Introduction

Dutch cities are rightly famous for being bicycle friendly and in 1996 28% of all trips were made by bicycle; more bicycle trips were made by women than men and the elderly made 20% of all their trips by bicycle. (Pucher and Dijkstra 2000).Compared to Australian cities, Dutch cities are also pedestrian friendly, safer and provide more transport choices for children, and for female and elderly travellers. Most disabled people, especially wheel chair users, find it a lot easier to get around. (Parker 2001) In 1995 Australia had the third lowest level of non-motorised travel in the OECD but 46% of all trips in the Netherlands were made by either walking or riding bicycles, the highest in the entire OECD.**(see Figure 1**)

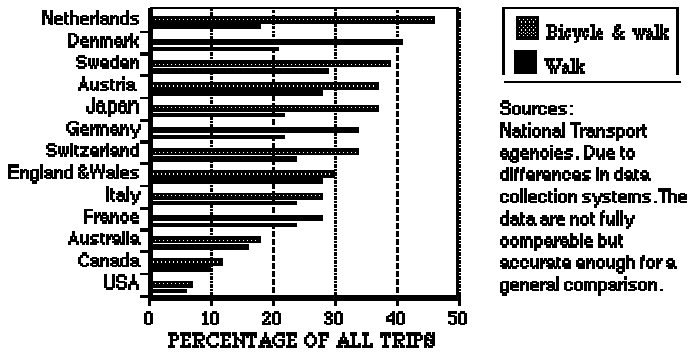

Figure 1.OECD Countries modal share of walking & bicycling

This paper describes how the the Dutch have achieved synergetic joint outcomes in the areas of road safety, health and the reduction of air pollution and greenhouse gas emissions as result of national environmental planning, It is argued that the Swedish Zero Road toll vision for Australia will only be practical within the context of a "whole of government" approach to environmental planning as it is in both the Netherlands and Sweden. (Yencken and Wilkinson 2000)

The high level of non-motorised travel in the Netherlands is not accidental nor is it the result of Dutch culture. For 25 years pedestrian and bicyclist safety have had a much higher priority and in the 1990's that priority has been reinforced by a a whole range of integrated planning measures designed to create a more sustainable and safer transport system. Indeed the National Environment and Policy Plan (N.E.P.P) drives national planning, involves all government agencies, industry and other groups and is updated every four years so as to achieve sustainability by 2010. There is a supportive national road safety policy which in practice results in fewer road users being exposed to injurious mechanical forces in collisions that produce death or crippling injuries.(Corben 1998) There is a “sustainable road safety philosophy” that gives priority to the needs of vulnerable walkers and cyclists so that a high level of non-motorised travel is maintained.

There is no perceived conflict between being "safe" and being "green" as there is in Australia. This is because the"green tax laws" in the NEPP have resulted in far fewer old cars, fewer four wheel drives and hardly any pedestrian crippling bullbars. The Dutch car fleet has many more newer and smaller cars with rounder and softer frontages. These pedestrian friendly features are particularly beneficial when cars are driven at much lower speeds in built up areas in which there is more rigorous traffic law enforcement. The Dutch

car fleet is more pedestrian friendly than the Australian car fleet and significantly reduces the incidence and severity of pedestrian and bicycle collisions.

The creation of bikeway networks which have mostly separate bike paths and footpaths and upgraded road intersections that reduce vehicle speeds have made it safer for pedestrians and wheelchair users. There are central refuges at most unsignalised crossings with pedestrian routes and short cuts to residential precincts. The widespread implementation of the Dutch Bikeway design manuals (CROW 1993a)(CROW 1993b) has been of great benefit to cyclists as well as pedestrians.

Bicycle Federation of Australia (BFA) representatives who have cycled and walked extensively in the Netherlands, have developed road safety policy recommendations based on the Dutch planning model. Those policies that the BFA has in common with The Pedestrian Council of Australia (Parker 1998c) are summarised at the end of this paper.

Comparing 'urban Australia' and the Netherlands

The Netherlands cannot be compared with the sparsely populated inland continent of Australia which is mostly bush, desert and forest. Indeed 90% of 7.8 million square km of continental Australia is mostly uninhabited and is 200 times larger than the Netherlands. Here wherever the data are available we compare, two areas of land almost the same size with almost the same population; that is, urban Australia where 85% of Australians live (in cities of 10,000 population or more) with all of the Netherlands. Note that the data for "all of Australia" used figures 1, 5, and 6 are still usefull urban indicators because 95% of pedestrian fatalities are in urban Australia.

As the Australian transport data base regarding motor vehicles is robust we can draw some very firm conclusions about the comparative efficiency of the two car fleets and the role of non-motorised trips in substituting for a high proportion of short and mostly dirty car trips which are made with cold start engines. The 38 comparative data items for Urban Australia and The Netherlands are collated in a table (see Appendix 1). 1996 was selected as the year for comparison because of the almost identical population that year.

Although the average density of Dutch cities is now three times that of the Australian capital cities encouraging safe non-motorised travel is not only related to density. Many other cities have similar high densities but far lower levels of non-motorised travel and high levels of greenhouse gas emissions. Frankfurt and Hamburg and London are just three examples. Higher densities are just one of the preconditions for the high levels of non motorised travel in the Netherlands most important of all is to recognises the complementary roles of walking and cycling

Dutch transport planners clearly understand that in an age of increasing mobility and time scarcity pedestrians will use cars unless they are given the option of safe cycling trips for short distances or bike/rail trips for long journeys. (Wellemen 1999) The Dutch view is that the 'real cyclist' is actually an ordinary pedestrian on two wheels who wants a more convenient way to get from A to B for trip of 1 to 3 km. The 'real cyclist' for planning purposes is the typical European office worker in his or her work clothes and often riding a wreck of bike with upright handle bars; or a housewife cycling home from the shops with

bike carrier full of food, or maybe a child on a carrier. The safe bikeways that men and women choose to use every day in the Netherlands are also well used by racing and touring cyclists.

If we want to encourage both walking and bicycling in Australia it makes good sense to regard the bicycle as a pedestrian vehicle. If pedestrians are not given a safe cycling option Australian experience shows they will use cars instead. If we want realise the huge cost savings that are possible Australian planners have to learn just how difficult it is to do everything that is necessary. Changing unsustainable transport trends is far more difficult than merely throwing money at a problem or building more and more roads to accommodate more and more cars.

