



23rd Australasian Transport Research Forum
Perth, Western Australia 29 September – 1 October 1999

Making Cycling an Alternative to the Car for Urban Travel

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Abstract

Australian cities are characterised by a high level of car dependency that has fostered environmental problems, poor public health and compromised quality of urban life. An avalanche of literature bemoaning the impact of the car on our cities abounds. Reorienting the transport infrastructure in cities away from car based solutions towards public transport and non-motorised transport modes (walking and cycling), has the potential to significantly redress the damage caused to our cities and the environment by car dependency. This paper explores some of the ways that planning for cycling has responded to the challenge presented by cars in cities, using Adelaide's experience as a case study.

The modal characteristics of cycling and the extent of metropolitan Adelaide's cycling infrastructure are examined. A review of planning policy measures to facilitate increased cycling in the community is outlined and then assessed in terms of actual cycling activity in the community. The paper speculates about measures that may facilitate a cycling culture in our cities similar to what has been achieved in the Netherlands. These measures include: changes to urban form; a direct cycling network independent of the road system and integrated with public transport; the creation of a cycling culture; increased restraints on car usage; increased marketing of cycling and improved safety. The case for increased cycling in our cities is rationally convincing, however, the community has to become emotionally convinced about the need to change from car dependency to cities conducive to cycling as the dominant transport mode for local urban trips under 5km and public transit for longer urban trips.

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Introduction

The low urban density of Australia's cities, community attitudes, widespread car ownership and society's economic imperatives to minimise travel times are factors that conspire to encourage urban dwellers to choose the car over other transport modes. Unfortunately, the excessive reliance on cars for urban travel is making Australian cities dysfunctional in environmental, social and even economic terms. If there were a change of community urban travel behaviour from cars to favour cycling, then this would help to ameliorate many of the problems associated with excessive car usage. However, an action-oriented approach is needed to overcome the apparent inertia of community opinion that considers the car as the natural choice for urban travel, in favour of cycling. An action-oriented approach needs to focus not only on creating favourable community perceptions of cycling as a viable urban transport choice but also to ensure that the nature of urban transport infrastructure makes it obvious that cycling is the natural urban transport choice, rather than the car.

This paper starts out by exploring the characteristic of car dependency in Australian cities and responses to the problems resulting from car dependency. The characteristics of cycling as a modal choice are examined to demonstrate some of the limitations of cycling when compared to other forms of urban transport. The trends and nature of cycling in metropolitan Adelaide is examined, drawing on a large study commissioned by South Australia's Transport SA, to determine whether policies are making any difference. The state of cycling infrastructure in metropolitan Adelaide is detailed as a case study to demonstrate that cyclists are not well provided for when compared to the state of road provision for motorists. Past and current planning responses in metropolitan Adelaide are critically discussed to extract key themes that seem to have emerged from past and current policies. Finally, the paper concludes with discussion about how Australian cities can move towards developing a "cycling culture"

The car biased transport system of Australian cities

The transport systems of Australian cities are overwhelmingly car oriented rather than public transport, cycling or pedestrian oriented. The bias towards private cars as the dominant transport mode is commonly referred to as car dependency. Car dependency is an urban condition in which the majority of the population, (either by choice or because of a lack of alternative transport options), almost exclusively relies on cars for their urban transport requirements. Indeed, passenger cars accounted for 74% of the 166 514 million km travelled by all vehicles on Australia's roads in 1995 compared with 0.9% for buses, the term "car dependency" would seem to be particularly apt (Trewin, 1997, p15). Further evidence of Australians' dependence on motor vehicles is demonstrated by the near saturation levels of car ownership (when discounting persons not able to drive such as children). In 1995, there were 606 motor vehicles on register per 1000 persons in Australia (Trewin, 1995, p10).

Urban planning literature has long recognised and grappled with the problems associated with car dependency. In the first half of the 20th century, planning responded to the growth of car usage by adapting urban land development and urban road networks to the particular travel and parking requirements of cars. Freeways, road hierarchies, integrated

land use and transport in "new" town planning, off-street parking provision and precinct planning where originally conceived to accommodate the demands of motorists to efficiently and effortlessly travel "door-to-door" in the shortest possible time. However, when car ownership rates really began to take-off in the 1950s in the United States, commentators such as Mumford (1961) and Jacobs (1961) recognised the insatiable and voracious appetite for space and infrastructure that saturation levels of car ownership were having on cities. In addition to their concern about the vast tracts of the public realm being devoted to purely facilitating car travel, Mumford and Jacobs decried the corruption of aesthetics, health, amenity, community and civic life as a result of pandering to the needs of the motoring public in American cities. More recently, "New Urbanism", an urban design phenomenon of the 1990s, is an interesting response to the excesses of car dependent cities, in the way that they advocate rediscovering traditional 19th century urban values and transport methods (De Villiers, 1997).

