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Sustainable population: an urban transport perspective

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Executive summary

Recent strong population growth in Australian cities has drawn attention to a range of national transport, and transport-related, sustainability issues. Key areas of national sustainability concern in relation to urban land transport include traffic congestion, greenhouse gas emissions, road fatalities and serious injury accidents, social exclusion associated with poor mobility options and the risks that are associated with Australia's high reliance on fossil fuels for transport. Effectively tackling these national concerns requires an integrated policy and program focus on desired outcomes in each of the critical problem areas. The national dimension demands federal leadership and a number of recent initiatives are promising in this regard (for example, Infrastructure Australia processes, the Council of Australian Governments' Capital City Strategic Planning initiative, and high speed broadband).

Sustainable solutions will require concerted action over a number of years, with a clear focus on intended outcome goals for congestion, GHG emissions, safety and health, social inclusion and energy security. Switching funding programs from a modal focus to an outcome focus should assist progress. In addition to targeted transport infrastructure investment, significant initiatives will be needed in areas such as urban settlement policies and programs, road pricing reform, travel behaviour change programs and better management of freight movements. Federal leadership can play an important catalytic role in helping to drive change towards sustainability, across areas that include investment funding support, integrating policy and program frameworks, reforming pricing and planning systems and stimulating research and development.

About the Author

Professor John Stanley is an Adjunct Professor in the Institute of Transport and Logistics Studies at The University of Sydney. He spent nine years as Executive Director of Bus Association Victoria, after eight years as Deputy Chair of Australia's National Road Transport Commission, with prior experience in consulting and government, at Federal and State levels. He is also a Board member of VicUrban, the Victorian Government's development agency, and of Victoria's Alpine Resorts Co-ordinating Council. He has forty years experience in land transport policy and planning and publishes and presents widely on sustainable land transport.

Population papers series

Population related issues were among the most contentious areas of public debate prior to and during the recent election period. Given its enduring and multifaceted nature, the debate on population is likely to be of continuing policy interest to senators and members of the 43rd Parliament.

The Parliamentary library commissioned a series of papers from leading authors on a range of aspects of population including the environment, the economy, demographic trends, public opinion, urban transport and international comparisons. The views expressed do not reflect an official position of the Parliamentary Library, nor do they constitute professional legal opinion.

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Introduction

Effective transport systems are a vital foundation of competitive economies and liveable, inclusive communities. They enable the efficient and safe movement of people and goods that is critical to quality of life, while supporting access to the many activities that Australians enjoy. They are also an important influence on environmental quality, at various levels. With three in four Australians living in cities of over 100 000 people, the quality of transport in, and to and from, cities is vital to sustaining economic competitiveness, social inclusion and environmental performance, the three outcome areas typically used as a triple bottom line gauge of sustainability.[1]

This paper examines the major sustainability issues facing land transport in Australian cities and proposes a policy framework to tackle these issues, highlighting policy and program directions that are likely to be beneficial. It identifies a number of areas where the commonwealth government might make important contributions. While some interfaces with air and sea are noted, the focus is on urban land transport.

Key sustainability challenges for Australian urban land transport

In terms of the triple bottom line sustainability indicators, Australia's current land transport systems face some major long-term concerns, particularly relating to city transport choices. Current travel choices for people and freight movement have resulted in:

- congestion costs of about $10 billion annually, and rising[2]
- high and growing transport greenhouse gas (GHG) emissions. At a carbon cost of (say) $60 per tonne, Australia's approximately 80 million tonnes of carbon dioxide equivalent (MT CO_2-e) transport emissions would constitute an externality of about $5 billion annually
- a road toll of about 1450 or more annually, together with 30 000 serious injury accidents. The road toll alone can be costed at almost $10 billion annually, using a 'willingness-to-

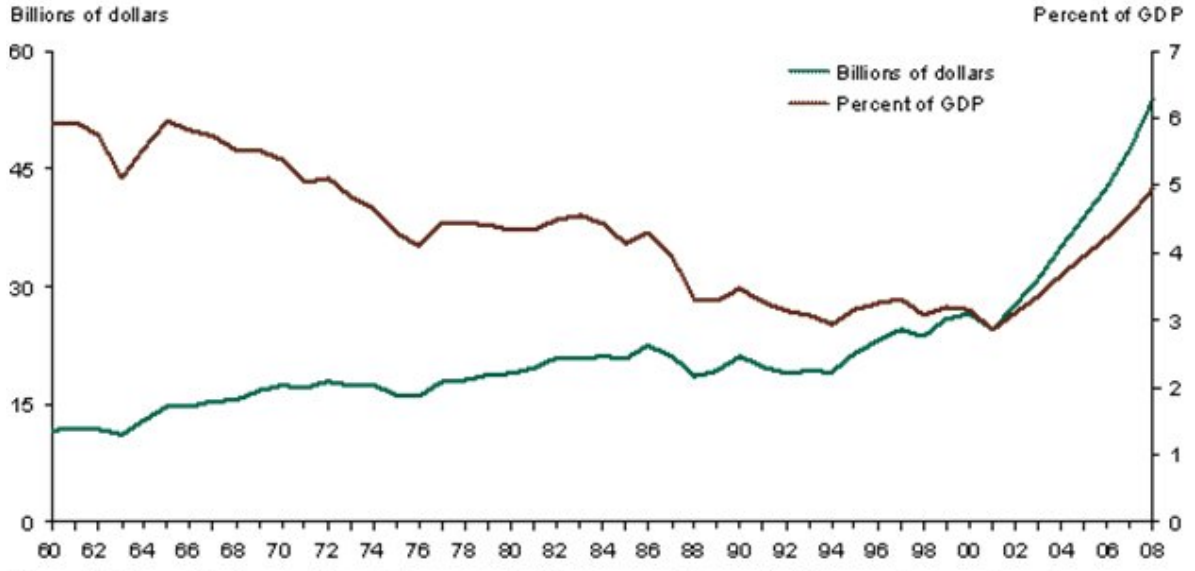
1. Following the approach taken in the Brundtland Report. See United Nations, *Report of the World Commission on Environment and Development*: *Our common future*, Australian edition, Oxford University Press, Melbourne, 1987.
2. Bureau of Transport and Regional Economics (BTRE), *Estimating urban traffic and congestion cost trends for Australian cities*, Working paper no. 71, BTRE, Canberra, 2007, viewed 6 September 2010, Hhttp://www.bitre.gov.au/publications/49/Files/wp71.pdfH

pay' value of life of $6 million.[3] This excludes injury costs and hospital and related costs to deal with accidents

- many people being at risk of social exclusion because of our high reliance on the motor vehicle, and
- high and increasing dependence on imported fossil fuels, which is a significant burden on the balance-of-payments current account and a source of risk in terms of peak oil and energy security.

