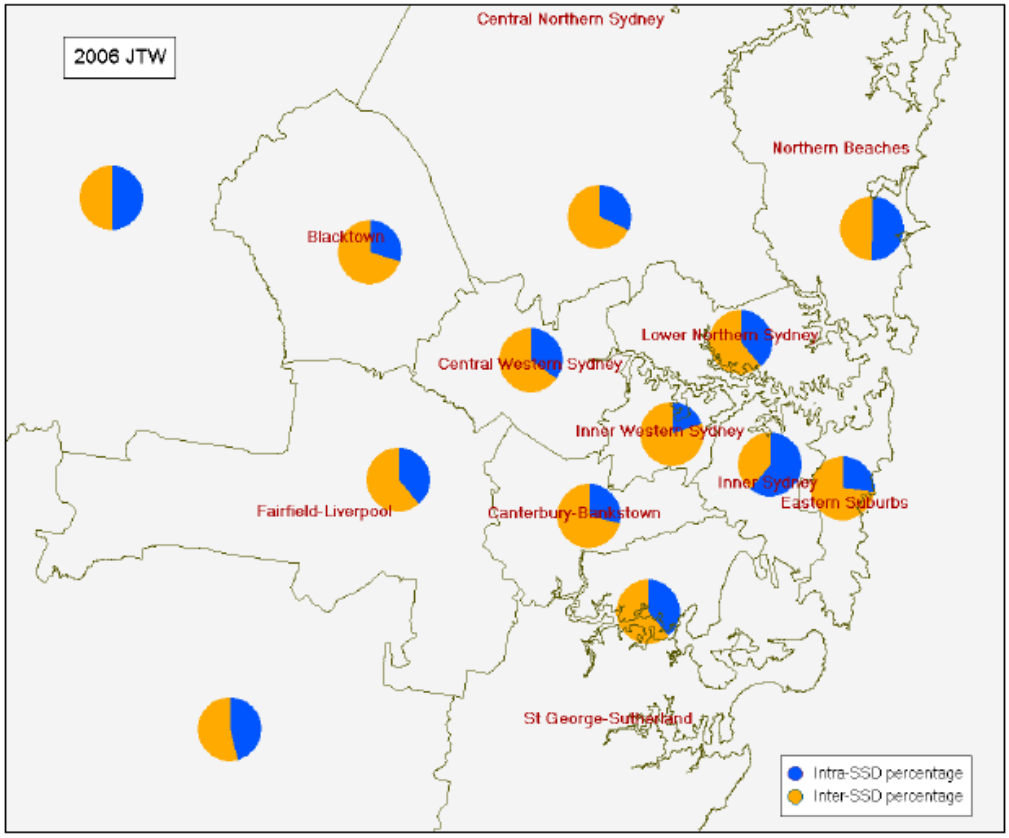
4.2 Mode choice by destination for the JTW

In addition to questions on mode choice for the journey to work, the Census also gathers information on destinations. These are reported on an aggregated basis, and provide some interesting data.

At the 2006 Census, only 14% of all journeys to work in Sydney had destinations in the CBD, and 47% of these journeys were made by public transport. Work trips to regional centres (Liverpool, Parramatta, Penrith etc.) made up 15% of the total, but, of these, only 32% were by public transport (Xu and Millthorpe 2010).

Overall, between a third and a half of all work trips in Sydney have a local destination: the blue parts of the circles on the map below represent intra-regional work trips. Most of these trips are made by car.

Figure 12: 2006 Inter-region and intra-regional trip percentage



A similar pattern is apparent in the 2011 Census data for Melbourne. There were around 91,000 daily work trips to the CBD destination zone from the outer-ring suburbs, of which around 43% were made by public transport. And, of the 213,000 work trips with destinations inside the home zone in the outer suburbs, only 2.55 were made by public transport (Karanfilovski 2013). (p. 83)(p. 83)(p. 83)(p. 83)(p.

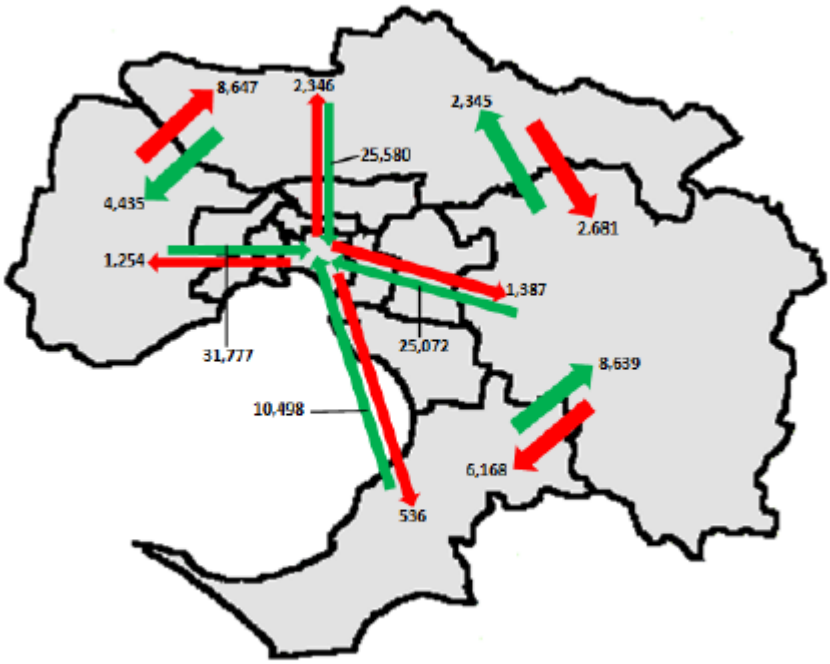


Figure 6.13: The JTW patterns between the Outer Region Destination Zones to the Inner City Destination Zone for all transport modes.

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4.3 Mode choice by age

The reasons for individual mode choice are complex, however, there is emerging worldwide data of new choices being made by young people. This is discussed in more detail in section 2.2.1.

Recent ABS data shows that 63 per cent of young adults (18-24 years) drive to work or full-time study, while 78 per cent of 55-64 year olds drive to work (ABS 2013c). This is to be expected given disparities in income and access to a vehicle; however, younger people in developed nations are increasingly less likely to acquire a driving licence: rates of decline are around 0.6 per cent p.a., and are highest in Australia (Delbosc and Currie 2013).

Among the growing population of older Australians, it is reasonable to expect continuing high levels of car dependency (Buys et al. 2012). However, travel choices in the future will depend greatly on the options that are made available.

4.4 Chauffeuring

Chauffeuring is "additional automobile travel specifically to carry a passenger" (Litman 2014). Such trips often require an empty return trip, in which case, the car occupancy rate can fall as low as 0.5.

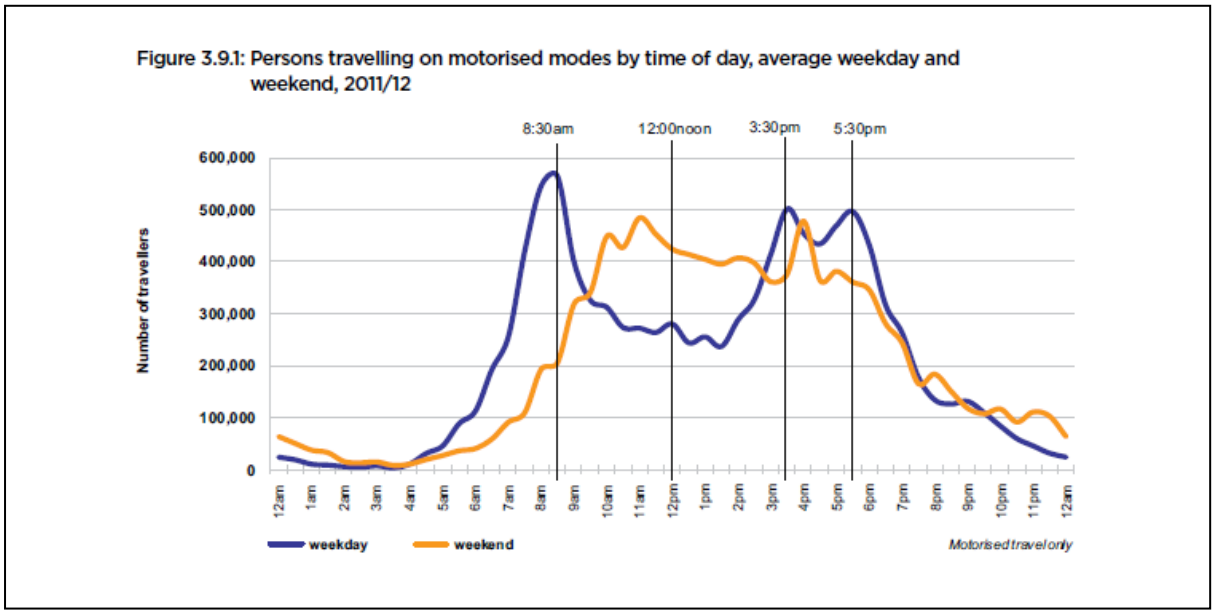
Data from the 2011/12 Sydney household travel Survey shows that the purpose of 18 per cent of all trips (and 13 per cent of vehicle-km) on an average weekday was to 'serve the passenger' (BTS 2013). A further 9% of trips were recorded as having a purpose of 'education/childcare'.

In the past decade or more, there has been a significant increase in chauffeuring, particularly for taking children to school (Carver et al. 2013). In Melbourne, Loader (2011) used the 2007/08 VISTA travel survey data to show that approximately 40% of car trips between 8am and 9am and 3pm and 4pm are to drop off or pick up school children. The Heart Foundation has reported that more than 60 per cent of children are driven to and from school, a dramatic turnaround from the 1970 level of 16 per cent (Moore 2012). The median distances driven between home and school were 2.9 km in urban areas and 4.7 km in rural locations, while 1.6km was found to be a distance that parents considered walkable (Carver et al. 2013). More than half of the students surveyed did not attend the school closest to them because their parents preferred to send them elsewhere(p. 75). The main reason why parents drove their children to and from school was the school was too far away (47%) followed by concern about traffic danger (45%), and the need to go on to another activity after school pickup (33%)(p. 74).

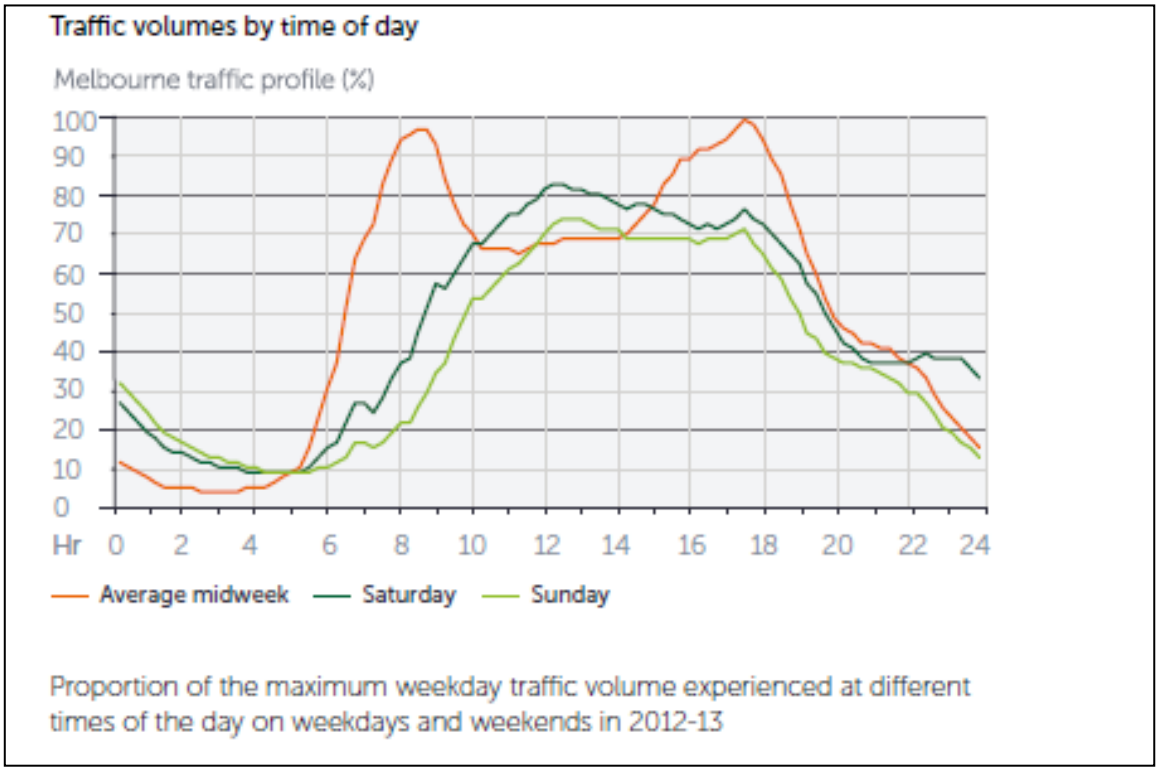
Providing lifts to elderly relatives and friends also forms part of the chauffeuring equation. While literature on this subject is scarce, an RACV study of people over 65 found that 85% of those surveyed had relied on lifts from others to get around (RACV 2006). Buses were available to most of the respondents, but only 45% used them(p. 5). Sixty-two per cent had access to trains, but these were used by only 22% of respondents.

4.5 Weekend travel

Data from the *NSW Bureau of Transport Statistics* and *VicRoads* has shown that weekend travel is now becoming an important factor in travel in Sydney and Melbourne. On Sydney roads, there was a 13.9% increase in average weekend travel between 2001 and 2011 (BTS 2013). The graph below compares weekend and weekday motorised travel in Sydney in 2011/12: the 'weekend peak', while less than the weekday peak, is long-lasting and of the same order as the PM peak on weekdays (p. 24).



A similar picture is evident in Melbourne, as illustrated below, where the weekend peak starts at approximately 10.30am and ends about 5.30pm (VicRoads 2014).



The 'weekend peak', while not as high as the busiest peak period on weekdays, is consistently high and busier than the non-peak periods on weekdays (p. 23).

The purpose of 90% of weekend travel (90%) is shopping and social/recreational activities including shopping (Moriarty and Honnery 2013). Several factors were cited as reasons for people using their car for weekend travel. These included complexity of the range of activities to be undertaken, as well as the greater affluence which has led to more car ownership, and the availability of cheap fuel by way of employer contributions to petrol costs meaning that people could move themselves and their families more cheaply by car than by other means(p. 803).

4.6 Trip lengths and distances travelled

The average Australian metropolitan trip length for all purposes and by any form of transport has increased is just under 7.5 km in 2013, and the average trip length on all modes of public transport is 11.5 km (BITRE 2013a)..

Aggregate metropolitan passenger kilometres on public transport increased by close to 30 per cent between 2004 and 2013, a rate almost five times that of the increase in car travel (BITRE 2013c). Just over half of this growth in public transport use can be attributed to underlying population growth.

The BITRE reports argue that 'saturating tendencies' (such as congestion, time available to travel, cost, etc.) are evident in the amount of daily travel that people will undertake in Australian cities and this will lead to lower growth in aggregate travel compared with long-term historical trends (p. 5).

4.7 Forecast trends for transport use

BITRE has forecast that between 2011 and 2030 the total urban public transport passenger task will grow from 19.71 billion to 25.34 billion passenger-km: a growth rate of 1.33% per annum (BITRE 2013b). On this reckoning, the share of travel to be undertaken by public transport will decline from 11.1% in 2011 to 10.6% on 2030.

This analysis is largely based on a business-as-usual outlook as evidenced by their sensitivity analysis. The only factors considered were high and low petrol prices, high public transport fares and ongoing effects from the Global Financial Crisis (GFC). High fares were found to have the greatest negative impact on public transport use with a decrease in use of 7.7%, while high petrol prices and ongoing effects of the GFC would have a negative impact of approximately 1%. However, no other public transport variables, such as increased frequency, connectivity or travel time advantages over increasingly congested car-based travel, were considered.

