Director-General of Transport
South Australia

A Review of Bicycle Policy and Planning Developments in Western Europe and North America

— *A Literature Search*

Government of South Australia

blank

Table of Contents

1. Introduction

The Government of South Australia, through the Office of Transport Policy and Planning and the Department of Road Transport, is reviewing the current role and future development of cycling in South Australia. As part of this review the Office of Transport Policy and Planning has commissioned this report, *A Review of Bicycle Policy and Planning Developments in Western Europe and North America*.

The purpose of this research has been to ascertain the levels of activity and administrative support for bicycling in other countries, as well as their bicycle policies, recent technical and innovative developments and trends. The objective has been to develop an information base of overseas trends and developments that can be applied to South Australia's own local issues and problems and from which policy makers and planners can learn.

The preparation of this document has been necessarily limited by the availability of time and funds. As a result it is primarily a literature search of materials that could be collected and reviewed within the brief time available. It also contains information from telephone conversations with key *bicycle experts* overseas. Every effort has been made to accurately record the views of these individuals, and apologies must be made for any misrepresentations. Though efforts have been made to present materially accurately and objectively this document should not be regarded as comprehensive.

The opinions, findings and conclusions expressed in this publication are those of the author and not necessarily those of the Government of South Australia or the Office of Transport Policy and Planning.

Jim Pravetz

June 1992

Office of Transport Policy and Planning
Government of South Australia

See note on page 148 regarding this July 1995 edition.

Cover photo from The Netherlands by Hans Penning.

1.1 Modal Splits

The following two tables are as printed in recent literature and are not a summary of values found during this research. Not all values are consistent with this report – for example the modal split in Groningen was found to be 55%, though it is reported as 50% and 30% in the two tables below.

Table 1-1 : Cycling as a percent of daily passenger trips
(Lowe 1990)

City	Percent of Daily Trips
Tianjin, China	77[a]
Shenyang, China	65
Groningen, Netherlands	50
Beijing, China	48
Delft, Netherlands	43
Dhaka, Bangladesh	40[b]
Erlangen, Germany	26
Odense, Denmark	25
Tokyo, Japan	25[c]
Delhi, India	22
Copenhagen, Denmark	20
Basel, Switzerland	20
Hannover, Germany	14
Manhattan, USA	8[d]
Perth, Australia	6
Toronto, Canada	3[e]
Adelaide, Australia	3[f]
London, England	2
Sydney, Australia	1

a. Share of non walking trips
b. Trips by cycle rickshaw only
c. share of cycling or walking to work
d. Vehicle trips (versus passenger trips; may carry more than one passenger)
e. Vehicle trips (versus passenger trips; may carry more than one passenger)
f. Source: Adelaide Metropolitan Planning Review

Table 1-2 : Modal Split in European Countries and Cities
(Bracher 1988a)

Country	City	Population (thousands)	Year	Foot	Bicycle	Public Trans.	Motor Car
France	–						
	Pergignan		1984	37.1	2.0	10.7	50.2
	Grenoble		1985	35.7	3.2	10.2	50.9
	Valenciennes		1985	33.0	6.4	8.0	52.9
Austria	–	7456	1971	26	6	30	38
	Vienna	1615	1971	20	1	32	47
	Salzburg	128	1982	29	11	20	40
	Graz	280	1984	28	9	20	44
	Linz	203	1971	18	5	36	41
Netherlands	–		1984		29		
	Delft	85	1986	25	40	10	25
	Tilburg	154	1980/2	20	33	3	44
	Groningen	160	1980/2	30	30	8	32
	Amsterdam	700	1980/2	24	21	23	32
	The Hague	450	1980/2	25	22	17	36
Sweden	–		1975		7		
	Malmö	230	1985	15	20	15	50
	Västerås	117	1981	17	33	10	40
Denmark	–			23	18	11	53
	Herning	55	1981	19	20	2	59
	Helsingor	56	1981	20	25	10	45
	Odense	171	1981	20	25	10	45
	Arhus	252	1981	20	25	11	44
	Copenhagen	580	1980/2	27	20	20	33
Italy	–						
	Parma	176	1984	22	19	22	37
West Germany	–		1982	27	11	13	49
	Hannover	506	1986	33	17	20	30
	Frankfurt	630	1982	29	9	23	39
	Stuttgart	561	1986	31	3	22	44
	Erlangen	100	1985	21	29	12	38
	Rosenheim	52	1981	26	23	8	43
	Freiburg	184	1986	25	20	17	39
	Berlin	2030	1986	24	5	29	40
	Köln		1982	30	11	15	44
	Detmold		1981	27	14	7	52
	Münster		1982	25	29	7	39
Great Britain	–		1978/9	39	3	14	45
	London		1983		2.4		
Spain	–						
	Madrid	4400	1981	56	0	29	15
Finland	–		1980		15		

2. The Netherlands

The Dutch are famous for their high level of bicycle use, made safer and more convenient by an enormous provision of facilities. "The provision of bicycle lanes, underpasses, special signals, advanced stop lines, etc. make cycling in Dutch cities a real pleasure." The Dutch also make extensive use of traffic calming and 30 km/h zones as tools of local area traffic management to make neighbourhoods safe for cyclists and pedestrians. Apart from the extensive cycle path network, they have perhaps the best dual-mode (bike/train) transport system in the world. Literally hundreds (sometimes thousands) of bicycles are parked at each railway station. Cycling is an everyday part of life with 30 - 50% of trips made by bicycle. (Maher 1991)

It could be argued that the best cities for cycling in the world are all in western Europe, and that most of these are in the Netherlands. "The myth is that cycling is popular in the Netherlands because it is so flat. The reality is that bikes are big because the Dutch toiled to make it that way." (Martin 1992)

Overview

(Simons 1987)

The Netherlands probably is the most cycling-friendly country in the world. The network coverage is such that cyclists seldom have to deviate from clearly marked bicycle paths or lanes during any trip, even across the entire country. Bicycle facilities can be found in virtually every town, city and rural area. Major roads have high quality, parallel segregated facilities for cyclists with unidirectional paths on either side of the road. Priority is given to bicycles in many urban areas. The result is that cycling is a very comfortable experience and bicycle use is very high.

The Netherlands 22,000 km cycle network, which includes 1000 km of bicycle lanes, is the densest in the world. Important provisions are the cycle routes in urban areas. These routes provide short-cuts and save connections for the cyclist. Separation of the different modes of transport is important (this includes separating pedestrians and cyclists). Bicycle bridges, tunnels, parking facilities and sheltered parking places are provided to make cycling a smooth experience. Provisions for cyclists are considered to be relatively cheap in relation to the costs of other more expensive facilities that would need to be provided if there were less bicycle traffic.

Bicycle use in the Netherlands varies by trip type:

80% of students use bicycles for daily trips
33% of all commuters use bicycles
51% of daily shopping
19% of weekly shopping
47% of daylight social calls
19% of evening social calls
18% use bicycles to bring children (as a passenger) to school
3% use bicycles for holiday trips (each year 70K use the bicycle to travel to other countries)
33% use bicycles for weekend trips.

Of all modes of transport bicycle usage has shown the fastest growth in recent years, almost 29% over 6 years. There are 10% more female bicycle users than male. Highest bicycle usage is in the 5-15 year age group, then 15-18 and finally 45-65. Cycle ownership in bigger cities and in the west of the Netherlands is a bit lower than the rest of the country, perhaps due to better public transport.

The Dutch are positive about bicycles. More than 90% of the population is in favour of bicycles. Non cyclists are not negative towards cycling. The idea that the bicycle is a mode of poverty or for those who cannot afford a car has passed. The status has changed such that it can be said that interest in cycling is rising according to a rise in income; High income villages have cycle ownership that is above average. Preference for cycling is based on fitness, environmental friendliness, and speed (faster for trips under 8 km).

Consumer research indicates that

> 86% of Dutch think the bicycle is a means to enjoy ones free time,
> 62% think that the bicycle gives a feeling of togetherness and happiness,
> 15% attach the bicycle to a feeling of freedom and independence.

Negative notions of cycling are seldom mentioned. Bad weather conditions like wind and rain are hardly mentioned as a reason not to bicycle – these conditions were only mentioned by non cyclists. Bicycle theft is a large problem with between 0.6 and 1 million bicycles stolen per year. Dutch cyclists have little interest in traffic safety. Measures to enhance safety are mostly neglected.

The Effects of State Subsidising of Bicycle Facilities

from (Wilmink 1987a)

Reasons for the high number of cyclists in the Netherlands are (i) the country is flat, (ii) distances between cities and villages are small, (iii) the road network and population is dense, and (iv) there exists many good bicycle facilities along urban and rural roads. Not everyone in the Netherlands uses their bicycle every day. In the early 1960s bicycles seemed to die out and the use of the bicycle was threatened by the very fast growth in motor vehicle mobility. Bicycle paths were even being removed in favour of extra lanes for motor vehicles; The policy was to cater for the demand for more space for motor vehicle mass transportation.

A drastic change in policy occurred in the mid 1970s following the oil crisis. To change the modal split towards an energy friendly mode of transport the Dutch Ministry of Transport and Public Works introduced a fund for the construction of urban and rural bicycle facilities in 1975. This Act operated until 1985 when it was abolished and, during the decade, some 500 million guilders ($A360 million) were spent on subsidies.

In the Act, for urban facilities it was stated that local authorities could receive a subsidy of 80% of the construction costs of new bicycle tracks. These facilities were required to be used predominantly by so-called utility cyclists, riding to work, school or shops. The Act was not intended for new districts in which bicycle facilities were to be integrated during the design stage. The Act was therefore aimed at retrofitting or improving existing situations where there were no bicycle facilities.

In rural areas the Act focused on secondary and tertiary roads, with 50% subsidisation available for tracks along these roads. Bicycles are not allowed on primary roads (e.g. motorways) and in this case parallel tracks or complete separate tracks are available. Secondary and tertiary roads carry significant motor and bicycle traffic.

A priority scheme was developed based on the product of bicycle and motor traffic. If motor traffic exceeded 2000 vpd and bicycle traffic exceeded 500 bpd a bicycle track was justified. The larger the product of motor and bicycle traffic the larger the priority. Correction factors were used that dealt with the percentage of cyclists younger than 15 or older than 65, the percentage of trucks and the width of the main road.

The Ministry also published standards with respect to the geometry of rural facilities. It was advised that the width of bicycle tracks should be at least 1.75 m, with a recommended width of 2.5 m. Bidirectional bicycle tracks required a width of at least 2.75 m with a recommended width of 3.5 m. The width of verge between the road and track had to be at least 2.5 m along secondary roads, with an advised width of 4.0 m.

In the cities some 240 million guilders ($A175 million) were spent on 280 projects in more than 100 cities. This money was mainly spent on separate bicycle tracks along main roads. In addition some 30 bicycle tunnels and bridges were built at a cost of some 30 million guilders ($A22 million).

In cities two types of routing were distinguished. One was tracks along main roads that provide the shortest and fastest connections between important centres. The other type of routing was through residential zones. Towards the end of the 1970s a general policy came about that made a clear distinction between roads with traffic function and residential streets. The positive experiences with woonerfs led to the creation of a lot of scattered woonerfs. Woonerfs are expensive to construct and maintain, so therefore less costly solutions such as blanket 30 km/h zones in residential areas were introduced. The bicycle subsidies were not intended for these zones.

During the decade of funding most dangerous urban main arterial roads were provided with separate bicycle tracks. In many cases these facilities do not yet form a coherent network. Many of the facilities were built with subsidisation, however many local authorities took responsibility and built their own bicycle tracks, often in combination with road upgrades. This provides another example were leadership from one government has been taken up by another.

In rural areas over a 1000 km of tracks were built, but much of the money came direct from the provinces that were aware of their responsibility with respect to the safety of cyclists. Between 85% and 100% of all secondary roads in the various provinces have bicycle tracks, while 60% to 65% of all tertiary roads now have tracks.

An additional effect of the Act was to create uniformity in design of facilities. Whereas before the Act tracks ranged in width from 1.5 to more than 3.5 m, afterwards tracks converged to two widths: 2.0 m in 40% of the cases, and the recommended width of 2.5 m in 60% of the cases. On bidirectional tracks most were built with the minimum width of 3.0 m, with few tracks using the recommended width.

The subsidies under the Act were aimed at demonstrating new developments and supporting changes in policy targets. These subsidies were not considered to be of a permanent nature. In this respect the act has been successful because attention to bicycle facilities in all stages of planning, design and maintenance of the infrastructure has become common practice. The last step will be to integrate the urban and rural networks in terms of utility and recreational purpose.

In conclusion the National Bicycle Tracks Grant Act has had a stimulating effect on development of plans for the construction of bicycle tracks. All provinces and most municipalities have their own bicycle plan, more or less integrated in overall transportation plans. Local and provincial authorities are aware of the role and position of the bicycle in the present Dutch transport policy. Most major urban and rural roads have their own bicycle facilities, with the construction of these facilities having a positive effect on road safety of cyclists.

Tilburg – In The Netherlands priority for bicycles at intersections is not uncommon, as demonstrated by this bicycle route crossing. The plateau and road narrowing help to reduce automobile speeds (Danish Vejdirektoratet 1988a).

National Bicycle Policy

(Public Innovation Abroad 1992)

The Netherlands is currently in the process of finalising a national bicycle policy, to be known as the national Master Plan: Bicycle. Together with the National Environmental Policy Plan, the coordinated public policy approach will work towards substantial shifts in the modal split. About a quarter of all local trips, on average, are made by bicycle. The cycling master plan has a time horizon up to 2010, and in conjunction with other traffic measures, aims to have bikes account for more than five billion kilometres annually by 2010, a 30% increase. A comparable reduction in the projected growth of trips by private automobiles in the Netherlands forms part of the plan.

The government also aims to get more people onto public transport by improving the bicycle/public transport connection. The projected 15% increase, representing at least 1.5 billion additional passenger train kilometres by 2010 over 1990, will be due to improving bike path access to and from commuter stations.

Of the over 300,000 commuters carried by Netherlands National Railway trains on an average workday, some 140,000 travel by bike to and from their commuter rail stations. To cope with this onslaught, the railways offer a choice of guarded or unguarded bike storage within 100 m of every one of the country's 351 train stations. Underground and multi-story bicycle parking garages have been constructed at a number of railway stations that get heavy use by commuters. There are about 175,000 lockable bike storage spaces near station platforms with daily occupancy reported in the 70% range. A special year-round rent-a-bike service, allowing commuters or occasional travellers to equip themselves with a bike to their destination stations for a nominal daily charge, is also operated by the railway.

2.1 Amsterdam

from (City of Amsterdam 1987)

In the early 1970s, Amsterdam was one of many cities to realise the need for better amenities for bicycle traffic. Little by little, cyclists had become in many respects the most underprivileged road users. Various interest groups began protesting against this trend and pushed for improved facilities for bike riders. Partly on the insistence of these groups, the Government began to pay more attention to the problems of bicycle traffic.

In the late 1970s Amsterdam's municipal council initially proposed focusing on just a few first class routes for the benefit of bicycle traffic. Separate bike paths and even streets exclusively for bicycles were planned for virtually all sections of the old centre. The inner ring was the first ambitious project to be realised in Amsterdam.

Three streets that form the ring between West Amsterdam and East Amsterdam were reorganised into roads exclusively for public transport and bicycle traffic. Cyclists were allotted their own separate path and cars had only very limited access. This inner ring has become a relatively successful bike route. Essentially however the ring route was primarily intended for public transport and the bike paths were an afterthought.

Weteringschans – Part of the 'inner ring'. A combined project for public transport and bicycle traffic.

Spuistraat – In this very busy part of the inner city, where loading and unloading of goods plays an important role, the cyclist has a separate bike path.

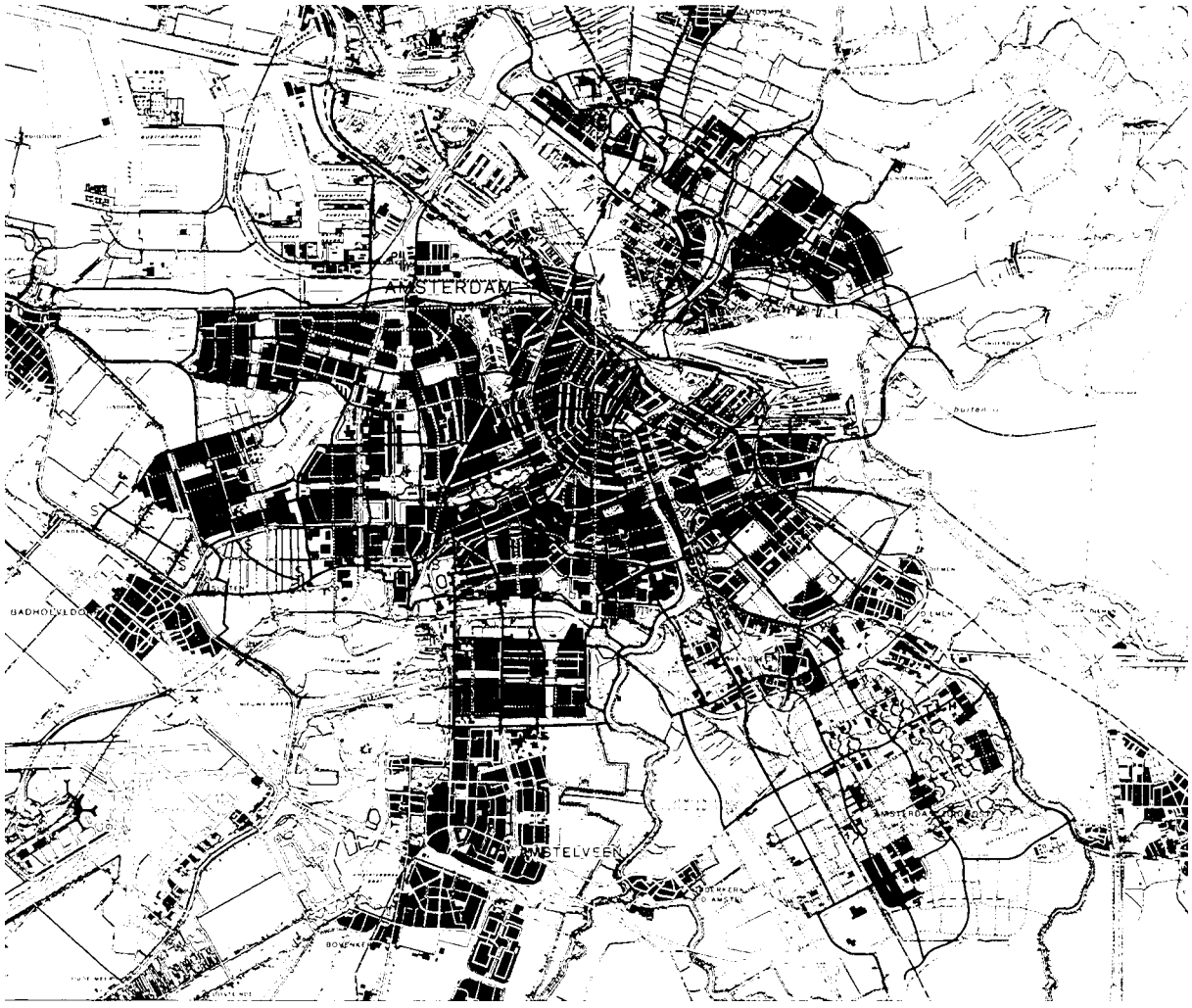
Doelensluis – Part of the road has been reserved for cyclists.

Nieuwe Spiegelstraat – A number of leading antique dealers are located on this street. Cars are only permitted to load and deliver in special sectioned off parking bays.

Amsterdam
(City of Amsterdam 1987)

In 1979, the municipal council decided to change the system from *just a few top quality routes* into a *central bicycle network*. The bicycle network had a smaller grid spacing than the original plan which had only a few routes. The grid spacing became approximately 1 km. At the same time, the idea of high cost separate routes was more or less abandoned and it was decided that, from then on, the routes would be developed simply by solving bottlenecks for bicycle traffic. Since a grid spacing of 1 km was still fairly wide spread for bicycle traffic, a secondary bicycle network was later added. The grid spacing of the combined network is now some 500 metres.

In 1979 the city of Amsterdam also set up a special work group to stimulate the development of this bicycle network. The Bicycle Work Group, which includes representatives from the various government departments involved, plus the Dutch Cyclists' Union tries to distinguish bottlenecks affecting bicycle traffic, makes proposals for remedying the situation and controls progress of the plans. A sum of around 4 million guilders ($A2.9 million) is available annually for the planning and implementation of the bicycle network. A fund for bicycle bottlenecks was first introduced in 1980.



Amsterdam (City of Amsterdam 1987)

The major goal of the bicycle network is to facilitate pleasant and safe cycling. Steps taken to solve bottlenecks do not always include expensive amenities such as separate bicycle paths. Other simpler methods are also used, including:

- removing obstacles
- providing separate lanes for different types of traffic
- improving crossroads
- eliminating through traffic
- preventing illegal parking
- adapting traffic lights
- routing bikes through parks
- making new connecting roads (the vast supply of water in Amsterdam is often an obstacle for bicycle traffic)
- reviewing the signposting system

Bicycle parking is also being provided.

The money saving approach of solving bottlenecks permits a gradual development of an entire bicycle route network rather than simple placement of unrelated individual routes. In general the bottlenecks are first detected by the Cyclists' Union who make up lists based on surveys, telephone complaints by members, and areas with high traffic accident rates. The most serious bottlenecks are solved first. Consequently a bicycle route in its entirety is only recognisable as such after several years.

Amsterdam's bicycle policy has begun to take definite shape (1987). Slowly but surely the removal of various bottlenecks has brought about really safe and easily accessible bicycle routes that have begun to form a complete network. The decision to combine the bottleneck approach and route planning is a choice for a long term project. The first long term results in the form of bicycle routes have already become visible. In the coming years the same degree of devotion will be necessary to realise more and better bicycle amenities and, also, to make full use of available funds.

2.2 Delft

(Dutch 1987)

Delft (population 80,000) is located between Rotterdam and The Hague and occupies a 5 km by 4 km area. In 1979 Delft Municipality developed a bicycle network scheme that was subsequently funded as a demonstration project by the Ministry of Transport and Public Works. The intent of the Delft project was to support theories derived from previous demonstration projects (Tilburg, The Hague, Rijswijk and Eindhoven) that indicated that implementation of a comprehensive bicycle network in an urban environment affects bicycle use and its quality much more than a number of individual bicycle routes. Before studies were carried out in 1983 and 1984. After studies were completed, except for investigation of safety aspects, by 1987. The Delft project concluded that implementation of the bicycle network plan resulted in a significant increase in bicycle use and in improved cycling conditions. Car use did not increase in the study period.

Map of Delft, 1:100,000 scale

The objective of the **Delft bicycle network plan** was to encourage use of the bicycle and make cycling safer, quicker and more comfortable, especially for those who rely on the bicycle such as students. Characteristics of the network, of which 75% existed prior to the study, is its hierarchy of three networks (this hierarchical structure is well established in dutch bicycle planning):

> The **city level network** consists of a grid of corridors at ca. 500 m spacing that traverse the entire town and connect to the regional bicycle network [the regional network connects to closely neighbouring built-up areas]. The main purpose is to serve heavy traffic volumes and link important urban activities (CBD, schools, university, railway stations, work areas, sport and rec facilities). It serves external and through bicycle trips in addition to internal Delft trips.
>
> The **district level network** connects various facilities within the district (schools, shops) and collects and distributes bicycle traffic to and from the urban (city) network. Links at this level are spaced 200 to 300 m apart. It is assumed that bicycle traffic on this level is less heavy and that trips are only for shorter distances. The main purpose is to provide access. Well chosen location and find grain are more important than capacity. Facilities necessary at this level are simple and varied (separated bicycle paths, bicycle lanes, small bridges, improved junction layout).

The **subdistrict level network** provides access to premises and serves bicycle trips within the neighbourhood. In most cases these trips are short and often made by children. It is a fine grained network at 100 m intervals. Provisions are very simple (little paths, small bridges, woonerfs, short-cuts). Facilities may be used by pedestrians as well.

The main effect of the project was not to reduce distances, but rather to provide a coherent and functionally designed system offering many new route alternatives. The project included two large underpasses, three bridges, 3.3 km of new path, exemptions for cyclists on 2.6 km of one-way streets, new segregated paths along 8.5 km of roadway, and resurfacing of 10 km of bicycle path. The study made use of a control area (Wippolder) where no bicycle facility improvements were provided, and two areas where significant improvements were made to bicycle facilities and access to the city centre (Tanthof and Noordwest).

The evaluation consisted of studies of two large high-capital projects (a bicycle bridge and tunnel) and a number of general study parts:

Table 2-1 : Delft Study Objectives

Primary Objective	Observations
general mobility, mode choice, choice constraints, perceptions	home interviews, in-depth interviews
bicycle trip pattern	road side surveys
route choice and network use of cyclists	route surveys
traffic volumes	counts

During the study period mobility in general remained the same, as did the number of trips made by the mobile group. In the control area an increase in car mobility of over 10% was found in terms of absolute number of car trips per person per day, as well as in terms of the proportion of trips made by car. This coincided with a decrease in public transport mobility and reflects similar trends in decreasing public transport mobility and increased car use in medium sized Dutch cities since 1979.