In Australia, early physical attempts in the 1980s to deal with the problems of car dependency focused on restoring amenity and road safety in local areas by "calming" traffic, an agenda largely driven by local government responding to their local constituencies (Allan, 1997). At a strategic level, however, freeway programs in Adelaide, Melbourne and Sydney were abandoned or held in abeyance by state governments in the early 1980s in response to community hostility to the encroachment of roads and traffic into their lives. Unfortunately, the community continued to be as heavily car dependent as before through the 1980s with the result that rapidly rising traffic congestion in Sydney and Melbourne now had dire economic repercussions in the late 1980s/1990s. The economic imperative for a better arterial road network began to have political acceptability as Australians switched to conservative state and federal governments. As the close of the 1990s nears, cities such as Melbourne, Sydney, Brisbane, Perth and even Adelaide are completing major urban arterial road projects, Melbourne's \$1.7bn City Link project probably being the most notable and grandiose. Despite calls by Newman et al (1992) to favour public transit oriented cities in preference to further road building and low-density suburban sprawl, few policy-makers appeared to heed this plea. Public transport patronage, at least in Adelaide, continues to fight a losing battle against increasing car use and may become functionally irrelevant as a transport mode if the current trend cannot be arrested soon. It was recently reported in the Adelaide media that over the past few years, the decline in public patronage has been at the rate of 1.5% per year, despite recent restructuring (tendering out services to private operators) and initiatives to improve the quality of the public transport experience. The initiatives took the form of new buses, improved night services with mobile phone facilities and better information provision of bus timetables.

Car dependency has also become perceived as a public health problem, because of the sedentary lifestyles that it encourages. In response to this problem, in metropolitan Adelaide, The Heart Foundation (1999) has developed a project known as "Supportive Environments for Physical Activity" (SEPA), which aims to work with local governments to develop strategies and actions that will result in urban environments that facilitate walking and cycling. Of perhaps greater concern, however, is the fact that despite a 47% decrease in road fatalities from 1970-95, in 1995 there were still 2,017 road deaths and road trauma was estimated to cost the community \$6bn annually (Austroads, 1997).

Where does cycling fit into the transport agenda of Australian cities in the late 1990s? Community demand for ecologically sustainability policies and practices by government may be the most powerful leverage amongst the community to make cycling a mainstream transport option. With transport responsible for 71% of Australia's greenhouse gas emissions in 1996 (AGSO, 1999) and Australia having the third highest per capita rate of transport related greenhouse emissions in the world in 1990 (Trewin, 1997), these statistics are likely to facilitate strong community and international pressure for change. Car use is also responsible for a range of other harmful emissions that compromise air quality such as volatile organic compounds (a precursor to the production of ozone and photochemical smog), carbon monoxide, nitrous oxides, sulphur dioxides, lead and particulate matter (Australasian Science, 1997). Photochemical smog, the apparent signature of developed cities, is the most visible malaise of car dependency that has forced governments to enact clean air regulations for motorised road transport. The introduction of catalytic converters in 1986 for all new cars was prompted by the pollution problems that Sydney was experiencing. However, while theoretically, technology can remove many of the harmful emissions from internal combustion engines, high levels of car usage will not substantially affect current carbon dioxide levels unless cars become much smaller and lighter and obsolete vehicles are retired. Cervero (1997) suggests that the only realistic response for governments to make in the planning of cities is to move from car dependence to "accessibility planning" in which public transport, walking and cycling will be the primary transport modes. Cervero upholds the Dutch experience as worthy of emulation in which 30% of all trips are by bicycle. Although Cervero's (1997) are not necessarily those of the Commonwealth Government, it does suggest a new mindset by government to at least allow such views to be aired in a government publication even if in practice little notice is taken of them within actual policy at the federal level. For example, the Howard Government does not have any specific policies that would facilitate the changes in the built environment needed to achieve what Cervero advocates. State governments are better in this regard, but still lack the capability to significantly reverse the effects of decades of urban sprawl.

Australia's national position with regard to its international obligations, expressed at the Kyoto Climate Change Summit in 1997, is disappointing in failing to adopt the resolutions to reduce greenhouse gas emissions by 5% in 2005 and by 10% for 2010. Notwithstanding this, since the Brundtland Report of 1987 crystallised the principle of ecological sustainable development (ESD), and which the Rio Conference on Climate Change in 1992 adopted as its mantra, almost any planning or transport strategy document now supports or makes reference to this principle. Austroads (1995), the national association of road transport and traffic authorities which provides strategic direction for the development and management of Australia's road system, has prepared its own strategy to facilitate ecologically sustainable development. Austroads ESD strategy acknowledges the need to put tighter limits on car use, although it is rather vague and makes no direct mention of how cycling could be part of the solution. However, Austroads' Strategic Plan 1998-2001 (1998), while having a strong bias towards car type transport solutions, acknowledges the need to conduct further research and develop guidelines to improve the safety and performance of the road system for cyclists.

Although state road transport authorities such as South Australia's Transport SA recognise cyclists as legitimate road users and there are design standards for the provision of cycling infrastructure, the amount of cycling infrastructure available relative to that provided for cars, is negligible as this paper will later demonstrate. While bicycle ownership is commonplace, they are mainly used for recreational purposes and not as a travel mode. Using Melbourne data, Parker (1998) indicated that in 1996, only 2% of trips were made by bicycle. However, he suggested that if the Dutch approach were adopted (ie with its strong emphasis on generous and highly accessible cycling infrastructure provision), 50% of Melbourne's car trips could be substituted by bicycle trips. Parker's estimate was based on the notion that 50% of car trips are 2.5km or less, which is well within the capabilities of most cyclists. While Parker's views represent an extreme scenario, they indicate what could ultimately be achieved, even though community use of cycling as an alternative to the car for short local trips is lacking.