Traditional transport modelling tools and methodologies, as used by BITRE in this case, consistently under-estimate the potential use of public transport under alternative transport and land-use policy packages, such as those described in the main body of our report. In light of the many local and international critiques of traditional techniques (for example, Evans et al. 2007), new assessment tools are being developed to better understand the impacts on accessibility of different scenarios for public transport supply (Curtis and Scheurer forthcoming, 2010).

Part 3: Behavioural factors as barriers and pathways in Australian transport decisions

"The humblest person is king in his own car" - or, what do people *really* like about driving cars, and might this change?

1. Introduction: Transport barriers as both rational and rationalised

Although it is valued for the sense of personal autonomy offered, transportation by private car is ultimately dependent on at least two things: one, for there not to be too many other cars around (congestion); and two, for there to be car parking space available at origin and destination. In a more general sense cars require (advertisements for four wheel drives excepted) places to be navigable for them: appropriately engineered roads and land uses arranged around these. Australia has extensive post-war car-oriented urban development, and has succeeded (not without conflict) in reconfiguring many older inner urban areas to accommodate continued growth in car ownership and use (Davison 2004).

The popularity of cars and their centrality to Australian transport is however at least one part of why the requirements for them to function as promised are seen as frustrated by Australian cities. The 2014 ITLS survey for example reported that 29% of Australians said transport in their local area was worse now than one year ago, up from 24% in the September 2013 quarter. The RACV recently critiqued the amount of time spent immobile by drivers in Melbourne car traffic congestion ("Melbourne congestion leaves drivers at a standstill for as much as 40 minutes in peak hour", Herald Sun, October 18th 2014). A 2007 BITRE report estimated the 'avoidable' cost of congestion for Australian capital cites totalled approximately $9.4 billion for 2005, with both congestion levels and costs rising strongly. Traffic congestion, in Sydney and Melbourne, is now as thick on weekend mornings as in the traditional weekday peak hours. Fear of competition for parking space is a major factor in planning conflict over intensifying cities (Taylor 2014). Even in areas served by public transport, and for trips (most noticeably of children to school) taken by other transport modes until comparatively recently, conflict over road and parking space is common – for example in competition between tram space and school parking spaces accompanying accessibility upgrades to Melbourne tram routes.

Comparatively uncritical responses to congestion and transport questions suggest that either more road capacity is needed; or that Australians need to drive slightly less (or at least avoid all driving at the same time). More critical perspectives on the impacts of car-based development identify – but are not limited to - impacts at scales from the personal to the global including health, local liveability, social equity, pollution, and carbon emissions (Gärling and Steg 2007). Potential responses to transport questions include the political favouring of major road projects in ever-elusive efforts to increase capacity (and votes from frustrated drivers); economic perspectives favouring flexible road pricing; transport planning perspectives seeking to facilitate mode shift to public or active transport; and urban planning approaches that seek to encourage denser development to minimise required trips; or to provide walking or cycling infrastructure to encourage active transport modes.

This paper explores available literature and evidence on one factor underlying each of these broad potential responses to Australian transport: *personal decisions*. How and why do Australians choose to drive, or not to drive, private cars? What are the barriers to transport change - and to what extent are environmental constraints (such as the local availability and quality of alternative transport) mediated by individual perceptions? To what extent might subjective, internalised barriers – attitudes, beliefs, habits, norms, preferences, rationalisations – explain recent transport patterns, such as weekend peak hours? Current Prime Minister Tony Abbott echoed the empirical literature on this topic when he claimed that: "*even the humblest person is king in his own car*". A range of studies of travel mode choice (Bamberg 2006; Bamberg and Möser 2007; Bamberg and Schmidt 2003; Bergstad et al. 2011; Cao and Cao 2014; Dill et al. 2014; Featherstone 2004; Gardner and Abraham 2008, 2007; Hagman 2006; Kent 2014; Nixon 2012; Nordfjærn et al. 2014; Steg 2005; Van et al. 2014; Wooliscroft and Ganglmair-Wooliscroft 2014) find that subjective factors frequently outweigh

objective measures in determining travel choices. Frameworks for explaining transport choice include the Theory of Planned Behaviour (comprised of attitudes, norms, and perceived behavioural control); the norm activation model (taking into account pro-environmental beliefs); and affective-symbolic factors such as role identity (the car as a personal symbol).

There is a body of literature specifically on the personal and cultural appeal of the car or 'automobility', including the comfort and privacy offered (Bamberg and Schmidt 2003; Bergstad et al. 2011; Bull 2004; Featherstone 2004; Gardner and Abraham 2008, 2007; Kent 2014; Nixon 2012; Redshaw 2008; Steg 2005). There are also studies of the specific perceptions involved in physically active transport (Dill et al. 2014; Foster et al. 2014a; Handy et al. 2006; McDonald et al. 2014; Pattinson and Whizman 2013; Rodríguez et al. 2006; Saelens et al. 2003; Sherwin et al. 2014; Thakuriah et al. 2012; Wooliscroft and Ganglmair-Wooliscroft 2014); and of the role of risk perception particularly in increasingly restricting the personal mobility of children (Burke et al. 2013; Foster et al. 2014a; McDonald et al. 2014; Morris et al. 2001; Rudner and Malone 2011). Transport is demonstrably about more than what is easier, faster, cheaper or smarter as a way to get around. Institutional decisions over policy and funding for transport and development are also subject to heuristics ('rules of thumb') and biases in judgement.

This paper first sets out literature on external then internalised barriers to transport choices. Much of the recent literature on travel choice emphasises interactions between external (local environment and infrastructure, costs) and internalised factors (beliefs, attitudes, norms, fears, habits, perceptions). The second section of the paper identifies potential pathways to future transport change. This draws on the 'peak car' literature (Delbosc and Currie 2013; Goodwin and Van Dender 2013; Metz 2013) and literature on the economics of car parking; and of residential self-selection (Bagley and Mokhtarian 2002; Guo 2013; Manville 2013; Pierce and Shoup 2013; Shoup and Association 2005; Stubbs 2002) . Pathways for shifting travel choices include changes to car parking policy in areas where parking demand is comparatively elastic. There is also consideration of the emergence of "blurred" technology and innovations between private and public (including car sharing, tech buses and driverless cars); and the market influence of segments of the population (most obviously younger people) who drive less (and sometimes cycle more). Most of these shifts are around the edges of car based transport patterns in Australia, and vary greatly by location. They have potential for conflict, some of which is already visible in Australia. The extent of conflict over perceived loss of free parking is, for example, indicative of how central a role it plays in maintaining travel patterns. The role that planning requirements play in setting minimum parking provisions underscores the need for policy makers to be better engaged with the evidence base on transport behaviours.

2. External barriers to transport choice: utility and cost, local availability, social disadvantage, neighbourhood design

The academic literature offers competing theoretical frameworks through which travel choices are explained. Utilitarian approaches emphasise time and cost to users. Pricing, for example, works on the assumption users will respond to increased travel costs or times by travelling by different routes or modes, or at different times – in the process reducing collective costs of congestion (Beckmann 2013; Tillema et al. 2011; Triantis et al. 2011). Economic approaches to transport are essentially utilitarian in that they may have no inherent interest in changing travel behaviour, but do have an interest in reducing inefficiencies. Studies taking this perspective emphasise Travel Demand Management – pricing and information on road use. Implicitly, transport choices are made based on the time and cost to users, and that decisions can be incentivised accordingly.

Similarly but with a different focus some studies highlight the market distortions created by heavily subsidised road use – including the provision of free parking, a strong determinant of mode share for which users rarely pay fully (Dell'Olio et al. 2012; Marusek 2011; Millard-Ball et al. 2014; Nurul Habib et al. 2012; Pandhe and March 2012; Pierce and Shoup 2013; Shoup and Association 2005). Transport studies sometimes begin with an additional assumption that there is a preference for increasing the mode share of alternative transport (public and active). The field of transport studies is often concerned with improving public transport as a viable quality option, sometimes for its own sake and for reasons of social equity, and sometimes because mode shift improves traffic congestion

(Buehler and Pucher 2012; Gärling and Steg 2007; Pucher 1988; Triantis et al. 2011; Van et al. 2014). Transport studies seek to make alternative transport modes competitive in terms of availability, cost, timeliness, frequency and reliability (Buehler and Pucher 2012; Dell'Olio et al. 2012; Sheuerer and Bell 2013; Tirachini and Hensher 2011).

Travel choices including whether to buy a car, or to use a car for a given trip, are also often constrained by the available options in an area or for a particular journey. An ABS survey on waste management, transport and motor vehicle usage (2012) reports that *not having a service available at all* was one of the main reasons why people did not use public transport in Australia (30%); as well as the *lack of availability of a public transport service at the right or convenient time* (23%). In much of Australia, public transport is not competitive in terms of the time taken, cost, and level of flexibility compared to car-based transport. Thus, utilitarian transport studies have considerable overlap with spatial studies of where there are few viable alternatives to car use – car dependency. Studies including from Australia point to areas in which car use is, in effect, inelastic. Increases in travel prices – most obviously petrol costs – or travel times will not influence transport use but instead increase costs to users, many of whom are already vulnerable to high transport costs (Dodson and Sipe 2007; Motte-Baumvol et al. 2010; Zhao et al. 2013). Spatial disadvantage in travel options is compounded by income – with low income groups, including private renters, sometimes restricted by housing market pressures to areas with poor transport alternatives. Residents of car dependent areas have constrained choices to shift travel mode, and any increase in travel costs (petrol prices) or times (through congestion) will either be paid by them directly or will result in restricted access to employment, education, or other services. Car dependent areas have additional exclusionary effects for people with disabilities (Hine and Mitchell 2001; Rains and Butland 2013).

A further aspect of external determinants of transport choice is urban design and planning. Studies of local infrastructure and design describe how welcoming an environment is, for example, for walking or for public transport connections, with *New Urbanist* design championed as a way of facilitating or promoting more active travel by reducing the physical sense of hostility to pedestrians (Burke et al. 2013; Dill et al. 2014; Handy et al. 2006; Rodríguez et al. 2006; Saelens et al. 2003). Urban planning approaches seek to manage the location of housing, jobs and services in ways that steer efficient transport patterns. The concentration of jobs and services into activity centres is one example – a long standing planning goal which has had limited actual implementation in Australia (Biermann and Martinus 2013; Curtis and James 2004; Curtis and Olaru 2010). More controversial is the suggested relationship between housing density and the feasibility or use of public transport – a claim with longevity, but ongoing debates about the empirical evidence (Dodson 2010). Rickwood and Glazebrook (Rickwood and Glazebrook 2009) emphasised that relationships between planning, density and travel behaviour are complex. Density may sometimes be a proxy for other variations, but is an inadequate explanatory factor in itself.

What the empirical literature does show fairly consistently is that while the built environment has an influence on travel choice, its effects are mediated by other factors. Ewing and Cervero (2010) undertook a meta-analysis of 62 studies of the effect of the built environment on travel behaviour in terms of car kilometres travelled. They found relatively weak associations for individual items, but noted that these effects (density, walkability, job accessibility) would be strong in combination. Although few of the studies they reviewed included attitudes as variables, the review highlighted attitudes and self-selection as potentially being an important determinant of variation in travel patterns. One quantitative study of San Francisco (Bagley and Mokhtarian 2002) found, using structural equation modelling, that there was little direct impact of neighbourhood density or design on travel choice after accounting for differences in the attitudes and socio-demographic characteristics of residents. Dill et al ((Dill et al. 2014) found that positive environmental features only influence walking and cycling when combined with changes to attitudes. Interaction of both is important. An Australian study (Knight 1993) found that positive personal attitudes toward sustainable transport and reduced car use had little influence on travel patterns in locations with poor public transport coverage. Handy et al (Handy et al. 2006) found that New Urbanist design still accounted for increased walking and cycling even after accounting for the differences of attitudes of residents moving into these areas.

2.1 Subjective barriers to travel choices

The availability and quality of transport alternatives, and the design of the built environment, are significant but demonstrably not the only factors determining transport choices. A sizeable body of research suggests that transport and planning policy should anticipate the influence of personal psychological and social factors.

Richer empirical explanations of travel decisions: Attitudes, beliefs, habits, norms

Although transport choice is mediated by available infrastructure and the quality of the built environment; personal attitudes, social norms, beliefs, habits and fears are equally powerful determinants of travel. Much of the literature on travel decisions emphasises *interactions* between external (such as built environment and infrastructure) and internalised subjective drivers. In the extreme, without viable local transport alternatives, personal preferences are largely irrelevant and transport mode choice is inelastic in response to costs or travel times (Zhao et al. 2013). In the other extreme, particularly well deigned infrastructure can change perceptions of how difficult it would be to ride a bicycle (Dill et al. 2014). However, environmental and 'instrumental' (objective) factors are not strictly deterministic. Personal barriers have been consistently shown to mediate instrumental factors in transport.

Personal transport decision-making has been explored through overlapping theoretical frameworks including the Theory of Planned Behaviour (attitudes, norms, and perceived behavioural control); affective-symbolic factors (the car as a symbol); the force of habit and of heuristics in human judgement; and in terms of cultural and political norms. The Theory of Planned Behaviour (TPB), as developed by Ajzen (1991), proposes that:

Intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour.

The Theory of Planned Behaviour has been a widely applied psychological framework for predicting "pro-environmental" behaviour including transport choice. TPB comprises attitudes ("do I like riding a bike?"), subjective norms ("does my family think I should ride a bike?"), and perceived behavioural control ("do I know where to ride safely?", "do I have time to ride?"). Pro-environmental behaviour including travel choice have also been viewed through a framework of moral norm activation (Schwartz 1977). Some people engage in behaviour because of personal moral feelings that it is the 'right thing to do' (Bamberg and Möser 2007).

Gardner and Abraham (2008) in a review of 23 studies applying TPB to car use, found the framework to be strongly predictive of travel behaviour. Consistently, attitudes and perceived behavioural control are important in predicting car driving, and more important than are social or moral norms. Bamberg and Moser (2007) in a meta analysis reviewed 57 studies applying TPB to pro environmental behaviour including transport mode choice, and found that attitudes and perceived behavioural control are important, along with personal moral norms. Studies of public transport increasingly recognise "behaviourally richer representations" of factors including reliability, risk perception, and crowding in public transport (Hensher et al. 2013). Dill et al (2014) examined 15 studies on the effects of behavioural frameworks such as TPB on active transport choice, in combination with the environment and infrastructure, and found that attitudes and perceived behavioural control are significant as barriers to take up of active transport particularly for older people and for women.

Affective-symbolic studies approaches to travel choice compare symbolic role of transport to instrumental determinants. These illustrate the effects of desire and social symbolism, usually in terms of driving cars (Bergstad et al. 2011; Lois and López-Sáez 2009; Steg 2005; Van et al. 2014); but sometimes for cycling (Sherwin et al. 2014). Affective symbolic factors have been found to vary by country (Van et al. 2014), and by demographics and associated role identities. For young males in particular, car ownership and use has been shown to function as a symbol of identity, power and freedom. This influences driving levels as well as styles (Bamberg and Schmidt 2003; Bergstad et al. 2011; Redshaw 2008) Redshaw (Redshaw 2008) explored car culture and car related traffic risks in

Australia as having distinct patterns for young men. Steg (Steg 2005) identified the sexual appeal of cars ("lust") as a determinant of car use above instrumental ("must") factors.

Habit and inertia are also predictors of travel. A meta analysis of 23 studies of car use found strong support for the theory of planned behaviour, combined with habit (Gardner and Abraham 2008). Bamberg and Schmidt (2003) explored the predictive power of different models of transport choice – morality, incentives, or habit. They found that habit – already using a car – combined with the attitudes, beliefs and perceived behavioural control predict car use. Personal moral norms had limited effect. A study of Norway similarly found that the theory of planned behaviour, car habit and resistance to change explained transport use and use of public transport (Nordfjærn et al. 2014). Bamberg (2006) demonstrated that people will use public transport more if they are presented with information shortly after moving house. This exploits the theory of planned behaviour – the options seem less difficult if habits are less entrenched. This effect, however, interacts with the objective quality of public transport available.