A declining rate of transport investment over the last three decades of the last century, when the share of Australia's gross domestic product (GDP) invested in transport and storage halved (Figure 1), contributed to an infrastructure backlog and to some of the sustainability problems outlined.

Figure 1: Transport, utilities and communication infrastructure fixed capital formation (FY1960-2008)



Source: Australian Bureau of Statistics (ABS), *Australian System of National Accounts,* cat. no. 5204.0, Canberra, 2008.

Countries from Europe to North America, and elsewhere, have recognised these pervasive influences of transport and the importance of an integrated national approach to transport

3. D Hensher, J Rose, J Ortuzar,and L Rizzi, 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation Research A: policy and planning,* no. 43, 2009, pp. 692–707.

policy, to maximise the potential benefits from an effective and efficient urban land transport sector. As a result, urban land transport has typically become a much more significant element of national policy agendas in recent years and there has been a strong focus on improving the degree of integration in transport planning and policy development and implementation.

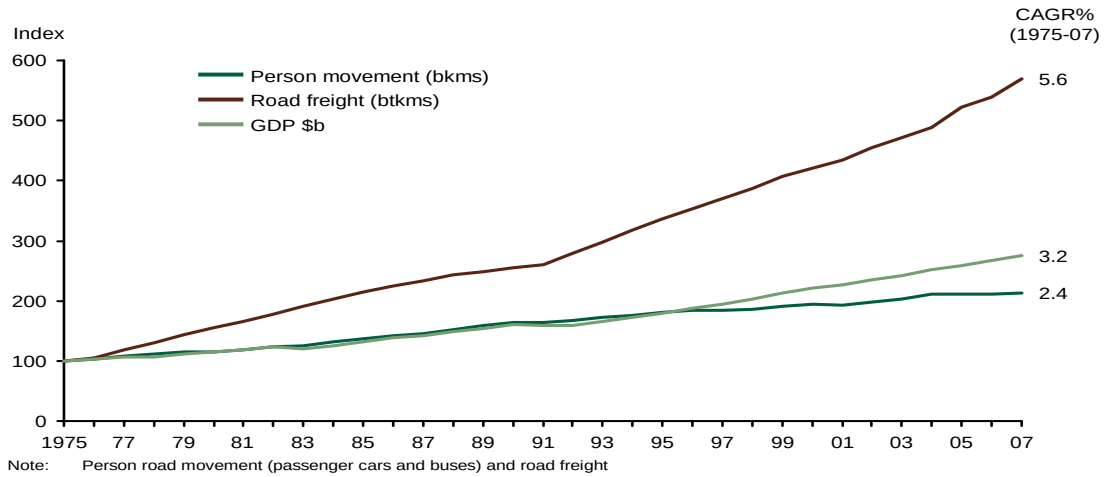
Population is central to questions of transport sustainability in our cities, for obvious reasons. The travel choices people make when deciding to travel or move freight directly influence the sustainability problem areas noted above, while the recent relatively high rate of population growth has accentuated many problems, because of the lagged response in infrastructure and service delivery (for example, public transport services). The strong recovery in transport infrastructure spending in recent years (Figure 1), much of it for major urban road projects and some public transport investment, has not been sufficient to stem the tide on sustainability outcomes, since (for example) congestion costs, GHG emissions and serious road injury accidents continue to rise.

Trends in city transport sustainability

Trends in the land transport task

Figure 2 shows that freight traffic on Australia's roads grew much faster than GDP over the three decades from the mid 1970s. Person movement grew in line with GDP until about the mid 1990s but has slowed somewhat since that time and particularly since the recent period of high fuel prices.

Figure 2: Growth in Australian road task (FY1975-2007)

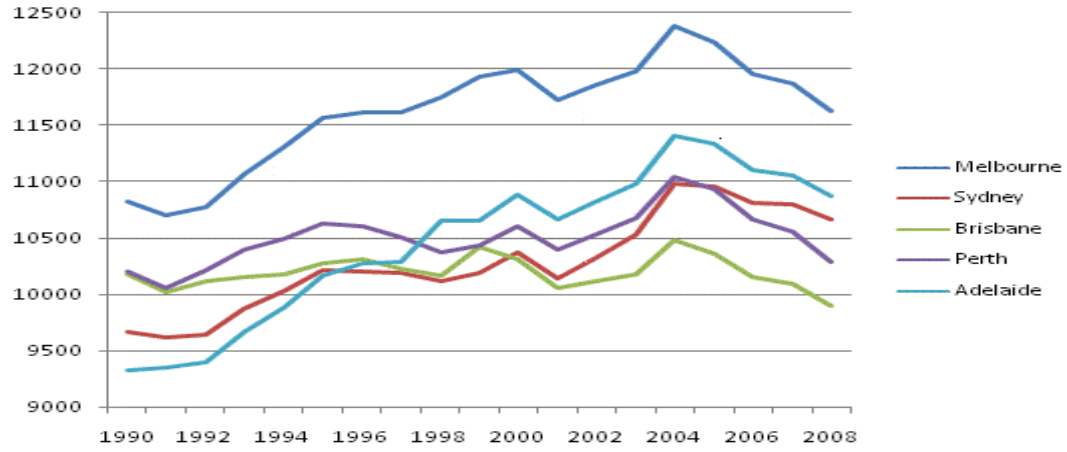


Sources: Bureau of Infrastructure, Transport and Regional Economics, *Australian Transport Statistics Yearbook 2009*, Department of Infrastructure, Transport, Regional Development and Local Government, Canberra, 2009. Australian Bureau of Statistics (ABS), *Australian System of National Accounts*, cat. no. 5204.0, ABS, Canberra, 2008. L.E.K. Consulting estimates of growth rates.

Figures 3 and 4 show that there has been a marked change in car and public transport travel choices in our cities in this recent period, with per capita car travel falling in all mainland capitals and public transport use increasing, strongly in some cities.