Characteristics of cycling as a modal choice

There are limitations of cycling as a transport mode, in cities dominated by low-density suburban sprawl with long distances to even local centres and facilities. Depending on an individual's abilities, a cyclist of average fitness is restricted to a range of about 5km over a 15 minute period whilst cars have virtually no range limitations in a typical urban area. Hilly terrain and hot weather will further restrict a cyclist's range. Furthermore, a cyclist can only carry a minimal payload, cycling is lacking in protection from dangerous traffic conditions and it offers little protection from the elements. However, on the plus side, for short local trips of up to 5km, the bicycle can compete favourably with motorised urban transport in its "door-to-door" flexibility, particularly in inner-city urban areas where parking is difficult and traffic congestion is significant. Even in Adelaide where parking is relatively abundant and traffic congestion is minimal compared to cities such as Sydney and Melbourne, a bicycle is usually the quickest transport mode in the city centre. The use of bicycle couriers in preference to motor vehicle couriers in city centres provides some credence to this point. Cycling also provides the added bonus of keeping fit and allowing a greater appreciation of the urban environment one is travelling through than is usually possible as a motorist. Other important benefits of cycling as a modal choice is that its emissions are negligible and the specific energy consumption is minimal compared to motorised transport (0.01 MJ/passenger/km versus 2.9MJ/passenger/km for a 2 litre passenger car with only one person) (Hughes, 1993).

If cycling is taken seriously as a transport modal choice, range becomes a significant limiting factor, effectively limiting its use to a local transport option for trips up to 5km, unless public transport can play a complementary role.

Cycling trends and behaviour in metropolitan Adelaide

Australian Bureau of Statistics (1997) data on travel to work and education facilities overwhelmingly demonstrates that the car continues to be the preferred mode of transport in Adelaide. This work was based on a survey of 2,400 dwellings in a multi-stage area sample, designed to be statistically representative of the travel to work/study behaviour of the 620,000 persons living in the Adelaide statistical division in 1997. The study findings point to a trend that appears to be favouring increased car use. In the period 1991-97, the

proportion of persons travelling to work and/or study as a driver increased from 51.1% to 54.3% (a 6.3% increase) and for car passengers, it increased from 17.0% to 22.4% (a 32% increase). During the same period, public transport usage for travel to work or study declined from 16.8% to 11.2% (33% decline), whilst bicycle usage declined from 3.3% to 3.1% (a 6% decline).

Reasons given as to why increased car use is occurring are multi-factorial, and to some extent restricted by the limitations of this ABS (1997) study's methodology. The study only directly explains why public transport and bicycles are not being used and not why car usage is growing. For example, the main reasons for not using public transport includes: car used for work; too long; poor transfer arrangements; a lack of service; a lack of safety; proximity to work/study. The main reasons given for not riding a bicycle to work were: vehicle needed for work (16.4%); too far (40.9%); no bicycle (14.2%); and concern about safety (7%). Interestingly, concerns about terrain, the weather, being unfit or lazy, poor health, having alternative transport, sharing a car or carrying equipment did not figure prominently.

Specific details on cycling use, the characteristics of cyclists, their behaviour, attitudes and their representativeness of the general community, has been explored by BikeSouth SA of Transport SA in a study covering the period 1996 to 1998. The study, entitled the "South Australian Cycling Report" (Wright et al., 1998), examined changes in cycling in metropolitan Adelaide, between two surveys, (June 1996 and June 1998). The samples were not the same, however, they were designed to be similar in terms of their demographic profiles. The 1996 survey had 2004 respondents of which 621 were cyclists, whilst the 1998 survey had 920 respondents of which 313 were cyclists. The sampling was designed so that its segmentation ensured that it included the full range of the types of trips cyclists are likely to make, including cycling to work, study, for competition/training, for recreation or for short local trips. Weighting ensured that the sample was representative of the age groupings in the metropolitan Adelaide community at large. The key indicators to emerge out of this study for the "average cyclist" are detailed in table 1, whilst those for the "average person" are detailed in table 2. The definitions of "cyclist" and "person" were left up to the respondent to decide what they preferred to be described as.

The results appear to strongly suggest that cycling as an activity has significantly declined. For the average cyclist, table 1 indicates that: there has been a 20% decline in the number of trips/year (now 293 trips/year); a 15% decline in the average distance per year (now 2,303 km/year); and a 21% decline in the time spent on a bicycle (now 123 hours/year). Although the data suggests that the proportion of people cycling in the population had increased from 31% to 34%, the authors' caution that this is not a statistically significant trend.

Table 2 averages the cycling activity of the cyclists over the whole survey samples. Hence the trends identified in table 1 are similar, but somewhat diluted. For the average person, table 2 indicates that the cycle trips/year, cycle kilometres/year and cycle hours/year have declined by 12%, 7% and 12.5% respectively.

Interestingly, in both table 1 and 2, it appears that the length of trips has increased and the average speed, although only marginally by about 5% and 7% respectively. However, a possible reservation regarding the findings in tables 1 and 2 is that it is unclear how distances and times were estimated in the surveys since having a speedometer on a bicycle cannot be assumed

Table 1 Comparison of benchmarks 1996-98: Average cyclist
(Source: Wright et al 1998)

MEASURE	Average cyclist 1996	Average cyclist 1998	Change
Cycle trips/year	293	235	-20%
Cycle kilometres/year	2,719	2,303	-15%
Cycle hours/year	156	123	-21%
Average kilometres/cycle trip	9.3	9.8	+5.4%
Average cycle speed km/h	17.4	18.7	+7.5%
Average minutes/cycle trip	32	31	-3.1%

NOTES:

1. Data is representative of metropolitan Adelaide
2. N=2004 for 1996 survey of which 31% were cyclists (621)
3. N=920 for 1998 survey of which 34% were cyclists (313)
4. The change in the proportion of cyclists is not a statistically significant increase ($p=0.28$)
5. Average speed refers to all trips
6. Average cyclist defined by respondent identifying themselves as such
7. Refers to trips by people defining themselves as cyclists only

Table 2 Comparison of benchmarks 1996-98: average person
(Source: Wright et al 1998)

MEASURE	Average person 1996	Average person 1998	Change
Cycle trips/year	91	80	-12%
Cycle kilometres/year	844	784	-7%
Cycle hours/year	48	42	-12.5%
Average kilometres/cycle trip	9.3	9.8	5.4%
Average cycle speed km/h	17.6	18.7	6.3%
Average minutes/cycle trip	32	32	0

NOTES:

1. Data is representative of metropolitan Adelaide
2. N=2004 for 1996 survey
3. N=920 for 1998 survey
4. Average speed refers to all trips
5. Average person refers to all respondents. Non-cyclists do not cycle. Hence the average represents the cycling activity of the cyclists averaged over the whole sample
6. Refers to trips by bicycle

Nevertheless, with the State Government of South Australia's own cycling strategy (Howard Holmes & Associates, 1996) aiming to double bicycle use during the period 1996-2000, the findings of the 1998 report are to date not very encouraging. The Overview Report for the 1996 study (Kennedy, 1996) was prescient in identifying these challenges and suggested that it would be better to focus in on doubling the time spent cycling in the community rather than the distance, number of trips made or the numbers of persons

cycling While not shown here, the 1998 study drew a somewhat long bow in claiming that when comparing the most directly comparable elements of the two studies (based on suburbs), the results are encouraging with a 12% increase in the time spent cycling evident. The concluding remarks of the 1998 study (Wright et al, 1998) are interesting. It is suggested that the focus should be on increasing social and recreational cycling, since this is the largest segment of cyclists. Scant mention was made of cycling as an alternative mode of transport for local trips or commuting. The rationale for focusing on this segment appears to be that the motivations for people taking up recreational and social cycling are well understood and these are the most likely forms of cycling to be taken up.

An interesting component of the 1998 survey (Wright, Cierpicki and Kennedy, 1998) was to identify the types of cycling activity that Adelaide cyclists were engaged in. Social or recreational cycling and "local" cycling were by far the most dominant categories, accounting for 44% and 36% of the 1197 trips in the sample respectively. Commuting to work or a place of education by bicycle accounted for 11% and 4% respectively. This survey suggests that around 5.1% of Adelaidians commuted to work or study by bicycle.

The 1998 survey (Wright et al, 1998) determined that cyclists tended to lead more active lifestyles than non-cyclists do, a scenario that was not significantly different from the 1996 survey. The research indicated that the more active lifestyle led by cyclists was statistically significant at $p < 0.05$ or better for visits to the beach, bike stores, fast food outlets, live theatre, the cinema, cafes or sports grounds. What is unclear about these findings, however, is whether the bicycle was the mode of transport used to access such locations. This seems to be a weakness in this research, because it does not indicate exactly how cycling fits into cyclists' activity patterns in accessing the locations denoted as being associated with "active lifestyles". If cyclists do not use a bicycle as the dominant mode of transport in accessing locations that brand their lifestyle as being "active", it suggests that there may be considerable potential to increase cycling amongst cyclists.

From the 1998 survey (Wright et al, 1998), it appears that age is a significant component in establishing the typical profile of the Adelaide cyclist. The propensity to cycle drops off rapidly for people aged 45 years or more. Other findings in the 1998 survey include a greater likelihood of being male (61%), being a student (24%) or employed in a professional position (19%).

Cycling provision in metropolitan Adelaide

In terms of infrastructure provision, metropolitan Adelaide now has some impressive facilities for cyclists (table 3). The total network of dedicated "right-of-way" sealed paths and bike lanes covers some 301km. Of this, around 99km are bike lanes on main roads; 61km are located on secondary routes; and nearly 141km are sealed off-road paths independent of the road system. The Torrens Linear Park, with around 57km of sealed pathways, has one of the most extensive dedicated continuous cycle networks of any city, that is completely independent of the road system. Within the City of Adelaide, as circumscribed by its outer boundary of parkland belt, there are about 26km of dedicated paths or bike lanes. Comparative data for other cities is lacking, but with the exception of Canberra, Adelaide would be the only major Australian city with a sealed off-road

cycleway (the Torrens Linear Park) providing access from the perimeter of its metropolitan area to the edge of the city centre without crossing a road.

Table 3 documents the extent of Adelaide's metropolitan cycling network. With the exception of Adelaide's northern areas (1 and 2), most areas have significant provision of cycleways. The North-East area of metropolitan Adelaide has the best provision of cycle routes with 28km of lanes on main roads and 55km of dedicated cycle paths. The inner South area had the highest provision of cycle-lanes on secondary roads with 20km

However, while good progress has been made to date, much remains to be done. Cycling in the City of Adelaide for example, can be a nerve-racking experience in traffic with dauntingly vast intersections, unsafe turn lanes, angle parking and poor phasing of traffic signals which seem programmed to minimise timely progress at cycling speeds of around 20-25km/h. Furthermore, bicycle parking and rest room facilities throughout the metropolitan area are not at a level that would encourage widespread commuting by bicycle. And unfortunately, the nature of cycling as a transport mode and the type of infrastructure provided means that it is generally a fair-weather pursuit.