On the other hand in the North-west and Tanthof study areas there was a decrease in motor vehicle trips in favour of bicycle trips: The share of the bicycle in all trips increased by 6% to 9% depending on the district. This went against the predicted trend for decreased bicycle use had no changes been made to the network. It also prevented the otherwise expected 10% increase in motorcar use. Bicycle use by men increased more than that by women [note that 10% more women cycle then men on average nationally].

Delft
Bike path serving Tanthof area. Note separate pedestrian facilities in both images at right.

author 1992

The study also showed that external bicycle traffic increased much more than internal traffic within Delft. North-south traffic grew almost 25%, whereas east-west traffic grew only 8%. This difference can partly be explained by the specific measures taken which enable the study area to be traversed in particular through the north-south direction. The effects of external traffic should not be ignored; The number of cyclists crossing into Delft, and the percentage increase over the study period, are 10K/day (+18%) from the south, 3K/day (+19%) from the west, 1.6K/day (+20%) from the north, and 11.7K/day (+1%) from the east. The numbers for cyclists exiting Delft per day are similar.

The study revealed that isolated infrastructure measures clearly offer less prospects for increased bicycle use than systematic, mutually interdependent measures, as were implemented within the framework of the Delft bicycle network plan.

The first policy target of the bicycle network was to promote cycling. All studies point out that an increase in bicycle mobility (in terms of bicycle kilometres) has occurred by at least 6%. An interesting result was that the average distance travelled increased from 3.7 to 3.9 km, in spite of the fact that shorter routes were available. Travel time did not change thus implying an increase in average travel speeds. It also shows that destinations further away came within the reach of the bicycle. In Tanthof, for example, trips were 6% longer and 15% faster. The number of trips with subjective objections because of long travel times decreased from 28% to 18%.

A second policy target was to limit car use by promoting bicycle use. The study showed that car use in the study area remained stable. Remarkable is the fact that the car use for internal trips in Delft even decreased. A part of this decrease was caused by the network. Overall it was concluded that bicycle traffic increased by 15%, the modal split changing in favour of the bicycle from 40% to 43%. These results are considered to be underestimates of the effects that are expected in the long-term as the full network is completed and residents become acquainted with the new facilities.

Delft – An advanced stop line is provided for cyclists at this intersection. author 1992

In regard to the traffic engineering practises of a hierarchical network the study clearly showed that bicyclists prefer new and improved routes. There is a shift to higher standard routes at the city network level. In bicycle kilometres there was an increase from 30% to 35% along these routes, while cycling on normal streets decreased from 45 to 40%. The study showed that 60% of all bicycle kilometres were travelled at the city (urban) level, whereas this level represented only 30% of the total network length.

A few recommendations were: (Wilmink 1987b)

> It is not necessary that measures are expensive and of a large scale. Also small-scale cheap measures have a positive effect if these measures aim at improving the *continuity* of a route. In particular measures that cut down *travel time* are important. However all measures should fit into a master plan, which has hierarchical levels. These levels must be clearly distinguished by geometric features and mesh width. The construction of a coherent and consistent hierarchical network of bicycle facilities does promote cycling considerably. This is not only a short term benefit but it also provides the bicycle a good competitive position in the long run. Expensive measures should be focused on the highest level.

author 1992

Delft – Bike Lanes along arterial road.

A black spot approach does not promote cycling. Cyclists in the Netherlands do not take much account of road safety. Furthermore measures should fit into a master plan.

A logical consistent network makes it easier to create a mental map. In this way road users can easily assess distances and travel times. This mental map influences the decision making process with respect to modal split. Thus the chance of using a bike increases as the mental bike map is better. Therefore local authorities should frequently publish an overview of the new facilities.

Local authorities play an important role in the promotion of the bicycle. The positive attitude of the Delft municipality during this project has attributed much to the success of the network. It is not enough to build bicycle tracks, it is also vital to market them. Delft has given a good example by giving information during public participation sessions, by a permanent exhibition and frequent publications in the local press and dissemination of leaflets and a map with cycle routes.

A new development that had a successful trial in Delft was the use of flashing yellow traffic lights for cyclists (Harreman 1987). A crossing facility, primarily installed for the safety of the cyclist can sometimes be regarded as a nuisance by this same cyclist because they must wait for a green light, regardless of whether there is any traffic. This takes far too long for a hasty cyclist and the incidence of going against red lights is high. In the meantime the cyclist may have pressed the button and taken off, and there is every chance that a motorist will be stopped by a red light a few seconds later. To prevent this the green/yellow/red lights for cyclists are replaced with a green/flashing-yellow. The cyclist is allowed to proceed during a flashing yellow, without using the traffic installation. When there is too much traffic the cyclist activates the green by pressing a button. Delft has also successfully introduced provisions to allow cyclists to turn right on red lights where indicated by a sign or special right-turn light. The success of these provisions, particularly the flashing yellow light, have been so successful that they are being more widely introduced around Delft.

New Traffic Signals In Delft

In a number of places in Delft one can find a new kind of traffic signal. The red and yellow traffic signals have disappeared there and have been replaced by a yellow flashing light. The green light can always be demanded (activated) by pressing the button.

From now on pedestrians and cyclists can decide for themselves whether or not they want to use the green light. Crossing when the yellow flashing light shows is not punishable. But it goes without saying that it will involve more risks. When in doubt it is advisable to demand for the green light.

This is what the new traffic signal looks like:

The upper light: Flashing yellow

The lower light: The well-known green bicycle

When the new traffic signal is burning the same rattling ticks for the blind can be heard as is now the case with the existing red traffic lights.

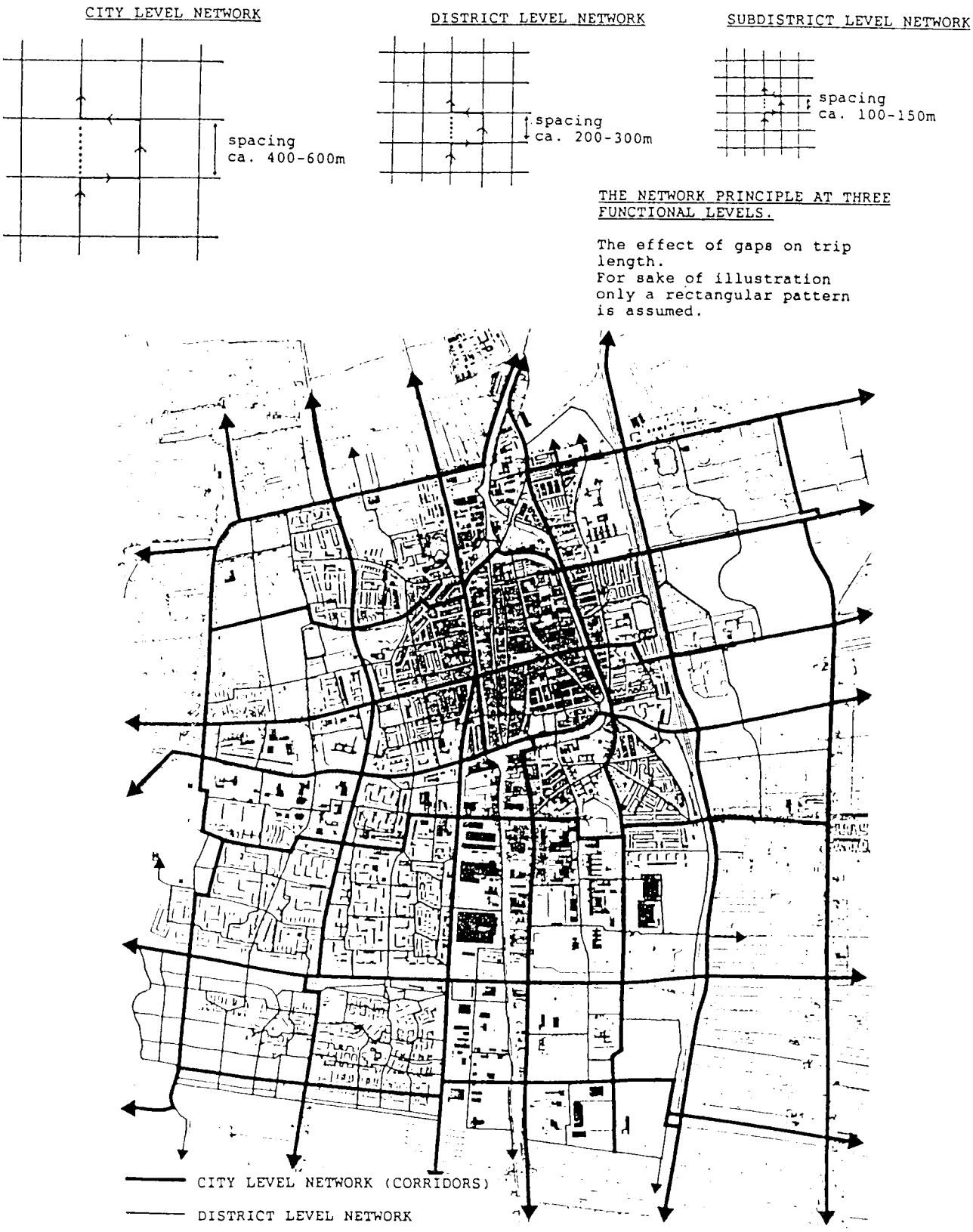
Studies of safety aspects of the Delft project indicated that the increase in cycling did not result in more accidents, and therefore safety was slightly improved. (Grotenhuis 1989)

Comments on Delft

(Clarke 1987)

The three experimental cities of Nottingham, Delft and Detmold were compared by (Clarke 1987). The advantage of Delft's network is that a cyclist can go everywhere on bicycle facilities, even in many places where motor cars do not have access. The network approach showed that much more than just isolated cycling facilities are required to alter people's choice of transport. In Delft it was difficult and unnecessary to actually get on the main roads (as well as it being illegal where there are bicycle lanes).

Delft provides long, continuous, wide and comfortable routes along the main roads in Delft. The key feature is that cyclists actually have priority at many junctions. There are traffic signalled crossings at big junctions, with phases and or lanes for bicycles. At smaller intersections cyclists can get to the front of the queue using advance stop lines, used not just to help cyclists turning across on-coming traffic, but simply to get them to the front of the queue and give them priority. It is clear at all times where cyclists should be, wide and smooth surfaces are provided and there is a feeling of safety.



Delft Bicycle Network Plan (Dutch 1987)

One of the main features of the Delft plan was the way in which vital crossings of roads and canals were provided. These crossings ranged from wooden bridges across narrow canals to purpose built drawbridges, tunnels and subways. Although expensive, it is these facilities that make the whole project work and makes cycling the most attractive means of getting around, allowing bicycles to avoid squeeze points at bridges.

Because authorities want people to come to the city centre by bicycle, facilities to the city centre were excellent. Bikes had better access then cars. Some pedestrianised streets were open to bicycles. Access to train stations was much better than for cars.

Cycling has been given real priority, both in the general traffic, but more crucially by providing short cuts and links through closed roads and residential areas, across canals and railways, through the town centre, to the train station. Cycling is therefore the most attractive mode of transport. Money and political will were clearly not an issue in Delft – if the situation demanded a subway or new bridge then one was put in. The entire scheme was expensive, but only in comparison to the amounts usually spent on bicycle facilities, and not in comparison with the percentage of trips made by bicycle. In Delft it was easy, comfortable, safe and convenient to cycle in the town, and cyclists do not feel like "freaks or second class road users".

Hero Weston

Delft – Advanced Stop Line.

2.3 Groningen

(Huyink 1987)

Cycling policy in Groningen (population 270,000), as elsewhere in the Netherlands, is an integral part of the total traffic and transport policy. Cycling policy is also integrated into regional planning policy. More than 50% of internal commuter traffic (excluding education) is by bicycle. This is the highest level in the Netherlands. More than 20% of non residents working in Groningen travel to work by bicycle.

Groningen gives priority to the promotion of the use of bicycles and public transport and the restrictions of automobile use. This is met with a policy aimed at reducing suburbanisation, concentrating the population in the town, and concentrating employment near public transport junctions. Restricting parking facilities for long term parking in the town centre, improving public transport and cycling facilities are more direct means. One car parking space is permitted for every four employees (Public Innovation Abroad 1992). Bicycle parking is provided at train stations; One station can park 3000 bicycles.

Under an ambitious traffic circulation plan introduced in 1977, central Groningen was divided into 4 sectors. Bicycles, pedestrians and public transport is permitted to cross between sectors, but motorcars must leave the city and use an encircling highway before crossing between sectors. Other examples of restrictions on motorcars are: A giant downtown car parking lot was turned into a town square; A traffic snarled thoroughfare is now a bustling open-air market; Construction of buildings has been permitted in the middle of former highways, blocking motorcars but allowing bikes to pass. (Martin 1992)

While local opponents of this restrictive policy predicted a sharp decline in economic activity in the city as a result of restrictions on motorcars, current trading practices are reported to be the best in the whole of the Netherlands. Record land value and tourism increases have been reported. Traffic accidents have declined by a third in the city centre. (Public Innovation Abroad 1992)

The basis for the main plan for cycling is a system of cycling facilities that go beyond the district, which in principle link up with the need for direct cycling connections between the town and outer districts and also between the different outer districts. Groningen is now organising its bike-based regional commuter plan with the cooperation of 26 nearby communities and its two adjoining provinces. The main plan for cycling consists of separate bicycle paths along the roads and bicycle routes along roads with little motorised traffic.

In principle new paths have an asphalt surface. Old flagstone paver surfaces will be resurfaced with asphalt during maintenance. This results in lower maintenance costs and extra comfort for cyclists. An integral system of signposting is used to inform tourists and residents alike of bicycle routes.

In Groningen more advance stop lines are being created. These increase the comfort of cyclists – no exhaust fumes from the cars and the cyclist can get a good start on other traffic, especially when turning left (across on-coming traffic). To save cyclists unnecessary waiting at traffic lights, paths just before the lights for right-turning cyclists are being introduced.

Groningen

Reconstruction of a traffic-light-controlled intersection. (de Wit 1988)

before

after

2.4 Houten

(Meilof 1987)

As already indicated cycling has a positive image in the Netherlands. Combating the negative image of cycling is fundamental to encouraging more people to use their bicycles. There are some interesting ideas from the new planned town of Houten (30,000 inhabitants). This town is planned on a human scale around the bicycle rather than the car. Car traffic is guided outside the town as soon as possible to a ring road.

"Creating direct, comfortable and safe cycling routes might not be sufficient to stimulate bicycle use. Making bicycle use attractive to car owners will require more effort. It has to be attractive not only in a physical way, but also in a psychological way. However, psychological aspects are difficult to deal with. People are emotionally attached to their car and like car driving because amongst other things it gives them a status. Other means of transport haven't such things. It is generally known that influencing these feelings is extremely difficult. In the new town of Houten planners try to influence the status of car driving and cycling. An environment is created where the cyclist feels important, seen by everybody on the squares, on the boulevards and on the important streets. Meanwhile cars users should have to move from small residential streets to an outer ring-road outside the limits of the town, not visible to the inhabitants."

Preliminary findings from centre cordon counts show 68% bicycle traffic and 32% motor traffic. In other towns with comparable numbers of inhabitants up to 50% bicycle traffic was found. Later findings have shown that 80% of non walking trips are made by bicycle (Public Innovation Abroad 1992).

2.5 Other Issues

Most bicycles in the Netherlands are inexpensive, utilitarian machines. This is partly due to high bicycle theft and also because distances are short enough that more efficient vehicles are not needed. In most instances paths are smooth bitumen, particularly newer paths. There are also many paved (smooth interlocking brick) paths. Though these paths are probably not a problem for most short distance trips made by ordinary bicycles using wide, low pressure tires, they are uncomfortable to ride using racier bicycles with high pressure tires. As indicated for Groningen, an effort is being made to lay asphalt over older paved paths.

Paths are built for combined moped and bicycle use. Until introduction of mandatory helmet laws for moped users mopeds were a very popular means of transport, but moped ownership has declined to 600,000. The design standard of paths is such that they are adequate for the speeds generated by mopeds and faster bicycles. Moped use of bicycle facilities is considered a safety problem.

Surface maintenance is a problem on any bicycle path and the Dutch recognise that bicycle wheels do not sweep debris. Debris is less of a problem in the Netherlands than on paths in most other countries. Presumably this is because of higher maintenance. Guidelines call for sweeping "when needed" in rural areas and 8 times per year, with weekly checkups in urban areas (de Wit 1987). It should also be noted that the distance of separation and landscaping that occurs between roadways and bikeways is in most instances sufficient that debris from the road cannot cross onto the bike track.

The Dutch bicycle system is not totally separate from roads. As indicated earlier many kilometres of bicycle lanes are used in cities. There are even many locations where there are no bicycle facilities. Along bicycle lanes bicycles are treated as vehicles and provided with lanes at intersections for the various turning manoeuvres. Advance stop lines are becoming more popular and are considered a safety benefit. There are instances where roads do not have bicycle lanes along their full length, but bicycle lanes are started 50 m before the intersection and provided with an advance stop line.

The Dutch bicycle facilities are not without their problems. Complaints by faster cyclists of confinement to bicycle paths when they are congested with other users is not uncommon. There are also complaints (Jansen 1987) about intersections and the long waiting periods for cyclists. Bicycles must often wait through two sets of lights to cross left (across on-coming traffic) as their separate paths take a circuitous route around the road intersection. The incidence of traffic light infringements amongst cyclists is very high as cyclists choose not to wait. Young, faster cyclists have problems coping with a system that is designed to cater comfortably for children and the elderly at road intersections but which are highly restrictive for their needs. Greater priority for bicycles is called for.

There are also complaints that the position of cyclists with regard to motor traffic at intersections is dangerous when paths are caused to cross the road at the outer edges of the intersection. This makes cyclists very difficult to spot by approaching motorists. It is argued that cyclists should have advanced positions at crossings, thus making the cyclist more visible and giving the cyclist a better overview over all traffic movement. The advance stop line for bicycles is the facility that is considered a solution to this problem (Jansen 1987), (Huyink 1987) and (Wellemand & Dijkstra 1987). Wellemand indicates that bicycle lanes at intersections have a favourable effect on both bicycles and mopeds. The advance stop line allows cyclists to position themselves for left (across on-coming traffic) turns and can be accompanied by an advance green of several seconds for cyclists. It is proposed that one intersection solution would be to make bicycle paths turn into bicycle lanes before they join with primary intersections. Bicycle paths are still considered to have a positive safety benefit along roadways, particularly where high speeds are involved.

2.6 Summary

The Netherlands is the most densely populated country in Europe. Cycling for recreation and transportation has had a long tradition, but during the 1950s and 1960s cars began to take over. In 1975, after the oil crisis of the early 1970s, the Government decided to change its transportation policies and to encourage more use of bicycles for transportation. This was done to combat urban sprawl and a decline in the quality of city life, and to reduce pollution. To support this policy change the government began a 10 year program that provided $A360 million, approximately 10% of transportation funds, in subsidisation towards facilities for bicycle transportation. The bicycle network now extends over 22,000 km.

Bicycle use is now at 30 - 50% of trips in Dutch cities. Projects have demonstrated that the trend towards greater automobile use and decreasing bicycle use can be countered in the Netherlands by developing complete bicycle networks that provide cyclists with priority in cities. Provisions for cyclists are considered to be relatively cheap in relation to the costs of other more expensive infrastructure that would need to be provided if there were less bicycle traffic. Dual-mode bicycle/train travel is very popular with hundreds of bicycle parking spots provided at train stations.

A hierarchical approach to bicycle network design within urban areas has been developed. At the top is the urban level network that provides for trips across cities and that links with regional routes that connect between cities. Below the urban level is the district level which connects destinations (including train stations) with the urban network. At the lowest level is the subdistrict or neighbourhood level which provides for short trips that are often made by children. The more costly

Hans Penning

Dual mode – Bicycle parking at train station (bottom photo).

facilities are reserved for the urban level network which consists of high quality and high priority bicycle/moped routes. The subdistrict level is very simple and consists of traffic calmed streets, little paths and short-cuts that may be used by pedestrians as well. It should be remembered when trying to visualise the network hierarchy that there are great differences in size and density of cities in North America and Australia compared with the Netherlands.

The Dutch have tried to make cycling as comfortable as possible by separating motor, bicycle and pedestrian traffic and providing wide, clearly marked areas for cyclists. The most common facilities in the Netherlands are high quality bicycle/moped paths that parallel major roads. The Dutch feel that the safety of cyclists is increased by separation from motor traffic. Cyclists are given priority at minor intersections along these paths and are provided with separate crossings and traffic signals at major intersections. At intersections the Dutch have determined that bicycle lanes and advance stop lines increase safety and there is evidence of an increasing trend toward providing this type of facility rather than separate crossing points.

The attitude of the Dutch towards cycling is positive. The idea that the bicycle is a mode of poverty or for those who cannot afford a car has passed. Bad weather conditions like wind and rain are hardly mentioned as a reasons not to bicycle – these conditions are only mentioned by non cyclists.

It is felt that encouragement of greater use of bicycles cannot be accomplished simply by providing infrastructure. Bicycle use must also be promoted and educated.

3. Denmark

In Denmark an annual total of 5.5 billion kilometres were ridden by bicycle and moped in 1988, compared with 2.6 billion kilometres in 1975. This is more than the number of passenger kilometres done by train. Cars account for 50 billion passenger km. 18% of trips are made solely by bicycle, with a further 1% made by bike plus public transport. In central parts of many cities the bicycle's share is even greater. (Jensen & Larsen 1989).

Table 3-1 : Denmark Modal Split
measured in billions of kilometres (Jensen & Larsen 1989)

	1986	1987	1988
Bicycle and moped (mopeds count very little)	4.1	4.6	5.5
Walking	2.7	4.0	–
Train	4.5	4.7	–
Bus	9.0	9.1	–
Car	45.7	48.1	50.6

On average every adult Dane cycles 1,100 km per year.

Table 3-2 : Denmark Trip Lengths for 1981
(Jensen & Larsen 1989)

	0-1 km	1-3 km	3-5 km	5-10 km	10-15 km	>15 km
Bicycles	45%	37%	11%	5%	2%	0%
Cars (drivers)	13%	26%	16%	19%	9%	17%

Table 3-3 : Denmark Traffic Accident Rate
(Jensen & Larsen 1989)

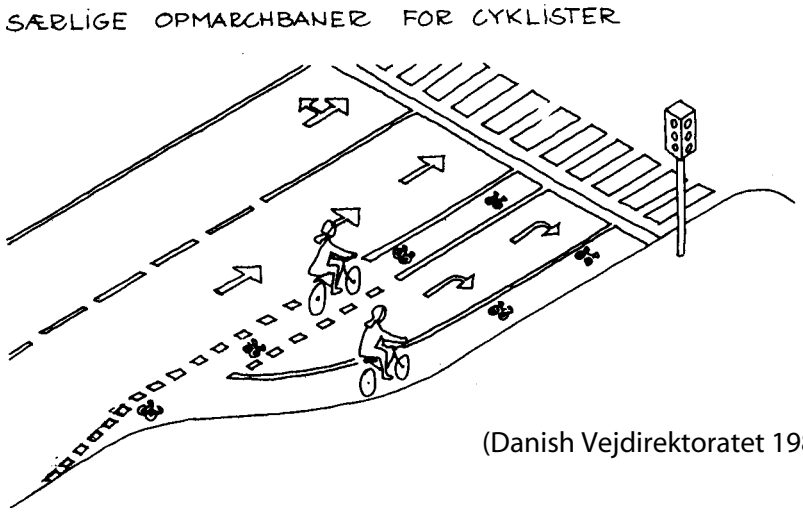
	1970	1975	1977	1980	1982	1985	1987	1988
Cyclists killed in traffic	152	118	113	84	96	101	87	81
All road users (including cyclists) killed	1208	827	828	690	658	772	698	713

Like the Netherlands, Denmark successfully reversed a decline in bicycle use with an aggressive program to discourage car use and promote bicycles. The national government has allocated $7 to $13 million annually to building bike lanes along main roads. Now roughly 75% of major roads are bicycle routes, and ridership stands at 18% of personal trips. What's more, Denmark has some of the highest gas prices in Europe, and sales tax on new cars is almost 200%. (Martin 1992)

The common bicycle track of most Danish towns is a 2-3 m wide asphalted traffic area separated from the pavement and the lane by kerbstones. The one-way tracks are situated on both sides of the road. In rural areas bicycle tracks are often designed for two way traffic with a track only at one side of the road. This solution is good where there are relatively few cyclists and not too many road crossings. Also, in places where buildings and schools are situated on the same side of the road, the two-way track is a suitable solution. During recent years legislation has imposed special responsibilities on police and road authorities to make routes to schools safe, and as a result coherent planning of school tracks has been made. (Jensen & Larsen 1989)

Where bicycle paths along main roads cross minor side roads, the construction of the side roads is modified so that the whole verge area is prolonged across the throat of the minor road giving continuity and a perceived priority to pedestrians and cyclists. (Moses 1988)

Following the lead of the Dutch, traffic calming has been implemented in many places in Denmark, especially in residential areas. Some designs are intended to reduce speeds of cars to 30 km/h, others 15 km/h. In recent years experiments have been made to reduce motor traffic through small towns. Refer to section 3.3 on traffic calming. (Jensen & Larsen 1989)



(Danish Vejdirektoratet 1981b)

In 1984 the Government granted Dkr. 10m ($A2.1 million) to four Danish towns, Århus, Odense, Helsingør and Herning, for pilot projects on bicycle routes through dense urban areas (Danish Vejdirektoratet 1988b). The intention of the experiments was to give the cyclists a coherent cycle route in the central town areas, where, due to limited space, it had been difficult to improve conditions for cyclists. The projects also tested various designs, especially at intersections. Tests included before and after studies of traffic, behaviour and interviews to determine road users' assessment of the routes. (Jensen & Larsen 1989)

The results of the 4 bicycle route experiments have been rather mixed. It seems that the bicycle traffic only increased in the places where restrictions were at the same time imposed on car traffic. Only where the cyclists have really had an advantage by using the cycle route was it possible to shift bicycle traffic to the new route. Good experience was gained from new designs of sections and intersections. It has, for example, turned out that cyclists, pedestrians and buses can function together with a considerably softer separation than is the tradition in Denmark. (Jensen & Larsen 1989)

Cyclists account for one third of all traffic fatalities and injuries in Danish urban areas. While the total number of registered traffic fatalities and injuries has fallen since 1985, the corresponding figure for cyclists has remained nearly constant. The Danish Road-Safety Commission's plan of action has the objective of reducing the number of fatalities and injuries in traffic by 45% before the year 2000. Any improvement in the safety of cyclists in urban areas will therefore be of great significance and for this reason the Danish Road Directorate has started a 3-year research programme on the safety of cyclists in urban areas. The research will be based not just on statistics, but also on interviews and analysis of observed behaviour. The research programme comprises 6 projects: (Denmark 1991)

- **Cycle lanes in urban areas.** Comparisons of paths versus lanes, lanes versus no lanes, lanes of varying widths, and consideration of the cyclists' sense of safety and ease of travel.
- **Marking of cycle stripes.** Using slightly elevated barriers to separate lanes from traffic and its effect on safety and the illegal stopping/parking of cars inside the bike lane.
- **New designs of crossings.** This project focuses on the conflict between cyclists travelling straight-ahead and vehicles turning right (left). Geometry and markings will be modified, and resultant behaviour will be video taped.
- **Safety of cyclists at urban crossings.** Part of a join Nordic project, with a purpose of rendering safer crossings that have high frequencies of accidents.
- **Safety of cyclists on urban roundabouts.** The good safety of roundabouts for motorists is not shared by cyclists. This project aims at finding a correlation between the design of roundabouts and the safety of cyclists.
- **Conflict between cyclists and bus passengers at bus stops.** In urban areas of Denmark buses stop outside of bicycle lanes and passengers must cross the bicycle path. This is a major accident problem.

