

In Transport the Small Picture is becoming the Big Picture

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***Abstract:** There is increasing interest in sustainable transport, e.g. walking, cycling and public transport. This is reflected in the wording of numerous recent transport and other Government strategies.*

Engineers have an important role in the implementation of these strategies in relation to cycling, including the manner in which roads are designed or maintained, and the planning of bicycle networks.

Provision for cyclists in the design of roads or new urban areas is not automatic or necessarily required, and is often not considered to be important. There has been a culture of opposition to accommodating cyclists. However, engineers need to be aware of their duty of care to all road users.

Despite this, it is evident that many traffic engineers are supportive of measures for cyclists, but they may have insufficient knowledge or experience to provide adequately for cyclists. Australia is demonstrably inexperienced in its endeavours to cater for cyclists. There have been a number of prominent failures in Australia over the years where treatments for cyclists have been installed only to be later removed due to the outcry from cyclists, the public or both.

Amongst other benefits, comprehensive engineering education has the ability to emphasise the duty of care owed to all road users, and also to provide a knowledge of the basic principles and of good practice, in relation to accommodating cyclists.

Keywords: Traffic Engineers, Expertise, Cycling

Introduction

The interest in sustainable transport, e.g. walking, cycling and public transport, has never been higher. Sustainable transport objectives are amongst the most important in recent Local, State and Federal transport strategies.

In general the provision of cycling facilities in Australia is only a recent undertaking. Major programs and research on cycling were initiated after the mid-70s oil crisis, and more specifically developed through the benchmark project; the Geelong Bike Plan (Geelong Bike

Plan Committee 1977). Most local and state authorities across Australia are now actively involved in the provision of cycling facilities.

The need to equip engineers with the skills to adequately provide for sustainable transport including cycling is therefore more important than ever.

Why Cycling is Receiving Greater Recognition

Cycling offers many significant benefits which have direct relevance to many issues associated with the transport system, community health and the environment. These are discussed briefly below:

Health

- *Physical Inactivity* is now recognised as one of the most significant health risks to the Australian community, second only to smoking. The health benefits of physical exercise from active transport such as cycling are substantial and well documented (National Public Health Partnership 2001, Bauman et al 2002, Roberts et al. 1995).
- *Emissions* - active transport also contributes to improved air quality as a result of reduced congestion and car emissions. Thus 'active' transport is an issue for environmental as well as individual health. Research both in Australia and overseas indicates the number of premature deaths due to smog is likely to exceed the annual road toll (Denison 2000, Kunzli et al. 2000).
- *Road Trauma* - the Commonwealth Bureau of Transport Economics has estimated the cost of road accidents at \$15 billion per year. (2000). Promoting sustainable transport and particularly cycling has been shown to be an effective collision counter measure (PWWM 1994).

Environment – cycling contributes neither to noise or air pollution, and does not draw on fossil fuel reserves that produce greenhouse gases. Other benefits are conceivable such as reduced parking and road space demands, and hence reduced paved area, reduced rainfall runoff, reduced erosion etc

Equity - the bicycle has been referred to as the 'equity vehicle', as a transport mode that is available to a wide cross-section of the community - young and old, rich and poor. In comparison to motor-vehicles, bicycles can provide substantial savings in the cost of transport.

Road Congestion – increasing car ownership and use levels, and in Australia these are amongst the highest in the world (Austroads 2000). This contributes to congestion, whereas cycling is an aid to congestion on roads.

Urban Traffic Conditions – traffic practitioners are constantly engaged with improving urban amenity through reductions in local area traffic volumes, noise and speed. Increased cycling is obviously beneficial in regard to these issues.

Resources – in addition to contributing to reduced reliance on oil imports, cycling has limited infrastructural and storage space requirements and has limited energy requirements in respect of both manufacturing and use. There is mounting evidence that declining oil production

appears inevitable over the next decade – it is being used faster than it can be found. (Akehurst 2002, Warren Centre 2002).

Usefulness – cycling has been long recognised as the quickest door to door mode of transport over short distances (5-10km) in urban areas, considering origin and destination walk times (Hudson 1982). Despite improvements in the management of roads and technology, this may be more accurate today than in the past due to parking and traffic congestion.