The discouragement of walking and cycling in Australia

In Australia the practice in recent years of subsidising car use as part of salary packaging has resulted in car dependency for 'all trips' including the trip to work and school. The over use of the motor car and the decline of informal car sharing for the trip to work from 1976 results in single occupant cars causing severe congestion in cities. In Victoria trips to school (**figure 2)** show a large decline in walking and cycling and this is similar in other states. For example in Adelaide in 1981 only 24% of Adelaide's children were being chauffeured to school and 55% of them either walked (42%) or cycled (14%). By 1997 60% of Adelaide's children were being chauffeured to school and only 24.5 % of them either walked (20.5%) or cycled (4.5 %).

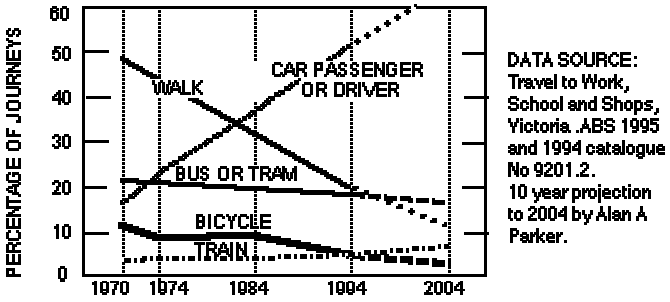

Figure 2. Victoria 1970 to 2004: Percentage of Journeys to Educational destinations by Mode

The 1976 to 1996 Census data for the journey to work is the only reliable data for 'urban Australia. The trends shown in **figure 3** will continue for many years and the next census in 2001 is almost certain to be as projected. On average three times as many men will continue to ride to work as women because of the actual and perceived hazards.(Parker 2000) That is not the case in the Netherlands where just as many women cycle to work as men.

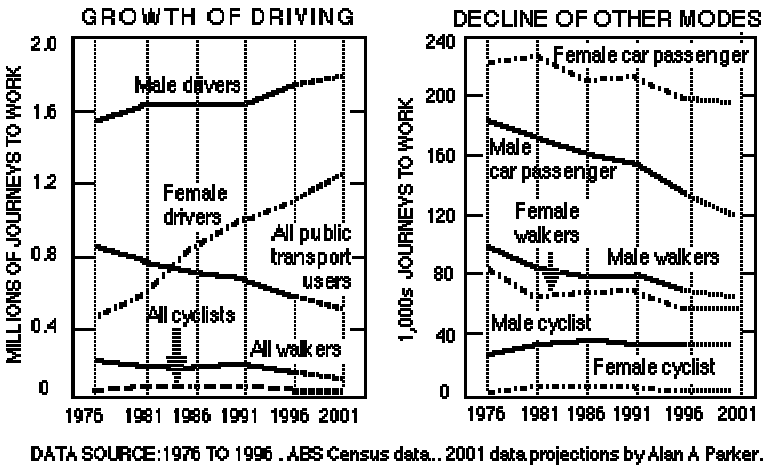

Figure 3. The journey to work 1976/2001 urban Australia

The Melbourne data **(see figure 4)** are the nearest to a surrogate "urban Australia" data indicator. Assuming that Melbourne walking trips and cycling trips trends are similar to 'urban Australia', the decline of walking trips over the last 18 years was much greater in 'urban Australia' than in the Netherlands. The unsustainable decline of walking and public transport shown on figures 4 from 1978 to 1996 in Melbourne, and perhaps 'urban Australia', is much greater than in the Netherlands. and perhaps 'urban Australia'. From 1978 to 1996 the high level of bicycle trips(28%) in the Netherland was maintained and there was a small increase of all bicycle trips to 2% in 1996 Melbourne and perhaps 2% in 'urban Australia'. The decline of walking and public transport in Melbourne for 'trip to work' (see figure 3) reflects the decline of 'all walking' and 'all public transport' trips in Melbourne. (see figure 4.)

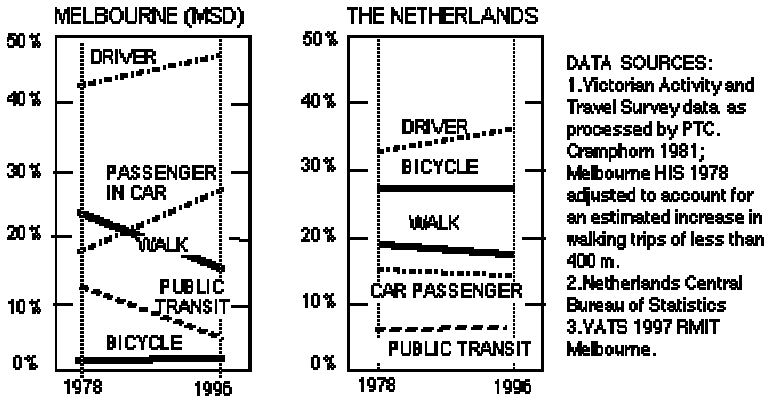

Figure 4. Melbourne MSD and The Netherlands: Percentage of all trips for all purposes 1978 to 1996

There is a lack of robust data for 'all walking and 'all cycling trips' which hides the full extent of unsustainable trends in urban Australia. As is shown later, makes it impossible to measure how safe cycling and walking are per distance travelled

The Dutch philosophy of sustainable road safety

Dutch road safety policy is based on the philosophy of "sustainable road safety" which in practice results in fewer road users being exposed to mechanical forces in collisions that produce death or crippling injuries. As a result of traffic calming since the early 1970s there are now 6,500 "Woonerfs", that is safe local streets where cars can only travel at 12 kph or less, and 30 kph limits in all other residential precincts. Although elderly cyclists and pedestrians are far more susceptible to dying due to injuries when run over, the Dutch are not deterred from making these trips, as are many elderly Australians and Americans. (Pucher and Dijkstra 2000). The disabled use their small electric vehicles on bikepaths and in residential areas.(Parker 2000a)

The philosophy of "sustainable road safety" recognises the vulnerability of non-motorised road users and gives priority to their safety needs. This is why,, the default speed limit on undivided main roads in built up areas is 50 kph (Corben 1998). As Corben puts it:-

"they are providing more pedestrian crossings and accepting that 'the car' is no longer sacred"....."designating appropriate road function, while important in managing all types of road traffic, could be especially effective in improving pedestrian safety...they will be upgrading main roads that tend towards a flow function and downgrading main roads with mixed flow and access functions".

In addition most main roads have separate bicycle paths separate from the footpaths and in places where that is not possible bikelanes are provided subject to there being a maximum speed limit of 50 km/hr . Pedestrian zones are found in all Dutch cities and often take in much of the city centre. (Pucher and Dijkstra 2000) The philosophy of "sustainable road safety" informs the Dutch approach to road hierarchy in the central area of cities. They integrate the provision of bicycle and pedestrian facilities as part of an overall plan to constrain motor vehicle traffic, restrict car parking (CROW 1994) and provide short cuts for walkers and cyclists (CROW 1993a).