Table 3 Cycle lane and off-road sealed bikeways in metropolitan Adelaide
(Source: South Australia (Government of), October 1998)

TYPE OF BIKE PATH	NORTH-AREA 1 (50km ²) Gawler	NORTH-AREA 2 (160km ²) Smithfield Elizabeth	NORTH-EAST AREA 3 (160km ²) Salisbury Golden Grove Tea Tree Gully Cavan	NORTH-WEST AREA 4 (150km ²) Port Adelaide Woodville	NORTH-EAST AREA 5 (150km ²) City Enfield Prospect Highbury Norwood Burnside	INNER SOUTH AREA 6 (100km ²) West Beach Glenelg Mitcham	MID SOUTH AREA 7 (140km ²) Brighton Blackwood Happy Valley Hallett Cove	FAR SOUTH AREA 8 (170km ²) Reynella Morphett Vale Noarlunga Seaford Rise McLaren Vale	TOTAL METRO AREA (1080 km ²) (AREA S 1-8)
	km	km	km	km	km	km	km	km	km
MAIN	0.6	0.6	27.8	7.2	27.7	13.8	10.6	10.2	98.5
SECONDARY	1.2	1.2	6.1	8.8	13.1	19.7	7.8	3.1	61
PATHS	0.3	3.3	18.1	23.3	55.3	13.5	9.9	10.0	133.7
HIGH SPEED VELOWAY								7.7	7.7
TOTAL	2.1	5.1	52.0	39.3	96.1	47.0	28.3	31.0	300.9

	CITY	Torrens Linear Park
MAIN	3.6	
SECONDARY	2.1	
PATHS	17.4	57
TOTAL	23.1	57

NOTES:

1. MAIN refers to bike lanes on main/arterial traffic roads
2. SECONDARY refers to bike lanes on distributor or collector roads. Assumes that bi-directional travel

3. PATHS refers to sealed two-way bike paths independent of the road system

4. Unsealed paths are not included

5. Both MAIN and SECONDARY bike lanes assume that the road allows travel on bike lanes in both directions

6. The distances indicated are route distances not length of one-way bike lanes.

7. Information compiled from *Bikedirect* maps 1-8. 2nd edition. Transport SA

The areas referred to in table 3 refer to *Bikedirect* maps covering an urban area of approximately 1,080km². The pattern of road provision in urban areas normally results in about 15-20% of the land given over to road pavements. This means that in the areas referred to in table 3, we could expect around 200km² given over to road-space compared with a mere 0.75km² (ie 2.5m width x 301km) devoted to dedicated cycle lanes on the road system and sealed off-road paths. Although it can be argued that the bulk of the road network is multi-modal in a way that off-road paths are not (except possibly for pedestrians), clearly the emphasis in the urban road transport system is overwhelmingly biased towards motor vehicles. If less than 0.5% of road infrastructure by area is devoted to the exclusive use of cyclists, should we be surprised that the proportion of the community using cycling as a serious mode of urban transport rarely exceeds 5%?

A review of planning responses in metropolitan Adelaide to cycling

The 1992 review of cycling development in South Australia Plan (Over Arup & Partners, et al, 1992) noted that little progress appeared to have been made since the 1982 Adelaide Bike Plan. With the exception of the Engineering Program, the Education, Encouragement and Enforcement programs were lacking in results. It is interesting to note that the 1992 final report of cycling in South Australia (Over Arup & Partners, et al), concluded that "cycling isn't just about Transport (it) may also serve other lifestyle policy settings, in terms of the health and fitness of the community". The future focus for the 1992 report emphasised:

- Creating an improved cycling environment with better facilities and complementary education programs to encourage further cycling activity
- Better enforcement of cycling behaviour by the police
- Improved safety
- Research to determine current cycling activity, community attitudes, a cost-benefit analysis, a review of education programs and new planning and design guidelines

With the exception of the issues of enforcement and research into cost-benefit analysis and developing new guidelines, the 1996-98 surveys on community attitudes have demonstrated that significant progress is being made towards creating an environment more conducive to cycling activity in South Australia (Wright et al, 1998). Moreover, the content of the 1996 Cycling Strategy for South Australia (Howard Holmes and Associates, 1996), with its overarching themes of improved quality of life through cycling activity and the development of a "cycling culture", indicates a strong will on the part of government to facilitate greater community involvement in cycling.

Educating the community to realise the benefits of taking up cycling, and in providing information of the bicycling facilities available, appears to be well advanced as a marketing campaign. During 1998, there was extensive advertising in the print and TV media to ensure greater awareness of the need for motorists to share the road with cyclists and to suggest indirectly that cycling is an activity taken up by a broad cross-section of the community. BikeSouth of Transport SA has produced an impressive array of helpful information in the form of maps and leaflets to help cyclists make the most of the facilities on offer. While this information is readily available free of charge through local councils, they perhaps need wider dissemination in the community to help increase cycling activity. Wider dissemination requires a broader marketing effort and distribution in locations or facilities likely to be frequented by active people.