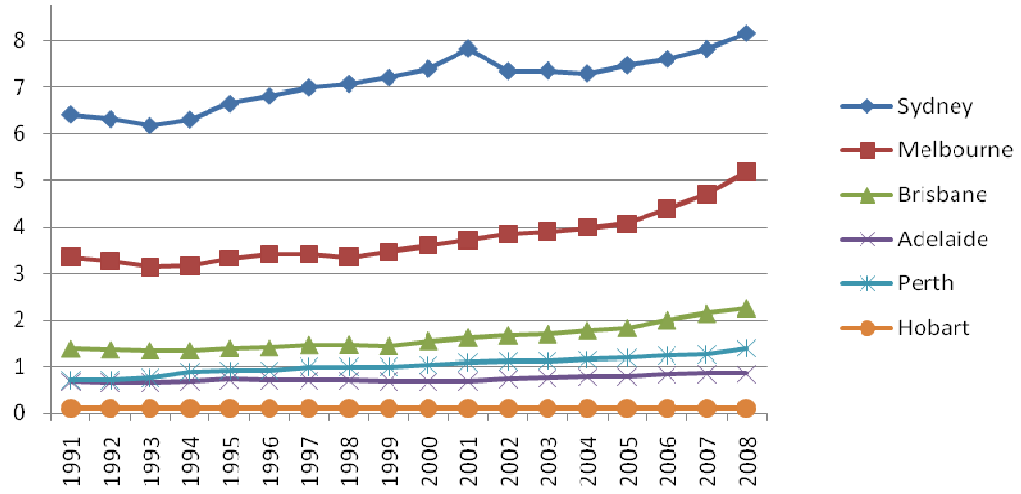
Congestion levels may themselves be contributing to this slowing of growth in per capita car use. The declining rate of per capita car use has helped slow the rate of growth of congestion costs and GHG emissions, in the face of strong population increases in many cities. This draws attention to the importance of better managing the strong growth in road freight traffic if better sustainability outcomes are to be achieved.

Figure 3: Estimated car passenger kilometres per capita (FY1990-2008)



Sources: Bureau of Infrastructure, Transport and Regional Economics, *Australian Transport Statistics Yearbook 2009*, Department of Infrastructure, Transport, Regional Development and Local Government, Canberra, 2009. Australian Bureau of Statistics (ABS), *Regional Population Growth*, cat. no. 3218.0, ABS, Canberra, 2009.

Figure 4: Public transport use in capital cities (FY1991-2008) (billion passenger kms)



Source: Bureau of Infrastructure, Transport and Regional Economics, *Australian Transport Statistics Yearbook 2009*, Department of Infrastructure, Transport, Regional Development and Local Government, Canberra, 2009.

Trends in city transport sustainability indicators

A large number of sustainability indicators could be chosen to reflect the performance of Australia's city transport systems. This paper selects a small number across the three sustainability outcome areas of economic competitiveness, social inclusion and environmental performance, reflecting the author's view on the major issues that remain to be tackled effectively. These indicators relate to the outcome performance of Australia's urban transport systems. The relevant indicators are:

- congestion
- greenhouse gas emissions
- social exclusion
- safety and health, and
- energy security.

Indicators could also be presented relating to (for example) matters such as traffic noise, air quality, run-off from road surfaces to streams and impacts on regional/local biodiversity. However, the author considers that legislative/regulatory processes and works practices have achieved progress in such areas (for example, improving air quality through emissions regulations, through processes managed by the National Transport Commission, and environmental regulation of works practices) and that they are of less relative significance for sustainability than the matters chosen.

Congestion

It was noted above that road traffic congestion in Australian capital cities has been estimated by the Bureau of Transport and Regional Economics to cost $10 billion annually and this cost has been has projected to double by 2020.[4] However, the recent declines in per capita car use shown in Figure 3 can be expected to slow this projected growth in congestion costs somewhat. These declines in per capita car use mean that current pressures for increasing congestion costs will be coming from road freight, which has been growing strongly (Figure 2) and from increasing city populations.

An important aspect of road congestion is the high rate of cost increase for additional units of traffic growth (high 'marginal social costs of congestion' in economic jargon). One implication of this cost relationship is that small reductions in congestion levels can generate large savings (benefits). United Kingdom research has suggested that urban congestion costs (in the UK) can be cut by over 40 per cent if congestion pricing reduces urban traffic volumes by about four per cent.[5] School holiday traffic levels in Australia typically involve slightly larger traffic reductions, illustrating the significant congestion gains to be achieved from small reductions in road traffic volumes. However, if the benefits of such a reduction in traffic volumes and associated congestion costs are to be sustained, measures are needed to limit any subsequent traffic generation caused by lower congestion levels.

Congestion is not restricted to road use. At the same time as peak period congestion has been a focus concern on Australia's urban roads, the growth in public transport use (shown in Figure 4) has seen increasing problems of over-crowding, particularly on peak radial services. A major focus of current urban public transport policy and program development is identification of the highest priority capacity enhancement initiatives. Many of the funding submissions to Infrastructure Australia have been for such purposes, with the subsequent Federal funding commitment of over $3 billion towards Victoria's $4.3 billion Regional Rail Express project being notable.[6]

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4. BTRE, op. cit.

5. Great Britain, Department for Transport, *Feasibility study of road pricing in the UK: a Report to the Secretary of State for Transport*, Annex B: Modelling Results and Analysis, Table B3, Department for Transport, London, 2004, viewed 10 June 2010, Hhttp://webarchive.nationalarchives.gov.uk/20040722012351/http://dft.gov.uk/stellent/groups/dft_roads/documents/divisionhomepage/029798.hcsp

6. A Albanese (Minister for Infrastructure, Transport, Regional Development and Local Government), *$4.3 billion regional rail express to create jobs and help suburban and regional passengers*, media release, 18 May 2009, viewed 8 September 2010, Hhttp://www.minister.infrastructure.gov.au/aa/releases/2009/may/aa164_2009.htmH

Greenhouse gas emissions

The Department of Climate Change projects that Australia's transport GHG emissions in 2020 will be over 50 per cent above 1990 levels and 28 per cent above 2000 levels.[7] Passenger car emissions are projected to be 13 per cent above 2000 levels and commercial vehicle emissions 45 per cent higher than in 2000, reflecting the strong growth in the road freight task noted above. Even in 2020, however, car emissions are projected to be well above emissions from commercial vehicles (47 MT CO_2-e from cars, compared to 36 MT CO_2-e from commercial vehicles), so emissions reductions strategies need to target both cars (because of their absolute significance) and commercial vehicles (because of their growth in significance). The Department of Climate Change does not publish separate projections for cities but, based on traffic task, over half land transport GHG emissions will be attributable to Australia's cities, which must be a major focus in policies and programs to lower emissions. Population growth is adding to these emissions.