Cars specifically – comfort, control, and the promise of 'automobility'

A body of literature looks specifically on the personal and cultural appeal of the car - including its promise of power and freedom; and the comfort and privacy offered (Bamberg and Schmidt 2003; Bergstad et al. 2011; Bull 2004; Featherstone 2004; Gardner and Abraham 2008, 2007; Kent 2014; Nixon 2012; Redshaw 2008; Steg 2005). Current Prime Minister Tony Abbott echoed the empirical literature on this topic when he claimed that: "*even the humblest person is king in his own car*". Australian cities have a strong history of cultural associations catering for the freedoms of cars in urban areas (Davison 2004): often, the car is the easier choice because urban areas have been designed to facilitate this impression. However studies also show that many people choose to drive a car even when it takes longer or costs more money (Bamberg and Schmidt 2003; Bull 2004; Featherstone 2004; Gardner and Abraham 2007; Kent 2014; Knight 1993). The sense of privacy, comfort and control of the car are frequently shown to outweigh the more utilitarian factors that transport planners may assume will prompt travel decisions.

Being urged to drive less as a solution to social or environmental problems has very little impact on behaviour (Kent 2013). Understanding why cars are the preferred or default choice may also accord with the vaguely transport related words of another, now late, Australian Prime Minister (Gough Whitlam) who quipped that: *"the punters know that the horse named Morality rarely gets past the post, whereas the nag named Self-interest always runs a good race"*. There are multiple theoretical frameworks applied to how and why transport decisions are made. A commonality between most of them - classical economics, the economics of heuristics and biases, and the majority of the literature on behavioural and transport choice – is that what someone 'ought' to do is of all but no consequence. Only a very small portion of people feel a compulsion to act in what they see as environmentally responsible ways (Bamberg and Möser 2007; Knight 1993). Most transport decisions seem to be based on what people want – including what they think other people will want from them, and (through the effects of marketing) wants that are sold by association.

Echoing this literature, the ABS survey on waste management, transport and motor vehicle usage (2012) found that other reasons for not using public transport included a *preference for the convenience, comfort and privacy of a private motor vehicle* (26%). At least one recent Sydney study (Kent 2013, 2014); as well as European, North American and other research (Bamberg and Schmidt 2003; Featherstone 2004; Gardner and Abraham 2008, 2007; Hagman 2006; Redshaw 2008; Steg 2005; Van et al. 2014); regular car drivers concede that they would rather drive a car even if it took longer or cost them more money. A meta analysis of 23 studies of car use found strong support for the theory of planned behaviour (attitudes and perceived behavioural control), combined with habit (Gardner and Abraham 2007).

Kent (Kent 2013, 2014) identified people in Sydney for whom their journey to work would be faster by public transport or walking, but who drove to work. When interviewed, the drivers were asked why those chose to drive to work – and replied, incorrectly, that it was quicker. Rather than being strictly about time, that study and the broader literature on automobility indicates cars functions more as extensions of the home or body than as a form of transportation (Bull 2004; Featherstone 2004). The

preference for a private vehicle is based on factors including privacy and personal space, climate control, acoustic privacy, flexibility, and social status. For some, time in the car functions as work, personal, family, or communication time (Bull 2004; Laurier 2004; Nixon 2012; Price and Matthews 2013) and this control of time and space is valued rather than considered a loss. There are also affective-symbolic studies of car use (Steg 2005): cars as symbolic value particularly for certain demographics (young males). For another demographic group, women with children, a major factor in driving is complex trips and errands, for which the car is felt to offer the greatest convenience and control (Jain et al. 2011; Price and Matthews 2013). Hagman (2006) describes the deep appeal of private car travel, again emphasising control over, rather than loss of, time:

The image of cars extending one's radius speed and freedom of movement is also deeply rooted in the minds of car users. When asked what is good about the car, most a car users answer that it saves time and provides flexibility…with a car you are 'free to rule your own time'. (Hagman 2006)

In an everyday sense high levels of car use are facilitated by personal rationalisation. A recent Australian book exploring "car culture" (Redshaw 2008) suggests that the allure of what cars can do in ideal circumstances blinds them to their faults in other situations. The level of deaths from traffic accidents (1.2 million worldwide per year) is also sometimes given as an example of the collective normalisation of the costs of car use (Featherstone 2004). At the personal level, transport costs are also often mental constructs (Glazebrook 2009). For example a study of commuters in the UK revealed:

Misconceptions regarding journey times and control in relation to car and public transport use, systematic underestimation of car-related monetary costs, and the importance of self- and identity-relevant consequences in relation to transport policy acceptance. (Gardner and Abraham 2008).

Including a Melbourne study (Pandhe & March 2012), often the only reason why people will *not* drive or own a car is a lack of free parking (Guo 2013; Guo and Ren 2013; Hagman 2006; McDonnell et al. 2010; Nurul Habib et al. 2012; Pandhe and March 2012; Shoup and Association 2005; Stubbs 2002; Taylor 2014). Although politically contentious, time spent in traffic has comparatively little deterrent effect on either residential or travel choices as compared to parking (Hagman 2006). As well as pull factors to cars, push factors operate, based on qualities of public transport or fear of active transport. Although varying by country, desire for car travel is increased by fear of encountering strangers, crowds and hostile or dirty environments outside of cars (Van et al. 2014).

Car as bubble wrap – the role of risk perception in deterring alternative transport

Fear and risk perception are important barriers to transport decisions, particularly for demographic groups thought of as vulnerable. Research has explored the specific perceptions involved in taking up physically active transport (Foster et al. 2014a; McDonald et al. 2014; Pattinson and Whizman 2013; Saelens et al. 2003; Wooliscroft and Ganglmair-Wooliscroft 2014); and of the role of risk perception in increasing restrictions on the personal mobility of children (Burke et al. 2013; Foster et al. 2014b; Malone 2007; McDonald et al. 2014; Morris et al. 2001; Rudner and Malone 2011). Fear of traffic and fear of violent crime are the two main reasons given for increasingly driving children to school rather than allowing them to walk, cycle or take public transport. Fear of crime also influences women's use of public space and public transport (Dill et al. 2014; Koskela 1997; Levy 2013).

Independent mobility (that is, not being driven by car) to school by children has declined markedly in Australia over recent decades (Burke et al. 2013; Morris et al. 2001). Around 75%, and as high as 91%, of school journeys are now made by car. This reflects trends in some other developed countries - in the UK, the proportion of 7-8 year olds allowed to travel home from school on their own dropped from 80% in 1971 to 9% in 1990 and 6% in 2010 (Foster et al. 2014b). Transport by car to school accounted in 2001 in Melbourne, for 81% of trips to school (Morris et al. 2001). Chauffeuring of children in Australia has been attributed to:

Broader societal forces, including changing lifestyles and community perceptions of the levels of personal security in in present day society (Morris et al. 2001).

There have been corresponding increases in car trips on weekends and at peak hours. Such patterns are also a product of increasing car use by women balancing work and family commitments. (Jain et al. 2011; Price and Matthews 2013). Morris et al (2001) cited a 1999 Victorian Travel and Activity Survey (VATS) (not since updated) figure that children being driven to school accounted for 17 per cent of all morning rush hour (8:30 to 9:00am) car traffic in Melbourne. Given that interview data suggests school driving levels are likely to have increased, these trips represent a significant proportion of current road traffic and congestion (as well as, more broadly, raising concerns around health and development).

The rapid decrease in children's independent mobility illustrates the combined effects of local environment changes, changing social contexts, and changing social ideas of risk. Supportive design – footpaths and trails, connected streets, low traffic streets - is considered an important facilitator of active transport by children, but is not determinist given that mobility by children is so strongly mediated by parental attitudes. An Australian study compared children's travel for primary schools in Rockhampton, Brisbane, Melbourne and Perth, comparing features of new Urbanist design such as pathways. They found that having a walkable built environment had some positive impact on children walking and cycling, but could be cancelled out by parental attitudes and time commitments. The highest walking rates were in inner Melbourne, rather than new Urbanist suburban developments. That study also found that increasing school catchment size limited children's walking to school. Like Burke et al (2013), Morris et al (2001) also found that increasing distances to schools in Australia have increased the propensity for chauffeuring of children. Also important is the 'business' of parents – reinforcing broader transport and development patterns, the longer the parents' journey to work (particularly if longer than 30 minutes), the more likely parents were to drive their children to work:

Where parents have a large part of their day taken up with work, voluntary work or simply travelling to and from work, this coupled with their unwillingness to permit children to travel independent of an adult, may simply mean it is easier to drive the child to school regardless of suburban design. (Burke et al. 2013)

The other significant contributor to children being driven to school is fear of abduction or sexual attack, an influence worsened by growing awareness of sexual crimes against children and by reduced social trust. Fear of crime and of strangers increases the odds of parents restricting children's mobility, particularly for girls (Foster et al. 2014b). The perception of risk is a product both of actual incidence, and of subjective and cultural assessments of the implications. Response to risk is both 'rational' and 'experiential' – that is, emotional (Slovic et al. 2004). Responding to emotional and intuitive judgements, people consistently overstate catastrophic risks and underestimate actual hazards (Kahneman 2012; Slovic et al. 2004). Over 90% of sex offences against children occur in the victim's own home and are perpetuated by someone known to them: thus the comparative risk of attack by 'stranger danger' (the "10 per cent") is dwarfed by the actual risk profile of offences (Tekle-Johnson 2009). There is considerable disparity between exposure to risk and how risk is perceived and responded to through social and legal norms.

Targeted attitude programs and supportive infrastructure to increase the perception of safety have had some success in changing travel patterns. In the US the "Safe Routes to School" highlights the combined importance of traffic safety and parental perceptions in shaping travel to school, with significant increases in independent mobility around schools running the program (McDonald et al. 2014). A Melbourne longitudinal study found that passive road safety interventions may promote active transport for younger children, particularly girls (Carver et al. 2010; Morris et al. 2001). In Japan, a policy since post war period has facilitated walking to school through designated routes, and public safety programs tailored by each school. Japan's high rate of children walking to school is also attributed to the country's low crime rate, and possibly to higher rates of stay at home parents (Mori and Armada 2011). German and Swiss cities also have high rates of children's independent mobility, with around 70% of Swiss children walking or cycling to school. This has been attributed to lower fear of traffic and of strangers; combined with supportive pedestrian environments and active travel programs (Grize et al. 2010)

Rates of cycling and walking are also mediated by fear and risk perception. Women have been shown to be less likely to cycle, for reasons of fear of traffic and crime, and lack of confidence or perceived social support (Dill et al. 2014). In Australia, the main barrier to more cycling is fear of injury from car traffic. Some literature suggests that this fear is little alleviated by the provision of on-road cycle lanes (Pattinson and Whizman 2013). Similarly in New Zealand, Wooliscroft et al (Wooliscroft and Ganglmair-Wooliscroft 2014) found that fear of car drivers was the main deterrent to cycling, and that cycle lanes in themselves have little impact on willingness to cycle. A regression analysis study of active transport in Portland Oregon (Dill et al. 2014) found that the general built environment – flat, low-traffic streets – favourably predicted bicycle use, but not bike lanes. They argued that while important, adding bicycle infrastructure to "an otherwise poor cycling environment" has limited effect.

2.2 Pathways to sustainable transport futures

Transport preferences and choices are not static. Major changes that have occurred have done so in the absence of changes in policy or infrastructure, for example the increase in driving of Australian children to school. As well as highlighting the importance of behavioural factors as barriers in transport, this implies that patterns may be fluid in response to changing social attitudes and norms in future. Stressors now occurring in Australian cities mean that transport behaviours are already changing.

This could lead to opportunities for new policies, and for new politics of conflict. This section identifies potential pathways to future transport changes in Australia. It considers the 'peak car' literature; as well as evidence of the effects of relaxing minimum car parking requirements particularly in more accessible areas. It also considers the emergence of new technologies and innovations around flexible transport; and of the effectiveness of 'soft marketing' in unlocking travel behaviour. Tension around change, some of which is already visible in Australian areas, underscores the need for policy makers to be better engaged with the evidence base on transport behaviours.

'Peak car' – demographic shifts in car use

The 'peak car' literature (Goodwin and Van Dender 2013; Headicar 2013; Kuhnimhof et al. 2013; Le Vine et al. 2013; Metz 2013) indicates that car use is tapering off in younger people. Younger people in developed nations are increasingly less likely to acquire a driving license. Delbosc and Currie (Delbosc and Currie 2013) reviewed evidence from 9 countries in which licensing declines are around 0.6% per year, and highest in Australia. They tested for several explanations – including attitudinal differences, location, technology - but found no strong causal evidence. The stronger causal evidence was for changing life cycle stages, and for the declining affordability of cars. Although the empirical evidence is not strong, there is a common suggestion that younger people are driving less as a result of changing attitudes and social norms in which technology is more important than car use in maintaining social connections (E.g. The Atlantic City - "Millennials Love Transit Most, Boomers Still Stuck on Cars"). Most of the peak car literature is about the prospect and the implications of new ideas of mobility; or on specific statistics of reduced car ownership and use by country. There is limited empirical evidence of reasons for the shift.

Headicar (Headicar 2013) used National Travel Survey Data for the UK found that car use had declined in the UK and argued that the increasing concentration of population growth into London and other denser cities has been associated with changing population profiles and reduced car use in those areas. In London, per capita car usage has declined since the 1990s. Kuhnimhof et al (Kuhnimhof et al. 2013) reviewed evidence of decline in car usage in several countries since the 1990s. Car usage had long growth period then a tail-off since the mid 1990s. They explore several explanations but highlight the importance of declining rates of car use by young adults. In some countries (Germany and the UK) shifts to other travel modes played a significant role. In another study (Kuhnimhof et al. 2012) declines in car ownership and licensing specifically by young *men* was found to be a major influence. Extending this focus on declining male driving levels, another study (Le Vine et al. 2013) linked this trend to declining levels of tax support for company cars in the UK, with associated reductions in male business driving.

Based on a recent special issue on peak car, Stokes (Stokes 2013) surmised the available evidence on future car access and use into an explanatory tool to predict car use scenarios at the national level. This tool has two main inputs: age cohorts, and behavioural inertia. That is, one component of 'peak car' is that older people will continue to drive. In Australia, older age groups (55-64 year olds) are more likely to drive (78%) (2013). The main barriers to public transport use by this group were the inconvenience of public transport and their health and/or mobility (Buys, Snow et al. 2012). In younger groups, although car use is still high, a growing proportion do not even obtain driver's licences. This combined with the effects of location and economic change may see growing segmentation in where people choose to live and how they travel.

'Peak Car' - the "broken promises" of the car

Peak car – the tapering off car use in many developed countries - is also linked to disillusionment with the inefficiencies of cars in some urban areas. Congestion is one factor - "the bigger the city, the bigger the problem" (Feathersone 2004). 'Peak car' suggest that many cities are transitioning to a new transport era where the edges of car domination are being eroded, in part as the result of traffic congestion and the self limiting factors of high car use. Traffic congestion is to some extent an inevitable function of the physical size and number of cars: traffic congestion is a collection noun for cars. Congestion represents a limit to auto-mobility, when cars no longer meet their marketed expectation of freedom and control. Congestion introduces risk and unreliability to car travel. Congestion influences the perceptions of driving, and is seen as serious problem by drivers and cities. From the early 20th century strategic and statutory land use plans have been concerned with managing the pressures of car use and specifically, the costs of congestion. Melbourne's first comprehensive plan (1929) for example is primarily concerned with traffic congestion.