To ensure the provision of more cycling facilities, urban planning needs to express this aim at both the state and local strategic levels of planning, but also in a statutory or regulatory sense. Both State and local government in South Australia have clearly articulated in strategic planning terms a desire to increase cycling activity and enhance cycling facilities. The 1998 Metropolitan Planning Strategy (Premier of South Australia), for example, suggests a number of strategic actions needed to increase the use and safety of cycling such as:

- Pursue the acceptance of cyclists as legitimate road users
- Recognise the diverse needs of cyclists riding to school, work and where possible allocate appropriate road space for their use.
- Support education programs that increase the awareness of issues associated with cycling.
- Develop partnerships with local government, cyclists and others for a coordinated approach to implementation of the government's cycling strategy.
- The strategic actions of the Strategy (Premier of South Australia, 1998) that can be pursued through the statutory planning system include:
 - Recognise the diverse needs of cyclists riding to school, work and where possible allocate appropriate road space for their use.
 - Develop a comprehensive network of safe, protected cycle paths, tracks, links and storage facilities for metropolitan Adelaide.
 - Encourage the provision of facilities such as secure cycling parking and showers at work
 - Include cycling as an element of development, traffic management and community planning

While the Planning Strategy should not be viewed as a regulatory or statutory planning instrument, it nevertheless sets the guiding vision for the metropolitan area and has to be referred to when each local government area prepares or updates its Development Plans every three years. Moreover, the Premier has to report to State Parliament annually on the progress being made in implementing the Planning Strategy, so the objectives expressed in it are subject to some degree of political scrutiny. However, with respect to cycling, it rarely attracts any comment in this forum, largely because it is not identified as a major policy area in the Planning Strategy.

The Cycling Strategy for South Australia (Howard Holmes and Associates, 1996) is the main strategic planning instrument within South Australia to realise the Planning Strategy's aim of increasing the use and safety of cycling. It is a detailed document with a suite of specific targets designed to achieve a vision of "enhancing the well-being of South Australians through access to enjoyable cycling in safe conditions". It has the rather ambitious goal of "doubling bicycle use from 50 to 100 hours/annum" to be achieved by attaining the objectives of an enhanced "cycling environment" and the development of a "cycling culture" which supports the management and nurturing of a growth in safe and enjoyable cycling. The specific targets with regard to achieving a cycling environment are: a statewide cycle route network by 2005 (likely to be of a recreational nature); a safer cycling environment; widespread, easily accessible cycling facilities (e.g. cycling parking); and for cycling to be integrated within urban development, transport planning, traffic management and community planning. Planning SA, the state urban planning agency, would be responsible for overseeing this integration, presumably by scrutinising new Development Plans and any amendments made to existing Development Plans. The South Australian version of the Australian model Code of Residential Development would also be used to advocate the need to integrate cycling infrastructure into urban development. The specific targets with regard to achieving a cycling culture are: comprehensive promotion plans; collaborative approaches between government and the private sector to improve safety; maintaining a strong, proactive cycling industry; and that partnerships are fostered to ensure coordinated, integrated approaches to implementation of the Strategy.

Despite lacking legal weight to translate its broad objectives into concrete actions, the fact that BikeSouth was established about 1995 within Transport SA with funding to implement and Co-ordinate this Strategy is a strong indication that the State Government is serious about fulfilling the targets set out in the Strategy. A detailed review of the Cycling Strategy is not within the remit of this discussion because it contains 26 specific strategies. However, with regard to creating a cycling environment, progress is clearly evident. Examples include: councils such as the City of Port Adelaide-Enfield's efforts in marketing and investing in new cycle routes; the recent completion of a high speed 60km/h Veloway in Adelaide's southern suburbs; and Adelaide's mountains-to-the-sea Torrens Linear Park cycleway, allowing uninterrupted cycling across the east-west expanse of the metropolitan area. Moreover, upon completion of the South Eastern Expressway extension, the notorious Mount Barker Road will be reduced to the status of a secondary road, with broad cycle lanes. This will provide safe access for cyclists (though a tough 400m+ climb!) between the Adelaide Hills and the city which was previously lacking.

With regard to the aim of the Strategy creating a "cycling culture", BikeSouth's "Share-the Road" campaign in 1998 on TV was the most visible articulation of this strategy. Compared to the 1982 Adelaide Bike Plan, what is most noticeable is the similarity of the approach, with tangible progress apparently being made with infrastructure provision in the form of cycle routes. However, with regard to the issue of creating a "cycling culture" (or "encouragement" and "enforcement" as it was known in the 1982 Plan), as table 2 demonstrated, the community's use of cycling as an urban travel mode is declining, in spite of BikeSouth's considerable marketing effort with its promotional material.

Local councils are not required by planning legislation to produce separate cycling strategies. Notwithstanding this, the activities of BikeSouth and Planning SA, can

encourage local government councils to recognise and meet the needs of cyclists BikeSouth can encourage the preparation of a cycling strategy when a local Council's Development Plan comes up for review by Planning SA. The City of Adelaide was perhaps the most proactive of all Adelaide metropolitan local government councils in producing a strategic bicycle plan in 1995, and indeed, this preceded the State Cycling Strategy by a year. In the aftermath of that document, there was some investment in improving infrastructure for cyclists, with sealing of the unsealed Torrens Linear Park pathways, the completion of the new West Terrace/Anzac Highway pathway with lighting (3km) and incorporating new cycle lanes in some of the city centre's roadways (about 5km). However, some of the city cycle lanes have since been removed (2km) and Council's staffing in this area appears to have been dramatically scaled down. The Adelaide Strategic Bicycle Plan (Dorretyn & Co, 1995) had proposed a capital works program of about \$2.8m for the period 1995-2000 (roughly 54km of bi-directional cycle routes), but it seems on current evidence that this level of investment is unlikely to eventuate.