The relatively high GHG emission rate of Australia's motor vehicle fleet is a significant contributor to the transport sector's emission levels. The average Australian car emits about 230 grams of CO_2-e per kilometre, compared to 169 grams for new vehicles in the UK (in 2005), 106 grams for the Toyota Prius, and against a European Union new car fleet average target of 130 grams by 2015 and an indicative target of 95 grams by 2020.[8]

Social exclusion

There is a growing body of evidence that mobility is an important influence on people's ability to participate in society. Poor mobility can be a significant contributing factor to social exclusion. In car dependent societies like Australia, the lack of car availability, in particular, can be a significant constraint on social inclusion. The 2006 Australian Census, for example, showed that:

- 13 per cent of people were aged under 18 and four per cent were aged 80 or over, both groups being likely to have low access to cars
- 10 per cent of households did not have a car
- 24 per cent of single person households did not have a car, and

7. Department of Climate Change (DCC), *Tracking to Kyoto and 2020. Australia's greenhouse gas emissions trends 1990 to 2008–12 and 2020*, DCC, Canberra, 2009, table 10, p. 33, viewed 15 August 2010, Hhttp://www.climatechange.gov.au/~/media/publications/projections/tracking-to-kyoto-and-2020.ashx
8. D Bannister, *Cities, mobility and climate change*, paper presented to the World Conference on Transport Research, Lisbon, 2010; European Commission, *Reducing CO2 emissions from light duty vehicles*, European Commission, 2010, viewed 24 August 2010, Hhttp://ec.europa.eu/environment/air/transport/co2/co2_home.htm

- nearly 50 per cent of households had only one car.[9]

These simple numbers suggest that transport is likely to be a concern for significant numbers of Australians. One important recent study has shown how urban dwellers living in the outer suburbs are most vulnerable to the impact of high fuel prices and high mortgage interest rates.[10] A recent Melbourne study indicates the relatively greater transport disadvantage faced by people living in outer suburbs.[11] The study found:

1. People living in outer suburbs make about the same number of trips as those living in inner suburbs (approximately 3.7 trips a day) but travel almost twice as far in so doing (40 kilometres a day in outer Melbourne, compared to 23 in inner Melbourne), a function of the relatively lower accessibility of outer areas.
2. Public transport service availability in outer Melbourne is about one-quarter that in inner Melbourne.

Figure 5 shows how this pattern varies for Sydney, with the proportion of household income spent on car use (including ownership costs), in particular, increasing substantially as the distance from Sydney City increases.

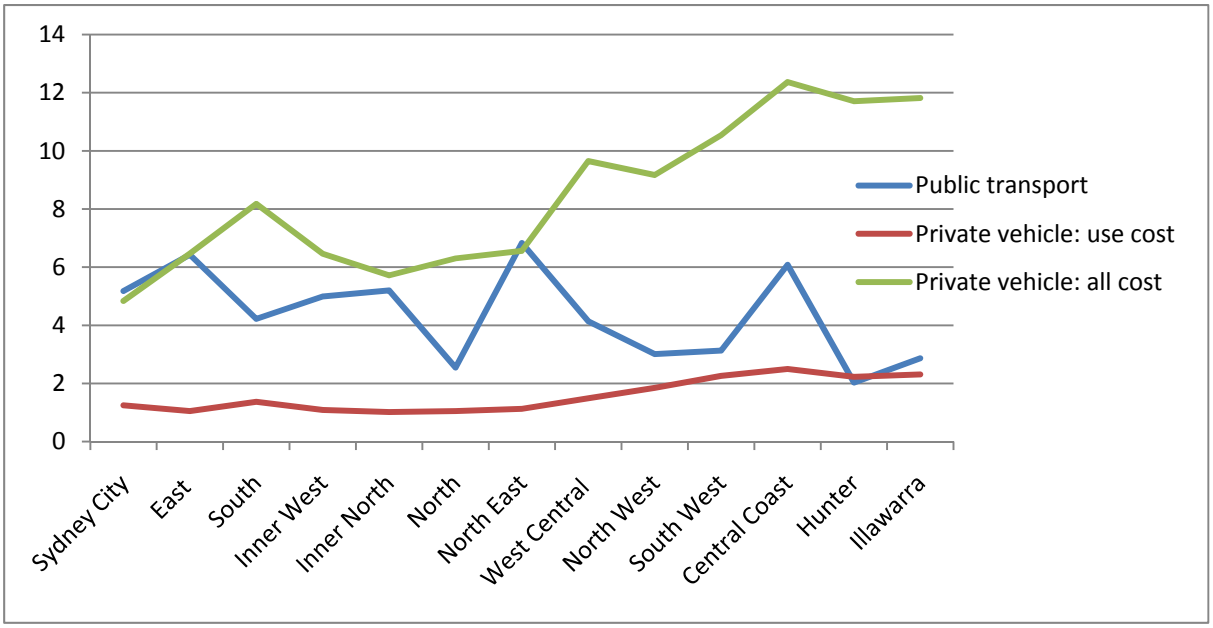
9. Australian Bureau of Statistics (ABS), 'Census data', ABS website, viewed 15 August 2010, Hhttp://www.abs.gov.au/websitedbs/D3310114.nsf/home/census+data?opendocument#from-banner=LN

10. J Dodgson and N Sipe, *Shocking the Suburbs: Urban Location, Housing Debt and Oil Vulnerability in the Australian City, Urban Research Program*, Research paper no. 8, Griffith University, June 2006, viewed 15 August 2010,

    Hhttp://www.griffith.edu.au/__data/assets/pdf_file/0004/48577/urp-rp08-dodson-sipe-2006.pdf

11. G Currie and A Delbosc, *Exploring transport disadvantage, social exclusion and well-being in spatial context*, paper presented to World Conference on Transport Research, Lisbon, July 2010.

Figure 5: Personal travel cost by public transport and private vehicle as a percentage of household income by region: Sydney



Source: Derived from data in Xiaofen Chen and D Hensher, 'What does it cost to travel in Sydney? Spatial and equity contrasts across the metropolitan region', *Working Paper ITLS WP-10-04*, Institute of Transport and Logistics Studies, The University of Sydney, 2010, viewed 20 August 2010, http://sydney.edu.au/business/__data/assets/pdf_file/0004/61915/itls-wp-10-04.pdf

National Economics argues that accessibility problems in Australian outer suburbs have been accentuated by the decline in transport infrastructure spending illustrated in Figure 1 and by lags in provision of other services to these growing areas, arguing that these factors have contributed significantly to current housing supply shortages.[12] Their report emphasizes the importance of:

- improving transport connections from outer areas to employment nodes
- building employment opportunities in outer areas, and
- improving the local availability of services in outer areas (for example, to reduce the need to travel)

for tackling the current problems of housing supply shortages in outer areas. They argue that a failure to adopt such policies will be likely to lead to growing concentrations of low income

12. National Economics, *State of the Regions 2010-11*, report prepared for the Australian Local Government Association, Canberra, 2010, viewed 4 September 2010, Hhttp://www.alga.asn.au/sor/2010/H

households in outer areas, remote from opportunities, with allied concerns for growing social exclusion. This perspective underlines the importance of taking integrated approaches to policy, not considering transport in isolation.