Developing one way street systems that remain as two-way routes for cyclists has freed up road lanes in the arterial road network for pedestrian use has increased bicycle and public transport access. Some of the road lanes and on-street parking spaces are removed and replaced with bikeways, bicycle parking bays, pedestrian malls, and tram and bus lanes in car free areas. All these measures constrain car use because they effectively increase the mesh size of the arterial road network so that driving is less convenient and cycling is more convenient.

Figure 5 shows that the Dutch have one of the lowest road death rates per 100,000 population in the OECD despite having the highest proportion of non-motorised travel in the OECD. (see figure 1) The Dutch road death rate is 30% less than Australian death rate, despite the high level of bicycle use and the absence of compulsory helmet wearing legislation. However, figure 5 because it compares the death rate for all of Australia, and half the Australian motor vehicle fatalities are outside of urban areas the death rate of car drivers is only 10% higher in urban Australia. (see Appendix.1) Nearly all the Australian pedestrian fatalities are in urban areas so that figures 5 is a crude indicator that pedestrians are safer in

the Netherlands than in 'urban Australia'. Figure 5 is only useful as general measure of road fatalities.

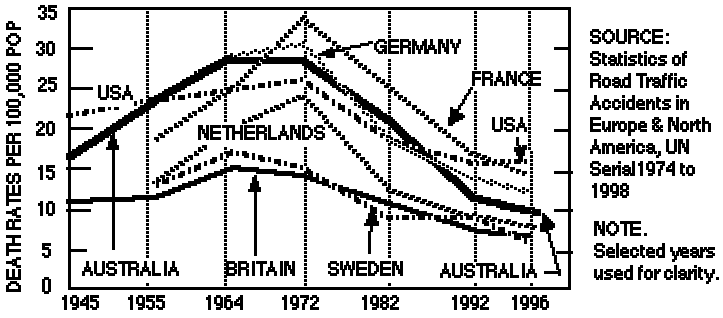

Figure 5. Road deaths per 100,000 people: 7 OECD Countries

Pedestrian death rates per 100,000 population is a somewhat better indicator of pedestrian safety (see **figure 6)** particularly around 1990 when a similar percentage of walking trips were made in both 'urban Australia' and the Netherlands. Figure 6 shows a large reduction in the pedestrian death rate per 100,000 population from 1965 to 1998 and a great improvement in pedestrian safety in both countries. We know that the Dutch walk just as far as they did 20 years ago but over the same period the percentage of walking trips has decreased by around a third from 24% to 16% in Melbourne and perhaps all of urban Australia. Figure 6 is only a usefull safety indicator for Dutch pedestrians because they are still walking almost as much as they did in 1980 (Wellemen 1999) but not for Australian pedestrians because many surveys, in some but not all cities, have shown that people are now walking much less.

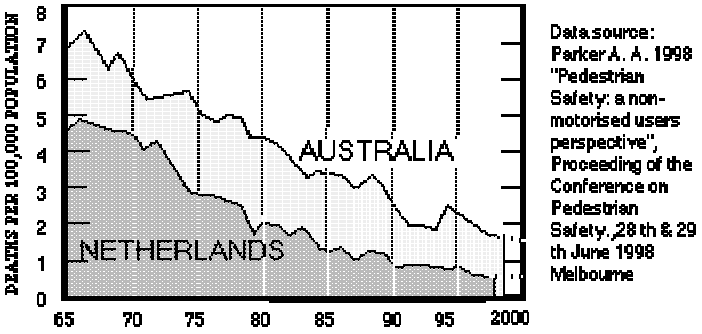

Figure 6. Pedestrian road accidents death rates per 100,000 population. The Netherlands and Australia

Figure 6 tells us that the Australian pedestrian death rate per 100,000 population was around 50% higher in 1965 than in the Netherlands and since 1979 has been around 150% higher. However, the trend to lower death rates of Australian pedestrians is misleading because urban Australians walk less less often and for shorter distances than they did in the past. The benchmark for pedestrian (and bicycle) safety in Australia has to be measured on the basis of deaths per distance travelled and the only time the Australian walking and cycling death rate per 100 million passenger kms was measured was in 1985 (INSTAT 1989). By this measure walking was 5.6 times safer and bicycling was 2.2 times safer in the Netherlands than in Australia in 1985.

Also we know that in the Netherlands the walking death rate had nearly halved by 1996 to 2.0 and bicycling death rate was down 30% to 1.9 (Wellemen 1999) but we do not know for certain what the Australian death rates are or what real progress is being made in making the non-motorised modes safer. This is why the 1996 Australian death rates in appendix 1 an approximation by this writer which assumes that the death rate has nearly halved like it has in the Netherlands.

The 1985 Australian death rates per 100 million passenger kms are appalling and we can only hope that it has greatly improved since then. Obviously accident analysts need facts, so it would be prudent for the Australian Transport Safety Bureau (ATSB)to collect the data on regular basis, just as the Dutch do, because it is usefull, not only in transport to do practical things like benchmarking the National Bicycle Strategy, but also for public health departments and the environment agencies who want to encourage walking and cycling. The absence of sound benchmark data has for many years deprived community advocates of the means to make their case.

Road user education and enforcement policy in the Netherlands

Two other radical Dutch approaches that improve the safety of walkers and cyclists are innovations in driver and rider education and new traffic laws that recognise the vulnerability of non-motorised users.
Driving training in the Netherlands is more relevant to the safety needs of cyclists and pedestrians than in Australia because it enables drivers to anticipate unsafe and illegal behaviour by cyclists and pedestrians. By the age of ten every child has received extensive instruction on safe walking and bicycling practice.(Pucher and Dijkstra 2000).
Australia also educates young children; the Bike-Ed program is promoted nationally but needs more emphasis on the on-road elements in the program.

Dutch traffic law was changed in 1998 regarding accidents involving cyclists and pedestrians so that motorists are now considered to be wholly at fault. Having the right of way does not excuse motorists from hitting cyclists and pedestrians and the courts require that motorists should anticipate unsafe walking and cycling behaviour. That applies even to illegal behaviour and insurance companies pay damages to cyclists and pedestrians automatically regardless of guilt. The low speed limits which are more rigorously enforced, with no leeway given to offending drivers. (8kph to 12kph leeway in Australia) Finally, the punishment of driving offenders is more severe (Pucher and Dijkstra 2000)

The Dutch approach to sustainable land use and spatial planning

Most of major cities of the Netherlands are within a river delta, at the centre of which is an open scenic area called the Randstad (Green Heart) which mostly lies below the level of the North Sea. After 700 years of land reclamation and the building of great dikes much of this mix of man made and natural environment is now at risk due to climate change. For the Dutch the elimination of car dependent urban sprawl and preservation of non urban land for farming and recreation is not really a matter of choice but of environmental necessity. It is a very small country threatened by rising sea levels and storm surges from the North Sea and more extreme floods from rivers that rise in central Europe.