(Danish Vejdirektoratet 1981b)

The Danish Cyclists Federation (membership 22,000) is an organisation engaged in traffic policy and cycle touring, the primary aim of which is to promote and make visible bicycle traffic in Denmark. Increasing densities of motor traffic led to more and more protests from cyclists and culminated in the late 1970s with big demonstrations with thousands of cyclists. More recently the group has exerted its influence on parliamentary decisions. Through membership of various boards and committees it has played a major part with respect to initiatives of traffic policy concerning the building of tracks along roads and cycle routes in town centres. They are also engaged in the work of the European Cyclists' Federation. (Jensen & Larsen 1989)

A few suggestions from the Danish Cyclists Federation for improvements to Danish cycling conditions were (Aggernæs 1989):

- The network of bicycle routes should be developed so it is faster to use the bike than the car in the city, when distances are under 5 km.
- Local government should assure that cycle tracks are wide enough. No holes, bumps, and the tracks should be cleaned once a week.
- Bicycles should be allowed on trains at all hours, not just outside rush hours. Bicycles should travel free on trains.
- If there is only room for a cycle track less than 2 m wide then don't make the cycle track – instead remove the cars from the street.
- Two-way cycle tracks should be a minimum of 4 km long (cyclists do not like to cross the road often).
- It should be legal to cross a T-junction through a red light.
- Heavy vehicles should only be allowed to use special routes.

Behaviour problems with cyclists is something that appears to exist everywhere. "Bicycle paths are no better than the users, and used without respect for bus passengers, pedestrians and turning cars, they generate dangerous situations and also accidents. The bicycle is still popular with the Danes – the cyclists are not always!" (Larsen 1989)

In a number of areas of Denmark cycling on the road shoulder is encouraged. The shoulder may be marked with a bicycle logo to indicate its purpose. Examination of general safety has indicated a halving of the level of hazard with installation of edge lines on roads to assist cyclists. (Moses 1988)

3.1 København (Copenhagen)

(Copenhagen 1989) and (Rørbech 1989)

During the 1920s to 1940s Copenhagen (current population 700,000) expanded rapidly in population and area. At the same time the bicycle became a household object and dominated transportation in the city. As a matter of course, all new roads constructed or enlarged during those years were provided with cycle tracks. The size and layout of the city made it ideal for cycling. The town did not extend more than 5-6 km from the centre, and any place in the town could be reached fairly quickly by bicycle. Bicycle use peaked in the early 1950s and on the main bicycle routes the cyclists simply occupied the entire width of the street, with few cars venturing onto these roads. Just after WWII over half of persons entering the inner city rode bicycles – 80,000 bicycles and 10,000 cars during peak hour. Today 50,000 cars and 10,000 bicycles pass the same borders.

The following 15 years saw a drastic fall in the number of cyclists and a rise in car traffic. The city grew far beyond its former limits, and there was a pronounced migration from the central part of the city to the outlying areas. Thus, in the municipality of Copenhagen, the population fell from 770,000 in 1950 to 500,000 at the end of the 1950s. As settlements became more scattered travelling distances increased, causing residents to trade their bicycles for cars.

More people have begun to cycle again in recent years. At the start of the 1980s bicycle traffic increased 50% in the central parts of Copenhagen. Even though cycle traffic today cannot compare with the situation in the 1950s, the bicycle is still an important means of transport in Copenhagen with about 25% of all everyday trips being made by bicycle. As these tend especially to be short trips, the bicycle is often neglected in the debate on traffic policy.

Table 3-4 : Copenhagen Traffic Counts
Road users in 24 hours on 2 bridges in central Copenhagen
(Jensen & Larsen 1989)

	1951	1955	1960	1965	1970	1975	1980	1985	1988
Bicycles (x1000)	137	91	69	36	24	18	29	34	27
Mopeds (x1000)	2	15	21	14	11	7	2	2	1
Cars (x1000)	42	67	86	104	113	112	103	108	107

Until the end of the 1970s virtually all cycle tracks constructed were in conjunction with new roads or along wide traffic routes already in existence. Here it was possible to create good, wide tracks, often including space for a shoulder to separate cyclists and cars. The tracks were rarely less than 2.7 m wide, and any shoulders were about 0.8 m wide. Such cycle tracks provide ample space for overtaking, even by two cyclists riding side by side.

During the 1980s the construction of cycle tracks centred around heavily trafficked roads with dense streams of bicycles. The tracks were accommodated in these narrow street profiles at the cost of car parking and in some places, pedestrian areas. It has rarely been possible to make the cycle tracks wider than 2.2 m, in fact they are only 2 m in some spots.

The vast majority of Copenhagen cycle tracks are "traditional cycle tracks", demarcated by kerbs along both sides of the track. In a few places the facilities have been made with a painted stripe, or kerbstones have been fixed to the roadway with glue. Finally, there are sections where the cyclists ride in local traffic lanes.

By the end of the 1970s Copenhagen had a fairly comprehensive system of cycle tracks along the major roads, established over more than half a century. The total length of cycle tracks was 240 km (not including tracks through parks and other green areas). Tracks had been provided all over the municipality, but gaps existed, particularly in the downtown, old city quarters and along some of the largest cycling and shopping streets. Between 1979 and 1989 an additional 40 km were added to provide a virtually unbroken and relatively tight-knit network of tracks covering almost all major roads and local distributor roads, with the exception of a few of the important and busiest streets. It is intended to remove these gaps and complete the network and to enhance facilities for combining public transport with cycling.

Almost two thirds of all reported accidents involving cyclists occur at intersections, while the remainder occur on sections (mid block). Traffic accidents involving car drivers make up 3/4 of cycle accidents. At intersections, most accidents occur when cyclists heading straight-on are overlooked by motorists, who – failing to acknowledge the cyclist's right of way – cut the cyclist off. In order to avoid as many of these accidents as possible, marked cycle crossings have been made at a number of intersections.

At specially marked hazardous intersections *blue cycle crossings* have been painted in order to focus motorists' attention on cyclists. Some large, traffic-light-controlled intersections have special cyclists' signals with staggered green-light times. Here the cyclists are given a few seconds head start so that they are not so easily overlooked by motorists. In the same way, they are halted a few seconds before the cars, allowing the later to turn unimpeded.

At traffic-light-controlled intersections the bicycle tracks either extend right up to the stop line or are cut short over the last 20-30 m with bicycle and right (left) turning motor traffic combined in one lane. The fully extended tracks are convenient and give cyclists a feeling of security. The truncated cycle tracks give a feeling of less security, but accident statistics indicate that in reality they are safer for cyclists where motorists must otherwise turn right (left) across the bike lane. There is much opposition

A traditional Copenhagen Cycle Track.

Marked cycle crossing through signalled intersection.

Narrow Cycle Track.

Copenhagen
(Copenhagen 1989)

to the suggestion that the bicycle lanes should be truncated. Findings leading to this suggestion are based "strictly from an engineer's point of view" qualifies the project engineer, Jørgensen. This approach was referred to in debate at Velocity 89 as *safety through terror* – there will be less accidents when people are so scared that they pay the utmost attention. The debaters suggested a new law called *Jørgensen's Law:* "You should never measure a safety device by accident statistics only".

The effect of cycle tracks on sections is greatest: here they are reasonably comfortable as well as safe. But these sections are not without problems either. The more recent, rather narrow cycle tracks, in particular, have given rise to new accident situations, where fast cyclists wish to overtake slow ones or have to stop for passengers boarding and leaving buses. Opening of car doors also creates problems, as do stopping on the narrow bicycle tracks. Signs reading *One Way Street – Cyclists permitted in both directions* provide special bicycle routes through the inner city, without any problems at all.

Copenhagen Bicycle Tracks 1989 (Copenhagen 1989)

The city uses some innovative methods to protect cyclists from motor vehicles. Where roads cross bike routes, cars typically must go over special ramps that serve as giant speed bumps. When cyclists and cars share the street, motorists are alerted by signs, markings and even different-textured pavement. Other traffic calming tactics include digging a hole in the middle of the street and planting a tree, or setting up a picnic or playground area. (Martin 1992)

"Drivers are given clear visual, sensory and tactile clues that they better slow down," says Michael Replogle of the Institute for Transport and Development Policy in Washington, DC. And they have slowed, in more ways than one. (Martin 1992)

Perhaps Copenhagen's highest profile cycling project is the *Bycyklen* (city bike), or white-bike program. By simply inserting a 20-krone coin (about $4) in one of hundreds of special bike racks, you can borrow one of these machines to pedal around the city. After your ride, you just return the bike to any rack and get your money back. Flats aren't a problem because the tires are sold rubber. Plans call for a fleet of 3000 of the distinctive white bikes, which are designed to be noticeable so people won't be tempted to borrow them permanently. (Martin 1992)

A comparison was made between bicycle facilities in the Hague in the Netherlands to those in Copenhagen. The road markings and signal regulation for cyclists is much better in the Hague, leaving the cyclist never in doubt of where they have to go, even at difficult intersections. The Dutch paths were altogether in better physical condition. Copenhagen has frequent poor patching of their paths. (Frost 1989)

Future Policy

(Rørbech 1989)

The future-oriented bicycle policy proposed by Jens Rørbech, Chief City Engineer in Copenhagen, calls for the establishment of special bicycle routes. Conventional bicycle paths may be a good and safe proposition, but only to cyclists riding at moderate speed and over short distances, up to 4-5 km. These conventional paths are less attractive to cyclists who need to travel longer distances. The many stops decrease speed, which is time consuming and tiring. In addition, noise and fumes from motoring traffic are annoying when you spend considerable time in this environment. As well, the general *bustle* and *visual chaos* of conventional paths make them less attractive over longer distances.

For trips under 5 km bicycle use today is reasonably high, with little possibility for further increases. However, for distances between 5 and 12 km there is considerable unexploited potential for increased use of the bicycle. But in order to exploit this potential, long distance cycling must be made attractive, in the form of a wide meshed network of attractive bicycle routes. Rørbech anticipates that future work will be directed towards siting of potential bicycle routes and perhaps implementing one of the most important ones as an experiment. These routes will follow paths, quiet roads, perhaps park paths and other places attractive to cyclists. The objective should be a successive protection of the *bad* spots, especially intersections involving danger and delay for the cyclist. Adequate signposting will need to be provided along these *utility bicycle paths*.

Some further visions for the future of Copenhagen are given by the Chairman Transport and Town Planning Committee (Frost 1989)

- Establish a ring road all around Copenhagen. This would relieve the inner city of through traffic and, for those on bicycles, make cycling in the inner city a pleasure.
- Establish an underground railway to Amager, an area only served by buses, to reduce car use from that area.
- Reduce street parking in the inner city, combined with multi-storey car parks at access roads to the inner city.
- Outside the inner city car traffic must be kept to the main roads, leaving the local residential areas free of unnecessary traffic.

(Danish Vejdirektoratet 1981a)

(Danish Vejdirektoratet 1981b)

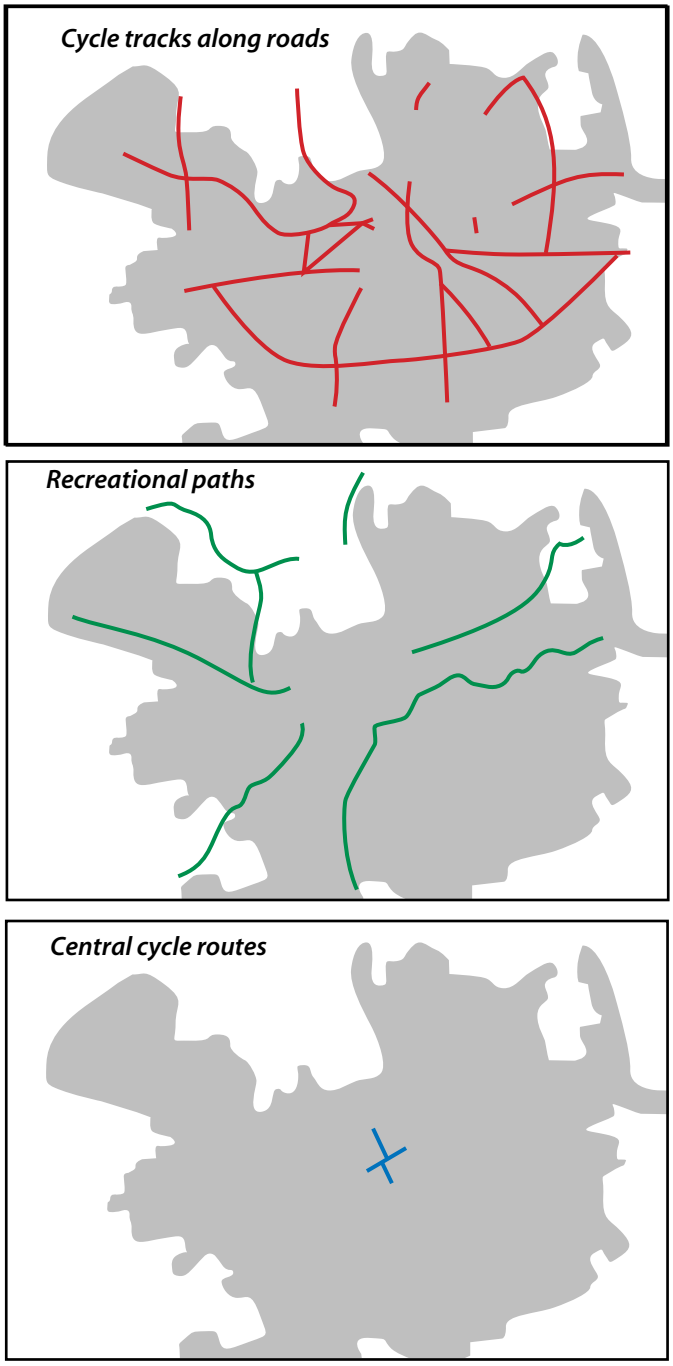
(Danish Vejdirektoratet 1981a)

3.2 Odense

Odense (population 200,000), one of Denmark's 275 municipalities, is Denmark's third city. For a number of years Odense has built cycle tracks – from 1976 according to a coordinated traffic and recreation plan. The target has been to connect all town areas of the municipality with Odense and give access to schools and green spaces. (Jensen & Larsen 1989), (Jacobsen 1989)

Most of the 250 km of tracks are situated along roads, with tracks on both sides of the roads. A minor percentage of tracks have been placed in isolation to the road network, either paths along streams or on disused railways. The first tracks in Odense were built where there was room for them. The centre, where the cyclists, like in all other towns of the country, had the worst problems, had to wait. It was difficult to make room for tracks, at least if the motor traffic should not suffer from it. The attitude towards cars and bicycles changed with time so that now it is more acceptable to take room from cars for cycle tracks and introduce restrictions on cars in the town centre. The complete track system is shown on a free map which is frequently revised. The system is also signposted. (Jensen & Larsen 1989)

As a result of the 4-city bicycle route trials sponsored by the Danish Government, Odense entered into a comprehensive traffic plan to transform the city centre. Through traffic is diverted from the centre by means of a continuous ring road, which has been created by adding to existing roads. The network of pedestrian streets has trebled in length within the last three years. This makes walking easier and has been a boost to trade. City bus routes through the city are now more direct and a central terminal has been established for transfers. (Jacobsen 1989)



Odense

The principle for the bicycle routes in the city centre was two special routes, one east-west and the other north-south, with a small connection stretch on the main square just in front of the town hall. These routes were established on the basis of four principles: (Jacobsen 1989)

- Ordinary paths on both sides of the road in the few places where this was possible.
- A Bicycle path running contra-flow on one-way streets.
- Bicycle paths in pedestrian areas.
- Bicycle paths in areas reserved for city buses.

Car traffic has been discouraged from entering the city centre by a complicated network of one-way streets and pedestrian/bus streets with no access to private cars. However, comprehensive car parks have been established on the fringe of the centre in connection with the ring road, thus making access to the central area easy for cars. After-studies of the bicycle routes showed that half of cyclists now find it easier to get from one place to another, and only 20% find it more difficult. 42% found it safer, and 15% found it less safe. The cycle routes did not impact on shopkeepers, partly because these routes were part of a comprehensive plan. The overall impression of citizens of Odense was that the new traffic plan had proved to be a success. It was felt that very careful planning and lots of information to the public are necessary to obtain satisfactory results. (Jacobsen 1989)

Moses comments that he observed a range of bicycle facilities in Odense. These included designated bicycle lanes on road shoulders, divorced bicycle paths separated from major routes by a kerb, split pedestrian/cycle paths with one half designated as a bike path and the other half as a pedestrian path. In the city centre bicycle lanes were designated by red thermoplastic, though it appeared that the Danes would be standardising towards blue rather then red. The bicycle lanes were nearly a metre wide, being set out from the kerb by 300 mm. In some areas the path left insufficient width for vehicles to pass without infringing on the bicycle lane. (Moses 1988)

3.3 Cycling and Traffic Calming

from (Brindle 1992)

We can learn much from Denmark with regard to provisions for cyclists on Level II traffic calmed roads. Level II covers environmental traffic management and changes in driver behaviour which affect busier traffic routes, such as shopping streets and roads through country towns. Level I traffic calming describes actions in local streets; Level III covers city-wide actions such as traffic restraint.

Denmark deserves close attention from Australian traffic planners. Its bicycle ethos is well established yet its urban/suburban context is more relevant to us than in the Netherlands. Danes appear to like driving and Denmark has a strong traffic planning profession (Danish road engineers are very active in Asia). It has attractive cities and its suburban areas (average densities around 25 persons/ha) would appeal to most Australians. Long before the term *traffic calming* came into common use, Denmark had introduced statutory provisions for *quiet streets* (30 km/h) and *rest and play streets* (15 km/h). One of the good things about Denmark is the way it has introduced traffic restraint, with popular support, and a strong pro-bike policy, without adopting an absolutist anti-car attitude.

Hilleroo
Traffic Management.
(Moses 1988)

Herning
Pedestrian Mall.
(Moses 1988)

At the root of the Danish approach is a beautifully simple way of classifying roads for traffic management purposes. They adopt a two-class road hierarchy of *traffic roads* and *local roads*, which allows them to nominate those roads which should *not* be regarded at all as part of the city's traffic network. They then add speed categories - not *design speeds*, as reflected in typical traditional road design standards, but *target speeds*. These are specified in four bands:

High speed	70-80 km/h
Middle speed	50-60 km/h
Low speed	30-40 km/h
Very low speed	10-20 km/h

A road can be designated as a traffic route but have a target maximum speed of 30-40 km/h, or 50-60 km/h, or 70-80 km/h. Clearly, this will produce three different kinds of Traffic Road, since the nature of each road should reflect its target speed which in turn reflects the non-vehicle needs of the road. Conversely, not all 40 km/h roads are *local roads* – some may be traffic routes, say through shopping centres or recreation areas.

We know that *traffic roads* must be made more congenial for bikes if cycling is to make a serious contribution to urban mobility. These routes are the most direct and continuous, they pass through activity areas that people want to get to and they are the dominant kinds of roads in high density areas. European practice (especially in Denmark and Germany) demonstrates the sort of environmental traffic management that could be carried out on Australian streets carrying higher levels of traffic, especially through shopping centres. Some of the European examples demonstrate speed reduction, others demonstrate space rearrangement without greatly affecting capacity or journey time. Not all of them include separate provisions for cyclists.

Strandvejen (the modified main shopping street through Hellerup, a suburb of Copenhagen) demonstrates that pedestrian and bicycle activity can be considerably enhanced without loss of traffic capacity (albeit with extra delays at peak hour). Previously with four traffic lanes and no separate bicycle provision over its narrowest section, Strandvejen was converted to one lane in each direction, foot and cycle paths on both sides, separate turning lanes at intersections, and recessed bus bays. In order of priority, kerbside parking, kerb extensions for pedestrians and a constructed median were provided as space permitted. 18,000 vehicles per day (vpd) now use one clear lane in each direction. It should be added that this used to be the main north route out of Copenhagen – it is now paralleled by a freeway 1 km to the west.

Table 3-5 : Strandvejen, Hellerup (suburb of Copenhagen)

Adapted cross section	Traffic lanes (x2)	3.25 - 3.75 m
	Bicycle lanes (x2)	1.9 - 2.5 m
	Footpaths (x2)	2.0 m min.
	Median	2.0 - 5.0 m
	Parking lanes/bus bays	2.2 m approx.
Total width required (minimum)	Without median	20 m
	With median	22 m

The Danes have also shown, in their EMIL (Environmental Priority) Project, how similar treatments can be used on highways through country towns, adopting low speed (40 km/h) or middle speed (50 km/h) targets. These have resulted in measurable drops in vehicle speed but with less than 15 seconds increase in travel time through the towns; about 70% of the townspeople and about half of through motorists approve of the changes. The significant factor is that the levels of traffic service have been retained while providing safer conditions for pedestrians crossing the highway – and introducing separate bicycle lanes in each direction.

Table 3-6 : Vinderup through road (Country town, Denmark, pop. 3000)

Motor vehicles		3900 vehicles/day
Bike traffic		1300 bicycles/day
Bike lanes (one way)	(x2)	1.5 m
Carriageway width	2-way section	6.5 m
	Divided section (x2)	3.25 m.
Median (ped. refuge)		2.0 m

Table 3-7 : Danish standard cross section elements

Traffic lane widths (minimum)	High speed	3.5 m
	Middle speed	3.0 - 3.25 m
	Low speed	2.75 m
	Very low speed	2.5 m
	Shared bicycle/vehicle	4.0 m
Parking lane width		1.8 - 2.5 m
Median width		2.0 m
Bicycle lane widths	Segregated	2.2 m (1.7 m min.)
	On-road lane	1.5 m (1.2 m min.) incl. line

3.4 Highlights

- Like the Netherlands, Denmark successfully reversed a decline in bicycle use with an aggressive program to discourage car use and promote bicycles. The national government has allocated $7 to $13 million annually to building bike lanes along main roads.

- Results of bicycle route experiments showed that bicycle traffic only increased in the places where restrictions were at the same time imposed on car traffic. Only where cyclists really had an advantage by using the cycle route was it possible to shift bicycle traffic to the new route.