Safety and health

About 1450 people lose their lives on Australian roads annually and 30 000 are seriously injured. While the number of road fatalities was about halved from 1980 to 2003, there has been little progress in cutting the number since that year. Of 1366 fatal crashes in 2009, some 406 were in low speed zones, 299 in mid speed zones and 616 in high speed zones.[13] This is not a direct indicator of city location, or otherwise, but the numbers in the low and mid speed zones (at least) are likely to be urban and a small number of the high speed zones may also be in urban areas (for example, on freeways, which have very good accident performance).

In addition to the problems associated with road safety, there is growing community concern about links between a sedentary lifestyle and health status. For example, Australian Institute of Health and Welfare data indicates that 52 per cent of women, 67 per cent of men and 25 per cent of children are overweight or obese in Australia and the prevalence of obesity has more than doubled in the last 20 years.[14] One third of Australian children are considered to be at risk of developing obesity-related health problems (for example, type II diabetes) and, overall, inactivity among adults has been estimated to add $1.5b annually to direct health costs in Australia.[15] Further:

Physical inactivity is a key risk factor for chronic disease, but a growing number of people are not achieving the recommended levels of physical activity necessary for good health…the majority of Australians do not get enough physical activity.[16]

Figure 6 illustrates the increased dependence that has developed on the motor vehicle for personal travel. It shows how the mode split for travel to school in Sydney has changed dramatically over the 30 years from 1971. Similar patterns are likely in all capital cities.

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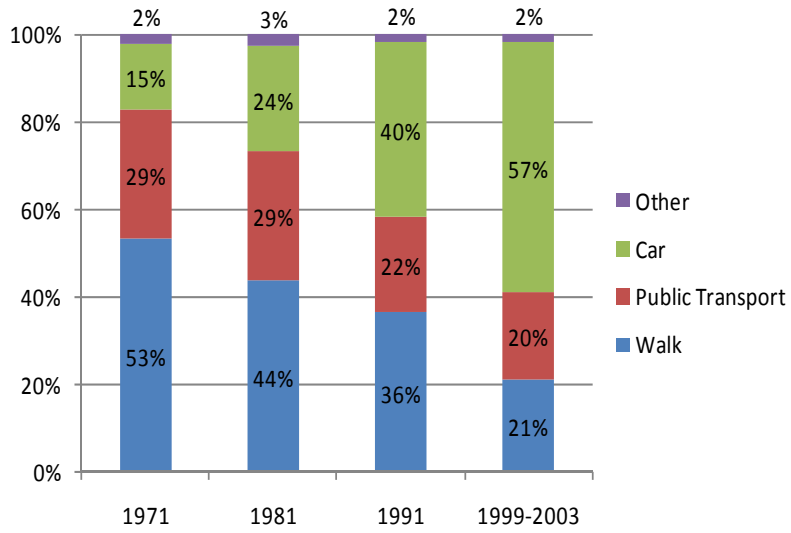
13. The number of fatal crashes is less than the number of fatalities because some crashes involve multiple fatalities. Bureau of Infrastructure, Transport and Regional Economics, *Road deaths Australia 2009: statistical summary*, Department of Infrastructure, Transport, Regional Development and Local Government, Canberra, 2010, viewed 21 August 2010, Hhttp://www.bitre.gov.au/publications/69/Files/Ann_Road_Deaths.pdf

14. Australian Institute of Health and Welfare (AIHW), 'Overweight and obesity', AIHW website, viewed 8 September 2010, Hhttp://www.aihw.gov.au/riskfactors/overweight.cfm

15. Medibank Private, *The cost of physical inactivity*, Medibank Private, August 2007, viewed 31 August 2010, Hhttp://www.medibank.com.au/Client/Documents/Pdfs/pyhsical_inactivity.pdf

16. L Cobiac, T Vos, and J Barendregt, 'Cost-effectiveness of interventions to promote physical activity: a modelling study', *PLoS Medicine*, vol. 6, no. 7, July 2009, viewed 4 September 2010, Hhttp://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000110

Figure 6: Mode splits for travel to school in Sydney (1971-2003)



Source: H van der Ploeg, D Meron, G Corpuz, and A Bauman, 'Trends in Australian children travelling to school 1971-2003, burning petrol or carbohydrates', *Preventive Medicine*, 46, 2008, pp. 60-62.

Whereas active transport (walking/cycling and public transport) accounted for over 80 per cent of Sydney trips to school in 1971, that share had halved by 2000–03, with car use increasing from 15 per cent to a massive 57 per cent. Much international experience is similar. This Australian trend is partly due to changes in workforce participation of women, with children now more likely to be dropped off by an adult on the way to work. It is also believed to be due to growing concerns about the safety of children walking or cycling to school, with programs like the 'walking school bus' emerging as a response.[17] Reversing this trend and encouraging walking, cycling and incidental exercise (including walking to and from public transport) would help to reduce the problem of obesity associated partly with growing car dependency. It would also have additional benefits in terms of reduced traffic congestion.

Energy security and peak oil

Australian capital city average retail petrol prices increased fifty per cent between 2002–03 and 2007–08.[18] Diesel prices in Melbourne increased nearly 50 per cent between June 2007

17. The walking school bus involves a group of children walking to school under adult supervision.

18. Bureau of Infrastructure, Transport and Regional Economics, *Australian Transport Statistics Yearbook 2009*, Department of Infrastructure, Transport, Regional Development and Local Government, Canberra, 2009, Table 11.4, viewed 21 August 2010,

and June 2008. These fuel price rises appear to have contributed to rapid growth in Australia's import bill for petroleum products and significant changes in people's travel behaviour, as shown in Figure 3.[19]

The causes of the recent rapid rise in fuel prices are the subject of much debate. However, there is a growing concern that the rises reflect, in part at least, long-term structural imbalances between oil demand and supply and that 'peak oil' is close, if not already at hand. In estimating future GHG emissions from Australia's vehicle fleet, the Department of Climate Change has cited 2020 oil price forecasts by the US Energy Information Administration and International Energy Agency, of $US120 and $US110 respectively, well above current prices.[20]

Rising oil prices are an indication of supply shortages, relative to demand. This adds an additional dimension to the oil price question, the issue of energy security. Australia is currently about 50 per cent self-sufficient for transport fuels, with this share reducing and being projected to be at about 20 per cent by 2030.[21] This increases Australia's vulnerability to supply restrictions/shortages. Any such limitations in availability would have adverse economic consequences, the severity depending on the scale and length of restriction.

Policy directions

State governments, in particular, have been targeting the issues raised above for a number of years. The evidence that these issues are generally getting worse, not better, suggests that much remains to be done and that **transformational change**, not the incrementalism of the past, is likely to be required to deliver more sustainable long-term outcomes.