Sixteen million Dutch have to do everything they need to do in the space occupied by 16 million Australian city dwellers. (34.400 square km, See appendix 1) So it is not surprising that there is a long standing consensus in the bureaucracy and government that what little land they have must be carefully conserved for future generations. For 20 years this consensus has been reinforced by powerful resident action groups who are only too aware that the only way to fit in more car traffic would be to fill in many of the canals and make them into roads. This would ruin the historic town centres. Recently the decision was made to eliminate urban sprawl to stop cities growing into one another.

For all these reasons spatial planning has not been delegated by government to private developers and never will be. Indeed all residential and urban development is subject to "spatial planning controls" at all levels of government. In Australia there is nothing comparable to this method of creating the 'compact urbanisation' at the edge of existing Dutch cities. This is not just a policy of increasing the average density but doing it in such a way that reduces the need to travel by car while increasing the convenience of using urban bikeway networks. (N.S.P.A. 1997)

The crucial industrial and commercial spatial planning policy is to put the "right business in the right place". For example outer urban super markets surrounded by hectares of car parking or low rise, low density, new universities which are conveniently accessible only by car, are no longer built. Instead there are compact local shopping areas within walking distance or multi story campuses built alongside rail lines; if there is no local station they build one.

The Dutch experience shows that letting private property developers, large retailing organisations and the road building agencies have too much control over urban planning is unsustainable and inequitable. From a demand management perspective aimed at encouraging the non-motorised modes this form of development is inherently unsustainable.

How to safely deploy cyclists and pedestrians to "green' the car fleet

Urban Australia and the Netherlands have the following similar characteristics in 1996.

1. Both areas have a population of approximately 15.6 million
2. Both areas cover around 34,300 square kilometres of land..
3. Both areas had the same standard of living; per capita GDP of around $20,250
4. Similar per capita travel by all modes on an average weekday. The average Dutch person travels 35 kms which is only 2.5 km less (7%) than the average Australian.
5. Similar proportion of single occupant car users for all trips in both countries; 48% in Australia and 43% in the Netherlands.
6. Similar per capita travel by car passengers for all purposes on the average work day; Dutch car passengers travel only 10% less (1.1 km) than Australians.

There were also some demographic differences in 1996. The Dutch rate of population growth has been lower for many years resulting in 14% more Dutch households. There is a greater proportion of older people living in smaller households, who make around 25 % of their trips

by bicycle. Given the above similarities we need to understand the Dutch car fleet produces far fewer emissions than the urban Australian car fleet.

The Dutch car fleet in 1996 produced 78% less carbon monoxide, 43% less nitrogen oxides,82% less volatile organic compounds (see-appendix).and 49% less greenhouse gas emissions in 1996 **(See figure 7)**.

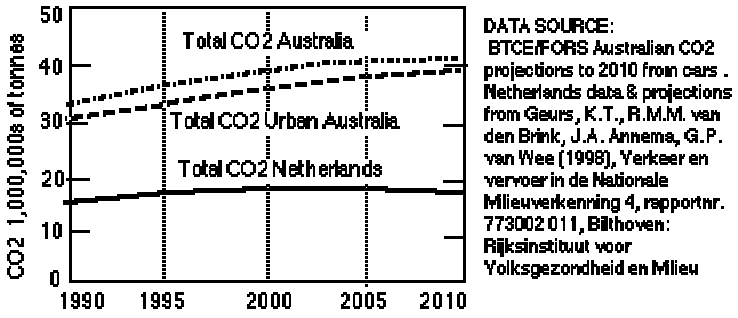

Figure 7. CO2 emmisions from passenger cars in urban Australia and The Netherlands

These data suggest that in the Netherlands bicycles and walking substitute for many short car trips, made with cold engines which are very dirty. This certainly accounts for a significant proportion of emission reductions. This is why the Dutch calculate the emission reduction potential of new bicycle facilities using pollution levels short car trips not the average pollution levels for all car trips. This improvement in Dutch car fleet performance is only partly due to the fact that per capita travel by car drivers on the average work day was 3.6 km less (18%) than urban Australia. Nearly all the reduction in Dutch car travel, but only part of the huge emissions reduction, was due to the following :-

.

1. 810% (2.6 km) increase in average per capita Dutch bicycle travel every weekday.

2. 73% (0.4 km) increase in average Dutch per capita distance walked.

3. 25% fewer Dutch car trips were less than 2.5 km, than in urban Australia.

4. 50 % (1.5 km) more Dutch workday trips were made by public transport.

5. Twice as many Dutch households without a car.

It seems likely that bicycle and walking trips in the Netherlands are substituting for around 10 billion car kms per year which is a very significant reduction in emissions and fuel consumption. Given that the Dutch only travelled 2.5 km less each workday by all modes than Australians these are large reductions indeed. The 28% reduction in the energy use (MJ/vehicle km) of the average car in the Dutch car fleet in 1996 compared to urban Australia is also assisted by the incentive of petrol being twice as expensive. However, there are several other factors that contribute to the reduced emissions in 1996:-

1. 41% of passenger cars are powered by LPG which produces 14 % less GHG and significantly less air pollution.

2. There are 24 % fewer cars in the Dutch car fleet than the urban Australian car fleet and the average car is smaller and uses 26% less fuel.

3. Only 23% of the Dutch car fleet was older than 10 years compared to 43% of the Australian car fleet. Even though the average Dutch car travels 3,170 km more each year Australia has many more old cars in its fleet. The Netherlands has a low level of multiple car ownership with 60% fewer households with two cars and 90% fewer households with three or more cars and bicycles can safely be used instead of additional household cars for many purposes.

4. Public transport patronage has maintained market share in the two decades prior to 1996 and has increased considerably since then as a result of bike/rail commuting by workers and students between the Randstad cities by express train which replaces many long inter-city commuter trips by car. There are between 2000 and 6000 bicycles parked at central rail stations and hundreds parked at local stations.(Parker 2000a)

5 There are very few car parking spaces at stations and most of these are reserved for the disabled, except in rural areas where there are a similar proportion of undercover bicycle parking spaces and car parking spaces. Bicycles not only make better use of cars but substitute for short bus trips and provide more convenient access to the rail system. Bus and tram fleets as consequence are smaller and better utilised with less peak loading in the rush hours.

Pedestrians who walk or access stations by buses have better services because of the large increase in bike/rail travel that has taken place. Again the symbiotic relation between walking, cycling and public transport reveals itself as a means of directly reducing car use and indirectly reducing serious road trauma.