Concerns and focus on congestion continue. The 2014 ITLS survey reported that 29% of Australians said transport in their local area was worse now than one year ago, up from 24% in the September 2013 quarter. The RACV recently critiqued the amount of time spent immobile by drivers in Melbourne car traffic congestion ("Melbourne congestion leaves drivers at a standstill for as much as 40 minutes in peak hour", Herald Sun, October 18th 2014). A 2007 BITRE report estimated the 'avoidable' cost of congestion for Australian capital cites totalled approximately $9.4 billion for 2005, with both congestion levels and costs rising strongly. Traffic congestion, in Sydney and Melbourne, is now as thick on weekend mornings as in the traditional weekend peak hours. A 2014 Property Council survey suggested that only a minority of respondents in major Australian cites agree that their city has minimal traffic congestion.

The desire to drive on roads without other cars may be unproblematic in itself and make for good television, but when translated into policy pressure often means inefficiencies in spending and urban outcomes. Compared to public transport, cars and roads are very expensive to run both for individuals and for government (Glazebrook 2009). This remains a significant factor in transport decisions in Australia. However increases in the costs and time involved in running a car may mean transport shifts in future. Congestion can prompt mode shift, albeit only in a minority of drivers. Lack of parking, as noted below, is a more decisive factor. Moves away from car use may also be due to a greater personal sense of control and speed being obtained from alternative transport (notably cycling) when car use becomes inefficient. Increasing costs of car use also increase public transport use for some: the reasons cited by people catching public transport in Australia include "increased interest rates, increased food prices and increased petrol prices" (BITRE 2013). As Zhao et al (Zhao et al. 2013) found in their detailed study using the Sydney Household Travel Survey, however, reductions in vehicle kilometres or switching of travel mode is only possible in areas with high accessibility and services.

Disillusionment with congestion sometimes is associated with greater public support for public transport. The ITLS survey reports that 42% of Australians said that the highest priority issue for transport in Australia is public transport improvements, followed by road improvements (21%). Cynically, this may be as per the satirical Onion article "95% of people support other people using public transport". Metz (Metz 2013) suggests that "revival" of investment in rail-based transport "is a

characteristic of the new era" of transport, with competitive cities attracting residents through investment in sustainable transport.

"The High Cost of Free Parking" - Parking and mode shift

One of the few factors shown to prompt mode shift by people with a default preference to drive is a lack of free parking (Cao and Cao 2014; Dell'Olio et al. 2012; Guo 2013; Guo and Ren 2013; Marusek 2011; Millard-Ball et al. 2014; Nurul Habib et al. 2012; Pandhe and March 2012; Pierce and Shoup 2013; Shoup and Association 2005; Stubbs 2002; Taylor 2014; Triantis et al. 2011). Without parking, there is no mobility by private car. As Hagman (2006) surmised:

People who have access to cars can choose among a number of various arguments for using the car on individual journeys – because it is faster, more convenient, they need to carry equipment, etc. When it comes to not taking the car, however, studies in Sweden and Denmark show that one particular argument dominates – most people will leave their cars at home only if they find it difficult to park when they reach their destination.

The availability of parking, particularly free parking, is a major determinant of travel mode choice. In Australia, Pandhe and March (Pandhe and March 2012) in a survey of Melbourne CBD workers, found that just over half of workers would not drive to work if there were no parking provided. Open pricing of parking results in significant reductions in car journeys; and flexible pricing has been shown to reduce the amount of 'cruising' for parking space (Millard-Ball et al. 2014; Pierce and Shoup 2013). Illustrating the importance of parking but for another transport mode, bicycle use is significantly increased, based on a study of Washington DC, by provision of supportive destination infrastructure – bicycle parking, and showers at work. Conversely, car parking reduces bicycle commuting. Bike riders are typically also car drivers and switch from driving for broadly similar reasons of autonomy – bicycles can be a close substitute for cars (Buehler 2012; Thakuriah et al. 2012).

Car parking is built in to cities on a large scale without noticing it, often accounting for over 30% of urban areas (Jakle and Sculle 2004; Ben-Joseph 2012), but tending only to be noticed or thought of when looking for a spot. This invisibility and frustration characterises parking politics, with competition for parking space but unawareness of its impacts a major factor in planning conflict over intensifying Australian cities (Taylor 2014). Conflict over road and parking space is common – for example in competition between tram space and school parking spaces accompanying accessibility upgrades to Melbourne tram routes.

Congestion and parking difficulties are major challenges to the dream of auto mobility. This means great pressure on planners and politicians to cater to cars. The will to drive is evidenced in the rearrangement of cities for them. Despite the evidence against its effects (distorting perceived travel costs, reshaping the urban environment, and impacts on housing affordability – discussed below), minimum parking continues to be built-in to statutory planning processes. Shoup and others argues that providing or requiring ostensibly 'free' parking makes driving easier and seemingly lower cost than is really the case, and carries broader cost and should be openly priced (Pierce and Shoup 2013; Shoup and Association 2005). The required provision of car parking is highlighted as a policy factor in Australia which distorts travel costs and competition between transport modes (e.g. Shoup 2005). Rolling back of these requirements, however, is highly fraught given loss aversion attached to car use. Effective parking management is also generally restricted to high demand, high amenity areas (Stubbs 2002).

Parking reform and housing – is it possible to live without car parking?

Car parking also determines car ownership. Car parking requirements and, by association, availability strongly influences car ownership; and housing market outcomes. There are strong but often under acknowledged links between parking and housing supply (Guo 2013; Manville 2013; Manville et al. 2013; McDonnell et al. 2010).

There is some evidence that in locations with high land prices and high transport accessibility, parking is elastic – households will purchase more or less parking depending on their preferences and ability

to pay. Given the role of parking policies in adding to car ownership and use, several analysts argue that residential parking supply should be left to market forces instead and will result in reduced car dependence in areas with better transport options (Guo 2013; Manville 2013; Manville et al. 2013; McDonnell et al. 2010). This includes studies of the effects on residential markets for example in Los Angeles following removal of restrictive parking codes. (Manville 2013). In accessible, higher cost areas planning policies often require the provision of more parking than market demand (McDonnell et al., 2011).

With parking potentially reducing housing supply and increasing minimum housing costs (Manville, 2013); and with the availability of both on and off-street parking influencing car ownership (Guo, 2013); newer parking management approaches tend to advocate open pricing for on-street and off-street parking. Some cities and locations have moved from minimum to maximum parking allowances, or to allocating parking based on market demand. Doing so typically involves unbundling land use from parking. London switched from minimum to maximum parking policies in 2004. Guo and Ren (2013) found that after the reforms, the amount of parking provided for residential development in London reduced from 94 to 52 per cent of the previous minimum standard, equating to 120,278 fewer car parking spaces. Similarly in Los Angeles and New York City, strong underlying demand for housing without parking was identified in areas with good public transport accessibility (Manville, 2013; McDonnell et al., 2011). In such situations parking ratios either force consumers to purchase unwanted parking, or preclude them from purchasing housing. In the UK Stubbs (2002) noted that the perceived need for a car, and the potential influence of parking policy changes, are determined location and accessibility. Stubbs also found however that there is a strong preference for parking due to perceived value to others. In less accessible locations, parking is inelastic as car ownership is essential and all housing has, or is built around parking (Stubbs 2002).

Significantly, statutory planning requirements and other regulatory restrictions in Australia set minimum parking provisions for new housing. As a result, despite the complexity of underlying parking demand, residential parking is rarely openly priced and intermediaries determine its supply more often than do market signals. People will also own more cars where free street parking is available (Guo 2013). Guo (2013) argued for "the merits of leaving the decisions of whether, and how many, on-street parking spaces to provide in new residential developments to private markets rather than regulations". Thus one pathway for transport change in Australia is the relaxation of residential car parking requirements and subsidised parking provision in areas where parking demand is comparatively elastic – in other words, leaving parking provision to market rather than policy signals. Both of these are, however, highly fraught due to the perceptions of existing car owners (Rowe 2013; Taylor 2014). There is a strong need for careful engagement in making any such transition.

Residential self-selection

The literature also highlights debates around residential self-selection: the possibility that rather than influencing travel choices directly, local transport infrastructure influences where people would choose to live (Cao and Cao 2014; Chatman 2009; Handy et al. 2006). One quantitative study of San Francisco (Bagley and Mokhtarian 2002) found, using structural equation modelling, that there was little direct impact of neighbourhood density or design on travel choice after accounting for differences in the attitudes and socio-demographic characteristics of residents. Another study of a light rail system in Minneapolis-St Paul found that residential self-selection is a strong determinant of transport choice. The provision of a new light rail in itself had little influence on car ownership by existing residents. The study also confirmed that the availability of off-street parking influences car ownership, and that neighbourhood design (walkability) is an important predictor of travel choices.

The literature is still debating self-selection. Chatman (Chatman 2009) in a study of Californian regions found that residents consider travel options in moving, but found mixed evidence for self selection in that the choices of residents do not closely match the variation in transport by area. There is however at least some evidence that people preferring alternative transport seek out and find areas with these options, and that policies to alter the built environment will not necessarily directly influence transport choice of existing residents. The Australian housing market already reflects high demand for areas with higher accessibility. This may not be causal, but 2011 Census data indicates

rates of car use are much lower, and rates of car ownership somewhat lower, in inner urban areas well served by public transport. The 2011 Census highlights difference between car ownership and car use (journey to work). Taking Victoria as an example, in inner city areas, car ownership is still high (over 80%) but car usage is lower. In the CBD – where parking restrictions do not exist – car ownership is lower. In outer areas multiple car ownership is common and essentially all journeys made by car.

In a study of Paris, (Motte-Baumvol et al. 2010) found that lower income households moved to dense areas with better public transport provision, reducing the socio-spatial impact of transport disadvantage. Housing and travel costs are always traded off and many households choose to live in poorer serviced areas through a preference for larger housing and other amenities. Maintaining or allowing the ability of households to choose locations based on their own transport preferences has potential to unlock mode shift through self-selection. This perspective also acknowledges that many people prefer car-oriented lifestyles and, as noted in the literature on car use, are highly unlikely to respond to policy or market pressures to do otherwise. If however there are population groups in Australia who through income restrictions or personal preferences would rather live without car dependency, several policy barriers currently exist. The required provision of car parking is one. The lack of parity in funding public transport infrastructure also means that in Australia very few areas are well served by public transport, and these are highly valued by the housing market. In Australia, residential self-selection may influence where certain demographics will seek to locate in future. Housing market and planning policies can function as barriers or as enablers to this shift.

New transport models and the multi-modal city

Emerging transport modes sitting somewhere between public and private include car sharing schemes, bike sharing, "tech buses" (private buses - notably those operating in the California information technology industry), private taxi sharing, and some of the proposed models of driverless cars. Car sharing schemes include those broadly similar to car rental but with designated parking spots, such as those operating in Australia already. There are also peer-to-per car sharing schemes. In some cities such as Portland, Oregon, car sharing is more flexible and cars are deposited or rented from anywhere within the city, using mobile technology. These new technologies and models of car (or bike) use rather than ownership are marketed as offering many of the promises of cars, but with fewer responsibilities like running costs or parking. They are particularly targeted toward and taken up by professional, technology-centric areas. In Australian cities car sharing schemes specifically target areas with high rates of public and active transport.

Combined with technology shifts, some literature characterises growing competitiveness of other "blurred" or "informal" transport modes as a "fourth era in urban transport" (Metz 2013) or as "the emergence of new cultures of mobility" (Sheller 2012). The key concepts are of choice, competition and flexibility between modes. In some cities, Helsinki being a recently highlighted example, cities are planning to align communication technology with public transport, flexible transport, and other modes to out compete private cars for the level of autonomy and flexibility offered *("Helsinki's ambitious plan to make car ownership pointless in 10 years",* The Guardian, July 11th 2014). Notably, Helsinki's plan does not preclude car ownership, particularly given high rates of travel to rural areas by car. The focus is on flexible mode choice in urban areas where other modes have potential to be more competitive and efficient than private cars. This view tends to be less dichotomous (cars versus transport) and more about the challenges of multi-modal cities *("3 Big Challenges for Planning Multi-Modal Cities: It's just not as simple as 'stop prioritizing cars'"*, The Atlantic City, October 2014).

Specific studies of the effects of blurred transport models are not common. A regression analysis of the effect of car sharing facilities in Canada found that the availability of car share schemes resulted in reduced car ownership and reduced parking demand (Engel-Yan and Passmore 2013). Conversely, the upfront nature of costs makes them less attractive. These technologies have some role in transition toward multi-modalism: the choice of transport by trip rather than dichotomous categories (Tirachini and Hensher 2011). They also have a strong spatial profile that limits their overall potential influence in Australian suburban or regional areas. Alternatively, following a social marketing theory of change following a timeline, residents of professional inner urban areas may be early adapters and such

models may become more widespread in coming years. Policy and political barriers may also limit or shape this trend.

Soft marketing: you may like green eggs and ham

A review of the effects of traffic congestion on urban quality of life identified four main strategies – planning, prohibition, pricing, and finally marketing (Gärling and Steg 2007). Marketing of sustainable transport is sometimes underestimated, given that marketing of the car is such a large part of its success. Studies of differences in transport patterns overseas and of the effectiveness of targeted marketing programs suggest that there is some potential to prompt different travel preferences without hard infrastructure.

Given the literature on subjective factors in transport decisions, a key inroad is 'perceived behavioral control'. Attitudes and beliefs are difficult to change especially through the presentation of information. Studies across psychology, sociology and behavioural economics explore the role of cognitive biases and heuristics in decision-making (Gilovich & Kahneman et al 2002; Kahneman 2011; Lewandowsky et al 2005, 2012; Nyhan & Reifler 2010; Nyhan & Refler et al 2014). Experiments based on both on real events and invented narratives show a persistent tendency of people to fall back on heuristic thinking, like rules of thumb and association, rather than engage in reasoned deliberations (Kahneman 2011; Lewandowsky et al 2012). If the implications of new information challenge an existing idea, it will be reimagined or disregarded. Gut reactions, assumptions and biases feel like rationality and insight – with conscious effort being required to acknowledge their limitations. As a result, the possibility of changing ideas of what is possible in Australian transport would require much more active engagement than the presentation of information. Soft marketing in transport directly engages with perceived behavioural control – the things people think they will not be able to deal with.

Gardner and Abraham (2007) found systematic underestimations of car related monetary costs, and argued that "developing effective, persuasive campaigns or interventions depends upon identifying and targeting potentially modifiable psychological constructs". Price and Matthews (Price and Matthews 2013) argued that there was a potential for mode shift toward rail through family-friendly marketing. In Munich, specific intervention programs target people transitioning into having families ("Familienoffensive"), to facilitate greater use of trains by families with children.

In the area of children's mobility, supportive programs and interventions have positive impacts on changing mobility programs, with potential to "unlock" such change particularly in areas with good cycling and walking paths (Burke et al. 2013). A study of the "Safe Routes to School" program in the US found while infrastructure improvements accounted for an 18% increase in children walking or cycling to school; that "education and encouragement programs" furthered this with a 25% increase in walking and cycling (McDonald et al. 2014).

Dill et al (Dill et al. 2014) argued for the role of encouragement programs, marketing, and events to influence attitudes and "reinforce positive environmental features" around active transport. They found that this was particularly the case for women and older people. Dill et al ((Dill et al. 2014) argued that "soft marketing of the benefits of behaviours, including temporary street closures, are valuable" in that they can highlight the benefits of existing infrastructure and allow people to feel comfortable trying something new. In a review of two case studies of the potential for community based social marketing in transport (McKenzie-Mohr 2010) argued for tailored, local strategies engaging with specific local barriers to transport change. In Australia, Daniels and Mulley (Daniels and Mulley 2012) argued for soft marketing campaigns in promoting 'flexible transport' (loosely, specialised on-call buses) for low-density urban areas. They also found that lack of institutional understanding and over-regulation were barriers.

Classical economics would suggest that travel choices embody rational self-interest, perhaps with resultant collective externality costs like congestion and pollution that could be managed with pricing. The economics of heuristics and cognitive biases (Kahneman 2012; Thaler and Sunstein 2009) goes further and suggests that individuals have limited judgment concerning even their own self-interest and will act in internally inconsistent ways. The powerful heuristic of loss aversion suggests that

people feel losses more than gains. Other biases in judgment explored by the behavioural economics literature include that alternatives are judged more harshly than default situations; that catastrophic risks are overestimated; and that judgement is typically based on association (what things "seem like"). These carry implications for policy response to both to change and to inertia.