Government Policy is Recognising Cycling

Numerous recent or current transport and related policies exist across Australian Federal, State or Territorial jurisdictions, and internationally, which highlight the importance of sustainable transport and/or the promotion of cycling, to reduce congestion, reductions in greenhouse gas emissions and the like. This is demonstrated by the following excerpts:

New South Wales Government Metropolitan Transport Strategy, ‘Action for Transport in Sydney (1998)’ - ‘Transport accounts for 14 percent of Australia’s greenhouse gas emissions and is the most rapidly growing source. The growth must be slowed if Australia is to meet its international commitments to help prevent dangerous interference with the world’s climate.’

‘The State Government wants to encourage greater bicycle use throughout Sydney and is planning to create a citywide, interconnected bike network.’

Victorian Greenhouse Strategy (2002) – ‘Given the diversity of factors influencing transport greenhouse gas emissions the government will institute a package of greenhouse gas abatement actions through the Victorian Greenhouse Strategy and other initiatives such as the Metropolitan Strategy.’

‘Two new initiatives will be introduced through the Victorian greenhouse strategy.....: market testing of improved bus services and a safe walking and cycling routes to school program.’

South Australian Transport Strategy (2003) - ‘South Australia, like other States, is faced with a number of serious environmental issues,.....many of which are directly attributable to the transport system.’

‘Walking and cycling will be promoted as viable modes of travel, supported by well-designed infrastructure and services.’

Western Australia Transport Policy (2001) – ‘...greater use of bicycles will contribute to the health and well-being of the community, reduce our dependence on cars and thus improve the quality, reduce the need for costing road maintenance and expansion, and ease some of the pressure on our transport network.’

Commonwealth Government - Auslink - Towards the National Land Transport Plan Greenpaper (2003) - ‘Pollution from road transport seriously affects air quality in our major cities. Petrol engined passenger cars are the principal source of road transport emissions...

...Greenhouse gas emissions in 2010 are projected to be almost 47 per cent above 1990 levels with cars accounting for 53 per cent of transport emissions. Greenhouse gas emissions from

commercial vehicles are projected to increase by around 50 per cent between 1990 and 2010 and almost 85 per cent between 1990 and 2020.

World Health Organization, European Economic Commission (2002) - ‘The development of WHO Guidelines to carry out health impact assessment of transport policies on levels of walking and cycling and related health effects could form a basis to quantify these health effects and make them part of the cost-benefit/cost-effectiveness assessments of transport and land use policies at the urban level.’

In addition to the above, there are numerous other policy or strategy documents with similar statements developed by other jurisdictions (ACT US, NT DIPE, Queensland Transport, DIER).

Again, the referenced documents highlight the increasingly important role of sustainable transport and cycling, amongst key authorities both in Australia and elsewhere.

The Engineers Role in Promoting Cycling?

To achieve the policy objectives, or to promote cycling in view of the benefits outlined above, there are numerous measures that can be adopted which often fall within the area of responsibility of engineers. In general, engineers have critically important role in the provision of physical infrastructure, which includes planning, budgeting, implementation and quality control.

Effectiveness testing has suggested the following most important strategies to encourage more cycling, listed in order of merit (U-SA, 1996).

Strategy	Score*
Bike insured against theft as part of your normal household insurance for no extra fee	7.4
Cycle paths are clear of glass and other debris	7.2
Introduction of clear maps and good signage of bike ways, routes and connecting networks	7.0
Series of convenient bicycle routes constructed to enable cyclists to take in scenery and other points of interest	6.8
Parked vehicles are restricted on bike ways during peak traffic periods	6.7
You win or gain a new bike	6.7
Motorist responsibilities in regard to cyclists are enforced	6.5
Cycling skills and safety awareness are provided in schools	6.5
Cyclists are separated from traffic on roads with speed limits greater than 50 km/h	6.4

* Probability (0 low, 10 high) that strategy will encourage more cycling.

Several of these strategies are directly related to the duties of engineers, including the manner in which roads are designed or maintained, and the planning of bicycle networks.