For the future the Dutch have programs and infrastructure in place so as to increase non-motorised trip substitution for short car trips to 16 billion km per year by the year 2010. (Wellemen 1999) Note that the planned increase is around 20% or more than the total bicycle/walking km in urban Australia in 1996. Not only that but the relative energy efficiency of the Dutch car will also be accelerated by the more rapid replacement of cars in the Dutch car fleet and the fact that Dutch new cars are on average 14% more energy efficient than new Australian cars. Because proportionally more cars in the Dutch fleet are used more intensively and there are fewer multi car households, cars wear out quicker and can be replaced with more efficient vehicles

As shown on figure 7 Dutch car fleet per capita carbon dioxide emissions will reduce even further to around one third of the urban Australian car fleet by 2010. Unfortunately the data for Australia (BTCE 1996) are likely to be a under estimate from 1996 to 2010, given the unpredicted increase in the proportion of high performance cars and four wheel drives in the Australian car fleet since 1996, and predictions of increased sales to come. What is clear from the Netherlands experience is the need to both provide extensive bicycle and pedestrian facilities and to actively constrain car use and urban sprawl simultaneously. It is practical to safely increase the level of non-motorised travel in Australia, but what is being done is little more than tokenism.

The safety benefits of the Dutch National Environment and Policy Plans

Due to the implementation of three successive Dutch National Environment and Policy Plans, (NEPPs) over the last 12 years the Dutch car fleet not only has proportionally more safer cars, but these cars are driven at lower speeds in built up areas. This is much safer for cyclists and pedestrians and has contributed to the high proportion of non-motorised trips.

The NEPPs have contributed to the build up of a car fleet with an average vehicle fuel consumption 26% less than the average car in the Australian urban car fleet Unlike Australia the Netherlands in the transport sector has been moving slowly towards Ecologically Sustainable Development and the implementation of the of the Dutch Bicycle Master Plan has been part of this process. The central ESD goal (N.E.P.P. 3. 1998) is:-

"decoupling economic growth from the growth in fuel consumption and use of non renewable resources which is seen as both a sound economic and environmental strategy".

As the NEPPs evolved they improved and were better targeted. NEPP 3 makes it very clear why non-motorised travel is considered to be so important and why the car, which in the 1960s and 1970s years was regarded as a sacred cow as it still is in Australia, is now subject to many regulatory constraints: The transport objectives of the NEPP are:-

- Vehicles must be as clean, quiet, safe and economical as possible.
- The choice of mode for passenger transport must result in the lowest possible energy consumption and least possible pollution.
- The locations where people live shop, work and spend their leisure time will be coordinated in such a way that the need to travel is minimised.

Without the NEPP it was expected that car kms would increase by 72% over the period 1986 to 2010. With the NEPP this increase will be lowered to 48%, a positive step towards ESD. Dutch experience with implementing the NEPP suggests that there is the potential for a shift of at least 10% of all long "drive alone" commuter trips to multiple occupant trips. In addition to using bicycles to substitute for short, highly polluting car trips. (Wellemen 1999)

A study of 25 inter-urban commuting connections in the urban agglomeration of Western Holland showed that travelling time improves by an average of 15 per cent in favour of public transport if the distance to and from the station or bus stop is not covered by bicycle instead of walking or using a bus.(Wellemen 1999) In realising this predicted increase, it was found that access to a bicycle at both ends of a rail trip is important. A bicycle at the destination end will generate twice as much use, as the majority of the Dutch also have a bicycle at home. Following the research into the potential of bike rail travel a manual was put together for the railway company managers, municipal officials, and cyclist interest groups involved containing step-by-step plans for developing bicycle parking facilities at stations.

The NEPP aims to increase rail passenger traffic by a further 15% by 2010 through improving bicycle parking at stations. Netherlands Railway's plan is to increase rail passenger traffic from 9 billion passenger km in 1987 to 17 billion passengers in 2010. (RGI 1996) The implementation is already well ahead of schedule and this target will be reached well before 2010.

This writer travelling within 12 Dutch cities by bicycle and between them by train found that bike/rail travel was very convenient and well organised. The special provisions made for carrying bicycles on Dutch trains, parking bicycles and bicycle hire facilities at stations are most impressive.(Parker 1998 a). There are some places that the trains do not go but long distance express bus services introduced in the early 1990s will go there and bicycle parking is provided at many of the express bus stops. It was found that planning for bicycle parking at bus stops involved a great deal of cooperation from many interested parties, however most schemes worked successfully and are still doing so after several years.(Wellemen 1999)

Recent and planned investment in the NEPP is, or will be, providing high speed passenger train routes to reduce inter-city air travel between the Netherlands Schiphol Airport and German and French airports. The seamless connectivity of bicycles and public transport and the integration of the bikeway network with the rail network is not confined to domestic travel but also to international rail and air travel courtesy of KLM.

NEPP 3: the constraint of car parking and Green tax measures.

The national car parking manual (C.R.O.W. 1994) has been very successful and is unequivocal about the goal of Dutch transport planning, to provide for bicycle parking while seeking to constrain car use. It states unambiguously on the first page that:-

" Definition: A coordinated car parking policy is directed to restricting car use. The aim is to encourage selective car use so as to make a favourable contribution to accessibility and the living environment by reducing car mobility which reduces congestion while at the same time stimulates alternative modes of transport. It also plays a part in the sharing of scarce space".

Another means of constraining car use are the "green taxes" (eco-taxes) used to implement the NEPP, which have indirectly helped to reduce road trauma while reducing greenhouse gas emissions and oil dependence. The greening of the tax system, is designed to produce a shift from the taxation of labour to the taxation of environmentally harmful activities. Taxes on unsustainable transport consumption have been increased and the following incentives provided (NEPP 3 1998) to encourage the sustainable transport modes :-

1. Increase in fuel tax rates (1995); increase the variable component of motoring costs by increasing excise duty on motor fuels (1997). Petrol costs A$1.60c per litre at the pump.
2. Value-added tax incentives for employers to provide bicycles (1996) Reimbursement of cycle commuting costs in wages and income tax (1997)
3. Increase in scope and magnitude of the tax allowance for trips to work travel costs by means of public transport and the tax free reimbursement of public transport costs in wages and income tax (1997); increased allowance (1998)

4. Freeze on car commuting tax allowance (1997) Incentives for tele-working in wages and income tax (1997) increased again (1998)
5. More wages and income tax concessions for car pooling (1998)
6. Excise levied on new vehicles and the annual vehicle tax so as to provide incentives for the purchase of clean, energy-efficient cars, and to optimise the fuel mix.(2000)

Similar Green taxes were recommended in the Australian Senate report "The Heat Is On: Australia's Greenhouse future" released in November 2000.