One form of response to this challenge is to consider temporary approaches to change. In a review of innovative approaches to temporary road space allocations (often meaning car park loss) and 'pop up' parks, Rowe (Rowe 2013) found that the temporary 'pop up' status of interventions reduces fear and resistance, and also encourages constructive criticism and deliberation. The political pressure is to maintain the dream of auto mobility, sometimes against worsening odds, and there is immense community pressure to provide more parking or to retain free parking (Taylor 2014). The political and reactive environment of planning practice means the role for evidence in consensus-driven decision-making is fraught and far from clearly defined (Hurley & Taylor 2014 forthcoming, Krizen et al 2009). Temporary changes to parking space, as an example, allow both the costs and benefits of both inertia and of change to be assessed more equally. Such conflicts, some of which are already visible in Australian areas, underscores the need for policy makers to be better engaged with the evidence base on transport behaviours.

Part 4: Institutions and governance arrangements

1. Introduction

The purpose of this supplementary paper is to examine the role that institutions and governance arrangements can play in achieving the transitions argued for in the main paper, and in the scenarios that follow. Rather than considering each of scenarios separately, the paper takes a 'whole of city' perspective, asking how institutional and governance arrangements can best be configured to meet the diverse needs of people across the wider metropolitan area.

The structure of the papers is as follows:

- First, a review of the current state of urban and transport institutions and governance arrangements in Australian cities, and the reasons for this performance; and
- Second, an examination of local and international models of 'best-practice', and based on this review, a discussion of institutional reform options to facilitate the transitions argued for in the main paper.

Some definitions are necessary. 'Governance' refers to the way in which government is conducted, including processes of government (Oxford Dictionaries 2014)). 'Institutions' are one embodiment of governance, and are particularly important because they "create the framework of rules for public policy making" (Curtis and Low 2012).

The importance of the role of institutions and governance arrangements is widely recognised in academic literature, and in practice. Institutions, in short, "make action possible" (Curtis and Low 2012; see also Kennedy et al. 2005). But which actions? As per the main paper, this supplementary paper is framed around two broad directions in policy needed to shift Australian cities to a more sustainable, namely the need for:

1. A significant improvement in public transport planning and service delivery, assisted by land regulation to ensure adequate use clustering at key centres; and
2. Disincentives to car travel, recognising Australia's high levels of car dependency, and that positive developments in automotive technology cannot yet, or perhaps ever, be relied upon to do the 'heavy lifting' in meeting the wider city's mobility needs.

The next section discusses the current state of urban and transport institutions and governance arrangements in Australia.

2. Current state: Australia's urban and transport institutional and governance arrangements

Australian governments are keenly aware of the importance of effective institutional and governance arrangements, as can be seen in the regular exercise of departmental restructuring. To take one just one example, in Victoria, successive state governments have shifted the state land use planning function, over the past 15 years, from the Department of Infrastructure, to the Department of Sustainability and Environment, to the Department of Planning and Community Development, to the Department of Transport, Planning and Local Infrastructure.

With each successive change, governments claim that adjusting agencies, responsibilities and reporting arrangements is necessary to sharpen focus on a particular priority, and produce better results. Yet, few observable differences in urban outcomes are evident following such upheavals. This arguably reflects that organisational restructuring of this nature leaves largely untouched the core institutional and governance limitations in Australian cities.

The literature highlights several such limitations. For comprehension, these are grouped under two categories that Gleeson et al. (2010) consider to be the central spatial planning problems in Australia cities: a 'planning deficit' and a 'democratic' deficit. Below, for each of these deficits, the component issues and reasons are explored.

2.1 Planning deficit

The planning deficit describes limitations in the effectiveness of planning itself. Contemporary Australian society is highly market-oriented, and socially complex and fragmented. In this setting, pubic sector planning tools – the would-be "mechanisms that guide urban development" – are "underdeveloped" (Gleeson et al. 2010). These observations speak to a lack of government capacity to plan, and to deploy sufficiently robust tools and levers to implement those plans.

Such a deficit translates to very real effects in our cities. One common problem is a lack of coordination in planning efforts: between transport and land use development (urban 'sprawl' without supporting infrastructure); between road and public transport initiatives (incentives to both drive and catch public transport, the former of which jars with 'sustainability' goals); and within the public transport system itself (lack of modal integration) (Victorian Auditor General's Office 2014; see also Vuchic 1999).

The visible effects of this deficit in our cities have fed perceptions of an 'infrastructure crisis', to which politicians have sought to respond. Dodson (2009), for example, has observed an 'infrastructure turn' in Australian planning, where 'big-ticket' projects (or packages of projects) constitute the central thrust of government's 'planning' efforts. This involves a "shift away from a broader, and arguably more nuanced, conception of metropolitan planning as a spatial strategy", limiting the ambition and horizons of planning (Dodson 2009). In a similar way, Curtis and Low (2012) conclude that "too often in Australia, metropolitan plans look like bundles of infrastructure projects prepared by State governments tacked on to a range of 'hope' statements inserted amongst lavish displays of coloured photos".

The benefits of this heavy emphasis on infrastructure are, for some authors, dubious. Mees and colleagues (2010a; 2008), for example, question the rationale for two recent major rail projects in Melbourne, the $4bn plus Regional Rail Link (under construction), and the $8bn plus Melbourne Metro tunnel (now modified), by showing that basic, low-cost, operational changes may have increased capacity on relevant corridors to the levels required to service a growing population. Arguably, elevated planning capacity within government may have led to different priorities for action, at far less cost.

Mees and Dodson (2011) discuss this lack of planning capacity in the specific case of public transport network planning, the techniques for which were described in the main paper. The authors report sobering findings about the maturity of both the institutional arrangements and practices across the country, including that:

- Sydney's institutional framework is fragmented, with no single agency responsible for public transport;
- In Melbourne, service provision through the franchising system has driven a lack of accountability for outcomes, with poor modal coordination one result; and
- Brisbane's public transport service development in recent years has involved destructive modal competition between the State rail operator and city bus network, a pattern is being challenged by Translink, the regional transport agency.

While some defects that Mees and Dodson (2011) identified in New South Wales and Victoria have subsequently been addressed in part (through the formation of new public transport agencies, charged with improving planning, coordination, and accountability), Queensland's Translink, a 'model' agency, has been abolished. The one city exhibiting the most promise in deploying best-practice network planning is identified as Perth, in part because of continuity in multi-modal public transport institutions stretching back to 1974, and clear ownership of key 'tactical' planning functions, such as designing networks and coordinating timetables (Mees and Dodson 2011)

In spatial planning in general, and public transport planning in particular, then, there is significant evidence that a planning deficit exists. What might explain this planning deficit, particularly in the capacity of governments to deliver high quality public transport, integrated with land use?

Explaining the planning deficit

The literature suggests two factors are important: the translation of neoliberal ideology into institutional and governance arrangements, and the relative strength (and resilience to the ideological threat) of road planning bodies.

In a general sense, Graham and Marvin (2001) describe a loss of control by governments in late capitalism, due to increasing social complexity and 'splintering' of urban processes. The latter takes the form, for example, of restructuring, corporatisation and privatisation of formerly government-operated instrumentalities, such as water and electricity supply. With widespread fragmentation in service delivery chains, and the need to serve the multitude of needs of a diverse society, government attempts to address fundamental questions of urban structure, including location of urban development and provision of cross-city transport infrastructure, have foundered.

This reflects not only restructuring of the public sector, but also an ideological attack on planning as a function of government. As Harvey (2005) recounts, neoliberalism's essential position that markets, not bureaucracies, deliver optimal economic and social outcomes, has led not only to widespread privatisation, deregulation, and contracting-out of former government services, but greater involvement by the private sector in government decision-making (see also Gleeson and Low 2000). A 'privatisation' of planning itself has ensued (Paterson 2000; Winter and Brooke 1993). Planning, argue Gleeson and Low (2000) is "deeply imperilled" by neoliberalism, because under it, "planning has been outsourced, privatised, marketised and stripped of the knowledge and confidence that informed its founders".

The proliferation of neoliberal changes, and their effect on planning, is not uniform across the country. In Victoria, neoliberalism's impact has been the greatest, with rail franchising – and persistent criticisms about the decline of public sector transport planning (Mees 2010b; Stone 2010) – a prominent example of its application in practice. The effect on planning capacity is also revealed through the fate of the previous state Labor government's planning strategy, *Melbourne 2030*. This plan was consistent with many 'cluster and connect' approaches to urban development pursued in cities around the world for decades, involving concentration of housing, jobs and services in 'activity centres', located close to major transport infrastructure (including rail lines) (DoI 2002). Its failure to achieve such an outcome was the product, among other things, of having no clear implementation mechanism; the focus was on 'guiding' the market, rather than incentivising or regulating private developers. For Mees (2003), a plan with progressive policy intent foundered on a lack of both belief in the purpose of planning, and capacity to carry it out: *Melbourne 2030* is "much easier to understand when viewed as a metropolitan strategy written by people who have been taught that metropolitan strategies are pointless or even counter-productive."

By contrast, in Western Australia, the neoliberal shift, and its effects on public transport planning in particular, was resisted to a greater degree than in Victoria:

> During the 1990s, the ideological drive of the newly elected Liberals towards the privatisation of government services did not have the same impact on transit management as it did in Melbourne. Managers were able to offer the government a model of privatisation that included private tendering for the operation of bus services in a way that did not (according to Stuart Hicks, the state's leading transport bureaucrat) 'sacrifice the single, seamless system for public transport' (Stone 2008).

For Stone (2009; 2008) such navigation of structural changes to the public sector was the result of a strong planning and institutional framework in the first instance, supported by influential Ministers and community advocates. The result has been that the Public Transport Authority of Western Australia (and predecessor organisations) has:

> …(maintained) control over branding, timetables and network planning. Service integration has been retained, with Perth presenting a stark contrast to the lack of multi-modal planning in Melbourne and Sydney. The result has been a steady improvement in public transport use

> from a low base with real expectations of continued future growth (Mees and Dodson 2011; Mees et al. 2008; see also Stone and Mees 2010).

Integration of planning and transport agencies at the state level in the 2000s further signalled that Western Australia has felt the impacts of neoliberalism on planning institutions and practices in a more limited way than in other states (Curtis and Low 2012).

A further factor explaining evident weaknesses in public transport planning, and the institutions responsible for it, is the relative power of roads agencies at the state and territory level. This power reflects not only the success and popularity of the car as a mobility enabler from the mid-twentieth century onwards, but different institutional arrangements for car-based infrastructure and public transport delivery, respectively. While road agencies typically have had "direct lines of reporting to both State and federal ministers, and high levels of expenditure and discretional control over that expenditure", the same has not applied to public transport agencies (Sturup et al. 2012) . The latter have "traditionally been disenfranchised, with policy, design, construction and operations split between different agencies (some privatised), little direct access to ministers, and a debt burden that cripples their capacity to expand operations without explicit ministerial approval" (Sturup et al. 2012).

Curtis and Low (2012), reflecting on the different levels of institutional strength in different jurisdictions, note that New South Wales' road agencies have benefitted from "structural change (which) has seen the consolidation of roads agencies into one fairly autonomous roads authority, as compared with the public transport structure". In Victoria:

> *t*he gradual consolidation of all roads-related functions within one stable organization together with the ability to leverage support from other powerful players reveals that the roads organization has developed a strong and powerful capacity to influence the policy agenda, but roads planning has remained essentially segregated from the planning of public transport, and at arm's length from land use planningt (Curtis and Low 2012).

The main exception Curtis and Low (2012) highlight is Western Australia, given the structural changes in the 2000s, just described. These changes combined not only roads and public transport agencies into the one portfolio, but also land use planning, so that all functions reported directly to one Minister. Nevertheless, the authors conclude that the road agency maintained considerable power in this institutional arrangement (Curtis and Low 2012).

Several authors have argued that this relative power balance between roads and public transport agencies reflects institutional and technical 'path dependence', in which roads agencies, and their prescriptions for investment in infrastructure, have become entrenched (Curtis and Low 2012; Gleeson et al. 2010; Low and Astle 2009; Sturup et al. 2012). As Gleeson et al explain:

> Road agencies have provided the only confident, but seriously flawed, structural ambition for cities. The prioritisation of mobility over accessibility has driven the development of costly new road infrastructure that has intensified dispersion, and therefore the urban structural imbalance, whilst also worsening car dependency and greenhouse emissions.(2010)

The result of this process is that 'storylines' emerge that come to define the policy domain: cars represent independence and freedom, and are hence worthy of 'investment', whereas public transport is a burden on the public pursue, subject to high levels of subsidisation ((Curtis and Low 2012; see also Low and Gleeson 2003). Hence, "while road-building agencies were concerned primarily with finding ways to invest money, public transport agencies became preoccupied with cost cutting" (Low and Gleeson 2003).

A number of factors underpin this path dependence, and crowd out the 'space' in policy circles given to alternatives, such as public transport. These include high fixed costs (in building a road network), such that incremental investment in new roads is justified on the basis of it adding to the stock of a well-developed network, built up from previous investment. Further factors include societal expectations generated by this sustained investment that it will continue to occur (Sturup et al. 2012)

Of particular relevance here is that the ascendency of road agencies is maintained by the immense professional capabilities and skills that are generated by sustained investment in roads. This build-up

of expertise has two main effects. Firstly, the competence of road planners is recognised within and outside of government, giving the institutions they work for credibility in policy debates. Secondly, such recognition permits the agencies to successfully prosecute policy positions based on their definitions of problems (say, traffic congestion) and solutions (further investment in roads), such that it becomes the 'defining discourse' (Curtis and Low 2012; Sturup et al. 2012). As (Sturup et al. 2012) note, "it is the particular competencies of policy actors that lead to path dependence, not a failure of competence". That is, road agencies have been successful in development expertise and institutional strength. The challenge for those interested in moving towards more sustainability mobility systems is, therefore, to "reframe and redirect the competencies" towards public transport (Sturup et al. 2012).

These insights about the state of planning – the planning deficit – need to be viewed alongside what Gleeson et al. (2010) consider is the second key limitation at work, namely the democratic deficit.

2.2 Democratic deficit

The planning deficit "reflects and reinforces a deepening democratic deficit in our cities" (Gleeson et al. 2010).

This democratic deficit is revealed, firstly, through compromised decision-making processes, often involving Ministerial intervention in what are routine, development control decisions (such as approval of permits for controversial buildings). This increases the politicisation of planning at the state level, and in turn makes local councils and communities more defensive of their local 'turf'. Spiller (2013) explains, particularly in the context of Melbourne, that:

> Notwithstanding their tenuous situation constitutionally, local councils inevitably enjoy a powerful political position in their 'David and Goliath' stands against what they invariably portray as undue interference in local matters by the State Government. They can rapidly marshal local resistance should aspects of a metropolitan strategy run counter to local property interests or self-appointed environmental priorities. With some exceptions (but not many) local governments have tended to become a very conservative force, frustrating moves for urban consolidation and more sustainable transit-oriented development.

The result is that, secondly, the 'metropolitan community' is disenfranchised. That is, the interests of citizens and the wider city are 'lost' between state government politics and policy (say, attempting to implement compact city policies against local wishes) and reactive local governments (say, opposing any development) ((Gleeson et al. 2010; see also Spiller 2013). In response, the authors argue for a form of cooperative, local representative control over citywide decision-making, described as metropolitan governance, as discussed below.

Explaining the democratic deficit

As Gleeson et al. (2010) note, models of metropolitan governance are not new in Australia. The Melbourne and Metropolitan Board of Works (MMBW) was a metropolitan institution, until its abolition in the 1980s (Gleeson et al. 2010; Spiller 2013). It is the restructuring that followed this move that these authors cite as a key source of the democratic deficit. Political control was pulled in two directions: 'up' to the state government, through incorporation of formerly arms-length planning powers into state departments, and 'down', with delegation of planning decision-making down to local councils, subject to ministerial intervention (Gleeson et al. 2010; Spiller 2013).