To substantially improve the sustainability of Australia's land transport systems, especially city transport systems, national land transport policy needs to be framed around:

- managing congestion costs and improving economic competitiveness and liveability as it is affected by land transport
- achieving substantial cuts in transport GHG emissions

Hhttp://www.bitre.gov.au/publications/10/Files/BITRE_TRANSPORT_STATS_YEARBOOK_2009.pdf

19. Imports of petroleum, petroleum products and related materials increased from $14.9 billion in 2004–05 to $29.4 billion in 2007–08. See Australian Bureau of Statistics (ABS), *International trade in goods and services*, cat. no. 5368.0, ABS, Canberra, 2010, viewed 8 September 2010, Hhttp://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5368.0Jul%202010?OpenDocument H
20. Department of Climate Change, op. cit. p. 35.
21. RARE Consulting Pty Ltd, *Realising the benefits of hybrid technologies in the Australian bus industry*, report prepared for the Bus Industry Confederation, July 2010.

- ensuring adequate mobility options are available for all Australians (and international visitors)
- making the transport system safer
- encouraging healthier transport choices, and
- increasing our energy security, by reducing our reliance on (imported) fossil fuels.

National Economics has estimated a backlog of about $350 billion in transport infrastructure spending in our cities, which reflects the substantial decline in investment (as shown in Figure 1) experienced over the last three decades of the 20th century.[22] Given the high costs of major additions to road and public transport capacity in built-up urban areas, this estimate is not surprising. With many competing demands for scarce funds, the magnitude of this backlog draws attention to the importance of taking integrated approaches to tackling land transport sustainability issues. Policy and program approaches need to be integrated, in terms of:

- consistently and comprehensively pursuing high level goals of economic competitiveness, environmental sustainability and social inclusion (triple bottom line outcomes), and
- pursuing consistency between policy/program measures to address the critical national transport issues, across the three levels of government, other stakeholders and other sectors, not just via land transport policy. While land transport will be the primary focus in the search for solutions through national land transport policy, solutions to urban land transport problems will often arise elsewhere, such as in land settlement policies and programs, social policy programs and telecommunications innovation, such as broadband. To be most effective, these policies and programs should be integrated.

Motor vehicles will remain the major means of moving people and goods in Australia's cities. However, policy to improve the sustainability of Australian city transport systems is increasingly about:

- making more effective use of existing systems and services
- changing the modal balance for transport of people and goods away from such a high dependence on motor vehicles to methods of transport with less impact on the triple bottom line
- improving the environmental performance of all transport modes but particularly of cars and trucks, because of their dominant roles, and

22. National Economics, op. cit.

- ensuring that travel opportunities are available to all, irrespective of personal circumstances.

Six major **Program Directions** can support these policies, with indicative actions of the type shown below.

1. Reducing the demand for travel (for example, through land use planning measures such as increased density and co-location, so that activities become more highly concentrated and travel requirements reduce; and maximising opportunities for walking and cycling).
2. Achieving a shift to lower carbon transport modes (from cars to public transport, walking and cycling, and from trucks to rail).
3. Improving vehicle utilisation (increasing car occupancy rates, which are low and tending to get lower, and more efficient freight movements).
4. Reducing vehicle emissions intensity (more fuel efficient vehicles; alternative fuels that are less greenhouse gas intensive; greater use of intelligent transport systems; and better driving practices).
5. Increasing the availability of mobility opportunities (provision of reasonable base public transport service levels; and using available public transport opportunities more effectively – for example, school buses, and community transport).
6. Creating a more sustainable freight network (focus on improved freight movement to ports, intermodal hubs and to connect to key manufacturing and distribution centres).

Table 1 shows how these six program directions can positively impact on a number of the critical national land transport issues identified.

Most measures can help to address several of the critical issues, emphasizing the integrated nature of the policy directions that are being proposed. The extent to which any specific measure will be pursued in a particular city will depend on that city's circumstances and on the combination of measures that best improve sustainability against the key national issues that have been flagged, and others, in that city. However, some element of each of the six program directions should be expected in each city for an effective approach to improving sustainability. The Council of Australian Governments' (COAG) Capital City Strategic Planning Systems initiative should highlight opportunities in this regard.[23]

23. Council of Australian Governments (COAG), *Communiqué*, COAG, 7 December 2009, viewed 6 September 2010, Hhttp://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/docs/20091207_communique.pdfH

Table 1: Alignment of measures and their expected benefits

Critical national land transport issue	1. Reduce the demand for travel	2. Mode shift to walking, cycling and public transport	3. Improve vehicle utilisation	4. Reduce vehicle emissions intensity	5. Increase mobility opportunities	6. Creating a more sustainable freight network
Congestion	Yes	Yes, with suitable infrastructure provision, to ensure congestion is not shifted to another mode	Yes, provided traffic generation is managed	Neutral	Neutral	Needs to minimize road traffic generation
Greenhouse gas emissions	Yes	Yes	Yes	Yes	Depends on how provision is made. Low emission modes best	Focus on fuel-efficient flows
Social exclusion	Should target shortening trip lengths, not eliminating activities	Yes. Because these means of travel are low or no cost, they are inherently relatively inclusive	Yes. This is a common way people at risk of social exclusion improve their mobility options	Price increases may have negative impacts	Yes	Neutral
Energy security	Yes	Yes	Yes	Yes	Neutral	Needs fuel efficient modes
Safety/health	Yes	Yes	Yes	Neutral	Yes	Risk area

Many of the initiatives outlined above would benefit from urban development policies and plans that facilitate more compact urban settlement patterns, since travel demands are linked to urban settlement patterns. To illustrate this linkage, a recent study has examined the effects of urban form and public transport supply on travel mode choices and annual vehicle travel in 114 US cities.[24] Population centrality, the jobs-housing balance, city shape and density were found to have significant effects on the amount of vehicle travel. The effect of moving a sample of households from a city like Atlanta (733 persons per square kilometre; 7 000 rail

24. A Bento, M Cropper, A Mobarak, and K Vinha, 'The Effects of Urban Spatial Structure on Travel Demand in the United States', *The Review of Economics and Statistics*, vol. 87, no. 3, 2005, pp. 466–478.

miles of service per square kilometre, 10 000 bus miles of service per square kilometre) to a city with the characteristics of Boston (1202 persons per square kilometre 18 000 rail miles of service per square kilometre; 13 000 bus miles of service per square kilometre) is a reduction in annual vehicle travel of 25 per cent. This reduction is driven by differences in public transport supply, city shape and especially in population centrality (essentially compactness). While individual factors have only small impacts, the joint impact of the various factors is significant, emphasising the importance of taking an integrated and systemic approach to land use and transport development.

Similar conclusions emerge from a comparison by Buehler and others between Germany and the US.[25] It was found that Americans travel by car about twice as much as Germans. The analysis suggests that transportation policies and spatial development (German cities are more compact than US cities) each account for 25 per cent of the explained variability in travel behaviour. While urban structure only changes slowly, long-term approaches must be taken to deliver progress against the key sustainability issues that have been highlighted and this will require land use to play a central role.