- Where bicycle paths along main roads cross minor side roads, the construction of the side road is modified so that the whole verge area is prolonged across the throat of the minor road giving continuity and a perceived priority to pedestrians and cyclists. (Moses 1988)

- In a number of areas of Denmark cycling on the road shoulder is encouraged. The shoulder may be marked with a bicycle logo to indicate its purpose. Examination of general safety has indicated a halving of the level of hazard with installation of edge lines on roads to assist cyclists. (Moses 1988)

- Almost two thirds of all reported accidents involving cyclists occur at intersections, while the remainder occur on sections (mid block). Traffic accidents involving car drivers make up 3/4 of cycle accidents. At intersections, most accidents occur when cyclists heading straight-on are overlooked by motorists, who – failing to acknowledge the cyclist's right of way – cut the cyclist off. In order to avoid as many of these accidents as possible, marked cycle crossings have been made at a number of intersections.

Vinderup
Entry Statements.
(Moses 1988)

- At specially marked hazardous intersections *blue cycle crossings* have been painted in order to focus motorists' attention on cyclists. Some large, traffic-light-controlled intersections have special cyclists' signals with staggered green-light times. Here the cyclists are given a few seconds head start so that they are not so easily overlooked by motorists. In the same way, they are halted a few seconds before the cars, allowing the later to turn unimpeded.

- Copenhagen's conventional bicycle paths may be a good and safe proposition, but only to cyclists riding at moderate speed and over short distances, up to 4-5 km. These conventional paths are less attractive to cyclists who need to travel longer distances. The many stops decrease speed, which is time consuming and tiring. For trips under 5 km bicycle use today is reasonably high, with little possibility for further increases. However, for distances between 5 and 12 km there is considerable unexploited potential for

increased use of the bicycle. In order to exploit this potential, long distance cycling must be made attractive, in the form of a wide meshed network of attractive bicycle routes. The Chief City Engineer of Copenhagen anticipates that future work will be directed towards establishment of special bicycle routes and perhaps implementing one of the most important ones as an experiment. These routes will follow paths, quiet roads, perhaps park paths and other places attractive to cyclists. The objective should be a successive protection of the bad spots, especially intersections involving danger and delay for the cyclist. Adequate signposting will need to be provided along these *utility bicycle paths*.

- Denmark deserves close attention from Australian traffic planners. Its bicycle ethos is well established yet its urban/suburban context is more relevant to us than in the Netherlands. One of the good things about Denmark is the way it has introduced traffic restraint, with popular support, and a strong pro-bike policy, without adopting an absolutist anti-car attitude.

- We know that *traffic roads* must be made more congenial for bikes if cycling is to make a serious contribution to urban mobility. These routes are the most direct and continuous, they pass through activity areas that people want to get to and they are the dominant kinds of roads in high density areas. The Danes have demonstrated that pedestrian and bicycle activity can be considerably enhanced without loss of traffic capacity – one road, previously with four traffic lanes and no separate bicycle provision over its narrowest section, was converted to one lane in each direction, foot and cycle paths on both sides, separate turning lanes at intersections, and recessed bus bays. In order of priority, kerbside parking, kerb extensions for pedestrians and a constructed median were provided as space permitted. 18,000 vehicles per day (vpd) now use one clear lane in each direction.

- Behaviour problems with cyclists is something that appears to exist everywhere. "Bicycle paths are no better than the users, and used without respect for bus passengers, pedestrians and turning cars, they generate dangerous situations and also accidents. The bicycle is still popular with the Danes – the cyclists are not always!" (Larsen 1989)

4. Germany (former West Germany)

During the past decade there has been a change in philosophy in Germany that has resulted in an attempt to minimise the number of trips by car and to mould car use to the city rather than the city to the car. (Moses 1988) Traffic management techniques to reduce motor speeds are widely used. In many instances bicycles derive benefit from increased priority and safety. Cycling is on the increase with more and more German cities promoting greater use of bicycles.

Overview

(Holzapfel 1987)

Bicycle transportation has been supported for many years by urbanists and politicians. The only two transport modes that do not have any unfavourable effects on the environment and that will put new life into local areas are walking and cycling; These typical traffic modes of European cities contribute very much to the urban milieu. Spacious and unfrequented areas that are found in sprawled North American cities are not favoured, but this is where Germany is none the less heading as travel distances increase.

Table 4-1 : German Modal Split

	1976	1982
Bicycle	8.6%	10.2%
Walking	33.6%	29.8%
Motorcar	45.0%	47.0%
Mean Trip Length	8.8 km	10.3 km

Travel times for motorcars is shorter for trips of over 7 km, but for trips under this distance bicycles can compete on all routes where it is not handicapped by a great number of obstacles and detours (inconvenient traffic light crossings, construction sites, parked motorcars, unfavourable bicycle track routes) and where advantages can be taken of certain privileges. Bicycles and motorcars cannot be regarded as partners on the road, especially in cities where any enlargement of areas for motorcars has to be taken from space used for bikes and pedestrians.

There are two possibilities for the future development of German cities and it is up to the the government to decide the direction to be taken. The trend actually followed is undoubtedly directed towards a motor-favouring city with long distances. The second and of course more complicated possibility is towards a city favouring the use of bicycles and pedestrians. The later direction is more arduous because it evidently requires a reorientation.

Aside from certain demonstration projects all measures to improving bicycle traffic were not linked with a limitation of motor traffic. More attraction and space for cyclists can only be obtained by certain restrictions to be imposed on all other transportation means. If Germany really wants to have bike and pedestrian affable cities that do not require greater and greater distances, then speeds and areas allocated to motorcars must be reduced.

Design Guidelines

(Fechtel 1989)

The first German design guidelines for bicycle facilities were published in 1963. There were two important recommendations in these guidelines which influenced design of bicycle facilities for a long time:

1. Cyclists should be separated from cars when there are more than 2000 vpd and more than 500 cyclists/day, or more than 3000 vpd and 200 cyclists/day.
2. The most preferable solution should be bicycle paths along the (main) streets; cycle lanes seemed to be too dangerous.

These guidelines were intended to be preliminary, but unfortunately it was not until 1982 that there was a complete new edition of the guidelines. In the last 10 years there have been many investigations in the safety effects of bicycle facilities and the guidelines for planning and designing of bicycle facilities have changed in many ways too.

In the 1982 guidelines there was a new philosophy: the necessity of bicycle facilities and their standard should be measured in respect to the potential need for cyclists. The demand-oriented planning changed to a supply-oriented planning. To inspire and encourage the local traffic departments the Guidelines offered a number of new types of bicycle facilities like bicycle lanes, bicycle streets and bicycle routes, though at the time there was little experience in Germany with these types of facilities. The usage of the guidelines has become more and more important over the last 5 years.

During the past 10 years there has been an endless stream of publications about planning and designing bicycle facilities in Germany: Handbooks, technical notes, results of the investigations, discussion of changes in traffic rules. Some cities have even produced their own guidelines, and the discussion continues about whether bicycle paths or lanes are better. In addition there has been an enormous amount of new information resulting from experimentation in traffic calming, safety and bicycle facility trials. Interest in bicycle facilities has grown by leaps and bounds and there is a real need today to harmonise the different standards nationally. The new edition of guidelines will need to include details on:

- bicycle lanes,
- bicycle streets and bicycle routes,
- contra-flow bicycle lanes in one-way streets,
- cycling within and aside of bus lanes,
- priority crossings for cyclists,
- small measures to make cycling easier in low-trafficked streets and residential areas.

The Issue of Speed

(Briese 1989)

From a motorist's point of view and from most of the politicians specialising in traffic issues and most of the traffic planners and proponents of traffic safety, the bicyclist and pedestrian are considered to be slow. According to prevailing concepts of safety, these slow means of travel have to be separated from the fast motorised traffic. According to prevailing opinions safety for the cyclists stems either from bicycle paths or from prohibiting biking in areas where motorised traffic is expected to move quickly and without stopping. Such a safety policy does not encourage the use of the bicycle. The more apparent goal of this policy seems to be to get the cyclist *under control*.

A thesis contrary to this position is:

Speed and safety are equally important prerequisites for encouraging bicycle usage successfully. Whether planning for bicycle traffic can really be considered to be encouraging bicycle usage can be measured by the degree to which both components are connected to each other. Why? Because speed, if understood correctly, does not have to come at the cost of safety.

The demand for conditions requisite for fast cycle traffic is not a demand for participation in the intoxication of speed. It is a question of conditions which allow cyclists to travel in daily traffic without constant interruptions. It is a question of journeys to work, to school, to go shopping, and not only of leisure-time cycling which most traffic planners seem to have in their mind's eye when they are planning the cycle paths which slow the cyclists down. The fast bicycle is what we should demand and promote; it will not result in a higher safety risk as long as the bicycling environment is in order, but rather it will lead us all in the direction of a more humane system of transportation. Only if it is allowed to be a fast means of transportation can the bicycle compete with the comfort of an automobile, thereby contributing to the solution of traffic problems in the cities and motivating people to switch from their cars to the bicycle.

4.1 German Model Projects

Detmold and Rosenheim were chosen as locations for federally funded model projects to gain general insight into the promotion of bicycle traffic. In Detmold, when the project began in 1981, the total length of cycleways was only 32 km. By 1986 it was increased to 121 km at a cost of 7 million DM ($A5.5 million), with plans for a total of 228 km. Many of the facilities were conventional shared use paths (shared with pedestrians), though there was a mix with other types of facilities as well. The trend in Detmold was of rising motorisation and the effect of the model project was to cause "a stabilisation of bicycle use, together with an increase of use of the bicycle as a daily means of transport". (Richard 1987), (Hülsmann 1987)

In Rosenheim, a city where motor vehicle use is 43% and public transport, walking and cycling account for 57% of trips, the model project succeeded in increasing the percentage of trips by bicycle by 3% (from 23% to 26%). (Richard 1987), (Hülsmann 1987)

"The promotion of bicycle traffic in environmental, urban planning and traffic planning policies must go further than simply doing something to increase the safety and comfort of today's cyclists. Promoting the bicycle must succeed in getting traffic users to switch from the private motor vehicle which causes environmental pollution to the bicycle which does not. Effective bicycle promotion therefore requires traffic policies that take the bicycle into account and is not limited to constructing bicycle paths but tries to remove obstacles to bicycle use by implementing an integrated package of aims and schemes. In this way it should be possible to increase the proportion of bicycle traffic from the present level of 11% (national average) to between 20 and 40%. This would mean a considerable contribution to relieving the pressure on our roads and on the environment." (Richard 1987)

Setting up an improved infrastructure for bicycle traffic is not by itself an effective means of promoting bicycle traffic. What is required is a combination of measures relating to:

- legal aspects
- town and traffic planning
- organisation
- financial matters
- technical considerations
- motivation (public relations work). (Richard 1987)

Rosenheim and Detmold were chosen for the project out of 131 entrants because studies showed a potential to double the bicycle traffic, if the bicycle became more attractive and the car less attractive. The project was to incorporate road capacity reduction for motor traffic, extension of the bicycle network, and other measures. Initially proposals to reduce road capacity provoked resistance from politicians and local planners, indicating that many had supported their town's application only to get additional federal funding for bicycle facilities, and not to rework related traffic politics. (Bracher 1988b)

According to (Spiegel 1991) the Detmold and Rosenheim experiments were only moderately successful because they were modelled on the principle of separate bikeways. "Though millions of marks were invested to almost double the bicycle path network in both cities, only a minimal cyclist population increase was noted. Today traffic planners have recognised that they invested in the wrong concept. Entmischung, or separation of the traffic, does not make cycling attractive because the clear, free path ends at the first intersection, where motorised vehicles have the right of way."

Peter Bloecher (see next section) indicates that Detmold and Rosenheim were interesting experiments, but even more interesting are the successful experiences of Münster (50 km from the dutch border) and Erlangen (a university town near Nürnberg) because they have achieved even greater modal splits in favour of bicycles.

According to (Clarke 1987) Detmold provides the worst example of bicycle facilities amongst the three experimental cities of Nottingham, Detmold and Delft. Routes end suddenly, on main roads, with no signposting. One does not feel safe using the paths, and they are compulsory. Even when facilities are bad and unsafe, which often they are, the cyclists must use them. This is unsatisfactory for both pedestrians and cyclists who must share these paths in close proximity.

At intersections Clarke indicates that bicycle lanes end abruptly in Detmold in most instances and that advance stop lines occur as the exception rather than the rule. Cyclists are rarely given priority. This makes the routes unattractive and slower. Clarke gives Detmold a poor rating and criticises Detmold for:

- allowing no space for cyclists on roads where all lanes were given over to motorists;
- providing poor facilities where paths crossed main roads;
- doing little extra in the way of infrastructure to create good bicycle routes;
- bad path surfaces;
- not allowing bicycles onto pedestrianised streets;
- using little or no imagination or effort to tackle serious problems that make or break any network or cycle scheme; and
- basically shoving the cyclist out of the way for the primary purpose of increasing motor traffic flow.

Bloecher says that more and more bicycles are being promoted in Germany. It is not only money and building of lanes and paths, but it is important that the politicians must really want to promote bicycle use. It will become necessary to make car driving less attractive, perhaps by giving lanes over to bicycles. Despite the push to move people from cars to bicycles the politicians do not do enough to promote cycling. This is because to really promote cycling you have to make car driving unattractive.

4.2 Frankfurt

(Bloecher 1992)

In Frankfurt, West Germany (population 613,000) 13% of trips are made by bicycle. Frankfurt created a new Bicycle Commission one year ago (mid 1991) and appointed Peter Bloecher, a 30 year old university geography graduate, as its director. His responsibility is to plan all bicycle roads/routes, bicycle parking places, public relations and advertisement/ promotion.

Frankfurt's policy is to encourage bicycle use. Bloecher's policy is to integrate bicycles into traffic, not to separate them. In Germany for the last 20 or 30 years all planners wanted to separate bicycles from traffic because this was thought to be less dangerous, however experience over recent years has shown this not to be true. There are a lot of accidents in Germany were bicycle paths cross the road, so instead on the main roads and in the city they will now provide bicycle lanes. In other quarters where people live, on smaller streets, Tempo 30 is used. In Tempo 30[1] zones there are no bicycle paths, lanes or separate ways.

1. The characteristics of a TEMPO 30 area are: (Jürgen 1989)
   • The area is designated with a signpost at the entrance of the area,
   • Right-before-left priority is valid at all junctions through the area,
   • No traffic lights and no lane markings along the roads are applied in the area.

Frankfurt is just at the beginning of its plan. The first bicycle lanes were installed in February 1992 along four main roads. On three of these roads the lanes for cars were wide enough to allow a bicycle lane to be designated. On the fourth road there were 2-lanes in either direction for cars and one of these lanes was given over to bicycles. For these projects parking was not a problem, but parking is in general a big political problem. For the later road where the number of car lanes was reduced there were many angry calls afterwards.

Bloecher has made plans for the next year and is completing a comprehensive plan that calls for more bicycle lanes and a complete bicycle network for Frankfurt. There are very recent funding problems caused by the unification of Germany that are leaving many towns very poor, so implementation will be slower than is desired.

On main roads it is intended that bicycle lanes be used. The bicycle lanes are only for use by bicycles. At intersections the bicycle lanes are sometimes continued, but often they are not continued because most of the traffic politicians think that cars need the space at the crossing (for storage lanes).

On roads in Frankfurt that connect smaller towns at the border of the city to the city and where cars have more speed then Bloecher still wants to install separate bicycle paths, but only because there are no houses and road crossings. As soon as the path reaches a built up area where there are houses, road crossings, and lower automobile speeds then bicycle lanes are used. Where there is enough space for separate bicycle facilities for long distances then paths are ok, but not if you have to cross roads every 100 or 200 m. Pedestrians are permitted on the paths, but this is not a problem because outside of the city there are few pedestrians.

Bloecher proposes to install a *bicycle road* extending from the city to the suburbs. They would like to build the first of these roads this winter (1992). The road will be put together from several parts. At the beginning the road will use bicycle lanes along bigger roads, and then the road will pass through built-up areas and tempo 30 zones. Through tempo 30 zones a sign will be posted indicating that this is a bicycle road and bicycles will have priority. All motorists will be limited to 20 km/h and they will not be permitted to overtake cyclists and will have to yield always to cyclists. This route will have no stop signs.

Many people have said that bicycle lanes are too dangerous, but statistics from Frankfurt and the whole of Germany show why and where accidents happen. They happen because of a 'bad feud' between cyclists and car drivers. The roads that bicycle lanes are to be installed on are roads that cyclists use already with little alternative, so the situation will be better with installation of the bicycle lanes.

Frankfurt proposes a bicycle network that is sometimes on main roads, but also passes through tempo 30 zones. These zones are sometimes faster for cyclists because on the main roads the cyclist must wait for traffic lights that are synchronised for motor vehicles rather then cyclists, while on the tempo 30 roads that run parallel to main roads there are no signals and the routes are sometimes faster.

4.3 Münster

(Moses 1988)

Bicycles predominate in Münster in a similar way to their status in Delft. Alter World War II, the municipality decided to plan in a way that would encourage bicycles. Münster is a university town with some 50,000 students, 66% of whom travel by bicycle. More than 40% of trips made in Münster are by bicycle and for the first time in 1987 bicycle trips outnumbered motor vehicle trips.

Münster has been oriented to the bicycle in a very active way. Separate phases for right turn manoeuvres for bicycles are seen together with promotion of bicycles to a front position at signals with motorists having a subsidiary stop line 10-15 m back from the main signals. Bicycle lanes have been installed at traffic lights with right turn pockets for cars crossing these facilities.

Many years ago the city of Münster had a town wall some 5 km in circumference that has now disappeared. It, however, forms a natural ring road around the city that allowed for cycling, walking and jogging facilities to be established around the city centre. Up to 1500 cyclists per hour use one section that was viewed, the elevated route being complemented by stately avenues of mature trees. In one place a subway with a max 6% ramp allowed bicycles to travel under a major radial road. In a number of areas, cyclists are allowed to travel contra flow in a one way street and are able to operate where cars have been banned.

The cyclists and pedestrians demonstrably have great importance in Münster. Whilst perhaps not applicable to Australian conditions, it indicates what active and aggressive long term promotion of a mode of transport can do in an isolated community, notes Moses.

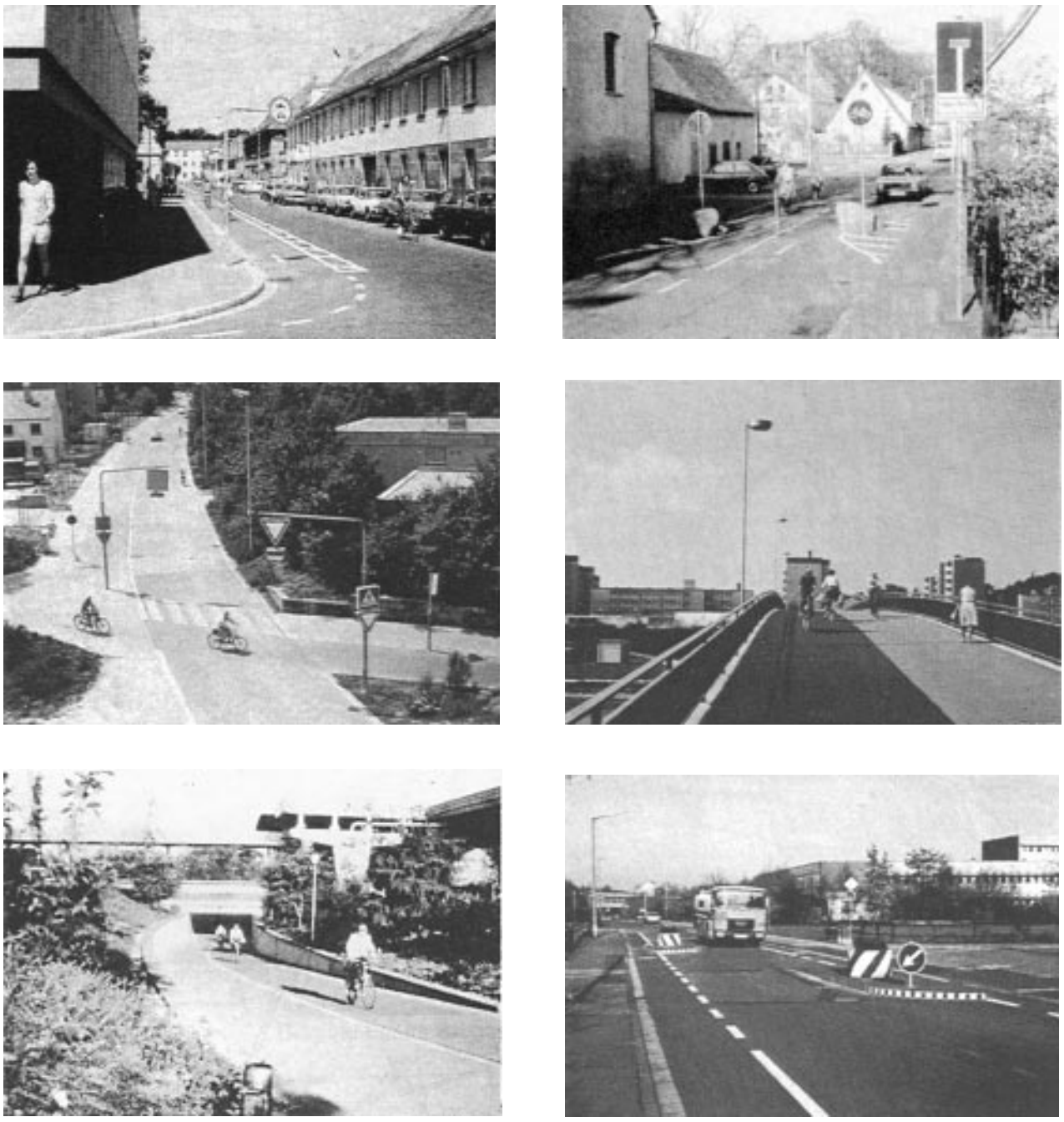
4.4 Erlangen

(ECF 1991)

Erlangen (population 101,000) has a network of bicycle facilities that is highly integrated into the city design and takes cyclists to all corners of the city and surrounds on comfortable, priority surfaces. There are a total of 175 km of bicycle ways, and 100 km of shared bicycle/pedestrian routes.

Priority for the bicycle – this slogan is not used just once a year for Environment Day, but has been determining transport policy in Erlangen since the 1970s. Dr. Hahlweg, the city's Lord Mayor, gave the electorate the election promise of a consistent cycling policy in 1972, was elected and turned the programme into political practice. Even after the election he continued to cycle for his daily transport needs and thus managed to get the promotion of cycling taken seriously. Institutional adoption of concern for cycling followed on from his personal commitment – an interdepartmental working group drew up a blueprint and resolutely and persistently monitored its successful implementation.

The development of a close-knit cycle route network, suitable parking facilities, segregation from major roads, two-way cycle access to one-way streets, traffic restraint, restrictions on personal motor transport, the provision of official bicycles – this comprehensive package of measures was not without success: The bicycle's share of traffic rose from 15% to 30%.



Erlangen (Nöske 1984)

It is written in (Spiegel 1991) that Erlangen is the most bicycle-friendly city in Germany. Large zones, coloured for greater visibility, and the implementation of right of ways for cyclists, have made their concept so popular that the bicycle has become the most popular means of transport in the city.

Erlangen – Bicyle Route Map
(Erlangen 1991)

4.5 Elsewhere

In Hannover (population 600,000) 25% of transport trips are by bicycle. In areas of Tempo 30 the cyclists has right of way across the throats of T-junctions with the whole pavement forming a plateau which the motorist has to mount via a ramp. Other facilities in Hannover include bicycle lanes at intersections. While there are not as many bicycles as in Münster, there are many bicycles on the roads of Hannover. (Moses 1988)

In Buxtehude cyclists are catered for by bicycle paths, protected left turn (across on-coming traffic) pockets and contra-flow lanes. They are also allowed to use pedestrianised areas in the city centre under dual-use regulations (bicycles yield to pedestrians). Cyclists often do not conform to the dual-use regulations. Plateau speed hump placement is coordinated with bicycle and pedestrian needs. One third of residential areas in Buxtehude are Tempo 30. (Moses 1988)

In Hamburg (population 1.6 million, largest city in western Germany) the percentage of trips made by bicycle is 7%, including school children. A reason given for the lower number of cyclists is the distances that need to be travelled in Hamburg from residence to work. Bicycle facilities are available. Due to the size of Hamburg and general public clamour for low speeds in local areas a large area of the residential part of the city has been designated as 30 km/h. Over 6000 signs have been posted designating these areas. (Moses 1988)

Buxtehude – Bicycle Lanes, northern Germany. (Moses 1988)

4.6 Summary

Germany, like other European countries, is moving towards increased use of bicycles for transportation in an effort to reduce dependence on automobiles. German bicycle groups are placing greater emphasis on motor vehicle speed reduction as the means by which cycling will be made safer and more attractive – the facilities provided during the 1980s, little more than stripes on sidewalks, did not make German cyclists happy. Bicycles presently account for 11% of urban trips in Germany, compared with 47% by motorcar. Unlike in the Netherlands where federal policy and funding has supported country-wide installation of bicycle infrastructure, the appearance of bicycle facilities in Germany is more ad hoc. The country appears to be in the early stages of developing greater awareness of bicycle issues, as demonstrated by Frankfurt's appointment of a bicycle coordinator in 1991.