More broadly, however, Australia's constitutional arrangements arguably militate against sustained governance frameworks at a metropolitan scale. First, the powers of local government are not codified in the constitution; along with a range of planning and related matters, such questions are left to the states and territories. As the capital cities are particularly critical parts of each state and territory, generating most wealth and consuming most expenditure, states and territories are understandably reluctant to delegate power down to the metropolitan community.

In turn, this means planning is stunted, particularly when state budget considerations are factored in. States and territories do not raise sufficient tax to fund their service provision responsibilities, across health, education and policing, public transport and other essential service domains, and are hence

reliant on Commonwealth grants for around half of their income (Morris, 2006, citied in Spiller 2013). Under such a 'vertical fiscal imbalance', funding shortages in particular state and territory service areas (e.g. public transport) can and do arise when outweighed by other priorities (e.g. health costs associated with an aging population), and cannot readily be bridged by states and territories raising taxes (for both political and inter-state competitiveness reasons). This makes reliance on state and territory government funding a tenuous basis on which to conduct long-range planning, including for needed major infrastructure works. Further, the Commonwealth's role in specifically financing urban services, including public transport, has varied over time, depending on the policies of the government of the day.

In the next section, options for reform are considered, based on local and international experience.

3. Reform options: towards metropolitan governance?

As noted in the previous section, Australia's Constitution grants states and territories key planning and transport powers. Any assessment of metropolitan governance reforms, discussed in detail below, need to recognise that alternatives exist: particularly, better integration of relevant functions at the state and territory level. Hence, this section considers both possibilities.

3.1 Better integration of state and territory functions

The locational decisions made by many state and territory agencies – where housing, jobs, services, schools and hospitals will be – profoundly effect the public's travel demands, and hence the ability of the public transport system to meet them. The challenge is how to harmonise the efforts of all agencies; some level of 'joined-up' governance between these functions is required as a basic precondition for coordination.

Combining transport and land-use agencies, as occurred in Western Australia in 2001, and Victoria in 2013, is just one means of approaching this challenge. In Western Australia, the Gallop Labor Government merged the Departments of Planning and Transport to form the Department of Planning and Infrastructure, with the Public Transport Agency established as the body responsible for public transport planning and provision within the portfolio. Victoria adopted its own version of the Western Australian model in 2013, when the Napthine Coalition Government formed the Department of Planning, Transport and Local Infrastructure, with portfolio responsibility over the roads agency, VicRoads, and the new public transport agency, Public Transport Victoria (PTV). Given the passage of time, the Western Australian experience is particularly instructive.

As noted earlier, Mees and Dodson (2011) suggest that public transport planning in Perth reflects, more than in other Australia cities, elements of best-practice network planning. Further, integration with land use agencies has ensured some level of integrated planning, particularly in the last decade (Curtis and Low 2012). This suggests that both providing institutional strength to the public transport agency, and bringing all transport and land use functions under the 'one roof', is a organisational format at the state level that may address some of the challenges described in the previous section.

Evidence suggests, however, that organisational restructuring is not a 'silver bullet' in achieving transport and land-use integration (Legacy et al. 2012). Even with integration of bureaucratic agencies at the state or territory level, it will still be necessary to implement strong regulation, particularly of land use development, align policy with that at the Commonwealth level,[2] and seek to legitimise planning policy through community consultation and deliberative processes (Curtis et al. 2010; Curtis and James 2004; Sturup et al. 2012). This suggests that *governance*-based, rather than *government*-based, solutions, might be preferable.

Further, the Western Australian case illustrates the contingent nature of such state- and territory-level organisational reforms. Two factors here are relevant. Firstly, organisational restructuring is a

[2] For example, the Commonwealth government's control of fuel excise has implications for state and territory transport policies Curtis, C, Armstrong, R & Babb, C 2010, 'The capacity of state and local governments to deliver land use transport integration: an analysis of land use and transport policies in Perth and Melbourne' 12th World Congress on Transport Research, Lisbon, , Curtis, C & James, B 2004, 'An institutional model for land use and transport integration', *Urban Policy and Research*, vol. 22, no. 3, pp. 277-297. .

common practice in the public sector. In July 2009, the recently elected Barnett Coalition Government split the Department of Planning and Infrastructure into the Department of Transport and Department of Planning. Currently, the head of the Department of Transport is also the head of the (subordinate) Public Transport Authority (PTA) and Main Roads (WA Department of Transport, 2014). While this ensures a level of integration within the transport portfolio, the decoupling of the planning and transport portfolios has the potential to weaken the integration of these government functions that had been in place since 2001. For example, an international survey of public transport governance frameworks in 2013 found, in Western Australia's case:

> The philosophy of the Department of Transport is very much a 'project and provide' approach, rather than one that recognises the interplay between transportation and land use and the benefits of attempting to modify transportation demand (Acuere Consulting et al. 2013)

Secondly, while, as (Mees and Dodson 2011) note, the PTA has demonstrated competence as a planning institution, it is nonetheless reliant on state budget funding for capital and operational funding. As Gleeson et al. (2010) make clear, this keeps public transport subject to prioritisation decisions (against health, education and so forth) by state treasuries. Demonstrating the effects of such financial dependence, the Western Australian government withdrew planned capital funding for a light rail network in Perth in 2013, in order to address concerns about a downward revision in the state's credit rating (Buswell 2013).

This illustrates aspects of the planning and democratic deficits in practice, in which the city population's desire for improved services is lost through the mediation of government priorities at the state level. In place of state 'ownership' of metropolitan transport and land use planning decisions, some form of devolution to the metropolitan levels, through agreement, is suggested as a way forward, backed by intergovernmental demarcation of responsibilities and appropriate funding mechanisms.

3.2 Metropolitan governance approaches to (public) transport and land-use planning

In general, metropolitan *governance* is distinct from metropolitan *government*, in that it does not call for an additional level of political representation. In making this distinction, Gleeson et al. (2010) refer to the London model, in which a separate, additional level of government sits 'above' the 33 local councils in the city, and a Mayor and regional assembly are directed elected by citizens (see also London Councils 2014; Transport for London 2014). Replicating the same approach here would "impose another electoral layer on the Australian multi-level government system", a move towards which "there may not be sufficient community enthusiasm" (Gleeson et al. 2010).

Rather, state and territory governments should adopt metropolitan governance institutions with political representation drawn from existing elected representatives at the local level, and appointed representatives at the state level. This would be similar to the governance model in place in Vancouver, or, indeed, the MMBW (Gleeson et al. 2010). Spiller (2013) describes the MMBW as "an elegant and effective example of subsidiarity, (in which) the Board retained development approval powers for sites and matters of metropolitan significance (e.g. the release of new urban land), and delegated authority over local matters to municipal councils". In addition to its town-planning role, the MMBW oversaw the extension of essential city infrastructure, including water and sewerage networks. Importantly, the MMBW had a robust funding base, including a hypothecated land value levy, and a mandate to issue infrastructure bonds on the capital markets (Spiller 2013). Such glowing testimony might make the demise of the MMBW appear surprising, but its ossification by the 1980s, and the ambitions of the ALP reformers of the time, and the implications for future urban planning governance have been well documented (Dingle and Rasmussen 1991; Stone 2009).

Recognising that such a shift requires significant devolution of current state and territory functions, as well as absorption of some aspects of local government development control, Gleeson et al. (2010) suggest a two-stage reform process. In the first stage, a metropolitan planning agency would be established, "reporting to a forum or 'board' comprising delegates from councils plus state appointed

members" (Gleeson et al. 2010). This agency would take responsibility for a number of important, citywide activities, such as:

- Planning and investing in major infrastructure;
- Selecting and facilitating development in major activity centres;
- Selecting and overseeing significant transport corridors;
- Managing economic development, including at employment nodes;
- Managing land supply, including devising and implementing land release exercises in growth areas; and
- Environmental and cultural protection (Gleeson et al. 2010).

In stage 2, the agency would obtain "responsibility for planning and financing major roads, public transport, major open space, major water cycle infrastructure, and urban regeneration functions" (Gleeson et al. 2010). Importantly, at this stage, the agency would be granted "separate taxing/bond raising powers" (Gleeson et al. 2010).

In the following section, the Vancouver model, several authors have pointed to as a model to emulate, is described further (see also Stone, 2013, for a discussion about Vancouver's success in moving towards sustainable transport). Next, the *Verkehrsverbund* (transport federation) model, in place a number of German-speaking cities in Europe, is explored, by reference to the experience in Switzerland's largest city, Zurich. Both cities have had success in moving towards transit-first models of development, as explained in the main paper. Part of this success involves the implementation, by local and metropolitan institutions, of disincentives for car travel, which is also considered. Finally, the discussion looks further at two critical factors of relevance to Australian institutions, given the vertical fiscal imbalance described above: funding mechanisms, and Commonwealth-state-local intergovernmental cooperation.

The Vancouver model

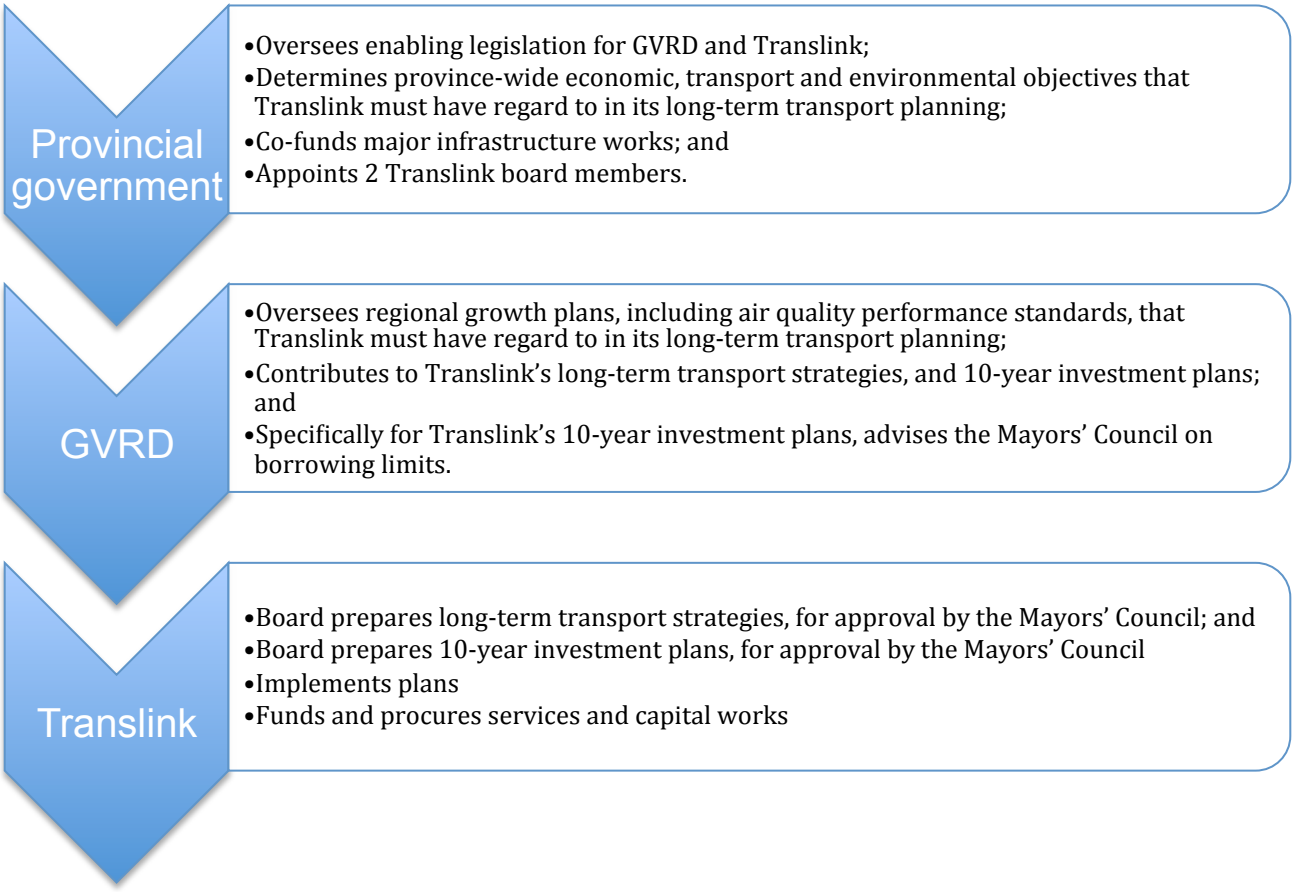
Two main institutions make up the Vancouver model of metropolitan governance: the Greater Vancouver Regional District (GVRD), which is responsible for regional planning, water, sewerage, solid waste, and parks; and Translink, which is responsible for regional transport (including, but not limited to, public transport) (Greater Vancouver Regional District 2014; Translink 2014b). Both institutions are established by provincial (state) level legislation. They work together to provide integration of the regional land use and transport planning, aided by the fact their respective political representation is drawn from the same source: local government politicians from Greater Vancouver's 21 municipalities (Greater Vancouver Regional District 2014; Translink 2014b)

The GVRD board is made up of 40 directors, 37 of whom are drawn from the 21 municipalities on a proportional basis; the remaining 3 directors represent unincorporated areas of Greater Vancouver, the area's First Nation peoples, and a separate municipality that is part of the GVRD for parks services only (Greater Vancouver Regional District 2014). Each director is appointed by its respective organisation (e.g. local municipality) (Greater Vancouver Regional District 2014).

Translink's political representation is similarly constituted, the main difference being that it is the Mayors of the 21 municipalities, not simply elected officials, that comprise the representative group, alongside the chief of the First Nation, and an elected representative from the unincorporated areas (Translink 2014b). This representative group is known as the Mayors' Council. The Chair and Vice-Chair of Mayors' Council sit on the Translink Board, alongside 7 expert members appointed by the Mayors' Council, and a further 2 expert members appointed by the provincial government (Translink 2014b).

Collectively, the agencies involved in transport and land use planning in the region operate in a cooperative network, with complementary, not overlapping, roles and responsibilities, as summarised below, in **Figure 1**.

Figure 1 – Division of responsibilities in Vancouver



(Source: derived from Translink 2014b).

The main transport plans, consisting of the long-term transport strategy and the 10-year investment plan, show how the model works in practice. The current long-term transport strategy is *Transport 2040*, which articulates 6 broad goals and 4 strategies for achieving them (Translink 2008). The 6 goals include "aggressive" reductions in greenhouse gas emissions, ensuring "most trips are by transit, walking and cycling", the "majority of jobs and housing in the region are located along the Frequent Transit Network", and finally, that "funding for Translink is stable, sufficient, appropriate and influences transportation choices" (Translink 2008). In order to achieve these goals, *Transport 2040* establishes four strategies:

- "Strategy 1: Make early investments that encourage development of communities designed for transit, cycling, and walking";
- "Strategy 2: Optimize the use of the region's transportation assets and keep them in good repair";
- "Strategy 3: Build and operate a safe, secure, and accessible transportation system"; and
- "Strategy 4: Diversify revenue sources and pursue new and innovative ways to fund transportation" (Translink 2008)

As the section below shows, funding arrangements have been put in place to make good on these commitments. Before turning to funding, however, it is necessary to discuss the institutional and governance model in Zurich, which, unlike the Vancouver model, involves an important role for the federal government, of particular relevance when considering the implications for Australian institutions.

The Zurich model

The *Verkehrsverbund* (transport federation) model is a regional collaborative governance arrangement between multiple tiers of government and transport operators that has been adopted in Germany, Switzerland and Austria, but is particularly successful in Zurich (Acuere Consulting et al. 2013; Augustin et al. 2011; Pucher and Kurth 1995; Stone 2011; Zurich Verkehrsverbund 2014).