Duty of Care

Despite significant and increasing evidence of the need to support sustainable transport, in some respects government policy and the benefits of cycling (listed above) are almost superfluous, when considered against the basic responsibilities of traffic and transport professionals.

A duty of care exists to all road users. This is not new. Recent national and international events (e.g. H1H, September 11) and even our increasingly litigious society have not changed this, although perhaps these aspects have increased the focus on one's duty of care.

Roads are hazardous by definition. In the case of cyclists there is no 'protective outer shell', there is a significant speed differential in comparison to passenger cars, and there is a large variation in age and skill. All road users including cyclists, must receive satisfactory consideration. Engineers need to be aware of this and must be able to provide adequately for cyclists regardless of the way in which they perceive cycling.

Why the Needs of Cyclists are Ignored

Provision for cyclists in the design of roads or new urban areas is not automatic or necessarily required, and is often not considered to be important. There are many reasons for this.

It is evident that cycling has an image problem due to:

- the way cyclists are perceived on roads;
- the fact that cycling has not been seen as the 'big time' in the transport field.

Many drivers regard cyclists as having limited regard for road traffic laws. Without doubt many traffic engineers also view cyclists in this way.

Whilst there is no suggestion that cyclists are without error, a knowledge of cycling can explain many of the apparently irresponsible acts of cyclists. For instance:

- running red lights - larger intersections have insufficient inter-green periods for cyclists to safely clear these intersections, as they travel in the order of half the speed of other traffic in urban areas. On side roads many cyclists are unable to actuate traffic signals as the signals directed at the main road generally rest on green and cyclists may have non-ferrous bikes which do not actuate the signals or have a lack of knowledge on how to position their bike to actuate the signals etc
- riding centrally in traffic lanes – it is well known amongst bicycle planning practitioners that cyclists can comfortably share a lane with passenger cars when the lane width is at least 4.0m, and that cyclists effectively control a lane (i.e. are unable to be passed within the lane) when it is less than about 3.2m. Between these widths, cyclists are generally regarded as being at risk, due to vehicles squeezing past cyclists within the lane when the width is insufficient. Many cyclists understand this and take defensive action by 'claiming the lane' i.e. by positioning themselves centrally in the kerbside lane.

Other reasons why cycling receives less attention may include:

- low cyclist numbers in Australia;
- technical aspects of providing for cyclists may be regarded as less interesting to engineers in comparison to calculating motor vehicle queue lengths;
- accommodating large vehicle swept paths etc.;

- dealings with semi-political and sometimes aggressive bicycle advocacy groups.

Low cyclist numbers are obviously of no assistance in the face of the massive demand for road space, or the problems associated with land acquisition which may be required in order to accommodate the additional width to accommodate cyclists in a road carriageway.

There is no equivalent for cyclists, to the Disability Discrimination Act which establishes a statutory obligation to provide for people with disabilities.

These factors all contribute to another problem in the transport profession that is widely discussed. There has been a culture of opposition to accommodating cyclists. This is also a concern for other forms of sustainable transport but generally not to the same extent. It is arguably a greater problem with more senior members of the profession, who are said to have 'grown up with the motor vehicle'.

In view of the sections above, often only government policy and a duty of care will ensure consideration of cyclists. Unfortunately, there are too many examples of supportive governments failing to back initiatives for cyclists when the costs become too large or the issues become too great, leaving just a duty of care as the primary reason to provide for cyclists.

Influencing engineers as to their responsibilities to all road users is therefore extremely important.

Lack of Knowledge of Cycling

It is evident that many traffic practitioners are supportive of measures for cyclists but have insufficient knowledge or experience to provide adequately for cyclists.

Some common factors that reflect a lack of knowledge and experience include:

- reinventing the wheel, e.g. introducing European style treatments but making the same (now well recognised) mistakes as some European countries in past years;
- use of census data in strategic transport planning – in South Australia at least, during the last four census days, the weather was particularly poor and as a result cycling was almost non-existent on those days;
- constructing paths as footpaths rather than 'bicycle roads', e.g. with abrupt corners rather than smooth curves;
- constructing a commuter route that is circuitous and hence slow, where in fact time is likely to be a critical factor in terms of a cyclist's route preference;
- intersection design and line-marking that ignores the needs of cyclists by forcing multiple stops, or worse, by discontinuing the cycling facilities that exist on the approach roads.