An example of World best practice: the Dutch Bicycle Master Plan (BMP)

The Dutch have monitored bicycle use since the 1950s and from 1991 many studies were commissioned by Bicycle Master Plan (BMP) team. (Wellemen 1999) There is now a database of bicycle related information that makes research possible. Since 1990 the instrument for implementing the strategy in NEPP 2 and 3 of replacing short car trips with bicycle trips was the BMP which has been evaluated as being successful. (Wellemen 1999) The annual growth of the Dutch National Bikeway network and the growth in bicycle kms travelled each year from 1975 to 1998 are shown in **figure 8**

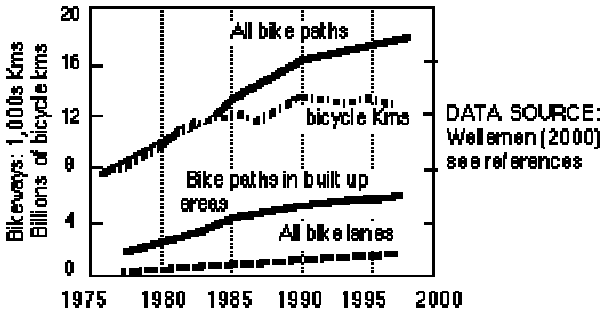

Figure 8 Bikeways in The Netherlands & and bicycle kms ridden.

Figure 8 shows that are far fewer kilometres of bike lanes than separate bicycle paths. Most of these bike paths kms are for one way paths on both sides of main roads. Most bikeway networks provide continuous routes for cyclists of all ages and avoid conflict with pedestrians because they are separate footpaths and separate signalised crossings at main road intersections.(Parker 1998 A) That has been the pattern of bicycle network provision for 40 years. There are relatively few "shared footways" in built up urban areas because wheel chair users and the frail and aged find shared footways intimidating. A recent study in the UK shared footways (Davies and Sharpe 2000) confirms this to be the case.

The English language version of the Dutch bikeway design manual (CROW 1993b) and the BMP are both targeted at a European audience.(Welleman 1999) What is not so obvious to the Australian or American reader is that there are bikeway shortcuts through the entire Dutch road system for cyclists and pedestrians in both rural and urban areas in a comprehensive national network which provides continuous safe routes. There are very few multilane roundabouts in built up areas because they are dangerous for cyclists and pedestrians. Instead they have low speed single lane roundabouts on urban main roads which

have separate paths or coloured bike lanes, some of which are protected by high concrete kerbs called “hedgehogs.(Parker 1998b)

There are also service roads designated as bikeways with intersection crossings that clearly show areas where cyclists and pedestrians have the right of way.

Studies conducted for the BMP have dispelled the myth that cycling is inherently unsafe compared to driving. For example, if we compare like with like, that is car drivers and bicycle riders in the same age group, we find that young drivers of 18 to 24 years of age are more at risk than bicycle riders per million kms travelled (Wellemen 1999).

The overall historical trends for bicycling in six cities including Melbourne and Amsterdam are shown in **Figure 9** The European data were taken from the historical overview and evaluation of the BMP. (Wellemen 1999) Some progress has been made in Melbourne but it is invisible at the scale shown for the last decade, (as it would be for other Australian capital cities). Figure 9 shows a growth in bicycle use in both Amsterdam and Stockholm since the mid 1970s.Both these cities have a much better road safety record for all road users than Melbourne and are very safe for pedestrians and cyclists.

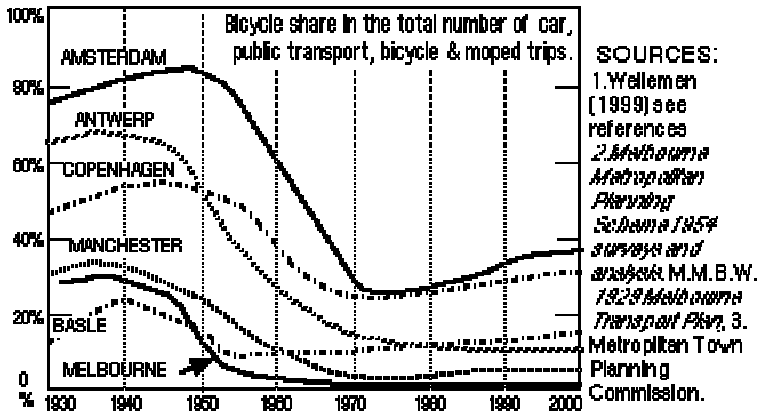

Fig 9 Amsterdam, Melbourne & five other cities,1930-2000

In urban areas there are significant health benefits from the incidental exercise that comes from every day walking and cycling. (NHMRC 1997) According to the (World Health Organisation 1999) the lack of physical activity is one of the major risk factors for coronary heart disease, which is the leading cause of mortality in the developed world. Walking and cycling as daily activities can promote health by providing physical activity, as well as well as decreasing noise and air pollution via trip substitution. Indeed the health benefits of regular physical activity are summarised by the WHO as:

- 50% reduction in the risk of developing coronary heart diseases (i.e. a similar effect to not smoking);
- 50% reduction in the risk of developing adult diabetes;
- 50% reduction in the risk of becoming obese;
- 30% reduction in the risk of developing hypertension;
- 10/8 mm Hg decline in blood pressure in hypertensive subjects (i.e. a similar effect to that obtained from anti hypertensive drugs).

- Other effects include reduced osteoporosis, relief of symptoms of depression and anxiety, and the prevention of falls in the elderly.

The role and common policies of walking and cycling groups in Australia .

The Pedestrian Council of Australia (PCA) was formed by a group of citizens and organisations concerned at the lack of priority given to the safety amenity and access of pedestrians by government agencies in Australia. The PCA was incorporated on the 1st August 1996 and has a small but growing membership and affiliated groups. ACROD and Paraquat represent the disabled and have members on the PCA board.

The Bicycle Federation of Australia (BFA) founded in 1974 represents the peak cycling groups in each state with total of 30,000 members. Together with the BFA the PCA represents the interests of all ordinary non-motorised users but not specialised sporting groups who have their own associations. While the PCA is not incorporated to protect cyclists safety, amenity and access, some PCA policies are of particular benefit to child cyclists under 12 who are legally allowed to ride on footpaths Likewise many of the shared footways that BFA groups have lobbied for have opened up many recreational areas and other destinations to pedestrians and the disabled.