It would seem that the state government is behaving proactively to ensure some success with its Cycling Strategy. Nevertheless, the main question from an urban planning perspective is whether an expressed political desire (which is all a strategy ultimately is), is enough to have a doubling of cycling activity by the year 2000. High profile projects such as the high speed veloway, Torrens Linear Park and Mount Barker Road cycleway may raise community awareness of cycling as an attractive alternative transport mode for commuting or recreation. However, if cycling is to be presented as a serious transport option, cycle lanes are needed on all secondary and arterial roads with speed limits of 60km/h and sealed off-road paths are needed where speed limits are 70km/h or more. Streets in local areas should have cycleways on local roads with speed limits of 60km/h and ideally, no local road should have a speed limit in excess of 50km/h. If such measures are to happen though, they need statutory force through planning regulations. While there are significant capital cost implications in adopting such standards, if the experience of the difficulty in introducing lower local speed limits is any guide (Allan, 1997), it is probably unlikely that legislation would be used to compel local councils to cooperate, unless the concept of a "cycling culture" becomes accepted in the community.

Towards a cycling culture

The rational argument for substituting cycling for car use presents a strong case. However, revolution, if it can be put that way, needs an emotional desire by the community for change (Engwicht, 1999). Identifying what triggers emotional responses is a challenge, because there is no guarantee that any two individuals will feel the same way about an issue or be sufficiently motivated to take "affirmative action". For some, the emotional trigger to make the switch to cycling may be the environment, for others it may be health or quality of life or greater practicality/functionality in congested traffic. Significant change on the scale desired by Parker (1998), requires universal ownership of bicycles and an almost militant, even emotional lobbying of government by the community to make cycling the norm for local area trips.

However, for cycling to become the natural choice of urban travel, changes to urban form would be needed. Distances are a problem in low-density suburban environments and need to be kept to no more than 5km for local trips. This implies that local facilities must be within a cycling distance that can be comfortably managed by a person of average fitness (ie. no more than 5km). Current planning theory (Newman et al, 1992) favours development that is "transit oriented", with local facilities such as a mass transit stop and local centre within comfortable walking distance of every residence (ie 400-800m). Mass transit would have facilities for commuters to take their bikes with them on public transport. A grid system of local streets would allow maximum permeability of local traffic. Urban densities would have to be around 25-35 dwellings/hectare to ensure that sufficient population catchments for transit are within these spatial parameters. Increased densities according to Lozano (1990), would have the added benefit of creating more urbane and sociable cities with a real sense of "place". Notwithstanding this, even at the low residential densities (8-12 dwellings/hectare) that are the norm in Australian cities, it should be possible to have every dwelling within a 5km bike ride of local area facilities.

In addition to these changes, it would be desirable to have a network of cycleways completely independent of the road system that link up all of the nodes in the urban environment (ie centres or other major urban trip generators) in the most direct manner. Making the system as direct as possible would be critical, but it would be expensive. Right of way corridors, tunnels and overpasses may be required to ensure this feature. Low speed (ie 25km/h) "power-assisted" bicycle derivative vehicles for people without the physical stamina to cycle should also be developed for use on such a system. This would not be too dissimilar to Duek-Cohen's (1976) concept of "slow-ways", although the network of cycleways he suggested was in parallel to the local road system. While the widespread adoption of 40km/h speed limits would possibly render such a total duplication of local access roads redundant, cyclists require a separate right of way as an alternative to travel on local distributors (or higher in the road hierarchy) with 60km/h limits. Perhaps in the 21st century we can look forward to moving "travelator" bicycle expressway tubes that allow a minimum speed of 20km/h to be maintained and protect the riders from the elements.

If significant progress is to be made in gaining community acceptance of bicycles as the most obvious choice of travel, then there needs to be much stronger integration between cycling infrastructure and public transport. Buses and trains should be designed so that at around 15% of passengers can take their bicycle with them and the balance able to leave their bicycle safely parked at the station. A problem with public transit is that for some commuters, their ultimate destination may lie beyond their final transit stop and be inaccessible to feeder buses or walking. Rather than risk these commuters switching to cars, if some knew that cycling was an option, they may be encouraged to treat their journey as multi-modal using transit and cycling. The figure of 15% is to some extent arbitrary, however, if less than 15% of commuters are allowed to take a bicycle with them on transit systems, it may not be apparent to potentially diffident commuters that the multi-modal approach is possible. Currently only 3% of Australians (Trewin, 1997) cycle to work or study, while 17.6% take a bus or train. If these cyclists were to use transit, then they would represent 15% of the passenger volume.

In the same way that developers are required to make provision for parking, they need to be compelled to do the same for cyclists. Planning legislation in Adelaide is considerably lacking in this regard. One of the most powerful constraints to car use is not to provide adequate parking. Using the Dutch approach as a guide (Parker, 1998), development could be planned to cater to at least 30% of people coming by bicycle. In Adelaide's metropolitan area, secure bicycle parking is not provided at any transit location and many city work places will not permit bicycle parking on their premises. Secure bicycle parking needs to be more than providing a post to chain a bicycle to. Bicycles need to be secure from unauthorised persons and ideally under shelter. Video surveillance may be necessary to convince people that their bicycle is secure.