There have been a number of prominent failures in Australia over the years where treatments have been installed only to be later removed due to the outcry from cyclists, the public or

both. The most disappointing aspect about this is that in some cases the practitioners themselves have become somewhat disillusioned with providing for cyclists.

In addition to a lack of knowledge of cycling, it is evident that the knowledge of cyclists' needs and provisions is sometimes not valued by decision makers, e.g. engineering managers. Also, it appears to surprise people at times, that in bicycle planning and engineering, there is good and bad practice, and that detailed guidelines and reference books exist.

It is important to understand that unlike European countries, Australia's interest in cycling is only recent. The first national conference on bicycle planning and engineering was held in 1986 in Newcastle. [Since then national or international conferences have been held on just three occasions (Melbourne, 1992; Fremantle, 1996; Adelaide, 1999) which is probably insufficient for networking, dissemination of recent research, amongst other issues].

'Bicycle agencies', which often reside in state road authorities, came to exist in a majority of states only during the 1990's.

As a country we are demonstrably inexperienced in our endeavours to cater for cyclists.

Bicycle agencies, which generally reside within state road authorities, have fallen in and out of favour over the years, and therefore have not enjoyed continuity, and are unable to pass on knowledge and experience as a consequence. In parallel to this, practitioners, both in road authorities and amongst consultants, have generally experienced a short professional life in cycling. For instance, notably, the stalwarts of bicycle planning and engineering from Victoria in the 1980's, and from Western Australia in the early 1990's, have generally moved on, and have little or no involvement in bicycle planning and engineering now.

This is quite possibly due to the 'rugged' nature of the work, resulting from intense criticism or inspection by bicycle advocates, politicians and senior management, when new programs, or unknown quality treatments, are either planned or implemented.

More specifically, the rugged nature of the work is due to the many problems in retrofitting an established road environment under heavy demand, with provisions for one mode of transport with limited numbers (which many believe is a result of the lack of provision). It is expensive and obviously the budget for an emerging transport mode is often limited. One is tempted to 'do it on the cheap' in these circumstances and as such there is significant potential for mistakes.

The risks of introducing new or innovative treatments are sometimes significant, and hence are also a factor.

There has been much discussion on the effects of down sizing in the 1990's. In cycling matters, the loss of staff has resulted in the establishment of a void in knowledge in some agencies during different periods.

Comprehensive engineering education on these matters has the ability to:

- provide a knowledge of the basic principles for every traffic practitioner;

- provide a knowledge of good practice that will avoid common and sometimes appalling errors;
- influence road planning where cyclists' needs will be accommodated in the road design, in an appropriate way;
- circumvent the impact of changing workplace environments;
- provide senior engineering managers with an appreciation of the impacts of decisions on cycling, in a similar manner to those associated with other transport modes.

Engineering education requirements, and curriculum development issues, in relation to cycling, have been outlined by van den Dool (2003).

Conclusion

To have relevance, transport professionals need to lead from the front. It is not possible to plan or design roads today without a good appreciation of the characteristics and needs of the various road users. In consideration of the duty of care of transport professionals to the various road users, nothing else seems appropriate.

Failing to embrace change in this regard is not without 'risk' as to the traditional role of transport engineers. For instance, in the past, the principal Quebec (Canada) bicycle advocacy organisation wrote the local bicycle engineering design guidelines, provided most of the planning and engineering expertise for cycling facilities and importantly, enjoyed considerable support from politicians. As a consequence it strongly influenced many road design and planning decisions.

There are many reasons to support cycling. The increasing support for sustainable transport and cycling by Governments, needs to be recognised by the educators of engineers. This must surely mean that those going on to practice in the transport field specifically, need to be more knowledgeable on cycling. Similarly, engineers need to be favourably disposed to providing for cyclists despite the low numbers, and even despite the lack of support amongst some in the community.