Australian cities are among the most widely dispersed in the world. More compact cities can help to reduce travel distances (for example, because of closer proximity of trip origins and destinations), make walking and cycling easier and improve the economics of public transport service provision. Through these impacts, more compact cities can contribute to cutting road congestion costs, improving air quality, lowering the road toll, improving health and reducing GHG emissions. A related benefit of developing more compact urban settlement patterns is the encouragement of what are termed the 'consumption externalities' of cities, such as restaurants, cultural facilities, and so on, which act as attractors for many knowledge workers.

In the Australian context, more compact urban development is likely to require a much greater focus on building activity levels (including residential populations) in our central business districts (CBDs), increasing jobs and population in other key urban nodes (including around railway stations) and increasing development densities along principal public transport corridors (higher density, low rise). Investment to increase public transport service levels will be needed along the major corridors, to cater for the increased travel demands from higher density mixed use developments. Capacity expansion also will be needed in several CBD-oriented public transport services, to tackle backlogs and cater for patronage growth (partly coming from population growth). Failure to provide such capacity carries risks of CBD job loss, with associated losses of agglomeration economies, for which CBDs are important. COAG's Capital City Strategic Planning process can play an important role in promoting more compact forms of urban settlement.

25. R Buehler, J Pucher, and U Kunert, *Making transportation sustainable: insights from Germany*, prepared for the Brookings Institution metropolitan policy program, April 2009, viewed 15 August 2010, Hhttp://www.brookings.edu/reports/2009/0416_germany_transportation_buehler.aspx

A ten point action plan

The policy and program directions summarised above would be encouraged by the following National Land Transport Ten Point Action Program.

1. **Improvement of fuel efficiency**. Very large improvements will be needed to meet GHG emission reduction targets of (say) 20 to 30 per cent by 2020 and perhaps 80 to 90 per cent by 2050, against a 2000 base. Electric vehicles powered by renewable energy (for example, wind) hold great promise in this regard. Mandatory fuel efficiency targets in line with European thinking, phased in over a number of years, seem likely to be required to drive the rate of change that will be needed long term. Reduced GHG emissions and improved energy security would be the main benefits. A carbon price, including transport, would also be supportive of improved fuel efficiency, as part of an integrated package of measures to improve fuel efficiency.

2. **Road pricing reform**. Australia's current road pricing system only charges heavy vehicles and only for road damage, through a pricing system managed by the National Transport Commission. All road users should be confronted by all the costs associated with their travel choices, to improve the sustainability of Australian land transport systems and make more efficient use of our scarce road capacity. This would help to drive the kinds of behaviour changes that are needed and, through hypothecation of revenues, generate funds to help support new investment. This would deliver benefits of lower road congestion costs, reduced GHG emissions, lower air pollution levels, an improved road toll and better health outcomes. International experience indicates that reductions in road traffic volumes of 14 to 23 per cent can be achieved in a short time period by implementing congestion charging (a key component of road pricing reform).[26] No other policy tool has been able to sustain urban road traffic reductions of such magnitudes in a relatively short time period. The initial requirement to implement widespread pricing reform is a two to three year community consultation about the what, why and how.

3. **More compact, walking and cycling friendly urban settlements**. This requires a much greater focus on delivering mixed use, polycentric cities and higher development densities along major urban public transport corridors, while supporting strong CBDs. This increased land use emphasis is particularly important because of the huge costs of adding major new transport infrastructure in existing capital cities. A greater focus on more compact settlement patterns is part of a new paradigm for managing urban transport and land use interactions, one aimed at reducing the need to travel. The achievement of increased urban densities as part of an integrated policy package should cut GHG emissions, contribute to increased social inclusion, lowering total congestion costs, improving air quality and improving the road toll and health outcomes.

26. A May, *Road user charging and implications for transport policy: findings from the CURACAO project*, paper presented to World Conference on Transport Research, Lisbon, July 2010.

4. **Increased investment in public transport**. Raising the current urban public transport modal share of about 7.5 per cent of all trips in Australian cities to 15 per cent, or higher, will require a major investment program and increase in services. Priorities should focus on improvements in trunk services to increase modal share and improvements in local services to enhance prospects for social inclusion, while feeding trunk services. As with actions 2 and 3, this action will reduce congestion costs, cut the road toll, improve air quality and contribute to lower GHG emissions and increased social inclusion.

5. **Investment in capacity for rail freight and inter-modal hubs.** This would assist a modal shift of freight towards rail, especially in congested areas and for long haul general freight movement.

6. **Freight efficiency improvements,** to improve economic competitiveness. This should include accelerated introduction of high productivity vehicles (for example, under the National Transport Commission's performance based standards regime), accompanied by reform of road pricing to ensure full cost-recovery; and completion of limited access orbital and other roads in major cities, focused on linking key freight origins and destinations.

7. **Reallocation of road space to prioritise low emission modes** (for example, high occupancy vehicle lanes). This initiative will help ease congestion costs as well as cut GHG emissions. It should also help lower the road toll and improve air quality, through promoting smoother traffic flow conditions.

8. **Behaviour change programs** (for example, TravelSmart).[27] As with most measures above, this initiative will deliver benefits in terms of congestion reduction, improved road toll, improved air quality, better health outcomes as well as cutting GHG emissions. Recognising the interdependence between initiatives and need for an integrated approach to policies and programs, initiatives such as Travel Smart will work better if measures such as 2, 3, 4 and 7 above are implemented as mutually reinforcing programs.

9. **Establishment of Regional Accessibility Planning Councils,** to lead the examination of access and mobility problems in regional areas and a co-ordinated approach to tackling those problems. This area of investigation should, among other things, produce proposals for minimum access levels for urban and regional Australia.

27. TravelSmart is a travel behavior change program that has been supported by the Commonwealth Government and states. It involves researchers working one-on-one with people to explore their travel choices, partly to reduce the need to travel and find lower impact ways to meet travel needs. Australia has been a pioneer in this approach, which has been successful in reducing car use while sustaining people's activities. See the TravelSmart website, viewed 8 September 2010, Hhttp://www.travelsmart.gov.au/

10. **Implementation of a National Transport Research Program,** to consolidate and extend existing knowledge of transport problems, opportunities and solutions. Australian land transport research is fragmented and there is little contact between researchers, with research relating to public transport faring poorly compared to that for road, car and freight movement. The US Transport Research Board model should be evaluated for its applicability to Australia.