Erlangen and Münster have shown that extensive networks of quality, priority bicycle ways will increase bicycle use. Erlangen's increase in bicycle trips from 15% to 30% is a direct result of government support and action to encourage bicycles for transportation. Detmold teaches the lesson that creating bicycle paths that remove cyclists from the road without providing priority access is not effective. Frankfurt is using lessons learned from other German cities, the Netherlands and Denmark and has chosen to provide bicycle lanes on main roads, priority bicycle routes through tempo 30 zones and off-road paths through open areas that avoid busier, high speed roads.

Stuttgart – bicycle trailer on inclined rail car. author 1985

5. Switzerland

Towns like Basle, Berne and Winterthur have a long tradition of cycling. In these cities measures in favour of bicycle traffic, and that restrict car traffic, are more easily accomplished then elsewhere. Though Basel is very much the cycling city of Switzerland, cycling is very popular all over the country, as well as across nearby borders. There is a dense network of cycling routes, well signposted and special maps for cycling are also available. (Weilenmann 1989), (Jutzi 1992)

author 1992

Biel-Bienne –
Regular sweeping maintains the bicycle lanes on the highway north from Biel-Bienne.
Yellow dashed stripes are used for marking bike lanes.

author 1985

Lake of Luzerne –
Highway cuts along a cliff face, with a path maintained for bicycles.

5.1 Basle (Basel) – Bicycles and Public Transport

(Tschopp 1987)

In Basel City, population 200,000, bicycle use is on the increase and motorcar use is on the decrease. The Canton of Basel has an additional population of 230,000. Accident rates for bicycles have been reduced by half from 1965 to 1985. Reasons for this are the introduction of 50 km/h speed limits, the installation of bicycle routes, more experienced cyclists, and the building of express motorways to reduce traffic in the town streets.

Table 5-1 : Basel – Modal Split for people on their way to work

Mode	Percent
tram/bus	43%
pedestrian	22%
bicycle	14%
car/motorbike	21%

In the city of Basel two long main streets have combined bus/bike lanes. All bridges crossing the Rhine River have wide bike lanes or paths, and bus lanes or tram tracks. Parallel bike routes exist along some tram lines.

Basel – Contra-flow bike lane on a one-way road, *above*.
Biel-Bienne – Bike lanes, *right*.

author 1992

Both Basel City and the Canto of Basel have plans for dense networks for safe, attractive and direct bicycle routes and improving public transport. The parliament of Basel Country granted 25 million francs ($A23 million) for bicycle routes in 1988 (Tschopp 1987). As a result an extensive network of cycle paths and lanes were constructed in the city and its suburbs. It has also become common practice to exempt cyclists from no-entry restrictions. There are many tram lines in Basel. To minimise risk bike lanes are laid out so that they cross the tram tracks at as close to a right angle as possible. (Jutzi 1992)

Public transport and bicycles have a harmonious relationship in northwest Switzerland. Defective bicycles may be transported outside rush hours on all buses and streetcars for a flat fare of 2 francs. Rush hour has no fixed time, but is dependant on availability of space on vehicles. For cycle tourists BLT Baselland Transport carries bicycles in two specially modified tram trailers (25 bike capacity each). For Switzerland's longest tramline (Dornach-Basel-Rodersdorf, 26 km) 18 new articulated streetcars can carry 8 bicycles in a special middle part with a low entrance. The Waldenburgerbahn railway introduced new rolling stock that transports bicycles in 1986. Most post buses can take 1-2 bikes and drivers are advised to do everything possible to help cyclists who are tired and/or who are caught in a rain storm. For the up-hill BVB Basler Verkehrsbetriebe 3 buses are equipped with outside racks. The Federal Railways have plans to introduce free bicycle transport on weekend slow trains.

Bicycle parking at train stations has become very crowded in recent years and parking, provided free to cyclists, is being extended. The bicycle parking is provided by the railroad, but paid for by the community. A billboard company paid for shelters at one station and uses the walls for advertisement.

Bicycles are rented by the Swiss Federal Railways (SSB). Data for the number of hired bikes are below. In 1987 a new company, sponsored by a bank, took over the renting business and replaced the old bikes completely with 2000 new vehicles, including mountain bikes, tandems and children's bikes. It is expected that 80,000 bikes will be hired in 1987.

Table 5-2 : Bicycle Rentals from Train Stations

Year	Number
1952	38,000
1960	36,000
1970	14,000
1980	22,000
1985	52,000
1986	68,000

Basel
(Winterthur 1988)

5.2 Bern – Bicycle Facilities

(Balsiger 1987)

The Bicycle Coordinator for the City of Bern suggests that if one wants to promote cycle traffic, one must deal with the following question: How can one improve traffic conditions in favour of bicycle traffic? A most important step is certainly to enlarge the amount of road space available for each and every single cyclist and therefore create a situation where the bicycle's usefulness in comparison to the car's is increased. Obligatory bikeways which simply serve to remove bicycles from the road may limit the bicycle's useful flexibility and in the end have a discouraging effect on the would-be cyclist. On the other hand measures which make a cycle route faster, safer and more convenient, be it through construction of special bikeways or the favouring of bicycles on the existing roads, may well turn a car driver into a cyclist.

Bikeways should have the same status as superhighways – they are an additional offer to the normal roads and no longer to be misused as a method for clearing the cyclist out of the car driver's way. Bikeways and back roads often only fulfill the needs of a minority (e.g.. children, sightseers, weekend cyclists). It is the normal road that has to deal with most of the day-to-day traffic and despite voices to the contrary, it is exactly here, on the existing roads, that successful measures can be taken to improve traffic flow, above all with specially marked bicycle lanes. Bicycle lanes accompany motorists and constantly remind them that cyclists use the road too.

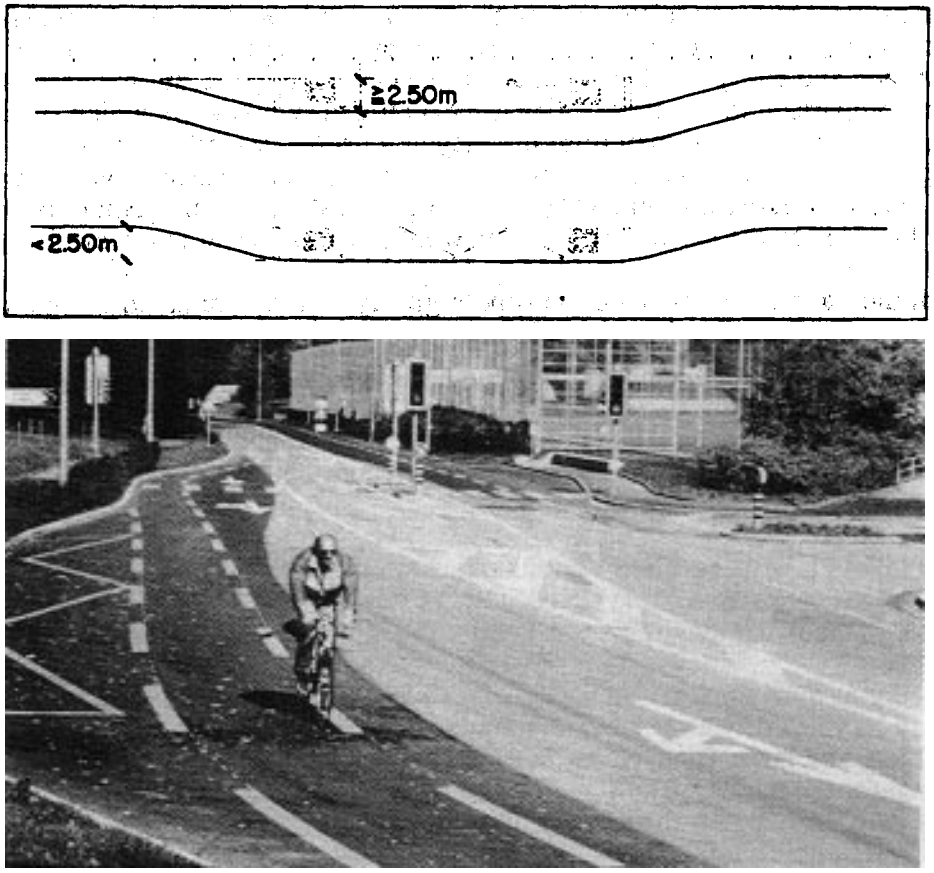
Apart from bicycle lanes, there are various other simple measures at hand which make the situation much more attractive for cyclists. These measures transfer the location of the cyclist from the gutter to the roadway.

- precedence at roundabouts
- two-way bicycle entry and exit to one-way roads
- special left turn lanes for cyclists (lanes that are less wide than the norm, however sufficient for the cycle traffic)
- islands to increase the cyclists safety where roads fork
- adjustment of lane widths to accommodate the cyclist
- widened bike lanes at cross roads so that cyclists can wait in front of motor traffic
- early green at traffic lights for cyclists only

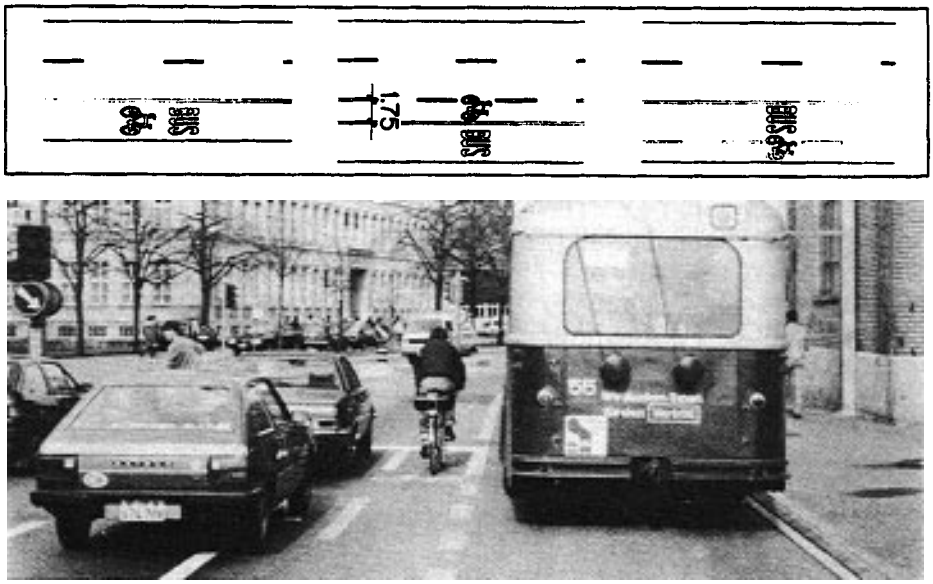
5.3 Winterthur

(ECF 1991)

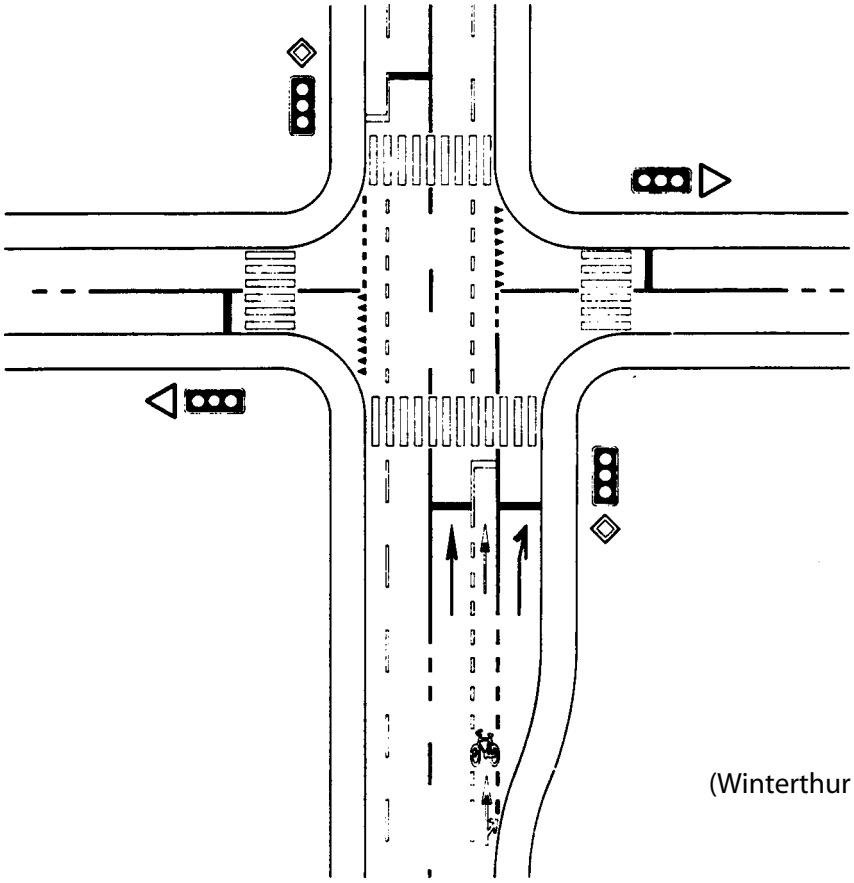
Systematic promotion of cycling has earned Winterthur (population 87,000) the reputation as "Switzerland's most cycle friendly city". This is backed up by a sensible cycling policy and expert cycle route planning which are being translated into a growing infrastructure and a cycle-friendly climate. The objective is the development of a network of some 150 km in length, of which about half is already complete. The emphasis on on the construction and signposting of continuous cycle routes and not spectacular one-off and site-specific projects. As a result the main axes of the network in the "City of 7 Hills" run in green corridors along the broad valleys, have no major climbs and thus encourage cycling. Only short distances have to be travelled to reach the historic city centre. Personal motor transport is limited, e.g. by speed restrictions and the removal of commuter parking spaces.



Luzern – Bus Stop (Winterthur 1988)



Winterthur – Bus and bicycle lanes (Winterthur 1988)



(Winterthur 1988)

(Winterthur 1988)

6. Sweden

Background

(Trevelyan 1976)

Cycling in the towns and cities of Sweden is so convenient and safe that it attracts, nationally, upwards of 30% of all trips[1]. A great deal has been done for the cyclists, and more is planned. It is generally accepted by planners, engineers and the public that facilities should be provided for the cyclists, in the same way as for pedestrians, public transport and the motor car.

The role of central government is to provide finance and guidance. An official cycle route design manual contains advice on how to obtain a consistent standard throughout the length of a cycle route network.

Sweden's ideal bicycle network is separate from the road network, with at-grade junctions used only at less important crossing points, and takes the shortest routes through rather than round the residential and commercial areas. Typically, much of the Swedish post-war suburban development includes combined bike/pedestrian paths, although the standard of provision varies greatly. In general paths are over 2.4 m wide, with underpasses at the major road crossings.

Dual use by bicycle and pedestrian is not considered a big safety problem, though elderly pedestrians would prefer the cyclist to be integrated with motor traffic (Moses 1988). A European Commission study, however, indicates that cyclists have more conflicts with pedestrians in Sweden then in any other European country (Bracher 1988a).

A large part of recent study (1976) has been devoted to the design of signalised intersections, underpasses and other methods by which a bicycle route can be carried across the existing road network in the older built-up areas.

Problems have been experienced with cyclists at intersections, be they light-controlled or allocation of right-of-way by roundabout. At traffic control signals it has become practice to introduce the cyclist into the main traffic flow prior to the intersection rather than cater for the cyclist by a parallel walk as problems had been encountered with turning motor vehicles coming into conflict with cyclists. At roundabouts the cycle lane is preferred just outside the trafficked way as a separate facility even though it was agreed that this was still not a truly satisfactory solution. (Moses 1988)

1. The claim that 30% of trips are by bicycle does not coorelate with other information. In some cities over 30% of trips are by bicycle, but the only national figure found indicates that 7% of trips are by bicycle (Bracher 1988a).

Design of Bicycle Facilities

(Ljungberg 1989)

Ljungberg presents the ideas of a group of 9 persons working on research with traffic planning at the department of traffic planning and engineering, University of Technology. The research deals more with the question of how to handle the cyclists that we have today, rather than how to get more people to ride bicycles. The goal for bicycle planning is to produce good bicycle facilities. A good route is as safe, trafficable and comfortable as the alternative mixed traffic streets. There are three aspects to good bicycle planning: safety, trafficability, and comfort.

Safety. Bicycle paths separate from the road are not necessarily safe. Accident studies from Lund and Malmö show that there are a lot of single vehicle accidents on bicycle paths – about 2/3 of accidents are of this kind – even though single accidents are the most underreported. It was found that the design and maintenance (or lack thereof) of paths caused a lot of the accidents. In mixed traffic 39% of accidents were caused by design and maintenance reasons, while for bicycle routes this figure is 58%. It was also found that the risk of being injured in a bicycle accident is as large on bicycle routes as in mixed traffic – even the severity of the accidents are equal on the two different types of environment – the method of determining this uses the idea to use accidents that are independent of the environment as a measure of the exposure.

Trafficability. A trafficable route is direct, allows free choice of speed and is continuous. It is important that bicycle routes go direct from origin to destination. We must remember that the cyclist is something between a pedestrian and a car driver. If the cyclist must make a long detour they will always choose another, more direct, but maybe more dangerous way. The route must give the cyclist the right to choose their own speed in most cases. If the route is too narrow, or curves have too small a radius, the cyclist will choose the streets instead because they are designed for speeds of at least 50 km/h. Also, the route will only be as good as its weakest point.

Comfort. A comfortable bicycle route has reasonable grades, smooth paving, convenient radii. Tunnels are better than bridges because they minimise grade. Surfaces should always be asphalted. Slopes between a bicycle path and the street must be smooth – no kerbstones should be used. Mixing pedestrians and cyclists when short of space is best accomplished using asphalt for cyclists and concrete tiles for pedestrians.

6.1 Malmö

(Ahlström 1989)

Malmö (population 250,000) is the swedish city situated opposite Copenhagen. It has experienced similar development in bicycle traffic to Copenhagen. It is the most suitable city to cycling in Sweden,with level terrain and very few days of snow.

During the 1950s and 1960s a lot of bicycle tracks were removed in Malmö, but in the new residential areas bicycle roads were built away from the car traffic. With the resurgence of cycling during the mid 1970s it became necessary to connect the new residential areas with the downtown areas. A two way track on one side of the road was chosen, the alternative being one way tracks on both sides. Two way tracks saved space and were chosen also because suburbanites had become used to two way tracks. 1000 km of tracks have been built since 1975, with annual expenditures presently at $A1.2 million per year.

The risk of traffic accidents on the bicycle network has risen by 50% during recent years. What is thought to be the cause of this increase is a feeling of security by cyclists who expect to be safe at intersections – a safety that could not be provided. The planning and design of the bicycle facilities was too ambitious and money was not available to prevent some bad, half solutions.

Malmö – Bicycle Path (Moses 1988)

There are a lot of conflicts between cyclists and pedestrians. The bicycle roads are too narrow, with too small curves – The speed of cyclists was not understood when the paths were designed. Bends and bad curves cause accidents. Not enough paint was used to guide bicycle traffic.

Malmö has learned from its mistakes. Where two way bicycle tracks cross side streets bicycle tracks have been rebuilt to give better vision for motorists to see cyclists. There are now three standard designs for when bicycle roads cross ordinary roads, with the choice of design depending on the amount of traffic. Where there are more cars than bicycles then cars get priority and two different solutions are possible: one with speed humps to slow motorists, and one without, depending on local conditions. When there are more bicycles than cars then priority is given to the bicycle, this being easily apparent in the design.

At signalised intersections cyclists are, by law, permitted to ride to the right (left) of car traffic to the stop line. Because cars and buses keep close to the kerb a painted 1.5 m wide bicycle lane leads up to the stop line to allow cyclists to pass. In some places cyclists have an advanced stop line so that they can be in front of the cars when the light turns green. In other places cyclists get a green light 10 seconds before the cars so that cyclists are out of conflict points when the cars start driving. In a huge intersection with a lot of left (right) turning cyclists then the cyclist is helped through with painted blue crossings - this works well.

Traffic signs are standardised, but in parks some signs have been put up that are a bit different. One meant for cyclists reads *Take Care of us Pedestrians*.

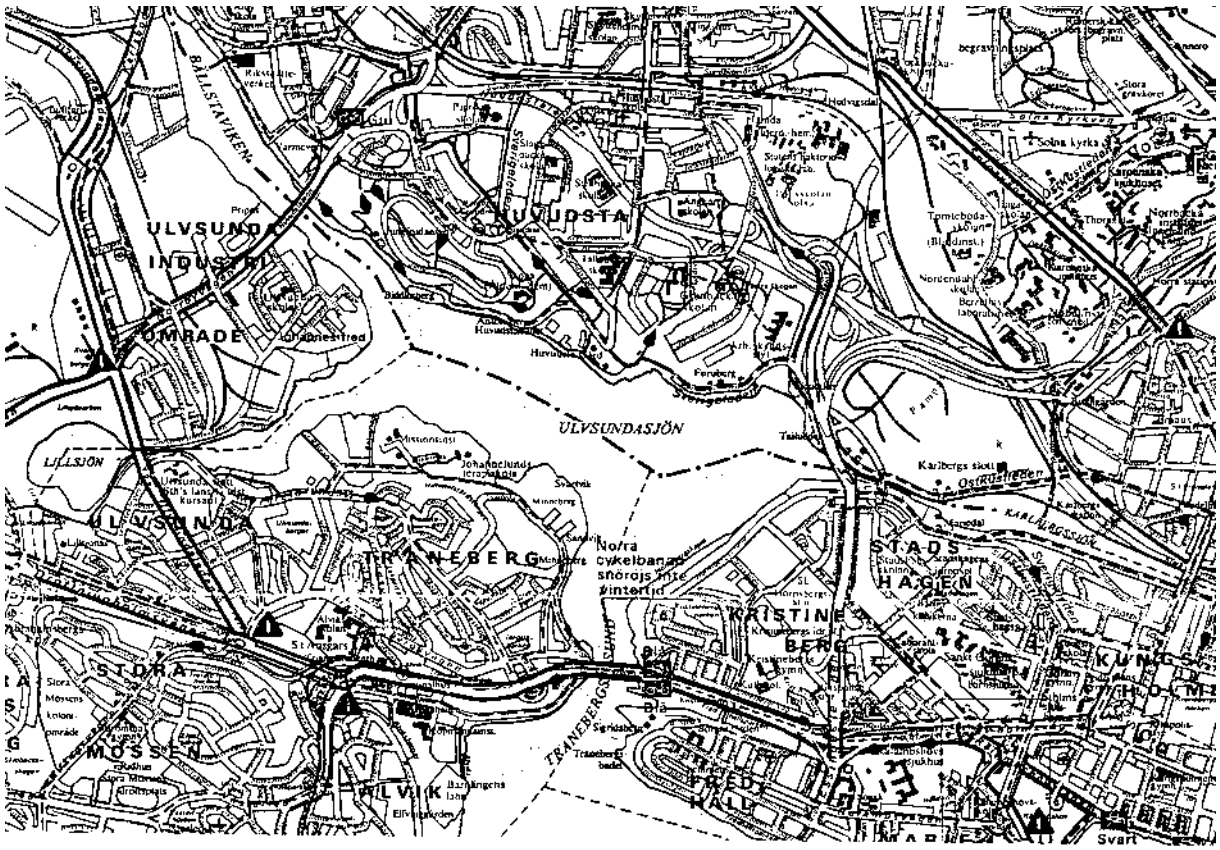
6.2 Stockholm

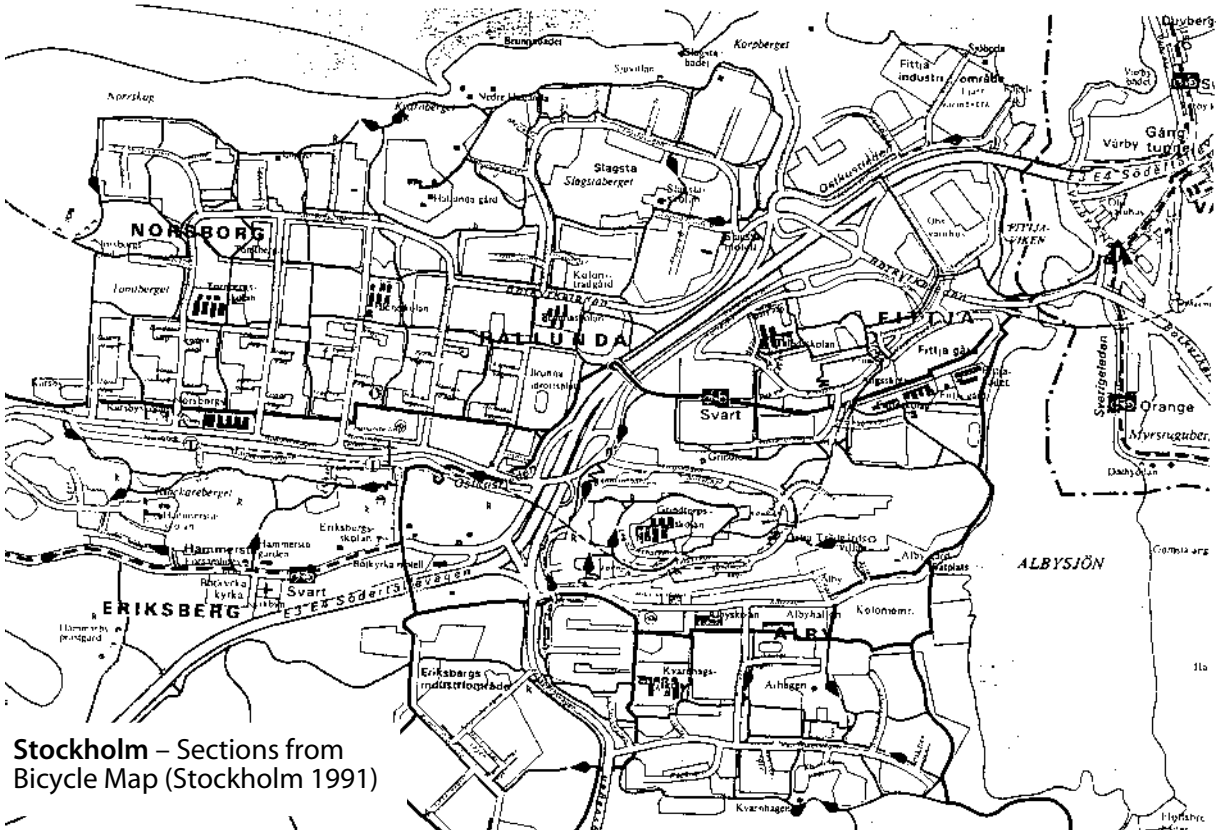
Stockholm (population 2 million) published a bicycle route plan for the metropolitan area in 1975 with aims to link up the many existing lengths of bicycle route in the suburban areas and to extend them into the centre of the city. The City Council adopted a policy of creating environmental areas from which through traffic is excluded as part of its overall road strategy. Cycle routes run through these areas and all road closures now include a gap for the passage of bicycles. (Trevelyan 1976)

Though the general aim is to segregate bicycles from motor traffic, the denser city areas make more use of on-road facilities such as bicycle lanes. Extensive use of prominent on-road line markings bring cyclists right into the older parts of the city. Narrower city streets are often made one-way for motorists but have contra flow lanes for two way bicycle access. (Trevelyan 1976)

During the last decades the number of people working downtown has increased rapidly whereas the number of people living downtown has decreased. The underground subway system functions well on a radial pattern, but not so well connecting between suburbs. There are no tramlines of significance. Today almost 600,000 cars go into the city every day, with resulting traffic jams, pollution and accidents. Old buildings moulder and much of the character of Stockholm has been lost by the modern city planning, with motorways destroying the genuine picture of the city. All political parties agree that something must be done to reduce the number of cars. (Dreber 1989)

From January 1990 every car has to pay SEK 300 ($A70) per month to get into the city. The fee also includes a monthly public transport ticket, and some of the money will go towards financing more and better public transport. During the last 10 years many different kinds of restrictions on car traffic have been tried. Some examples include fewer car parking places, more bicycle paths, and more room in the streets for buses and public transportation. In spite of all these efforts the number of cars has increased and drastic responses are necessary. A new plan for Stockholm, Trafikplan 89, is now in preparation and will call for improvements to public transportation, noise protection, economical incentives to reducing car traffic, bicycle ways and parking politics. (Dreber 1989)





Stockholm – Sections from Bicycle Map (Stockholm 1991)

Access to housing developments via path system.