BikeSouth would appear to be making some ground in creating a "cycling culture" in the community as earlier discussion in this paper has examined. The South Australian Cycling Report (Wright et al., 1998) determined that there was a 44% chance of non-cyclists taking up cycling in the future, with 21% of non-cyclists favouring social/recreational trips and 13% of non-cyclists favouring short local trips. Dominant reasons for non-cyclists not taking up cycling were: health/age/injury (18%); no bike (17%); a lack of time (13%); better alternative transport (12%); and lack of enjoyment/laziness (12%). Dominant reasons for stopping were: no bike (14%); moved (13%); and now had a car (13%). The most significant reason for restarting cycling was to get more exercise (49%).

These findings would seem to support the emphasis of the Cycling Strategy in focusing on cycling as a recreational pursuit, local trips and for lifestyle reasons (ie. improved health). A well designed recreational cycle network that is independent of the road system which connects points of interest, and local and regional centres, may make people more comfortable about genuinely integrating cycling into their daily lives, rather than merely viewing it as some sort of exercise regime. Growth may come from increased recreational activity but it is likely to be sporadic at best. Unreliable demand that is the nature of recreational activity, will make policy-makers reluctant to justify increased funding for cycling infrastructure. However, if cycling did become the dominant transport mode, it could be treated as an activity with an economic dimension (ie requiring registration and insurance fees) which may yield adequate funds for the provision of infrastructure, without recourse to subsidies from other government revenue. Unfortunately, if this were done at the current low levels of cycling activity, the rules, regulations and costs that are familiar to motorists, would be unlikely to entice people to cycling as an alternative cycling mode.

Perhaps the only way to reduce car use is to greatly increase the cost of car ownership. Road pricing, increased parking charges, carbon taxes, higher registration fees and higher taxes for car ownership and petrol would modify the demand. However, low-income households, without alternatives to cars as urban transport, may be seriously disadvantaged by such policy measures, unless there is sufficient capital investment in cycling and public transport infrastructure to make it a viable alternative to the car. An issue that demands further research is whether the people are discouraged from cycling because of the paraphernalia and high cost of bicycle ownership where a new road going bike with the necessary safety equipment (helmet, lights, mirror, reflective clothing), can easily exceed \$500. The provision of free bicycles at strategically located depots in urban areas that are

secured with personal identification or a refundable deposit, may be one way of having appeal to the casual cyclist.

Despite the efforts of BikeSouth and other cycling organisations, the South Australian Cycling Report (Wright et al., 1998) indicated that only 37% of respondents had any awareness of bicycle promotions. Awareness of cycling facilities was high with at least 72% of respondents aware of bike lanes or off-road paths. These findings suggest that improved marketing is needed, while facilities are sufficiently visible for people to be aware of cycling as an alternative form of urban transport. However, the study did point to a low awareness of storage facilities (19% for bike storage). Making contact with motorists through distributing material in petrol stations could be a good starting point since every motorist at some time will have to refuel and the majority of adults are probably in possession of a driver's licence. Furthermore, distributing promotional material wherever active people are likely to frequent such as cafes, gyms, sporting facilities, shopping centres, libraries, educational facilities and newsagents. TV, radio and the print media should not be overlooked, however, they can be expensive.

Safety is a major impediment to increasing cycling activity. The South Australian Cycling Report (Wright et al., 1998) found that 7% of cyclists had been in an accident although the circumstances were poorly detailed. Austroads (1997, p26) estimated that cars/light commercial vehicles accounted for 48% of vehicles involved in fatal crashes while bicycles accounted for 11.1% of vehicles involved in fatal accidents, using the measure of the proportion of vehicles involved in fatal crashes per vehicle kilometres travelled. It is imperative that any drive to increase cycling activity is concomitant with an increase in the quality and quantity of facilities necessary to minimise the safety risk to cyclists. Facilities as they currently stand in Adelaide, could not cope with large numbers of cyclists commuting in peak hours, particularly with regard to right turning movements at intersections.

Conclusions

The 1996 Cycling Strategy for South Australia was perhaps overly ambitious, since the goal of doubling cycling by 2000 in metropolitan Adelaide is unlikely to be achieved according to the 1998 review (Wright et al., 1998). Planning policy at the state level is moving in the right direction in encouraging the acceptability of cycling as a transport choice. Talk is cheap, however. While current levels of infrastructure investment in cycling is not disproportionate to the level of commuting, enormous changes are needed to achieve Parker's ideals of 50% of urban trips being made by bicycle.

A strong leverage for change in policy regarding the funding of cycling infrastructure, would be to try and redeem Australia's reputation as an environmentally responsible nation dedicated to reducing its greenhouse gas emissions in line with the targets advocated at the Kyoto Climate Change Conference in 1997. In 1995, personal urban travel in Australia by car resulted in 25% of Australia's greenhouse emissions. If 30% of car travel could be replaced by cycling (ie Dutch levels of cycling activity), Australia's output of greenhouse gas emissions could be reduced by about 8% (Estimate derived from data in (Austroads, 1997)). The need to avert the catastrophe of global warming due to greenhouse gas emissions may be the emotional "trigger" needed to inspire the

community to initiate a revolution in urban transport. Concerted, unrelenting and intensive lobbying by the community will be needed to jolt legislators, policy-makers, politicians, treasuries, planners and urban developers into providing urban cycling and public transport infrastructure with the same degree of functionality as is currently experienced with motorised road transport. It may take many years to initiate change from car dependent cities to cycling oriented cities, but the returns in terms of better community health, less urban pollution, more urbane cities and an improved quality of life will make this revolution worth the wait.

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