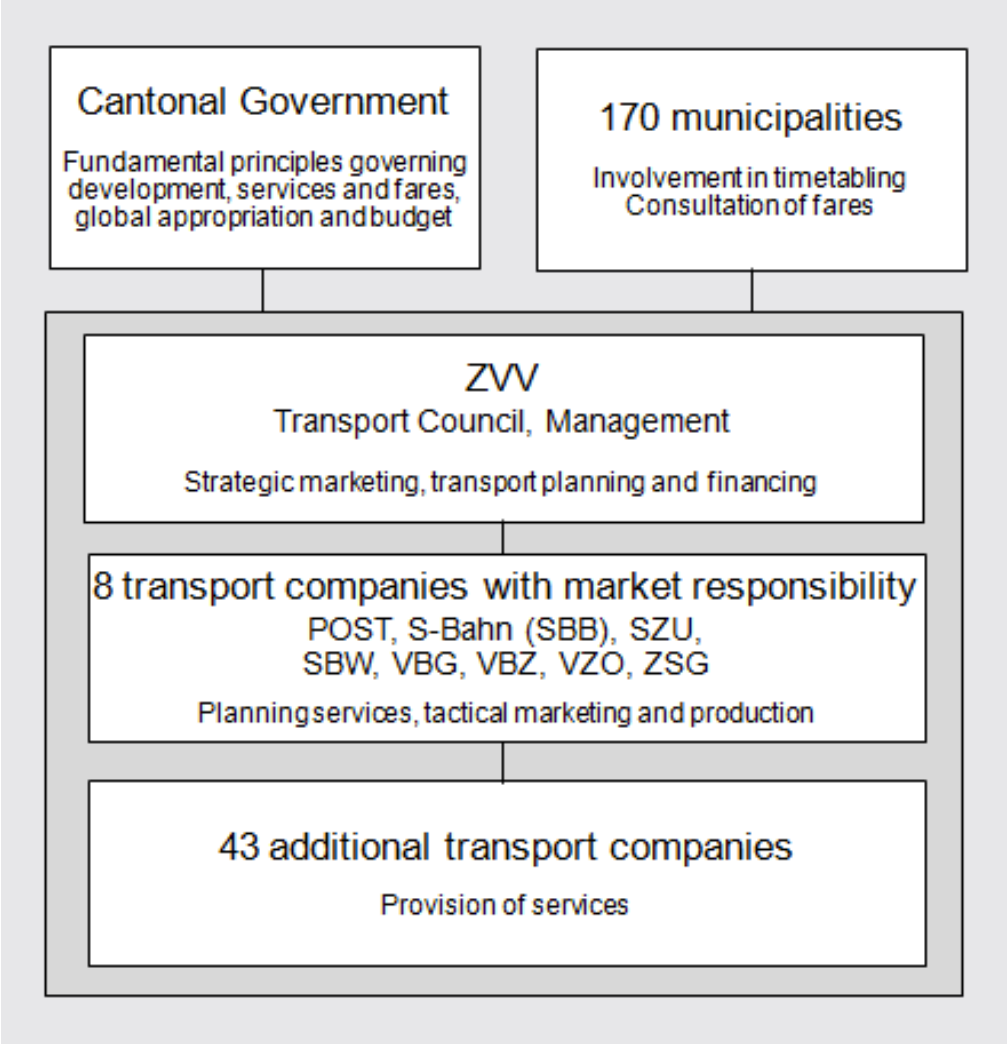
The Zurich *Verkehrsverbund* (ZVV) was established in 1990, to plan, coordinate and fund integrated public transport services across the 170 municipalities making up greater Zurich, including municipalities lying outside the borders of the Canton Zurich (the state within which Zurich is situated) (Pucher and Kurth 1995). There is no GVRD-equivalent in the land use field in Zurich, with these questions taken up in cantonal structure plans and local development control frameworks. Importantly, however, the organisation design of ZVV facilitates coordination between these levels, particularly given the make-up of the ZVV board.

Similar to Vancouver, the political representation on the ZVV is derived from both local and cantonal government. However, the Zurich model differs in key respects, particularly in that the Board (or Transport Council) is derived from a mix of cantonal and local political leaders, combined with technical advisors from the federal government and the national rail company, *Schweizerische Bundesbahnen* (SBB). The Board is constituted as follows:

- The cantonal government appoints the ZVV Chair and one additional board member (currently, the ZVV Chair is the Vice-President of the Canton Zurich);
- The Mayors of the municipalities in the ZVV system appoint 5 board members from amongst their number;
- The federal government appoints 1 board member from the Federal Office of Transport; and
- The national rail operator, SBB, appoints 1 board member from among its staff (Zurich Verkehrsverbund 2014).

This combined political and technical Board works with ZVV management to plan services and oversee the eight main transport operators in the system. These operators also have a planning role, but the authorisation decisions (to fund new services, for example) are taken at the ZVV level. A further 43 smaller transport operators act as partners to the 8 operators (ZVV, 2014) (Zurich Verkehrsverbund 2014). **Figure 2**, below, depicts the organisational structure of the ZVV system.

Figure 2 – Organisational structure of the ZVV system



(Source: Zurich Verkehrsverbund 2014)

Both the Vancouver and Zurich models combine the need for political representation at a metropolitan level, supported by technically robust planning, as Mees (2010b), Stone (2013) and others have discussed widely. This offers a useful comparison with Australian practice, in light of the planning and democratic deficits discussed earlier. Part of the success of these models lies in having robust funding arrangements, as explained in the next section.

The importance of sustainable funding

Development of high-quality public transport networks requires adequate funding – for current services, new services, and where appropriate, capital works aimed at increasing capacity in a particular corridor (such as the construction of a new train line).

Putting both operating and capital funding on a more solid footing – and spending the money wisely – is arguably an essential pre-condition to any reformed governance arrangements in Australian cities functioning effectively. The experience from Vancouver and Zurich suggests that stable funding underpins longer-term planning, and creates certainty, because plans stand a greater chance of being realised in practice. Part of the reason that funding is stable in these two cities is that it is drawn from diverse sources, including, in the case of Vancouver, from capital markets.

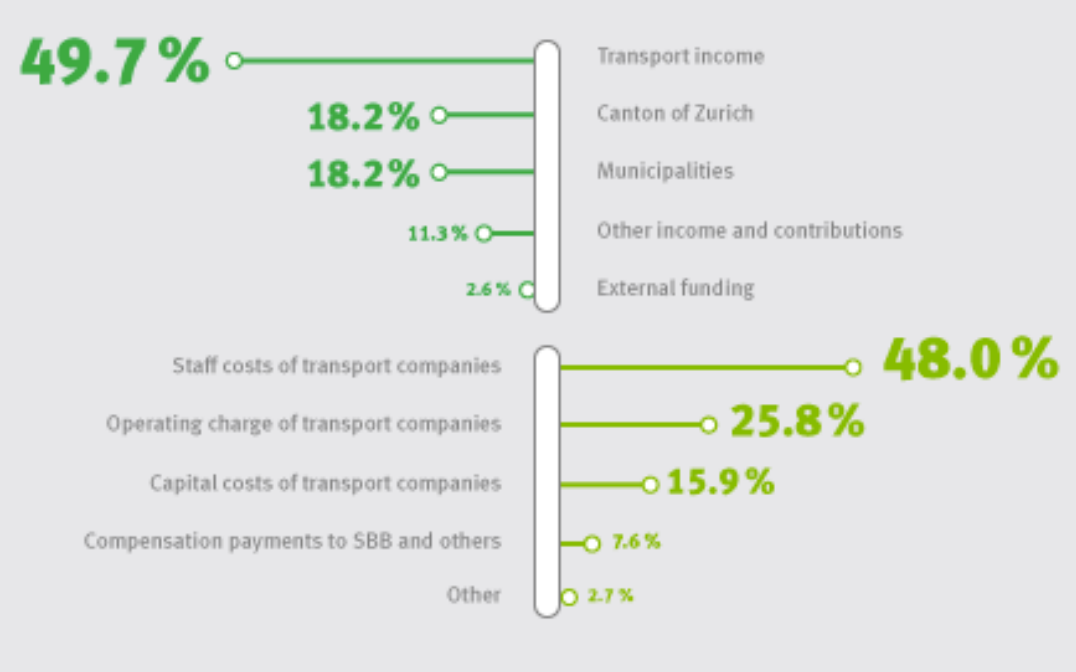
As identified in Vancouver's *Transport 2040* strategy, funding considerations are central to making the system 'work'. Success on this score is revealed through examination of the financial sources used to fund capital and operating costs in Vancouver. In 2013, of Translink's CAD$1.443 billion in revenue, CAD$741m was derived from taxation (fuel, property and taxation) receipts it collects under

provincial law (51%). A further CAD$451m (31%) was sourced from farebox revenue on the public transport system. Just CAD84m (6%) was provided directly by government, to cover operating and capital costs. Further, to pay for capital works, Translink currently carries some CAD$4.8 billion in debt, sourced from capital markets and governments, or resulting from future public-private partnership (PPP) payment obligations. It nevertheless maintains an AA credit rating (Translink 2013).

This diversity of funding sources would seem to underpin the 10-year investment planning processes, which in turn aligns with the strategic, longer-term planning in *Transport 2040*. The 10-year investment plan must be updated annually, and includes two main components: a 3-year plan, and a 7-year 'outlook', based on priorities that can be met through 'established' revenue sources. In addition, Translink may prepare supplementary plans, which include incremental investment opportunities that would require additional revenue sources, given Mayors' Council the flexibility to endorse more aggressive service and infrastructure investment where supplementary funding can be secured (Translink 2014a).

Similar to Vancouver, in Zurich, funding comes from a diversity of sources, as set out in **Figure 3**, below, alongside its distribution through operating and capital costs

Figure 3 – ZVV funding sources and costs



(Source: Zurich Verkehrsverbund 2013)

In general, the ZVV's funding sources are heavily weighted to government grants – from cantonal and local governments – in contrast to the tax collection powers of Translink. Capital funding – and hence, the investment planning process – is also notably different in Zurich. The canton and municipalities co-fund CHF90 annual budget for capital maintenance works, while major infrastructure projects (such as tram line extensions) are subject to funding decisions (based on voter approval, through the referenda system) at local, cantonal and federal government levels (Zurich Verkehrsverbund 2013).

By contrast, Australian public transport agencies rely almost entirely on state and territory government grants, for both operating and capital expenses. This is a highly contingent source of revenue that arguably works against medium- and longer-term planning. PTV, for example, was 100 per cent reliant on government grants for capital and operating costs up until 31 December 2013; in addition to being wholly reliant on government to fund new infrastructure, PTV received farebox revenue and remitted it directly to Treasury, in exchange for an annual subsidy payment covering all operating expenses. It now receives farebox revenue and remits it to operators, while receiving a

smaller government operating grant. Nevertheless, farebox revenue appears to cover only around 20% of operating expenses, with the remaining 80 per cent derived from government grants (Public Transport Victoria 2014). Similarly, in 2013, the PTA in Western Australia collected only around 18% of revenue from the farebox, and sourced the remainder from government grants. It receives capital funding contributions solely through government grants (Public Transport Authority 2013).

A number of factors may explain this lack of diversity in funding sources for Australian public transport agencies. It may be that state treasuries are reluctant to hypothecate revenue sources (such as land taxes) to public transport agencies, given budget pressures resulting from the vertical fiscal imbalance described above. However, a plausible explanation is offered by Moran (2014). The former head of the Victorian and Commonwealth public services explains that the vertical fiscal imbalance has generated, among states and territories, a view that the Commonwealth government is "the only source of revenue", and that this has meant "states prefer to go to the Commonwealth, rather than handle the more challenging task of gaining community support for generating the revenues needed to support the services they provide" (Moran 2014). Hence, the odds are against states unilaterally moving to introduce new funding sources that would put public transport agencies on a more sustainable financial footing that would, as in Vancouver and Zurich, underpin medium- and longer-term planning. To address this, some form of Commonwealth intervention is arguably warranted, in order to drive cooperation between the levels of government in Australia. This is discussed in the final section of this paper.

Before that, however, consideration is given to how metropolitan governance arrangements might support car use disincentives, the other main policy direction canvassed in the main paper.

Metropolitan governance and car disincentives

The Vancouver and Zurich models offer examples of urban and transport governance at the metropolitan level that highlight potential ways forward for Australian cities. These insights speak to the 'transit incentive' component of the model of transport incentives and disincentives, as discussed in the main paper (Vuchic 1999). But what of 'car disincentives', which are also required to re-balance cites towards sustainable transport?

Australia has had limited success in devising and implementing even modest policies aimed at reducing the growth of car use (let alone measures that might result in deep cuts in car travel mode share). Indeed, freeways are being expanded in our capital cities at a significant rate, most recently in the form of projects such as Sydney's WestConnex, and Melbourne's East-West Link. In part, this reflects the political attractiveness of big road projects (and the political consequences of implementing measures such as road pricing, or car parking removals). A further factor is the strength of roads agencies, maintained through the institutional path dependence described earlier, which help define the problems (congestion) and solutions (more road building) that provide the impetus for such investments.

Any move towards metropolitan governance in Australia cities provides an opportunity to challenge this direction in policy. The experience in Vancouver and Zurich suggests two possible approaches, the former based on metropolitan-level implementation of car travel minimisation measures, the latter showing what is achievable when 'bottom-up' initiatives from municipalities occur in the context of a coordinated, regional public transport system.

In Vancouver, Translink is responsible for management of the regional major roads network, alongside its responsibilities for public transport (Translink 2014a). This allows the resolution of questions about transit incentives and car disincentives under one organisational 'roof', and through the framework of citywide political representation described above. There is a clear line in Translink's activities from the sustainability goals in *Transport 2040*, down to a 10-year investment plan which contemplates road spending primarily for maintenance and rehabilitation of the network, rather than expansion (Translink 2014a, 2008). This lack of a freeway or arterial road building program works hand-in-glove with the significant transit incentives provided, in the form of a high-quality, and expanding public transport services. Such questions have been deliberated on and

legitimised through the agency's political representation, and arguably constitute a re-set institutional 'path', in favour of sustainable, public-transport based development.

Zurich, meanwhile, illustrates the possibilities of local action. The City of Zurich, covering the financially powerful, historical centre of the city, is responsible for local traffic in the area. In 1996, the City reached an agreement with business groups that instituted significant car parking reforms, which effectively capped parking supply at 1990 levels – a decision known as the 'historic compromise' (Garrick and McCahill 2012). Any off-street parking provision thereafter results in the removal of on-street spaces. In 2010, the citizens of Zurich voted in favour of a referenda that would further limit car-parking provision in local areas, based on the quality of public transport services in those areas (Garrick and McCahill 2012). While this example of localised action was the work of the City of Zurich, rather than a wider, metropolitan governance arrangement, it was arguably made possible in part by the development, through the ZVV, of a coordinated regional public transport system that provides a viable alternative to car use.

In both examples, car use is being managed, and particularly in central areas, reduced. This is occurring in the context of a wider coordination of regional public transport and land use, legitimised through the democratic process. These models suggest options for Australia cities as they tackle high levels of car dependency.

While technological changes in the automotive sector, such as the introduction of car sharing, and driverless cars, may make car use more efficient over time, they are currently not widely deployed. When they do become commercial, it would seem critical that their merits are assessed based on expected impacts across the metropolitan transport and land use system, configured towards public transport and clustering of development.

This proceeding section has set out a number of experiences from local and overseas contexts that may have application to Australian. The question remains, how can such changes be pursued here, given our particular urban issues, and institutional arrangements? The following section concludes this paper with a recommendation that the Commonwealth government use its funding powers to incentivise the development of improved institutions and governance arrangements, and through them, planning practices, in Australian cities.