Hero Weston

6.3 Västerås

(Moses 1988)

Västerås (population 100,000), a city some 80 km inland from Stockholm, has an outstanding example of a well developed bicycle route network. Västerås commenced traffic planning very early for Sweden with its first traffic plan, a comprehensive plan that catered for pedestrians and cyclists as well as cars and buses, during 1958-60. The motivation for the plan was a local government councilor who was very interested in traffic. The plan has been implemented over the past 25 years with the construction of an inner ring road being a high priority.

Progress on cycling facilities has occurred continually over a long period because of the traffic plan, and since the early 1970s $A400,000 has been directly allocated to cycling facilities annually. With coordination of major works where cycling facilities were included as an integral part of the project about $A600,000 was added to this amount. Over the years this has resulted in 260 km of cycleway together with 158 bridges or underpasses. Paths are mostly two-way, shared with mopeds and lit at night. "Like Münster, Delft and Buxtehude the car seemed to have become a more equal partner in the traffic sphere in the central city of Västerås."

There are over eight radial routes from the central area to the suburbs. The town centre is very much oriented towards pedestrians and bicycles with three main shopping streets pedestrianised (two of these carry heavily used bicycle routes). Over 1000 bicycle parking spaces have been provided in these streets alone. The accident rate of this system is good, with most accidents occurring where cyclists have needed to use the main road, and the only fatality involving two cyclists in a pedestrian/bicycle underpass. Most accidents on the network involve mopeds. (Trevelyan 1976)

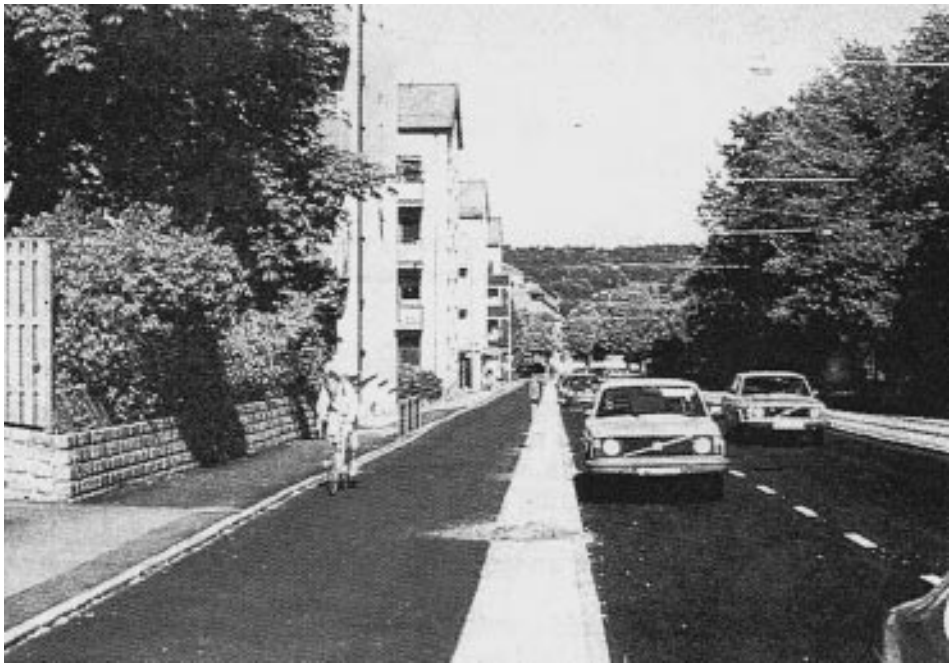
Negative speed humps were used in Västerås along a four lane road carrying 7000 vehicles per day. The negative hump measures 3.6 m in length by 1.85 m in width with a depression depth of 100 mm. The depression is accomplished in a 300 mm width causing cars to enter it with a general speed reduction, buses to straddle it, and bicycles to pass unobstructed. Refer to (Moses 1988) section 7.73.

6.4 Göteborg (Gothenburg)

(Moses 1988)

Göteborg (population 500,000) is the main port on Sweden's western coast, home to Volvo's main manufacturing plant, and the second largest city in Sweden. Göteborg has a 5-point plan for the provision of cycling facilities:

- To complete the planned network.
- To separate where possible cycles and pedestrians. A width of 4 m is required for this, 2.5 m for the bicycle path and 1.5 m for pedestrians.
- Enhance riding conditions by smoother surface and cleaning of bicycle paths.
- Modification of cyclist and car behaviour where their routes cross. This can be achieved by signal control or raised plateaux which are effective but expensive.
- Monitor the effect of the lanes and paths in relation to accidents and facility.



Göteborg – Cycling Facility (Moses 1988).

7. Britain

The general transport policy in Britain is shifting more towards what it was like 30 years ago in the United States, with a build-more-roads ethos. Today's urban cyclist in Britain is obliged, almost everywhere, to share the limited road space with an ever-increasing press of motorised transport. All too often this means cycling is both dangerous and unpleasant. One result is that less than 5% of journeys to work are made by bicycle. However there are a few of pockets of hope, and a larger number of towns and cities that are showing at least awakening signs.

Background

mostly from (Davies 1987)

Bicycle use in Britain declined rapidly during the 1950s and 1960s with the spread of the motor car. Usage fell from 16.2 billion kilometres in 1956 to 3.4 billion kilometres in 1974. Planners did not question this trend as universal car ownership was anticipated to soon arrive and environmental consequences had not emerged. The fact that the bicycle remained a major mode of transportation in some parts of the country, namely Cambridge, York, Middlesbrough and Crewe, was ignored. Indeed, the fall in cyclist casualties encouraged the authorities to take no action to arrest the decline in bicycle use.

The idea that the main purpose of transport planning is to provide for the motor car is particularly strong in Britain. Moreover, the cycling lobby was very week in comparison with the powerful interests of the road lobby. The very simplicity, cheapness and undemanding nature of cycling meant that it was not taken seriously.

Bicycle sales in Britain began to increase during the 1970s. 1974 saw the end to the years of decline and cycling rose by 60% to 5.2 billion kilometres in 1984. This rise was not uniform throughout the country. Counts in central and inner London showed increases of 70% between 1977 and 1984, but much smaller increases in outer areas.

With an increase in bicycle ownership and use came an increase in campaigning to promote cycling and to make it safer. Cycling organisations such as the Cyclists' Touring Club were joined by environmental organisations such as Friends of the Earth and during the 1970s and 1980s a Cycle Campaign Network of local cycle groups from around the country was formed. These groups have been criticized by some for having unrealistic expectations and by others for being too moderate. They can be credited, however, with raising cycling issues with local and national government and with possessing some of the best research and advice on cycle planning that exists in the country.

The 1977 Transport Policy White Paper was the first indication of a change in the Government's attitude towards cycling. It recommended that local authorities should consider helping cyclists by means of traffic management schemes and providing parking stands. In 1982 the Secretary of State for Transport (Norman Fowler) announced the Government's Cycling Policy and, for the first time in recent history, the Government expressed a clear desire to encourage cycling. Local authorities were offered funds for innovative cycle schemes and were encouraged to include cycling in their Transport Policies and Programs (TPPs). The initiative was laid clearly upon local authorities with the Department of Transport playing an advisory role only.

Since 1982 the Department of Transport has increasingly concentrated its cycling policy on reducing cyclist accidents. This has sometimes meant restricting the freedom of cyclists, such as banning them from certain trunk roads, and using publicity that tends to blame cyclists for having accidents. The Department of Transport's advice on cycling issues is sometimes regarded as "silly".

The Department of Transport has control over national motorways, bypasses and major trunk through highways, with the 47 country-wide highway authorities controlling the remaining roads. One of the Department of Transport's Policies is not to promote cycling because there are still a lot of motorised vehicles on the road and cycling can be dangerous. The Department of Transport encourages any one who wants to cycle by encouraging local authorities to provide facilities. The regional offices of the Department of Transport attempt to accommodate cyclists on trunk roads during building or reconstruction. (Keswick 1992)

The Department of Transport and the transport industry in Britain is dominated by engineers who tend to emphasis engineering solutions to transport problems. That is, to build more roads with larger junctions in response to forecasts of growing traffic levels. Most traffic management measures still seem primarily geared towards increasing the capacity of the road system for motor traffic, reducing congestion and increasing motor traffic speeds (McClintock 1989). Various attempts have been made to apply engineering solutions to cycling problems although the amount of money invested has been extremely small. In total, local authorities spend less than £2 million, 0.2% of the Transport Capital Budgets, on cycling facilities each year.

The best publicised although by no means only example of poor provision for cyclists are the Redways of Milton Keynes New City. This totally segregated network of paths for pedestrians and cyclists was a concept added onto the Master Plan sometime after it was first adopted in 1970 and the basic 1 km grid of roads was established. The Redways are often viewed as the ideal solution to cyclists' problems – mostly by engineers who never use a bicycle – but bicycle groups have strongly criticised the Redway for its substandard design. Many serious accidents occur on the Redway and 50% of cyclists in Milton Keynes prefer to use the grid road system. It was only recently in 1988 that the Milton Keynes Development Corporation finally agreed to a comprehensive programme to remedy these defects (McClintock 1989). Clearly from this example segregation is no panacea and is not feasible in many existing towns.

Some local authorities in Britain plan and provide cycle schemes. The number of such authorities is growing steadily, though they still represent a minority. About 70 councils are now members of the Local Authorities Cycle Planning Liaison Group that was started in 1984. This groups meets twice a year, along with representatives from the Cycling Advisory Group of the Traffic Advisory Unit in the Department of Transport, to exchange experience of the planning and implementation of facilities. Meetings are held at places with schemes *on the ground* and a period of 2-3 hours is devoted to inspecting these at first hand, and discussing their experience. (McClintock 1989)

There are transport supplementary grants of £43 million per year which cycle schemes can qualify for if they meet certain criteria, one of which is safety. Proposals must be put forward and the Department of Transport can approve it, but not all schemes get funded. Some cities are very pro cycling and will provide cycling facilities at their own expense, other cities tend not to be, depending on the make-up of the local authority.

With a green tinge towards politics, cycling is becoming more included. The pressure groups are getting more and more active, and are gaining successes with some politicians at local and national levels. The lobby groups are attacking traffic calming to ensure that bicycle are integrated.

Most bikes in the UK are much lighter and faster than those in the Netherlands. Smoother surfaces and better visibility at junctions are therefore all the more important in the design of facilities. (McClintock 1989)

Health and Safety

(Hillman 1992a)

Public-policy decisions involving cycling have been developed on the assumption that cycling is a dangerous activity likely to result in loss of life or severe injury. Nevertheless studies commissioned by the British Medical Association (BMA) indicate that there are benefits to those undertaking regular exercise, such as cycling, through improved health, fitness, and possibly longevity.

BMA analysis showed that the ratio of life years gained against life years lost was about 20:1. The life years lost was determined by looking at the life expectancy of cyclists killed and the life years gained was determined by relating the increased longevity of those who engage in regular exercise throughout their lives multiplied by the number in the population who regularly cycle. (Hillman 1992b)

Cycle Routes Program

In 1982 the Department of Transport requested County Councils to submit proposals for a network of cycle routes. The Department agreed to pay half of the costs, plus monitoring of results. Nottingham County Council was the only submission with anything like a network of routes and is discussed under its own section in this document. The other projects that were undertaken were individual routes. These routes were only slightly successful with bicycle traffic along the corridors increasing only marginally.

Britain's Top Cycling Cities

from (Matthew 1992)

The top four cycling cities in Britain, as selected by *New Cyclist Magazine* all have transport policies that put unnecessary car use at the bottom of their list. The cities of Peterborough, Cambridge, York and Oxford have, as a result, created bicycle-friendly cities. Attempts to help cyclists are city wide. Coherent networks are either in place or planned. There are designated and enthusiastic staff working hard on cyclists' welfare, usually in close conjunction with local cyclists and campaign organisations. Other strong points of these cities included: long term strategic planning, a regular financial commitment, wide-ranging programmes, and positive transport policies. This last point is crucial because it was in these cities that bicycles were explicitly valued as civilised and environmentally-friendly modes of transport – not a problem but a solution. However none of these cities could be regarded as a cyclists' paradise. Their work strongly points the way forward for Britain's other urban areas.

7.1 York

from (Matthew 1992)

Leading the way in Britain is York where 1/4 of all journeys to work are by bicycle. The city has made enormous progress in implementing a progressive transport strategy within the last two years. York is implementing a bicycle route network, special facilities, traffic calming, bicycle parking, and is catering for both recreational and utilitarian cycling. There is obvious drive and determination behind its work and local cyclists fully realise the genuine commitment given to cyclists. When implementing transportation measures York City Council gives priority to road users in the following order:

- pedestrians
- disabled persons
- cyclists
- public transport (including park-and-ride, and taxis)
- commercial and business vehicles requiring access
- car-borne shoppers
- coach-borne shoppers
- car-borne long stay commuters and visitors.

7.2 Cambridge

from (Matthew 1992)

Cambridge scored high because of its long-standing bicycle culture and its extraordinary willingness to experiment with new types of facilities to benefit cyclists. It has a continuous programme of new improvements, and high priority is given to cycling in the new Local Plan, and attention is paid to cyclists at main road crossings. Of all places where it was a pleasure to cycle Cambridge seemed best.

7.3 Peterborough

from (Matthew 1992)

Peterborough was ranked third by *New Cyclist* simply because of its cycle network, 40 km of cycle lanes and routes and 100 km of segregated routes. Most of these routes afford pleasant cycling, are popular and well-used, have a good range of cycle crossing facilities, and link well with shops, schools and work places.

7.4 Oxford

(Coates 1992)

Oxford is rated Britain's fourth best cycling city, because of its long standing traffic restraint policies. Cyclists clearly felt happier on the road and as a result cycle use doubled in the 1980s. However, the range of actual facilities is felt to be less than the top three cities, and cyclists still bitterly regret their exclusion from Cornmarket Street and Queen Street – central routes that buses and even taxis are allowed to use. A whole new deal for cyclists is likely to emerge from a new transport study that is currently under way. (Matthew 1992)

The city of Oxford (population 150,000) is more advanced than other areas of Britain in terms of traffic management policy, but perhaps not the leader when it comes to actual facilities on the ground. Oxford has had a *balanced transport policy* for the past 20 years which encourages cycling and public transport as opposed to cars. This has lead to a lot of investment in bicycle lanes on carriageways, bicycle routes, and reductions in car parking spaces in the city. New developments in the city are not allowed to provide parking spaces. In the last five years Oxford county has also adopted this balanced transport policy.

Oxford has always had a large population of cyclists, a significant percentage of which are students. The trend in Britain has been a decrease in cycling, while Oxford has managed to retain its level of bicycle use. Between 1972 and 1982 the number of bicycle trips increased 150% The trips made by bicycles into Oxford, as measured by cordon counts, accounted for 9.4% of vehicles in 1972, 21.3% in 1982 and 26% in 1984 and has since levelled off so that currently 20% of trips are by bicycle.

In 1973 the balanced transportation program was introduced and traffic constraints and a number of bus lanes on radial roads began to appear – bicycles were permitted in the bus lanes. By not providing for motorists people are influenced to use other modes of transport. Apart from a few facilities there was not much in the way of special bicycle facilities during the 1970s. The first bicycle lanes began to appear in Oxford in 1982. Their network of bicycle lanes on carriageways is the most extensive in Britain. The planning department aims to create a complete network. Resources are limited and it is intended to target trouble spots and to provide new facilities during road reconstructions and new site developments.

A minor innovation has been the continuation of bicycle lanes across minor priority intersections, reminding motorists of the presence of cyclists. Though standard practice in other countries, the Department of Transport advises against this.

The bicycle subcommittee of the Highways and Traffic Committee, a group that includes delegates from cycling organisations, have set targets to increase cycling by 30% in Oxford during the next five years. This target will be difficult to achieve but it is being taken seriously. The city council planning department is pro-cycling and have, with the help of the engineering department, recently revised plans that have identified additional corridors where Oxford would like to provide cycle routes – on carriageway as well as segregated from the carriageway on back road routes. Oxford is also taking measures to protect cyclists on trunk routes. Oxford engineers attend the Local Authorities Cycle Planning Liaison Group.

Oxford – The Advanced Stop Line – priority for cyclists over motor vehicles. (Maher 1991)

7.5 Nottingham

Nottingham (population 250,000) built a cycle route network of four routes covering the southern part of the city. Main roads in Nottingham are unpleasant to cycle on and the political will does not exist to allow car space to be lost on these roads. Nottingham adopted a policy of taking cyclists away from the main roads and onto back streets. The routes are quite direct and well signposted, however cyclists are rarely given priority along these routes in the event of the routes or lanes being broken by side roads or garages. (Clarke 1987)

Along the back street routes fast moving traffic, dangerously parked cars and poor road surfaces are common, making the routes less comfortable than is desirable. Inevitably these routes encounter main roads where well engineered traffic signals and crossings are the common provision. One of the main routes into Nottingham ends at a 5-lane ring road and across this road is a shopping centre that does not allow bicycles through. Two pedestrian bridges formerly banned to cyclists provide improved access. (Clarke 1987)

The network serves only certain parts of the city, and untouched areas are dreadful for cycling (Matthew 1992). Nottingham is a member of the European Cycling Federation's *Cities for Cyclists* union, is hosting Velocity 93, is continually upgrading its bicycle facilities, and clearly has aspirations of increasing its commitment to cyclists.

8. Italy

Despite being the major producer of bicycles in the world, the 5% bicycle modal split in Italy is well below the European average of 12%. It is another example of a country who has encouraged uncontrolled motorcar use through government policy and motorcar manufacturers' publicity. The effects on urban centres are becoming critical. Attitude of the general public towards bicycles remains poor. (Squarcialupi 1987)

Italy is well behind other European countries with respect to cyclist facilities. Only in recent years has the introduction of bicycle lanes even been considered, and indeed in most large cities Italy is still in the planning stages (and in many cities not even that). Some notable exceptions are Verone, Vicenza, Bologna, Parma, Modena and Torino that each have, to a greater or less extent, a network of bicycle lanes. In Milan little has been accomplished and there are but a few bicycle lanes of little practical utility that are often only an after thought to more serious public works. (Squarcialupi 1987)

There is a growing pressure for more facilities for bicycles from a growing number of bicycle associations. The main objective of such organisations is the introduction of bicycle lanes in every city and the adoption of all measures that could facilitate the use of the bicycle and render it a safer means of transport. Bicycles on trains is another issue which these groups are pushing. The organisations have set targets of 10 to 12% of urban journeys to be taken by bicycle, a doubling of present figures. (Squarcialupi 1987)

Table 8-1 : Modal Split in Italy
(Squarcialupi 1987)

Mode	Percent
car	53%
bicycle	5%
motorcycle	4%
walking	18%
public transport	22%

8.1 Restricting Traffic in Milan

(Ricardi 1989)

At the beginning of the 1980s excess use of private cars was resulting in traffic congestion, atmospheric and noise pollution, and utilisation of every possible urban space for parking (in particular abusive parking on sidewalks and green spaces). Steps to demotorize the city became necessary and a referendum in May 1985 indicated that 70% of the Milan population favoured restrictions on traffic circulation in the city centre.

Access limitations during the 7h00 to 10h00 time, Monday to Friday time period were introduced in July 1985 The protected area was 5 square kilometres, indicated by road signs and road blocks manned by traffic wardens. Only public transport, taxis, police, emergency vehicles, doctors on house calls, transporters of merchandise and valuables, residents, anyone possessing an off street parking place, out of province and foreign license plates, hotel automobiles and a few other categories were permitted, when accompanied by a special pass.

Controversy resulted, not only from minorities defeated in the referendum (including shopkeepers and car lobby groups) who were fighting to liberalise traffic in the city centre, but also from other groups who criticised the lack of implementation of other policies to complement the city centre limited access viability programme. During this debate the hours of restriction were extended to 7h30 to 11h30 in 1986, to 13h00 in 1987, and finally to 7h30 to 18h00 in 1988. The result was an increase in public transport patronage by 4.5%, while other cities in Italy faced declines in public transport patronage, an increase in bicycle traffic, and many more automobiles left at home. There was also an increase in congestion in areas bordering the restricted access area.

Though overall a positive step for Milan, a more comprehensive programme should have been implemented which included:

- Development of public transport.
- An integrated fares programme for public transport across Milan.
- Creation of parking places near subway stations in the suburbs.
- Creation of bus terminals in the suburbs to link with the urban public transport system.
- Moving customs offices far from the city to eliminate this source of heavy vehicle traffic.
- Introducing regulations with regard to loading of goods.
- Extended hours for shops, including late evening, to spread traffic over the day.
- Introduction of pedestrian islands in the city centre as well as the suburbs.
- Concessions to facilitate bicycle traffic.
- Above all, decentralisation of services, particularly those attracting large amounts of vehicle traffic.

It should be noted that the associations of urban cyclists are particularly unhappy because very little has been done to facilitate bicycle circulation in a safe manner. Not only the fact that a significant programme of bicycle paths and lanes, speed limits of 30 km/h on side streets has not yet taken off; not only that after introducing bicycle hire points in the city centre this service was left undeveloped; but also because there has not been made any effort to install bicycle parking fixtures inside building courtyards or in public areas around the city, to the extent that it is almost impossible to find an unoccupied pole to lock your bicycle to when you are obliged to leave it on the street.

9. France

Progress

(Desplats 1989)

Until 1982 development of urban traffic was a State priority and subsidizing ran at up to 40%. Changes in 1982 saw decentralisation of responsibility for development policy passing to local authorities (towns, counties, and regions). The State retained its regulatory and standardisation function. In 1982 therefore the safety of urban cyclists also came under the control of towns, who found themselves at the same time confronted with the problems of managing a very considerable road network, increasing car traffic, and the necessity to improve public transport. Bicycles have not been given much attention amongst these other priorities.