Some of these initiatives can be implemented quickly and have an impact in the short term (within a few years). For example, behaviour change programs and public transport upgrades that focus on bus service levels can be in place and delivering benefits within two to three years. Mandatory vehicle emission standards take longer to have their full effect, because they impact on new vehicles. Substantial changes take a number of years to work through the fleet. Similarly, urban structure tends to be set in the short term but can be influenced over the long term.

The major impact of the proposed changes will take place in metropolitan areas but regional and rural areas will not be immune to changes required to respond to climate change, in particular, because almost half the transport task of the road sector is performed outside our cities.

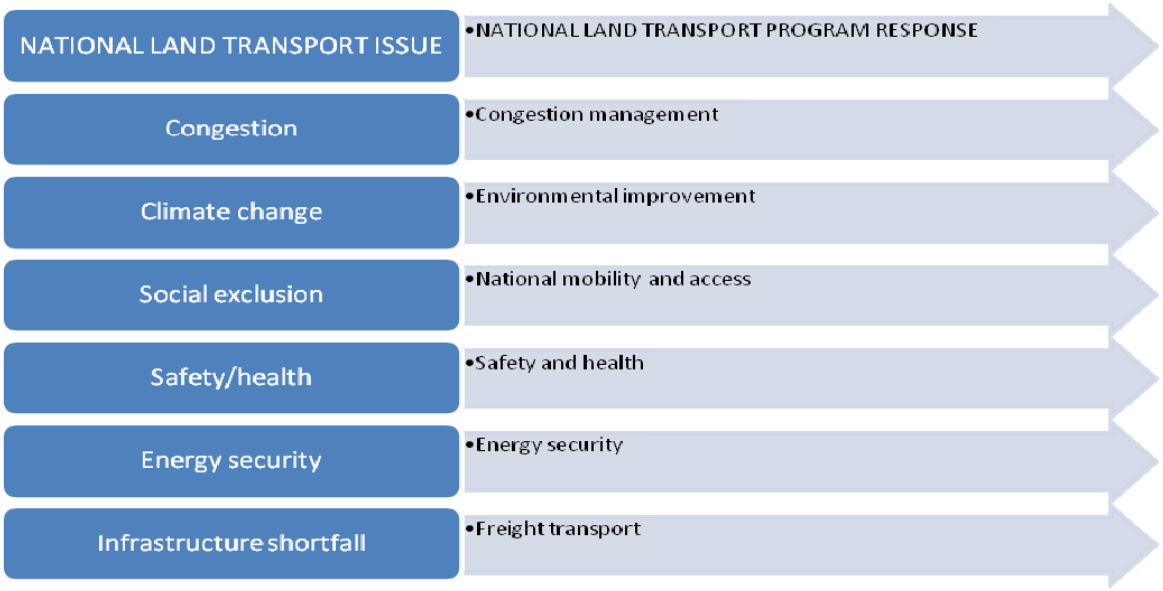
The federal role

The sustainability issues confronting Australia's land transport systems outlined above are significant and growing in magnitude. They affect all Australians to a greater or lesser extent, across all states and territories. While the cities are the areas of greatest concern, regional and rural areas also confront many of the issues (for example, the road toll, GHG emissions, social exclusion, economic competitiveness related to infrastructure provision and energy security). Because of the scale and geographical spread of these issues, national policy and program responses are required for effective solutions. This should involve the federal government showing leadership and working in partnership with others. Going further, some issues require a specific Federal policy and program response, for reasons such as the international dimensions of the issues in question (for example, climate change and GHG emissions) or other particular legislative responsibilities (for example, motor vehicle emission standards). Last but not least, the sheer scale of the financial requirement means that state-based budgets will not be sufficient to equip Australia's cities with adequate transport services.

If the rationale for federal involvement in land transport is to contribute to the resolution of a number of (outcome related) national issues that are severely impacted by land transport services/system performance, then there is a strong argument that federal land transport policy and program involvement should be firmly focused on achievement of clear outcomes on these same specific issues. This is in contrast to support that is essentially modally based (such as road programs and public-transport programs). A **national land transport program structure** along the lines shown in Figure 7 is suggested.

A program structured along these lines encourages an integrated approach to the pursuit of desired outcomes from land transport. Program elements in each area would need to include a wide range of measures for maximum effectiveness. This would include measures associated with (for example) infrastructure improvement, system regulation, operations management et cetera. A clear set of national key performance indicators should be developed and monitored, to measure progress against these critical policy goals. This could be done as part of the COAG Strategic Planning System process for capital cities. The current focus of that initiative includes a number of process-based criteria. Broadening these criteria to include additional criteria related to desired outcomes should assist progress towards more sustainable urban land transport systems and services.

Figure 7: An outcome focused national land transport structure



Because of the long time period that will be required to implement many of the suggested initiatives (especially those related to developing more compact urban land use patterns), long-term funding commitments will be fundamental to the achievement of effective outcomes. Rolling five year federal funding commitments, with provisions to guarantee minimum flows, would help to drive transformational change. These should be set in the context of supportive state and territory (and local government in some cases) five year plans, building on the current COAG initiative.

The federal government should not involve itself in operation of land transport systems that are currently state and territory or local government responsibilities but should influence the development direction of those systems in ways that contribute to better outcomes when assessed against the national interest issues raised in this report. In providing funding support along such lines, the federal government needs to assure itself that outcomes represent social value for money and that funding recipients do not simply substitute Federal money for state/territory/local government money. The use of performance benchmarking, a

comprehensive planning approach and subsequent performance monitoring can protect against these risks.

Conclusions

Recent strong population growth in Australian cities has drawn attention to a range of national transport, and transport-related, sustainability issues. While important progress has been made in lowering the road toll and reducing air pollution attributable to urban travel, headline indicators suggest that the situation is deteriorating on a number of important sustainability outcome areas. Key areas of national sustainability concern in relation to urban land transport include traffic congestion, GHG emissions, serious injury accidents, social exclusion associated with poor mobility options and the risks that are associated with Australia's high reliance on fossil fuels for transport.

Effectively tackling these national concerns requires an integrated policy and program focus on desired outcomes in each of the critical problem areas. The national dimension demands federal leadership and a number of recent initiatives are promising in this regard (for example, Infrastructure Australia processes, the COAG Capital City Strategic Planning initiative, and high speed broadband).

Sustainable solutions will require concerted action over a number of years, with a clear focus on intended outcome goals for congestion, GHG emissions, safety and health, social inclusion and energy security. Switching funding programs from a modal focus to an outcome focus should assist progress. In addition to targeted transport infrastructure investment, significant initiatives will be needed in areas such as urban settlement policies and programs, road pricing reform, travel behaviour change programs and better management of freight movements. Federal leadership can play an important catalytic role in helping to drive change towards sustainability, across areas that include investment funding support, integrating policy and program frameworks, reforming pricing and planning systems and stimulating research and development.