Policy issues of common concern to both the BFA and PCA

The BFA whose representatives who have cycled and walked extensively in the Netherlands and have made numerous submissions to government and what follows are the policy issues of common concern to both the BFA and PCA (Parker 1998 C) Indeed; to arrest the decline in walking the implementation of the following policies is a minimum requirement.

1. Introduce low speed limits, new traffic laws and a low speed culture: The European Charter of Pedestrians' Rights stated in 1988 that ***"The pedestrian has a particular right to expect: the fixing of speed limits... as a way of effectively safeguarding pedestrian and bicycle traffic".*** The international Velo-City bicycle planning conference in 1993 in the Netherlands reached a similar conclusion. This is why both the PCA and BFA advocated a 50 km/h default limit to replace the 60 kph default limit on most minor arterial roads. They also argued the need to gain public acceptance of 40 km/hr residential precinct limits, for media campaigns to create a low speed culture and for traffic laws that recognise the vulnerability of non-motorised users. In hindsight the BFA recognises that this is what has been done in the Netherlands and it works well.

2. The need for pedestrian friendly vehicles: There is need to ban bull bars in urban areas, because the accident data indicate that they the severity of injuries to pedestrians and bicyclists, (Parker 1995). Cars can be made more pedestrian friendly by design improvements to reduce pedestrian injuries in the next generation of Australian cars. Unfortunately the need for new Australian Design Rules, was ignored in the last report on the future of the car industry by the Productivity Commission.

3. Multilane roundabouts in urban areas: Australian multilane roundabouts have vehicle entry and exit speeds that are far too high potentially lethal for cyclists and pedestrians. Worse still it possible for motorists to drive very fast by cutting across the lane markings.

Austroads need to revise their roundabout design manual and the Road Safety authorities need to develop safety audit procedures that takes into account the safety of non-motorised users.(Parker 1998 B)

4. The need for Commonwealth funding: The Commonwealth has been asked to provide $200 million funding for a package of measures to implement off the shelf programs that encourage walking and cycling and can quickly be implemented by all state and local governments (BFA 1999). This would include existing bike plans and bicycle strategy plans, behavioural programs such as the Travel Smart programs in WA (Ker and James 1999)(Brog, et al 1999) and the promotion of similar programs in all states. It would also include a budget to administer the National Bicycle Strategy (Austroads 1999) and establish a national data base for walking and cycling.

BFA policy: ecologically sustainable and safe transport networks.

The BFA has developed a detailed Ten point Plan to encourage cycling and reduce the bicycle accident rate per distance travelled, which has much in common with the Dutch "whole of government approach" and calls on the Federal and State Governments to define, establish, and monitor ecologically sustainable transport networks. To implement the ten policies will require incentives, recognition, dissemination and rewards for best practice. Note the following BFA policy objectives are very similar to those in the Dutch NEPP and the Dutch Bicycle Master Plan :-

- Encourages a switch from the car to the bicycle
- Encourages a switch from the car to the combined use of public transport, bicycling, and walking.
- Encourages improved cyclist safety on roads and bicycle paths; and
- Encourages provision of secure bicycle parking and associated support facilities

Conclusion and recommendations for achieving synergetic outcomes in the areas of safety, health and the environment.

Both Sweden and the Netherlands are world leaders in national environmental planning, (Yencken and Wilkinson 2000) having achieved synergetic joint outcomes in the areas of road safety, and the environment which are second to none . Amsterdam and Stockholm are much safer for all road users than the Australian capital cities, and have high levels of bicycle and pedestrian use. The analysis of Dutch planning in this paper suggests that greatly improving road safety, health and the environmental is a practical proposition in all Australian cities. It is concluded that adopting the Swedish Zero Road toll vision for Australia is most likely to succeed within the context of a coordinated national environmental plan that is supported by State government plans for the ecologically sustainable development of Australia's cities.

Current transport trends in Australian cities are not sustainable. In comparison to the Dutch BMP the Australian National Bicycle (ANB) Strategy 1999-2004 (Austroads 1999) is not being implemented. The ANB Strategy states that its goal is to "double bicycle use by 2004"

and to "reduce the casualty rate" at the same time. However the National Bicycle Council (NBC) has failed to ensure that the ATSB collects the data so that it is not possible to even benchmark the Strategy. This analysis in this paper suggests that bicycle use will not double by 2004 and that world best practice in bicycle and pedestrian planning, land use and environmental planning is being ignored by the Commonwealth and State governments. Furthermore there is no mechanism for implementing the PCA Charter of Pedestrian right and no recognition by the Commonwealth that is has a vital role to play in changing planning and funding priorities for building the infrastructure that is necessary to encourage safe walking and bicycling.

For the future we know that an increasing proportion of young Australians are becoming overweight as a result of spending more time in front of the computer and being driven to and from school. On the basis of WHO studies we can safely assume that there are so many health benefits from walking and cycling that they may in the long term outweigh risk of exposure to road trauma in Australia.(Owen 1996)

We conclude that synergetic outcomes in the areas of safety, health and the environment are possible if the following changes of policy direction summarised in the BFA Ten Point Plan are implemented in Australia
:

1. Co-ordinate and plan for interconnected and integrated transport networks in all States and the capital cities of Australia that facilitate and encourage bicycle (and pedestrian) access and the use of roads.

2. Establish and then maintain equity in funding for non-motorised forms of transport after an appropriate catch-up period of high funding.

3. Promote Cycling as an energy efficient and healthy form of transport by the provision of personal and organisational taxation and funding incentives for non-motorised forms of transport.

4. Reform and reinforce links between the different agencies involved in planning and implementation of infrastructure, planning, health, and environment.

5. Identify and implement successful strategies for safer and more convenient cycling in transport networks

6. Establish and strengthen laws relating to vulnerability of cyclists and pedestrians.

7. Create Strategic Partnerships with groups promoting sustainable transport networks.

8. Establish model examples of ecologically sustainable transport networks and bicycle/public transport dual mode systems in capital cities.

9. Provide a national data base of bicycle use which includes general travelling statistics, exposure to road risk, bicycle theft and the use of bicycle facilities.

10. Establish short, medium and long distance regional cycling tourism networks as part of ecologically sustainable tourism programs.