France is a society where the automobile has become the symbol of social success and modernity. The resultant ever increasing number of bicycle accidents gives cycling a dangerous reputation and, to date, very little has been done to obviate this situation. In France cycling is regarded as a sport and leisure activity and little thought is given to the concepts of bicycle transportation. Behavioural studies indicate that this mentality may favourably alter with time.

Faced with deterioration of traffic conditions for two-wheelers (mopeds and bicycles), towns are beginning to react. In 1983 Bordeaux took the initiative of putting a town councillor in charge of bicycle safety for the very first time. In 1987 in Bordeaux a multi-disciplinary working committee, Villavelo, was set up, comprised of elected representatives, technicians, users, and specialists in traffic and road safety. The committee set to work on the improvement of road safety in town, and proposed a new way of getting about in the town centre.

In 1988 a club of cycling towns was created. Along the same lines and following the same initiatives as Bordeaux, several french cities and official organisations have formed associations within the club of cycle towns, determined to pool the benefit of their respective experiences, to think and put forward proposals. The aim is to create a dynamic movement to improve the safety of cyclists in urban areas. Founding towns in the club are Bordeaux, Toulouse, Queven, Strasbourg, Arès, Lorient, Saumur and Mérignac.

The club will act at three levels:

European. To encourage the creation of regulations and road signs applicable to all European countries for this mode of transport.

National.

- To propose an agreement with the SNCF (french railroad) covering the entire country to allow bicycles to accompany passengers on trains.
- To propose an agreement with the national conductors of heavy goods vehicles to have exhaust fumes, in particular, aimed upwards, as in the USA, and not in the face of cyclists.
- To propose an agreement with the national constructors of bicycles to improve standards. For example, theft proof systems, identity plates, stands, lighting.

- To encourage the creation of a road safety training diploma for children aged around seven (as in the Netherlands).
- To propose a reform, in legal terms, of the highway code, for questions relating to rules of priority.
- To meet regularly with the Minister of Transport.

Municipal. On this level, simple and sensible measures can considerably improve the safety of bicycles and mopeds. The members of the club will be particularly attentive to the following basic principles:

- Cycling as a mode of transport will be taken into account in any new development or redesigning of the road system.
- Maintenance of facilities already in existence to make them more effective and efficient: sweeping of the roads, connections between different levels, sign posting of the start of bicycle paths, properly equipped parking areas for bicycles.

Furthermore, the club would like to:

- Conduct surveys to determine the extent of the existing number of bicycles, and the number of those in favour of the bicycle if the roads were less dangerous.
- Assess and improve existing facilities.

Update

(Clarke 1992)

The *club des villes cyclables* now has more than 30 member cities, sharing information and expertise and attending regular meetings. Strassbourg has a fairly ambitious traffic reduction plan for their city centre. Bordeaux has built a fair amount of bicycle infrastructure to make their city more bicycle and pedestrian friendly. Changes are starting to occur.

10. Canada

Up until a few years ago utilitarian cycling was not actively encouraged or promoted in Canada. It appears that this situation has begun to change. Now there are at least a few cities that have appointed full-time staff to bicycle transportation issues. Indications are that government recognition and support for cycling is becoming more popular in some regions.

10.1 Ontario Policy Review

Ontario is Canada's most populated province with over 8 million residents spread over a number of large cities and many smaller cities and towns. 6% of residents 15 and over use a bicycle as their primary means of transportation. The office of the Minister of Transport has undertaken a total, province-wide, bicycle policy review. The results of this two year review are now awaiting cabinet approval (June 1992). Exact details of the policy are not yet public, but the feeling is that the review coordinator, David Hunt, has been very attune to bicycle issues and cyclists are expecting a good outcome. The review examined the issues of demand, energy, health, fitness, tourism, licensing, costs, funding, safety, public transport, legislation, registration, education/promotion, congestion, planning/ design standards, urban/inter-urban needs, theft, coordination/integration, economics and the environment. Contacts involved in the review included the general public, provincial ministers, interest groups, federal ministries, international, internal offices and municipalities.

It is expected that the review will reverse the current one which says the bicycle "is merely a recreational vehicle, not a means of transport. The change will allow municipalities that are responsible for planning bike facilities to get access to provincial funding as they do for transit and roads" (Cooly & Lazier 1992). Public transport receives approximately 75% subsidising and roads 50 to 60% – bicycles will likely also become eligible for subsidising. It is also likely that it will become policy to include bicycle facilities during bridge construction, seal shoulders on provincial (rural) roads and highways, and that the policy will confirm and entrench the priority of the bicycle as a vehicle. Greater emphasis on education and driver training has been requested. Bicycle organisations were also asking for a bicycle coordinator to be appointed to the province through this review, though it is uncertain of whether this request will be granted. Some money may be allocated from the review for pilot projects.

10.2 Ottawa

(Gaul 1992) and (Hope 1992)

The Ottawa-Hull metropolitan region (population 750,000) has multiple tiers of government across two provinces. The National Capital Commission (NCC) is the federal agency responsible for upkeep of the extensive NCC parkland holdings that occur along river corridors in both provinces and in the Gatineau National Park. The cities on the Ontario side are lumped into two municipalities that together form the Regional Municipality of Ottawa-Carleton and its metropolitan level planning group. The RMOC controls planning and arterial roads throughout the region.

The recreational paths through NCC land have been referred to by the government in the past to bolster its reputation as a "bicycle friendly" city. The paths are through the most scenic regions of Ottawa and, in some instances, along good commuter corridors. Most paths are narrow and many are falling into a state of disrepair.

According to Don Gaul, Bicycle Coordinator for the Regional Municipality of Ottawa–Carleton, the reputation of Ottawa and its NCC paths as creating a bicycle friendly city is undeserved. The multi-user paths provide access to the "outback" rather than to trip generators and, in the downtown area, are very congested with other users, whether they be runners, mothers with strollers or pedestrians. The paths "are becoming a dangerous burden to the municipalities and the NCC".

NCC Bicycle Path

This section of path is along an abandoned railroad line and offers good sight lines and a a more direct route than alternative roadways.

Milan Skubnik

The NCC has on numerous occasions attempted to place 20 km/h speed limits on the paths and in one instance removed a path in a hilly area because it was not designed to cope with the speeds of descending cyclists. Cyclists who choose to use parallel roads are often harassed by motorists for not using the paths (this is a similar complaint to those heard in Canberra and elsewhere).

Snow makes cycling virtually impossible during four months of the year, with the season for most cyclists being six months long or less. Past estimates in Ottawa of 0.3% to 1% of all trips being by bicycle have been proven incorrect. In fact 80,000 trips per day, or 5% of all trips, are made by bicycle. 50% of the population are considered to be cyclists, with 10% being commuter cyclists (including shopping and school trips).

Only five years ago little was happening to create a better environment for Ottawa cyclists. The situation has changed markedly today. The RMOC planning board now has its own Bicycle Coordinator, Don Gaul. RMOC is responsible for all arterial road corridors in the region, including the city centre, and will therefore be responsible for most utilitarian-type cycling routes at the regional level. The RMOC is in the early stages of preparing a comprehensive bicycle plan for the region.

The City of Ottawa has appointed Daphne Hope, former president of the local bicycle club, to a two year contract as Bicycle Coordinator for the city. Her responsibility is at a local level and includes bicycle parking and smaller routes that will link up the metropolitan bicycle route system. She has also completed a Community Cycling Manual (as part of some earlier work) that has been distributed on a national level. This manual provides details on bicycle planning, policy, long range planning, developing bicycle plans, and design guidelines. The Ottawa Police Department have 16 bicycle patrol persons.

The City of Ottawa and RMOC bicycle coordinators work closely together on most matters. Bicycle Advisory Committees are now established in Ottawa and the Ottawa and RMOC bicycle coordinators communicate regularly with these groups. Hope indicates that BACs are a very positive instrument, and that the Ottawa BAC is particularly effective. It is important to define the mandate of the BAC and to find the right balance of staff and volunteers. In Ottawa there is only one staff member on the BAC, but in RMOC there are only 3 or 4 volunteers and 5 staff – this does not work well.

The push is to integrate cycling into transportation planning. This is not considered an easy task, with a major hurdle being the education of an old department of engineers and planners by those “few people with foresight”. At present there are few facilities on the ground, except for a few back street bicycle lanes that are considered inadequate because their routes provide little priority to the cyclist.

When asked about provisions for less experienced cyclists Don Gaul indicated that he sees his role as being to provide for commuter cyclists who, according to surveys, want to take the same desire lines as cars without mucking around on back street routes. On-road facilities will provide for faster cyclists and reduce their dependence on NCC paths, thus making these routes safer for families. The strategic importance of the NCC paths for commuters is not being ignored, however talks with the NCC in an attempt to provide better facilities for cyclists on NCC land have met with frustration.

RMOC has completed two surveys of cyclists, one a $40,000 independent comprehensive phone survey to establish a profile of cyclists, and the other an on-road questionnaire of city commuters (with 1800 of 2000 cyclists responding) to determine route requirements, problems and other characteristics. These have been used to determine exactly what needs to be provided for those that use their bicycles for transportation. A comprehensive bicycle plan is then to be prepared by RMOC and integrated into the region's Official Plan, a long standing document that plans for roads, new settlements, public transportation (Ottawa has an extensive busway system) and all regional urban development.

The bicycle organisation within RMOC is still in its infancy and no bicycle route system has been determined, nor are sections of bicycle arterials yet being established. It is expected that it will be approximately three years before the bicycle route system implementation begins. The RMOC is ensuring that bicycles are being allowed for in current new construction projects, particularly bridges.

Don Gaul says that no cost effectiveness analysis has been done as yet. He indicated that it would be difficult to prove the value of facilities based on such techniques, and that the RMOC thinking is more in terms of reducing car trips.

Aside from hoped-for provincial subsidies, RMOC has its own funding under a Transportation Environmental Action Pan (TEAC). This plan has provided $1 million for two years and is being used to fund the surveys, comprehensive plan and blue bikes (providing bikes for employees for work trips during the day). The RMOC is also seeking funding under an Ontario pilot project funding scheme so that 1.5 m wide bicycle lanes can be provided along a new major east-west arterial in the southern built up areas of the city.

The RMOC official plan will be on a regional bicycle route level, rather than a detailed implementation level. Just as the region defines future road patterns for new developments, it will also define the regional level bicycle route network for these developments. All development must conform to the plan during implementation. The City of Ottawa policy document will contain more hard on-the-ground detail and will include attaching priorities to projects (for example, of bridge reconstructions).

The City of Ottawa is establishing policy with regard to urban environment and urban design that includes bicycle issues. They are also are working on zoning regulations that require bicycle parking in new developments, dependent on the nature of the development. The City is planning a comprehensive survey of city cyclists to determine their needs.

The Regional Council has passed a motion, that is meant to apply generally, that attaches priorities to transportation modes so that pedestrians have highest priority, then bicycles, public transport and finally private cars. Consultants working on plans for the reconstruction of a major bridge in the city centre, for example, are required to conform to this priority.

When it comes to implementing the regional bike route, Hope indicated that initially the easier fixes will be implemented. Taking parking from one side of the street to allow bicycle lanes, or marking roads with wider kerb lanes and limited parking (peak or all day) as bike routes are a few of the easier solutions. Other cases where reconstruction is required will have to conform to design guidelines that will become part of any road design. Hope indicates that if the bicycle facilities are not part of the standard design manual then provisions for bicycles will be ignored, unless political pressure is applied for each individual construction project.

Gaul summarizes by saying that there is a big push in Ottawa now to provide for cyclists. The Bicycle Coordinators have held a Bike to Work week, pancake breakfasts for commuting cyclists and other events. RMOC sponsored organisation of some events, held in conjunction with local bicycle clubs, with $10,000. Ideas are coming from staff, bicycle advisory groups, the TEAC advisory group. Ideas have been solicited, priorities have been set, and some ideas have been implemented.

10.3 Toronto

Toronto, Ontario (metro population over 2,000,000) is Canada's largest city and in some ways is regarded as the leader in cycling policy (though so far there is not much infrastructure in place). There are three full-time staff working on bicycle issues in the City of Toronto. There is a bicycle coordinator in the planning department, another person who looks after bicycle commuter issues, and a third person helping with bicycle routes (Hope 1992).

Metro Toronto's existing bicycle policy, written in 1974, only endorses off road routes through parks, and indeed this is where most bicycle facilities in Toronto are located. Dan Solomon, a transportation department planner, is drafting standards for a new official bicycle policy, expected to be presented to council later in 1992. Solomon is looking at what it would take to establish bicycle routes along the Toronto-area roads that Metro controls, including technical specifications for possible bicycle lanes and measures to fit lanes on to busy streets. (Cooly & Lazier 1992)

"I think it's safe to say that Metro is reviewing its existing policy for bicycles on arterial roads," he says. Solomon's comments don't suggest that Metro is on the verge of a militant endorsement of urban cycling, but they still bring some hope to the situation. The evident policy shift stems from Metro's placement of bicycle lanes on a 1.6 km section of the major Bloor-Danforth arterial that connects downtown Toronto with eastern Toronto via a bridge over the busy Don Valley Parkway. This is a de facto acceptance of the principle of bike access to roadways that took place only reluctantly and after years of pressure from angry cyclists who had to brave the car-clogged Bloor viaduct. "Metro was very skeptical about putting those lane marking in, but I gather their success has really changed their thinking," says Peter Tabuns, chair of Toronto City Cycling, a government organisation.

Toronto also made a trial of 3 km of urban clearway on the busiest, downtown portion of Bay Street starting in October 1990. It has the curb lanes set aside for buses, taxis and bicycles from 7h00 to 19h00 Monday to Friday. Parking and stopping are illegal during that period, and many left and right turns have been prohibited. The measures cut trolley-coach travel time by 11% and motor vehicle times by 6%, despite a 9% increase in traffic during the six month report period. Bicycle trips jumped by 80%. (Byers 1991)

10.4 Montréal

(Pronovost 1992)

The City of Montréal is located on Montréal Island, which defines greater metropolitan Montréal (population 2,000,000). Montreal and the province of Quebec have a strong bicycle advocacy group and association, Vélo Québec, with 10,000 members, 2/3 of which are on Montreal Island. Vélo Québec has been the major worker behind achieving recognition for cyclists in their province. Vélo Québec, in collaboration with the provincial Minister of Transport, has published a planning, maintenance and design manual for bicycle facilities.

The City of Montréal established a pro-bicycle policy in 1989. The city has a network of close to 160 km of bikeways that are on road, but separate from traffic, and very useful for commuters of all abilities. The paths offer good priority and are well designed, though there do remain some unresolved conflicts. There are three main continuous routes, all established over the last 3 to 5 years. The first traverses the Island from north to south, and the remaining two run east-west.

More is expected for cycling with the adoption in June 1992 of a new urbanism plan for the city. This plan includes residential speed limits, characterisation of some streets, low traffic streets and traffic calming, and includes bicycles as an integral part of the plan. It is expected that some good bicycle facilities will result from this plan.

$2.3 million was budgeted for bicycle facilities in Montréal for 1991. (Ontario 1992)

10.5 Elsewhere

Other municipalities in Ontario have also completed bicycle plans. Mississauga, a suburban extension of Toronto, has completed a comprehensive bicycle plan. Scarborough on the other side of Toronto has also done some work. The Regional Municipalities of Hamilton-Wentworth and Kitchener-Waterloo have done likewise, though their plans have not yet been incorporated into official regional plans. (Hope 1992)

British Columbia, the western most province of Canada, has progressed significantly during the past two years. They have adapted guidelines which relate width of shoulder sealing to geographical features of the highway, including gradient and speeds. These guidelines were incorporated into official policy. Vancouver has created a new seaside route, the most notable feature of which is how community associations were allowed to develop the routes through their own areas. The route connects up with a fast on-road commuter route to the city.

11. United States

The support of the federal government for cycling, which is described below, is an indication of what is happening nationally for cycling. More people are cycling and recognising bicycling as a legitimate means of transport and activity. More urban areas are realising that bicycling is a part of the solution to their transport problems. The urban areas are being told that they have to do more for cycling by the Federal Government, and also by the grass roots organisations who are getting more active across the country. There has been a heightening of the level of awareness and the level of interest, and the level of expertise. The attitude of the bicycle community, including engineers and planners, towards bicycle facilities has become more pragmatic. (Clarke 1992)

In May 1992 Chicago Mayor Daily announced a plan to make Chicago the most bicycle friendly city in North America. He will have stiff competition, particularly from cities like Seattle where the population has had over a decade to adjust to accommodating bicycles, and where they have their own high aspirations. There are good indications that when it boils down to choosing between providing for bicycles or providing for cars that bicycles will be chosen. There are strong forces at play, for example, the west coast's clean air requirements will demand ways of getting people out of their cars. It is likely that programs and legislation will become more draconian than ever before to meet these requirements. (Clarke 1992)

The bicycle community is in good shape to apply grass roots pressure. There are some big foundation grants for local and state bicycle advocacy and it is likely that the opportunities created by ISTEA (see later section) will be able to be capitalised. (Clarke 1992)

A recent Louis Harris poll commissioned by Rodale Press for Bicycling Magazine shows that bicycling, walking and running are enjoyed by a significant portion of the adult American population: (Harris 1992)

- 72% of all Americans want better planning for bicycles.
- 81% of people in town centres want better planning for bicycles.
- 81% of those aged 18-29 want better planning for bicycles.
- 59% of all Americans want more money to be spent on bicycle infrastructure.

Currently 76% of all respondents use a single-occupancy vehicle, and just 5% walk or bicycle. If all modes were equal, the survey showed that

- 51% would prefer to use a single-occupancy car,
- 20% would prefer car pooling,
- 14% would prefer transit, and
- 13% would prefer bicycling or walking.

This represents quite a shift. Experience indicates that once a shift starts the potential becomes much greater. (Clarke 1992)

The 1990 census gives some information about the amount of walking and bicycling that is done in the US. Overall there is not a lot. Nationally the share of adult commuter work trips make by bicycle is 0.5% and by walking is 5%, but these figures vary widely across the US. It is often the small university towns where most of the cycling is: Monterey has 17.2% of trips by bicycle, Boulder, Colorado is 14%, Champagne-Urbana, Illinois is 17.5%, the town with the State College of Pennsylvania has 35% of trips by bicycle. In 43 metropolitan areas, 12% of those sampled, 10% or more of the population walks to work. In other places there is a long way to go. The smaller cities and towns are more conducive to bicycling and walking because of smaller distances and less traffic. (Fegan 1992)

Federal Support for Bicycling

Federal recognition of the needs of the nation's cyclists is growing. The Department of Transport came out with a 100 page statement of policy. Within this it is stated that it is a policy of the Department of Transport is to encourage and increase bicycling and walking, and also to look at the safety of these two modes. The Department of the Interior is much more interested in bicycle promotion and bicycle provisions than it has been, particularly with greenways and trails. The ISTEA and 3% legislation (see later section) has also generated more interest from Congress than previously. No less than six bicycle-specific bills have been introduced in Congress in two years. Congress has also appropriated money for a National Bicycle Program Manager and $1 million for a National Bicycling and Walking Study, designed to develop an action plan for implementing the Department of Transport's bicycle and pedestrian policy (discussed below). (Fegan 1992), (Clarke 1991), (Clarke 1992)

It is an objective to increase bicycling and walking in the United States. There are now 8 people within the Department of Transport who are dedicated to bicycling and pedestrian issues; Two years ago there were only a couple of half-time people. The Department of Transport is divided into several administrations, including the Office of the Secretary, the Highways Administration, the National Highway Traffic Safety Administration, and the Federal Transit Administration. The Transit (public transport) Administration now has one contact person, though not full time on cycling and pedestrian issues. The Traffic Safety Administration has a bicycle and pedestrian program specialist, Leslie Heffner, and the Office of the Secretary has a national bicycle and pedestrian program manager, Josh Lehman. A dozen persons from the Department of Transport attend informal monthly meetings held by Lehman on bicycle and pedestrian issues. (Clarke 1992)

The Federal Highways Administration

(Fegan 1992)

The Federal Highways Administration is a division within the Department of Transport. It is headed by Thomas Larson, a person who is very supportive of bicycle and pedestrian programs and other alternative modes of transport, which do not just involve building more highways. He is looking at the broader ways of transporting people and goods in the US and has been very helpful in bringing about a new policy of promoting the increased use of bicycles and walking. Larson has initiated a bicycle and pedestrian training course for engineers and planners (Clarke 1991). Promoting bicycles is a new position for the Highways Administration – formerly they were in a position of accommodating bicycles and pedestrians, but not promoting their use.

As a result of the stated policy of the Department of Transport to encourage and increase bicycling and walking and to look at related safety issues, the US congress gave $1 million to the Federal Highways Administration for the Department of Transport to show Congress how they would fulfil their policy objective of increasing bicycling and walking in the US. The resultant study looks at the potential of bicycling and walking in the US. The study has been under way for 1.5 years, and is due for completion by December 1992. A report will be printed and made available to the general public.

The study is the most comprehensive national bicycle and walking study ever done in the US, and includes overseas research. The first objective was to see how much bicycling and walking was occurring. This was difficult because good usage figures are not maintained for bicycles and walking. The second part of the study is to develop a plan for increasing the amount of use, and enhancing the safety of bicyclists and pedestrians – this is currently being written. The third part is to determine the full cost and benefit of promoting bicycling and walking. The fourth part reviews successful promotion from around the world, and looks at how to apply these examples to the US. The last part is to develop an action plan – this is also now being written.

The study has sponsored 24 smaller case studies, for example of: promotion plans and programs in European countries, in Asia, in Australia and New Zealand; training methods for professionals involved in planning and designing facilities; current methods of integrating bicycle use with mass transit; educational programs available for bicycles and pedestrians; laws that are currently applicable and how they should be enforced.

Transportation Bill – ISTEA

(BikeReport 1992a), (BikeReport 1992b), (Snyder 1992a)

In December 1991 HR 2950, the new Intermodal Surface Transportation Efficiency Act, (ISTEA, pronounced ice-tea) was passed. ISTEA gives states and Metropolitan Planning Organisations wide latitude in spending federal transportation money. In order to receive the money the projects requesting funds must be on plans. ISTEA requires, for the first time, states and metropolitan areas to plan for bicycling and walking as a vital part of the nation's transportation system. Specifically, the new law directs every state to develop a long range bicycle plan, and to appoint a bicycle/pedestrian program coordinator in its transportation department.

The new act makes virtually all funds available for bicycle facilities, and includes bicycles in a special provision in the Surface Transportation Program, called the *transportation enhancement fund*, for which $US3.3 billion is allocated over the next six years. Title II of HR 2950, the Highway Safety Act of 1991, gives priority status to bicycle safety programs, which means that states may now obtain funds for such programs under an expedited procedure. “The new legislation will make bikes competitive - we will see more diversity of how funds are spent”, says Peter Lagerwey, Seattle Bicycle Coordinator (Lagerway 1992).

"Over the next few years every state and metropolitan area will develop new transportation plans reflecting the priorities of this legislation," said Andy Clarke of the Bicycle Federation of America. The BFA is holding workshops with bicycle advocates, industry and government representatives to plot a course of action to ensure that state and local cyclists are ready to take advantage of the opportunities created by the transportation bill.

Another bill that has been on the table for a few years, HR 2101, that guarantees a portion of highway funds for bike and pedestrian facilities is still active in Congress. This bill was the popular *3% for bikes* campaign of the Bicycle Federation of America, that received major national support from the bicycling community. No one expects anything more to happen with this bill, and it will likely die in Congress in October 1992. It was this bill, however, that was the leverage to get the ISTEA legislation passed. (Clarke 1992)

Characteristics of a Bicycle Friendly City

(Clarke 1991)

The US has some good examples of bicycle planning, programs and infrastructure, but they are few and far between. Some of these examples are highlighted in this report. For instance, the cities of Seattle, San Diego, Portland, Eugene, Ore., Arlington, Va., Davis, Calif., and Boulder, Colo. have extensive bicycle facilities. Over 90% of Arlington residents live within 500 m of the 136 km network of routes. Seattle spends $5 million a year on bicycle improvements.

Buses in Phoenix, Tucson, Seattle, Oakland and Boulder carry bikes on front-mounted racks on buses. In Dallas and San Jose bikes are allowed inside buses. Transit systems typically allow bicycle access in the evenings and weekends, and most have some bicycle parking at stations. Los Angeles, Arlington, Boulder, Madison and Seattle all have local ordinances requiring a minimum level of bicycle parking in all new developments, typically between 5 and 10% of car parking spaces. One member of US Congress introduced a bill to require bicycle parking at all federal buildings. Nothing has had more impact on promoting bicycles than the 150 plus police departments who now use mountain bikes in their regular street patrols[1].

Andy Clarke of the Bicycle Federation of America looked at what needs to happen to maintain the growth in the popularity of bicycling into the next century. For bicycling to grow, he concluded, people need more safe places to ride. It is government agencies that determine the development and management of safe places to ride, and in those places where opportunities were growing – Seattle, San Diego, Eugene, Ore.[2], Florida, North Carolina – certain common characteristics were identifiable:

- The presence of a bicycle coordinator or bicycle program manager in the transportation department.
- A strong citizen's group, usually active on a Bicycle Advisory Committee.
- A receptive political climate.