4. Conclusion

4.1. Commonwealth government intervention as a potential circuit breaker?

Due to its funding powers, the Commonwealth government has an opportunity to use tied grants to states and territories to drive particular policy outcomes. Specific grants on a project-by-project basis (e.g. individual freeway upgrades or rail projects, such as Victoria's Regional Rail Link) or longer-term program basis (e.g. Roads to Recovery funding to local councils) are a routine feature of Australian intergovernmental relations (Department of Infrastructure and Transport 2013a). The same Commonwealth government 'levers' might be applied to driving strengthened public transport funding and governance, integration with land use planning, and introduction of car disincentives.

In Switzerland, the federal government uses funding as a means of driving desired transport and land-use outcomes, particularly urban containment and meeting future mobility needs overwhelming through public transport and sustainable transport modes. The Agglomeration program was devised in 2001 as a means of coordinating local government and canton (state) level activity, particularly to achieve better 'vertical integration' between the three levels (Kübler and Rochat 2011; Kübler et al. 2003). Swiss metropolitan areas are generally a patchwork of local governments, and while the cantons, with significant tax-raising powers, offered a means of coordinating transport and land use development at the regional scale, further integration was deemed necessary (Kübler et al. 2003). In Zurich, for example, public transport planning and delivery had been 'regionalised', through the formation of the ZVV in 1990, yet significant land use coordination problems were evident (Kübler and Rochat 2011).

The Agglomeration program seeks to address these failures of vertical coordination by, in effect, making federal infrastructure funding conditional on policy and institutional cooperation at canton

and local government level. This can take the form of governance reform, including formation of regional-level institutions, and through the formation of integrated, and implementable, regional transport and land use policies designed by canton and local governments cooperating in a regional forum (Kübler and Rochat 2011). To support the program, the federal government provides stable budget funding of around CHF3.4 billion per annum (AUD$4.18 billion) (Kübler and Rochat 2011). This has led to a number of large infrastructure projects being funded, and integrated with detailed land-use planning, including a new tram line in Zurich West (CHF150m) and in Zurich's growing north-eastern suburbs (CHF650m) (Kübler and Rochat 2011).

Such schemes could arguably be adopted in Australia. Indeed, the institutional framework within which such reforms could be negotiated, namely the Council of Australian Governments (COAG), already exists. Specifically, COAG's Transport and Infrastructure Council could be tasked with progressing the design and implementation of a similar scheme. This would go beyond the loose forms of cooperation and information-sharing agreed in previous form attempts, including the COAG Reform Council's 'Review of Capital City Strategic Planning Systems', by providing financial incentives to states to restructure urban governance and planning settings (Council of Australian Governments 2012). In particular, these incentives could be designed around a common approach to metropolitan-level transport and land use governance and planning, including promotion of public transport integrated with land use development, car disincentives, and agreed political representation and funding approaches, drawing on best practices in cities such as Vancouver and Zurich. While best practice examples could inform setting of minimum standards for governance and planning, this need not be prescriptive, but rather, reflect a constructive, intergovernmental dialogue that recognises the states' constitutional responsibilities for planning and transport, as well as their practical expertise in these domains.

While this would undoubtedly be a complex and contested process, major national reform exercises such as the development of the National Competition Policy in the 1990s, show that extensive renovation of intergovernmental architecture is possible in practice.

4.2. Summary

This paper has sought to examine the role that institutions and governance arrangements can play in achieving a series of 25-year transitions that are needed in Australian cities, if sustainable patterns of land use built around public transport mobility are to be realised.

A number of weaknesses in current institutional and governance arrangements were identified. At a high level, these include planning and democratic deficits, with a series of corresponding issues: politicisation of infrastructure investment, constitutional arrangements that limit the Commonwealth's role in urban affairs but do not ceded significant tax-raising powers to the states and territories, erosion of planning's range and strength under neoliberalism, and the relative power of roads agencies.

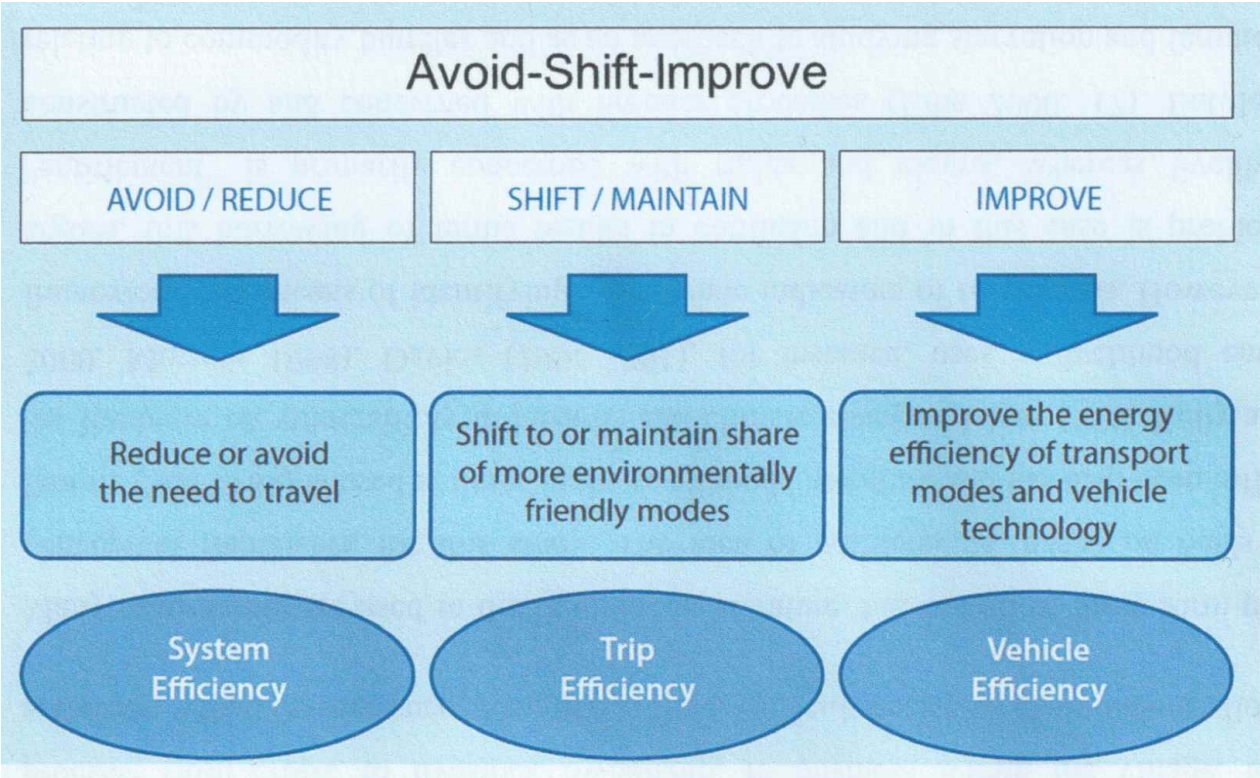
While the nature and diversity of these challenges may seem overwhelming, evidence from local and international settings suggests a way forward. Models of urban governance in Vancouver and Zurich provide insights into what is possible when metropolitan-level strategic planning is backed by political legitimacy and robust funding arrangements. Closer to home, aspects of good public transport governance are particularly evident in recent Queensland and Western Australian practice, but have arguably been wound back following changes of governments in those states.

The paper concludes that metropolitan governance arrangements, supported by 'vertical' integration of Commonwealth, state and local government actions, offer a potential way forward. This would involve the Commonwealth making more effective use of its funding powers, and the states and territories' concerns for greater taxation revenue, by investing in urban development programs conditional on the improvement of deficient institutional and governance arrangements (towards metropolitan governance with adequate citywide representation and funding) and policy settings (transit incentives, car disincentives).

Australia has embarked upon, and successfully implemented, large intergovernmental reform exercises of this nature in the past, and should seek to do the same for future prosperity and fairness of the cities in which most of us live.

Part 5: Pathways to sustainable mobility

As a way to make concrete the findings of the earlier sections, we have summarised the pathways to more sustainable access and mobility in Australian cities using a framework developed by the International Energy Agency. The Avoid-Shift-Improve Framework, illustrated below, can be used to conceptualise three major pathways to sustainable access and mobility in urban passenger travel, using energy efficiency as a proxy for the broader definition of sustainability adopted in this study.



Within this framework, the following table identifies some of the strategies and policy instruments that will need to be employed to achieve more sustainable urban access and mobility over the next 25 years. This list is clearly not exhaustive, but it gives an indication of the complexity of the task.

To conclude the report, we discuss some of the particular issues that arise in four generic locations: the inner, middle and outer suburbs of the capital cities, and regional towns.

Strategies and policy instruments	Avoid (or shorten) trips	Shift travel to cleaner modes	Improve efficiency/emissions (See 'technology study')
Planning/political leadership	Cluster 'destinations' in polycentric nodes. Consolidate urban growth boundaries. Establish political 'accord' on population growth and urban 'infill'	Establish segmented mode share targets for different trip purposes and locations. Use 'network' and 'least-cost' planning techniques to identify new PT service and infrastructure requirements, incl. interchange improvements. Safe networks for active travel.	Anticipating benefits and problems with emerging technologies
Regulatory	Minimum standards for new 'infill'	Parking controls	Effective regulation of new technologies and new 'para-transit' IT applications Emissions and efficiency standards
Economic	Mechanisms for 'affordable' infill	Funding mechanisms for new infrastructure and to cross-subsidise services required to provide effective 'networks'	Tax and subsidy incentives
Information	Tele-commuting and 'smart work centres'[3] On-line shopping	Multi-modal information in real-time	
Technology			ITS Electric and alternative-fuel vehicles

1. Inner suburbs

The modest trends towards sustainable mobility in Australian cities are most evident in the i
where agglomerations of residential housing, workplaces and a wide range of other 'destinat
created over decades of diverse economic activity and historical patterns of transport service
patterns of urban intensification in the inner suburbs are largely shaped by the interests of ca
considerable investment in office and retail space and in high-rise apartments, typically targ
highest and lowest ends of the market with little in between. The sustainability of such deve
question, (see for example, Thakuriah et al. 2012), but this question is outside the scope of t

Key observations of transport policy and travel behaviour:

Transport services are often described as 'rich', but are under considerable pressure. Public
transport networks are 'high quality' only in comparison to conditions in middle and outer s
against international benchmarks.

There is little clarity on policies to alter the balance of incentives and disincentives between
modes.

Car ownership remains high while the growing range of transport 'choices' (including safer
and bike share schemes, and available public transport services) and relatively short trip dist
reductions in local car-use possible.

There is continuing political conflict over intensification, and over allocation of road space t
modes, especially in relation to parking. This requires political leadership to establish a worl
built around targets and other guidance for the resolution of local conflicts

There is some evidence of self-selection among new residents who are willing to trade parki
and, to a lesser degree, businesses that recognise that their market does not rely on car-based

2. Middle suburbs

These established suburbs, typically in a 5–25 km radius of the CBD, have potential to deve
access and mobility pathways. They are "rich in services, transport, amenities and employm
compared to the outer and peri-urban suburbs" (Litman 2014) and are "highly flexible and a
features that make change possible including a mix of different land uses in a small area, a d
building stock and shopping areas that can change and grow as markets change (BTS 2013).
also have road layouts suitable for fast, direct bus services to provide local and feeder public
networks that offer households greater choice in response to increasing costs or travel times.

Current travel patterns, except for trips to the CBD, are built on the comparative comfort an
car travel, but growing congestion in peak periods and at weekends is eroding this advantage
frustrations that could, with effective leadership, be used to build support for new transport p
transport policies could play an important role in creating the conditions for a political settle
currently 'toxic' question of 'infill' development in the middle suburbs that will be required
increases as demographers expect.

Appropriate development of these potential infill areas of our cities to incorporate more med
mixed-use buildings could contribute significantly to their sustainability (ABS 2013c). How
have been targets in place for this type of redevelopment, no Australian city has yet come cl
development does occur, it is "largely self-organising, market-led and ad hoc" (Litman 2014

Three possible models have been identified: transport-oriented development, urban transpor
regeneration and residential precincts. While the first two approaches are considered necessa
contribute on their own to making our cities sustainable "as they consign the remaining 90 p
(middle-suburban) residences to piecemeal infill redevelopment" (Litman 2014). However,
infill is occurring in places with little or no effective public transport, which means that muc
development remains car-dependent (ABS 2013c).

Progressive community planners have long advocated a 'cluster and connect' model for redevelopment of Australian cities. As Melbourne faced a future of oil dependency and freeways in the '70s, the authors of Seeds for Change, proposed a model of "supportive neighbourhood houses and lively local foci and district centres strung together with public transport". This is consistent with a long tradition in urban planning theory and is supported by empirical research(p. 12). Siembab and Boarnet (2012) found, in the South Bay area of California, that the 'capture rate' (the fraction of trips that are strictly within a neighbourhood increases as businesses in the area increase. They concluded that a more important factor than residential density to reduce travel demand was for retailers, service providers and employers to have multiple locations, rather than just one single large centre (Siembab and Boarnet 2012).

A different model is suggested by Khor et al (2004), who argue that, at a 10km x 10km scale, the "built form, transit and land use strategies come together as co-functioning parts of an integrated urban system" . Rather than clustering services and amenity in central locations, complementary facilities might be redistributed across several destinations and made accessible by effective multi-modal transit connections. However, these 10km x 10km areas are not neighbourhoods necessarily as they can cross local government jurisdictions and so require multi-scalar alliances to achieve the necessary intensification of active transport flows and built forms (Dovey et al. 2013).

Whatever, the most practical urban design model might be, as we saw earlier, the realisation of the 20-minute city' ambitions will require strong policies to give public and active transport modes clear competitive advantages over the car.

3. Outer suburbs - new fringe development

New fringe or 'greenfield' development "generally encompasses non-productive land, habitats and productive farmland on the urban periphery" (Carver et al. 2013). Most development in these areas is detached family homes with few 'destinations' and poor supply of arterial roads and virtually non-existent local public transport. In addition, typical subdivision layouts require a greater proportion of land area for local roads than in the middle suburbs. (p. 6) Some subdivisions include well-designed infrastructure for walking and cycling, but these are not assembled in a functionally connected way. Residential and commercial land uses are strictly segregated and lot sizes are uniform. In short, the potential for adaptability does not match that of the middle suburbs(p. 6).

While housing is affordable, at least when transport costs not included, there is currently little elasticity to rising fuel costs as a car is required for almost all trip purposes. Australia is yet to test the limits of this equation as the GFC did in the suburbs of US cities.

Emerging advocacy coalitions for improved public transport among 'fringe' local governments are an indication of local desire for alternatives to car-dependence.

The new mobility technologies of ITS, web-based para-transit and car share might be seen as solutions to this extreme car-dependence, but will their introduction will require targeted government support. The business models for the introduction of most of these technologies rely on their attractiveness (as do taxis today) as one more item in an existing menu of transport choices. So, they will seek to establish themselves in the inner suburbs.

4. Regional centres

Regional towns or regional centres are not easily defined because of their varying size and characteristics. Approximately 20% of Australia's population lives in regional areas with between 40,000 and 500,000 people (Loader 2011). Another 5 per cent live in towns with populations that range between 1000 and 40,000 residents (Loader 2011). Biddle and Markham (2012) define a regional town as one with a "large enough population to be considered a self-contained labour market and service centre (more than 10,000), but not too large that they begin to split into more than one location with distinct regions and identities (less than 250,000)".

Commuting between regional centres and small towns and the larger metropolitan areas has been growing significantly since 2006, particularly for women, with the need to access employment being the main motivator (RACV 2006). Gender-based commuting patterns are attributable to the work opportunities offered to women in regional areas. Small towns are traditionally structured around male-dominated fields such as agriculture and manufacturing; while industries with high numbers of female workers such as retail, administration and education are largely found in regional centres.

While the need for public transport between towns is well understood – if poorly provided for – alternatives to the car for local circulation have received very little attention. Bus services, designed on network planning principles, are increasingly being implemented in regional towns in New Zealand, and can offer good opportunities in Australia. And, in the larger regional centres in Australia, inter-city and freight rail-lines are now being recognised for their potential as backbones of local networks. Realising this potential will require new levels of cooperation between rail agencies and local governments.

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