References

- ACT Urban Services (ACT US, 2003). *ACT Greenhouse Strategy Fact Sheet 10 on Reducing Transport Emissions*. Retrieved from <http://www.urbanservices.act.gov.au/Files/greenhousefs10-word.doc>.
- Akehurst J (2002) *World Oil Markets and the Challenges for Australia*, Woodside Energy Ltd, paper presented at: ABARE OUTLOOK 2002.
- Austrroads (2000), *Roadfacts 2000*.
- Bauman, A., Bellew, B., Vita, P., Brown, W. and Owen, N. (2002). *Getting Australia active: Best practice for the promotion of physical activity*. Melbourne, National Public Health Partnership.
- Bureau of Transport Economics (BTE, 2000). *Road Crash Costs in Australia*. Report 102, p xi.
- Commonwealth Department of Transport and Regional Services (DOTRS, 2003). *Auslink – Towards a National Transport Plan Greenpaper*, Canberra, p.18-19.
- Denison, L (2000). *Melbourne Mortality Study: Effects of Ambient Air Pollution on Daily Mortality in Melbourne 1991-1996*. Victorian Environment Protection Agency ISBN 0730675823.
- Department of Infrastructure, Energy and Resources (DIER, 2003). *Tasmanian Government's Environmental Policy For Transport Activities*. Retrieved from <http://www.transport.tas.gov.au/environment/enviro.html>
- Department of Natural Resources and Environment (DNRE, 2002). *Victorian Greenhouse Strategy*. Government of Victoria.

- Department of Transport (DOT, 1998). *Action for Transport in Sydney*. Government of New South Wales.
- Department of Transport and Urban Planning (DTUP, 2003). *South Australia's Draft Transport Plan*. Government of South Australia.
- Geelong Bike Plan Committee (1977). *Bicycle Planning in Australia*. Geelong Regional Commission, Victoria.
- Hudson, M (1982). *Bicycle Planning. Policy and Practice*. The Architectural Press Ltd.
- Implementation%20Report.pdf.
- Kunzli N., R. Kaiser, S. Medina, M. Studnicka, O. Chanel, P. Filliger, M. Herry, F. Horak, V. Puybonnieux-Texier, P. Quenel, J. Schneider, R. Seethaler, J.-C. Vergnaud, H. Sommer (2000). *Public-health impact of outdoor and traffic-related air pollution: a European assessment*. *Lancet*, 356(9232):795-801.
- Marketing Science Centre, University of South Australia (U-SA, 1996). *Effectiveness Testing of Proposed Cycling Strategies for Greater Metropolitan Adelaide*, BikeSouth, DoT SA
- Ministry of Public Works and Water Management (PWWM, 1994). *Cities Make Room for Cyclists*. Netherlands.
- National Public Health Partnership and SIGPAH (2001). *Promoting Active Transport. An intervention portfolio to increase physical activity as a means of transport Promoting Active Transport*. National Public Health Partnership, Strategic Inter-Governmental forum on Physical Activity and Health (SIGPAH), 2001.
- NT Department of Infrastructure, Planning & Environment (NT DIPE, 2002). *NT National Greenhouse Strategy Implementation Plan*. http://www.lpe.nt.gov.au/enviro/greenhouse/documents/NT_NGS_IP.pdf. NT Government.
- Queensland Transport (2001). *Transport 2007 – An Action Plan for South East Queensland*. Retrieved from [http://www.transport.qld.gov.au/qt/irtpsign.nsf/files/images/\\$file/T7%20](http://www.transport.qld.gov.au/qt/irtpsign.nsf/files/images/$file/T7%20)
- Roberts I, Owen H, Lumb P, MacDougall C (1995). *Peddalling Health: Health Benefits of a Modal Transport Shift*. ISBN 07308 0741X.
- The Warren Centre for Advanced Engineering (2002). *Towards a City of Cities*. University of Sydney.
- van den Dool (2003). *Reinventing the Bicycle Wheel*. Proceedings of the 14th Annual Conference for Australasian Association for Engineering Education and 9th Australasian Women in Engineering Forum. RMIT University, Melbourne, VIC. AaeE.
- WA Labor Transport Policy (2001), Retrieved from www.ministers.wa.gov.au/policies
- World Health Organization, European Economic Commission (WHO, EEC, 2002). Meeting on Transport, Environment and Health, Transport, Health And Environment Pan-European Programme (The PEP).

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