DATA 1996	Urban Australia	The Netherlands	Netherlands % difference
Surface land area in Sq kms	34700	34000	-2%
Population in Millions	15.2	15.5	2%
GDP per capita in $A	$20296	$20261	-2%
Urbans density: persons per ha	12.8	40	312%
Passenger car fleet millions	7.37	5.74	-22%
Car VKT per person per year	7332	5567	-24%
Car fleet VKT per year - billions	82.5	86	4%
Car VKT per car per year	13100	16270	24%
Age of the average car years	11.3	7.7	-32%
Households in millions	5.52	6.28	14%
Households with no car: %	13%	24%	112%
Households with one car: %	39%	60%	55%
Households with two cars:%	35%	14%	-60%
Households with 3 + cars: %	13%	11%	-91%
Fuel use MJ/per vehicle km	3.8	2.8	-26%
New cars fuel use: litres/100km	9	7.9	-14%
Price of Petrol in $ A	$ 0.7	$ 1.7	143%
Carbon dioxide (CO2) 1,000 tonnes	33646	17191	-49%
Carbon monoxide (CO) 1,000 tonnes	2324	500	-78%
Nitrogen oxides (NOx) 1,000 tonnes	203	115	-43%
Volatile Organic Compounds 1,000 t	382	100	-82%
Driving cars km per person per day	20.1 km	16.5 km	-18%
Car Passenger: km per person/day	10.4 km	9.3 km	-10%
Public transport km per person/day	3 km	4.5 km	50%
Bicycling km per person per day	0.32 km	2.9 km	810%
Walking km per person per day	0.52 km	0.9 km	73%
Total travel km per person per day	37.5 km	35 km	-7%
% of car trips less than 2.5km	45% approx	20%	-78%
All road deaths, number	1111 approx	1180	6%
All road deaths rate per100,000 pop	7.3 approx	7.6	4%
Car driver deaths, number	435 approx	414	-4%
Car driver death rate per100,000 pop	2.9 approx	2.6	-10%
Car driver death rate per billion km	5.2 approx	5.1	-2%
Pedestrian deaths, number	284 approx	109	-61%
Ped death rate per 100,000 population	1.9 approx	0.7	-62%
Pedestrian death rate per billion km	114 approx	20	-83%
Bicyclist deaths number	46 approx	233	406%
Bicyclist death rate billion km	40 approx	19.4	-54%

Appendix sources and notes on table 1 .

1. Urban Australia is defined as all urban areas with more than 10,000 population.
2. Australian car fleet VKT (Table 2 ABS 9219-0) assumes that 73% of car travel is in urban areas.
3 It is assumed that only 50 % car accident fatalities occur in urban Australia
4. 81 % of all Australian bicyclist and pedestrian fatalities occur in areas with more than 10,000 pop.
5. The tonnage of pollutants is for the car fleets in total 1996.
6. Australian Bicycling and walking km are 1985 figures (INSTAT 1988) factored to 1996.
7. Urban Australian data on household car ownership is based on Melbourne data.
8. Dutch data is mostly from the english language versions of Wellemen, (1994)(1999).

REFERENCES

Austroads (1999) *"1999 -2004 Australian Cycling The National Strategy"*, Austroads publication No AP-61/99

BFA (1999) *Bicycle Federation of Australia submission to the Senate Inquiry into Australia' Response to Global Warming*,17th October 1999

BTCE (1996) *Working Paper 24: costs of reducing Greenhouse Gas emissions from Australian cars: an application of the BTCE Carmod model"*

Corben, B (1998) Opportunities for applying European philosophies and practices to improve pedestrian safety in Victoria., pp 207 to 216 *Proceeding of the Conference on Pedestrian Safety* 29th and 30th June 1998

C.R.O.W. (1993a) *Record 9: Cycling in the city, pedalling in thePolder.* Centre for Research and Contract StandardisationEngineering. The Netherlands

C.R.O.W. (1993b) *Record 10: Sign up for the Bike: Design manual for a cycle-friendly infrastructure.* Centre for Research and Contract StandardisationEngineering. The Netherlands

C.R.O.W. (1994) G*uidelines for a coordinated parking policy*, Centre for Research and Contract Standardisation in Civil and Traffic Engineering The Netherlands

Davies, A and Sharp, M (2000) *"Cyclists and pedestrians - attitudes to shared use facilities"* CTC Research Report, published by the Cycle Touring Club of Great Britain, Surrey England

NEPP 3 (1998) *National Environment Policy Plan 3* English Language version (264 pages, Ministry of Housing, Spatial Planning and the Environment, The Netherlands

NHMRC (1997). *Acting on Australia's weight: a stratagem for the prevention of overweight and obesity*, National Health and Medical Research Council.Canberra

N.S.P.A. (1997), *Spatial Planning in the Netherlands; bodies and instruments*, National Spatial Planning Agency Ministry of Housing, Spatial Planning and the Environment October 1997

Owen, H (1996) The Health of Nations an essay on the costs of not promoting cycling pp 43-52, *papers of proceedings,* Velo Australis International Bicycle Planning Conference October 27-November 1 1996

Parker, A A (1998a*)* Designing for the Bike; The Dutch experience. Journal of the Bicycle Federation of Australia. p 48 to 52.*"Australian Cyclist"* February-March 1998

Parker, A A (1998b) pp 65-69 Roundabouts on main roads a non-motorised users perspective (See also photograph on the front cover of a Dutch roundabout).*Road and Transport Research*, March 1998,vol 7.No 1. Australian Transport Research Ltd

Parker, A A (1998c). "Pedestrian safety: a non-motorised user's perspective", Pedestrian safety conference, Australian College of Road Safety 29th & 30th June 1998, Melbourne

Parker, A A (1999) An integrated transport, health & environmental policy will make everyday walking and cycling safer. *1999 Road Safety Research Policing and Education conference*, Canberra 28-29 November, see CD Rom.

Parker, A A (2000a) *"Learning from world best practice: the Netherlands experience from 1950 to 2000"*, Transport SA, South Australia

Parker, A A (2000b) An integrated transport, health & environmental policy will increase everyday walking and cycling, *CD Rom proceedings Australian Pacific Healthy Cities Conference*, Canberra 26 to 28 June 2000

Parker, A A (2001) A Non-motorised User's Perspective on Safety Issues and World Best Non-motorised Safety Practice in the Netherlands, *papers of the proceedings* International Walking Conference 20th-22 nd February 2001, Perth Western Australia

Putcher, J Dijkstra, L (2000) *Making walking and cycling safer: lessons from Europe*, Transportation Quarterly ,Vol.54, No.3 Summer 2000

RGI (1996) *Political wavering clouds Railned planning* 426 Railway Gazette International July 1996

Welleman, A G (1999) *The Dutch Bicycle Masterplan: description and evaluation in a historical context. (English language version)* Directorate General for Passenger Transport, Ministry of Transport, Public Works and Water Management. The Netherlands
World Health Organisation (1999) *Charter on Transport, Environment and Health* adopted by Ministers and representatives of the European Member States of W HO and members of the EC responsible for Transport Environment and Health, August 1999

Yencken, D and Wilkinson, D.(2000), *Resetting the compass: Australia's journey towards sustainability, CSIRO publishing Collinwood.Victoria*