1. The League of American Wheelman have produced a Police on Bikes Survey Report, phone +1 301 944 3399.
2. 1% of Highway User Revenues go towards bicycle facilities in the State of Oregon. Sealed shoulders are common on highways and rural roads.

Bikes on Trails

(Mills 1990)

Rails-to-trails has to do with the conversion of abandoned railroad rights-of-way into public trails. Although the idea has been around for awhile, it is only within the past several years that is has become highly popular. By now, portions of more than 240 rail lines all across the country have been transformed into trails, and another 250 are in the works. The majority of the 30 million or so Americans who get out on these trails annually are cyclists. The rest are joggers, walkers, bird watchers, cross country skiers, horseback riders and so on.

Many states have hired trail coordinators to oversee the acquisition of development rights and work with local groups. A national trails task force is trying to keep track of everything that is going on. The trails help diffuse growing public pressure for recreational access to parks. The linear parks, slender ribbons of land, do not take up much room, yet 6 ha of land can create a park more than 30 km long, which a lot of people can do a lot of things on. According to David Burwell, president of the Rails-to-Trails Conservancy. "This program is enabling more and more people to enjoy the countryside by using trails that already exist".

The rails-to-trails network at present consists of more than 5000 km of trails in 34 states. The main concentrations are in the Northeast and Midwest. Wisconsin is the mileage leader, with nearly 750 km. California and Washington have the most trails, with 22 each. The shortest trail, about 500 m, is in Tulsa, Oklahoma; the longest, 233 km, is in Washington State. The variety is spectacular. The Boca Grand runs the 10 km length of a barrier island off the Florida coast. The Mount Lowe Railroad Trail winds up a mountain outside Los Angeles, along what was once called "the railway in the clouds."

Many of the trails, particularly those in urban areas, are asphalted bike paths. In Washington a proposed 17 km trail running from the downtown area to Silver Spring, Maryland will hook up with other such trails that are planned or already in existence, creating a bicycle beltway. Seattle's 19.5 km Burke-Gilman trail extends from the heart of the city, via the University of Washington campus, the shores of Lake Washington, past public housing projects and some of Seattle's most opulent homes out to wooded suburbs.

The Burke-Gilman is one of the most heavily used trails in the nation, was paved and opened in 1989, and has traffic signals and signs. A recent study showed that the trail enhances property values but does not bring about an increase in crime. The Burke-Gilman has been a catalyst for further rail-to-trail programs in the Seattle region. Soon it will link up with a 27 km trail to the east and a 10 km segment that heads west to the ocean. Sometime this decade 225 km of trails are expected to connect downtown Seattle with suburbs to the north, south and east of the city.

The Elroy-Sparta is a 51 km rural trail between two towns in south western Wisconsin. It passes lush, undulating farmland, through tunnels (up to 1.5 km long), that attracts more than 55,000 bikers every year, injecting more than $1 million a year into the local economies.

Mountain Bikes

(Clarke 1991)

In 1988 mountain bikes were being banned from more and more public lands by managing agencies who had no idea how to manage this new activity. A survey of land managers showed the need from more information and advice. The bicycle industry in the US developed an action kit for users to become more involved in trail management and the Bicycle Federation published *Mountain Bikes on Public Lands: A Manager's guide to the state of the practice, 1990*. Individual companies promoted trail ethics. Now mountain bikes are considered a legitimate recreational activity on public lands that require management – not banning – just as does hiking and horse riding.

11.1 Seattle

(Lagerway 1992), unless otherwise indicated

Seattle (population 500,000) and the greater Seattle metropolitan area (King County, total population 2 million) are in Washington State, in the northwestern corner of the United States. Seattle was named North America's No. 1 cycling city by the American *Bicycling Magazine* in 1990, "Some US cities – notably several college towns – remain more pleasant places to ride than Seattle, but you'd be hard-pressed to find another major urban area on this continent that invests so much in pedal power." (Martin 1992)

Seattle has a strong-mayor form of government. They have a city council and the mayor appoints the heads of the approximately 10 different departments, one of which is engineering. Seattle is a built-up area with few new road developments. The city has control of all major roads in Seattle, with the exception of six major highways which are under Washington State control. No conflict of jurisdiction occurs because State highways generally are not bicycle routes and, when bicycle routes do need integration with State facilities, cooperation is not a problem.

Seattle's pro-cycling government has become even more supportive with the arrival of new city council members. Its already good bike facilities are being expanded, ridership rising slightly, and the bicycle/pedestrian program has grown from 2 to 5 full-time employees. Traffic congestion is increasing in the city, but some see this as an opportunity for cycling, not a setback. (Martin 1992) Bicycling is very much integrated into Seattle transportation planning. Whenever roads or bridges are redone they look at how to accommodate pedestrians and cyclists, with the solutions differing each time. A lot of money is spent on their 150 bridges.

Peter Lagerwey is the Bicycle Coordinator for the city of Seattle. Lagerwey indicates that there are two halves to their bicycle program:

1. Try to make all streets as bicycle friendly as possible. When road line-markings are repainted they try to give more room for bicycles. When redoing bridges they try to accommodate bicycles. Regular sweeping.
2. Complete a comprehensive urban trail system which is a combination of both on and off road facilities, with bike paths along railroad right-of-ways, and bike lanes on streets.

Seattle has three major trails, from the north, east and south, that all come into the downtown area. These are a combination of mostly off-road paths, with some on road portions. Seattle has 66.6 km of separated paths, 20.4 km of bicycle lanes and 146 km of bicycle routes. The bike routes vary, with some recreational loops and some routes on arterial roads. The routes help to point cyclists to more bicycle friendly roads (where there are wide kerbside lanes for instance). The routes have a useful function in that if a road comes up for resurfacing and Lagerwey would like traffic flow channelling done differently to provide more space for bicycles then it is easier internally to get this done. There is no real concern if the routes are not used because commuters will always find their own routes based on experience. These routes are more of an aid to novice cyclists who are out riding on weekends and who have no experience choosing cycling routes.

The Seattle Comprehensive Bicycling Policy (Lagerway 1985) makes clear and very detailed statements that pertain to institutionalising bicycle transportation, improving the planning and engineering of the bicycle transportation system for utilitarian and recreational cycling, promotion of bicycle transportation and recreation, education, enforcement, encouragement to create cyclists of non cyclists and to get cyclists to ride more often, encouragement of special bicycling events, facilitating organised bicycle racing, and encouragement of bicycle touring to and through Seattle, to list but a few. The policy document also list the roles and responsibilities of city agencies, other government groups and the private sector. This document would be a good base from which any government could prepare its own policy.

The comprehensive transportation plan for the city is undergoing revision. A framework priority and policy document is now before council. A more detailed plan will follow. No targets for bicycle use have been set in the past. Lagerwey would like to see targets for incrementally increasing cycling to double its current level written into the new plan. Data collection is poor. Currently 10% of trips are by bicycle or walking. In the University of Washington area 8-9% of trips are by bicycle, in the neighbourhood coastal areas 6-7% of trips are by bike, on some downtown streets with bike lanes 15% of trips are by bicycle and overall in the downtown area 3% of trips are by bicycle.

Lagerwey says that they do not have trouble justifying facilities because whenever a facility is provided it “gets full”. One trail along an abandoned railway right-of-way gets 1.2 million cyclists per year, or 700-800 people/day using the trail specifically to get to work. There is no problem getting people to use facilities if they are part of a larger system. Isolated facilities are avoided because they do not get used and a situation develops where the unused facilities must be defended. An isolated path that ends at a park is not viable because “people don't go bicycling to take picnics”.

It is hard or impossible to show how the facilities affect modal splits. Lagerwey does not try to use data to compete with cars on a one to one basis because dollar for dollar they cannot compete – there are too many cars. He says if the same thing were done with public transport then public transport would really come out behind. Rather than trying to compete on those terms Seattle has said that it is a goal and in the best interests of the community to have people cycling, so they have decided to support cycling.

Lagerwey says that it is fair to divide cyclists into experienced and novice cyclists. The bicycle lanes are provided because they encourage new people to cycle, though the lanes do not make cycling much safer. 80% of kilometres are done by 20% of cyclists and this is mostly on roads, while 20% of kilometres are done by 80% of cyclists who form a broad range of the population that cycle only minimally. The trail system was built with these cyclists in mind, however even the novice cyclists will want to use the most direct route and bicycle lanes are for these people as well.

The trail system is multi-user and therefore not without problems. At one point there was a threat that the Park Department of King County which governs the trails would set a speed limit to control cyclists. Instead a trail ordinance was used to delineate a code of conduct for all users. The trails are patrolled by motorcycle police and radar checks are used on cyclists.

Seattle has developed its bicycle program over 15 years, with Lagerwey being the bicycle coordinator during the past 8 years. Lagerwey says that it takes time for attitudes to change, but they are now at the point where electoral officials are prepared to change the way things are done. Building paths on railway right-of-ways was easy at the beginning because this only took money and did not challenge the dominance of motor vehicles, whereas the projects that now need to be done in Seattle require taking lanes or affecting parking – tougher policy issues that should not be tackled at first. In 3 or 4 instances Lagerwey has already been successful in tackling these issues and he is confident of more success in this area in the future. The profile of cycling has come along so incredibly in the past few years that the engineering directorate has indicated a desire to do whatever is necessary to double or even quadruple the number of cyclists – a further softening in position that has not yet been tested.

The easy part of the cycling plan, the urban trail network, now complete, the next step involves shifting to where 80% of cycling occurs, on the streets. One goal is better connection between the city's three highest bike use areas: downtown, the First Hill area, and the University district. Another is construction of a *bicycle boulevard* with limited car access. “I sense a new seriousness about going beyond building fun trails,” Lagerwey says. “The climate in the US for bicycling is better than at any time since I've been in the business. It comes down to space and money. The idea of expanding a [transportation] system that is falling apart and dying is just not there.” (Martin 1992).

Seattle also does a fair amount of neighbourhood traffic control, something not typical of US cities. Traffic management devices are not designed only for cyclists, but they can benefit cyclists. In areas with a grid of residential streets they intend to install a variety of neighbourhood traffic control devices that will allow bicycles to pass but not cars – in many cases closures will be used. The plan is to implement a fair number of such schemes and to copy Palo Alto's concept of a bicycle boulevard (see “Innovations - The Bicycle Boulevard (Bryant Street)” on page 118).

A new $US1.8 billion tunnel is expected to be completed soon as part of the final 10 km of Washington Interstate 90 that connects to downtown Seattle. This 406 m long, 19 m inside-diameter tunnel will carry 5 lanes of traffic on its main level, and have bicycle and pedestrian facilities on a totally separate upper level (Parker 1983).

King County also has its own bicycle coordinator. While Seattle is a built environment with no new road programs, King County's program must coordinate with new developments. Washington State is using an open process to currently interview and hire a bicycle coordinator as part of new federal legislation requirements. In Washington, like a number of other US States, roads generally are redone with sealed shoulders. The benefit of sealed shoulders include greatly extended road life, much safer roads, and happier cyclists (when surfaces are high quality).

Education and encouragement are not roles taken on directly by Seattle's bicycle coordinator. A strong local bike club of 4000 members, with the help of Lagerwey, put together a full time education position that has existed for the past 5 years. Education programs are working in all the schools and the scheme is functioning very well. Encouragement occurs via the very high number of events organised by the local club. A 200 mile, 1 or 2 day Seattle to Portland ride with 10,000 participants provides enough funds for this organisation to fund all of their activities, including a paid State lobbyist.

Institutionalising Bicycling in the Transportation Planning Process

from (Lagerway 1988)

The City of Seattle has several thousand employees, with about 900 in the Engineering Department alone. Two paid bicycle positions (in 1988) working on bicycle safety and access can not be very effective. They will be limited by time to working on only a few of the many important policies, programs, and projects that affect bicycle safety and access (i.e. bridge projects, bicycle maps and plans). On the other hand, if city employees at all levels can be involved in addressing bicycle-related issues, bicycle safety and access will be significantly improved. The entire street system can be made bicycle friendly.

To involve city employees at all levels in bicycle-related issues requires that bicycling be institutionalised into the decision making process. This means that bicycle safety and access are automatically addressed in all policies, projects, and programs. The *system* itself needs to be structured in such a way that this involvement occurs. Institutionalisation requires both internal work by staff and external work by activists. The following is a list of ways to institutionalise bicycling.

Internal, bicycle coordinator activities to institutionalise bicycling:

- Local government policy documents on everything from transportation to open space articulate basic guidelines and approaches and should address the needs of bicyclists.
- All local units of government have planning documents at some level. These can be comprehensive plans or decentralisation plans that involve several documents. It is important it include bicycles in these documents rather than have a separate *bicycle plan* which may get lost in the system, and not be read by most city employees.
- Regulations regarding parking, showers, lockers should be included in local regulations.
- Local street design manuals define standards for streets and are thus critical to bicyclists.
- All capital improvement projects should be reviewed for their impact on bicycling, and bikes should be written into the scope of the work.
- Environmental impact statements, street vacations, and site plans should all be reviewed by the bicycle coordinator.

- Experts in bicycle transportation should be included on all consulting teams of projects that have a major bicycle element.
- Many civil servants are sympathetic to bicycling but have no training in bicycle transportation planning and need education.
- Bicycles should be counted wherever manual traffic counts are done for motor vehicles.

External, bicycle activist activities to institutionalise bicycling:

- Having an effective bicycle advisory committee/board is critical to institutionalising bicycling. In the long run, a bicycle program cannot exist without an effective officially recognised bicycle advisory board. A board should be established by resolution or ordinance and should not be tied directly to one particular department. A board should automatically review all projects that significantly impact cycling. Board members should also work to be appointed to citizen task forces for special projects.
- Bicycle clubs should provide the political support that is critical to any bicycle program. Letters and regular contacts with elected officials are essential. One idea is to have a post card writing session at monthly club meetings.
- Public hearings provide a forum for public involvement and should be attended by bicyclists. They also provide an opportunity to meet department heads and elected officials. Having different people testify at every hearing builds the image of a politically strong, active bicycling community.

While much can be done outside the system, it is also very important to have a qualified person inside the bureaucracy to be an advocate for bicycling and to provide citizens with timely information. Bicycle activists and coordinators should focus on developing ways to have bicycles included in all local projects, policies and programs. Once bicycles have been fully integrated and institutionalised into the system, the system itself, along with the people who work in it, will be involved in promoting bicycling.

12. California

An Overview of Bicycle Planning Efforts

from (Snyder 1992a)

Since the 1970s California has been one of the leading states in planning for bicycles. Much of what has been developed in the state has been used as a model for efforts in communities in other states. This development can be broken into three historical periods. The early period of bicycle planning roughly parallels the start of the bicycle boom when adults began using bicycles in large numbers in the late 1960s and early 1970s. The second period, called the years of Separate Efforts to Improve Bicycling saw many communities up and down the state take various steps to accommodate bicycles, though generally without overall coordination. This period roughly paralleled the 1980s. The third phase, which California is now entering, is called the Comprehensive Planning Phase. During this period bicycling is finally becoming an integral part of larger transportation planning efforts, rather than an unimportant add on.

The Early Years

The Davis experience was part of the Early Years in California. Davis, home of a University of California campus, rose to the forefront of cities thinking of the bicycle as a mode of transportation. It planned for bicycles quite early on. A flat city, it put into place an entire network of bicycle lanes and paths to the sides of streets. Moreover, they installed bicycle bridges, tunnels, traffic signals and turning lanes for bicycles. Since then the bicycle has come to symbolise the City of Davis. While Davis has been criticised for overemphasising side paths and putting in unsuccessful projects, it led the way so that others could learn from its mistakes. A quick visit to Davis will convince nearly anyone that the effort has been extremely effective in getting average people onto bicycles for transportation, with bicycles accounting for 25% of all trips (Martin 1992).

During the 1970s California state legislation was passed providing funds for bikeways. This was done primarily through the Transportation Development Act (TDA) Article 3, which allocates a portion of state sales tax to counties and cities for capital improvements for bicycles and pedestrians. While bicycle projects have been eligible for other state and federal funds since the 1970s, few transportation agencies have spent any money on bicycles that wasn't specifically earmarked for them. Nevertheless, TDA funds have provided a continuous source of funds of a magnitude matched by few states. By 1991, the annual allocation had grown to roughly $11 million.

The availability of TDA funds caused cities and counties to build bicycle routes. Many of these early routes were ill-conceived and there was an overemphasis on side paths. Bike lanes were too narrow, or poorly placed. Paths to the sides of streets placed bicyclists in dangerous crossings with motorists at intersections. Additionally, most of the early bike routes were for recreational purposes. Not all of them were a failure and some bike paths, such as the beach bike path in Los Angeles County were built early and are widely used today. Early mistakes led to the setting of design standards.

In 1978, the California Department of Transportation (Caltrans) produced the first edition of its Bikeway Planning and Design Criteria Manual. The manual set good design standards for planning bike routes. It was used as a model in developing national standards and today California remains one of the few states to have such a manual. This has brought much improvement to the design of bicycle routes.

Beginning in the 1970s Caltrans had a state-wide bicycle coordinator, as well as coordinators in every Caltrans district. The coordinators compiled data and researched possible bicycle routes on state highways. They were liaisons of information. The coordinators were lost in 1983 with a change of state governors.

Separate Efforts to Improve Bicycling

During the period of *Separate Efforts to Improve Bicycling* the state was largely out of the picture, thanks to the termination of the state bicycle coordinator role. Many cities made various efforts on their own to plan for bicycles, often using TDA money. In many cases projects, though well intended, have not been prioritised well. The following is a sketch of these efforts.

Bike Routes. Most cities and counties in the state put in some bicycle routes. While the quality of these routes is often good, cities are generally without thoughtful plans. Many routes are in the form of bike lanes on city streets, while many others have used flood control channel for bike paths. Some cities put in better networks of routes, such as Palo Alto, which emerged as perhaps the most bicycle friendly city in the state, if not the country. Of the larger cities, San Diego has one of the best bicycle route systems. San Diego has led the way on putting destination signs on their routes. Plans for the West LA Veloway, a proposed elevated bikeway, have emerged during this period.

Transit Links. Bicycle advocates have increasingly lobbied for connections to public transit. In the San Francisco metropolitan area the Bay Area Rapid Transit (BART) has put bicycle parking, including bicycle lockers, at many stations. Bicycles are permitted on the trains during certain hours. Palo Alto has two bicycle park-and-ride stations connecting with local bus service and a commuter rail. Los Angeles permits bicycles on its only light rail line. San Diego has placed bicycle lockers at train stations. Bicycle lockers have also been placed at a number of park-and-ride lots used by car poolers, van poolers, and express bus riders. Several communities including Santa Barbara, Los Angeles, and San Diego put bike racks on selected bus lines.

Safety Education. During the time when many bike routes were poorly designed, a strong school thought emerged among bicycle advocates that believed bike routes were an attempt to get bicycles out of the way of motor vehicles. Educating people how to share the streets properly with motor vehicles was promoted as a better alternative. The emphasis is on teaching driving skills to cyclists, or vehicular cycling. Numerous safety programs have been started. Palo Alto began on-street training for school students. Safe riding is taught to nearly every student passing through the Los Angeles public school system.

In the early 1980s Palo Alto became the first city in the nation to require bicycle parking and showers in new commercial buildings. In 1991 Los Angeles passed a similar ordinance which also requires clothing lockers. A few other cities have bicycle parking requirements. The trend is expected to grow. Bicycle parking has been placed in retail districts and in front of civic buildings of many cities, most notably Davis, Palo Alto and San Diego. Efforts are being made to ensure that bicycles can trip loop detectors at traffic signals. Both Palo Alto and San Diego mark the loops so bicyclists know where to stop to trip the signals. The City of San Diego loans employers bicycle lockers for three months. If popular, employers may buy the lockers. They are installed on employers sites for free by the regional ride-sharing agency. The bicycle locker loan-to-own program has been in place since the beginning of 1992 and is in high demand.

Some cities have bicycle coordinators dedicated to overseeing all bicycle planning matters. These cities have become some of the most successful. Palo Alto and San Diego stand out in this regard. Numerous cities have started citizen committees to advise public agencies and officials on bicycle matters. Some of the more active ones are in the San Francisco Bay Area and in the City of Los Angeles.

There has been a growth in public support and funding for bicycle/pedestrian projects. Proposition 116, approved by California voters in 1990, allocates $20 million over the next five years for such projects, compared to previous annual state funding in the half million dollar range. This fund is administered by Caltrans and it is stressed that money is to go only to projects with utilitarian value. $34 million in applications competed for 1991's $4 million allocation. The bill SB 1141 pending this year's legislative session will add an additional $2.4 million per year to bicycle projects.

Comprehensive Planning Phase

California is now moving into the Comprehensive Planning Phase. Bicycle planning is coming into its own and is becoming integrated with other transportation planning. This is likely due to several factors:

- Air quality regulations are calling for bicycles to be incorporated in transportation planning.
- New federal ISTEA legislation makes bicycles eligible for much more funding, but also requires that bicycle facilities be part of plans before obtaining funds.

In addition, Caltrans recently rehired a state-wide bicycle coordinator, and started a state-wide bicycle advisory committee.

Several cites are moving forward with new bicycle plans. Sacrament recently completed a plan. The City of Santa Monica has a draft of one of the most comprehensive bicycle plans ever produced in the United States. It proposes a complete network of numbered routes, public parking, amenities requirements in new work sites, park-and-ride links to transit, a comprehensive education program, traffic signal improvements, and other miscellaneous ideas to make the city more bicycle friendly. The City of San Jose is now preparing a comprehensive bicycle route plan. The City of Escondido is also preparing a plan. On a larger scale, the County of Los Angeles is moving forward on a bicycle plan. Many others are likely to follow.

A growing number of regions and cities are requiring employers to reduce the number of people driving alone to work in order to meet air quality goals. They must have formal programs with incentives to encourage car pooling, van pooling, riding transit, walking, as well as bicycling, working from home and changed schedules. The regulations generally have teeth. The four-county Los Angeles area South Coast Air Quality Management District Regulation XV requires that programs raise the ratio of commuting employees to vehicles to 1.5. This approximates a 30% change for many employers. Failure to have adequate programs can result in fines up to $25,000 per day. A similar regulation exists in Ventura County, and others are nearly on the books in San Diego County, the San Francisco Bay Area, as well as in other areas. These regulations have spawned some ambitious programs with bicycle parking, showers, financial incentives, and promotional events. Some companies in the Los Angeles area who give bicycles to employees, on top of having amenities, have 7% or 8% of their employees commuting to work on bicycles. This compares with a regional average of about 1%.

Metropolitan Planning Organisations (MPOs) are working closely with air quality management districts and regional transportation commissions to plan for transportation. The efforts combine measures to improve air quality with traffic reduction. The general thrust is in the direction of reducing the number of people driving alone by improving transit, encouraging ride-sharing, and improving non motorised transport. Regions which are out of compliance with federal air quality health standards (most American cities) must have comprehensive plans to meet the standards by the year 2010. Each region must have an Air Quality Management Plan (AQMP) and may mandate that cities have local AQMPs which are accepted by the regional air quality district.

In parallel to this, new federal transportation legislation, ISTEA, gives states and MPOs wide latitude in spending federal transportation money. In order to receive the money he projects requesting funds must be on planes. In the past a set amount of bicycle funding has caused the funding to drive the nature and scale of projects. With flexible funding and comprehensive plans, it is hoped that the plans will drive the funding.

Currently both the Los Angeles region (the South Coast Air Basin) and the San Francisco Bay Area are preparing regional plans. Bicycle activists have plugged in. In the South Coast Air Basin the updated 1991 AQMP mandated that all cities in the four-county region have ordinances requiring bicycle parking, showers, and clothing lockers in new work sites by the year 1993, and that all cities include bicycle route plans in their circulation plans. This year advocates are attempting to strengthen this by:

- Requiring and defining an adequate route plan of cities and counties.
- Placing implementation dates on these plans.
- Setting curb lane width standards on new arterial streets.
- Getting the MPO and counties involved in regional planning.
- Recommending regional transit link policy.
- Providing model bicycle plans to cities.
- Setting a goal of 5% of all trips on bicycle by 2010.

In the San Francisco Bay Area, the 1991 AQMP yielded the following:

- The metropolitan Transportation Commission requires cities to have bicycle advisory committees and bicycle plans to qualify for TDA funds.

- A policy was passed to allow more bridge access.
- A policy was passed to create links with public transport.
- A policy was passed favouring wide curb lanes on city streets.

California has come a long way in bicycle planning, yet has far to go. The improvements that have been scattered in a few cities need to be spread to all communities as standard items in the physical and programmatic transportation infrastructure. Transportation agencies are taking bicycling more seriously as a mode of travel than ever before. Current efforts to incorporate bicycle planning into other transportation planning brings hope for faster progress. Federal funding availability also has potential to speed progress. A rapidly growing number of cities will likely develop plans in the next few years. Whether these opportunities realise their potential depends on follow through by agencies. Advocates need to seize the opportunity and become more a part of the process to ensure a fair share.

Employer Incentive Schemes

(Fletcher 1991a)

Some employers in California offer incentives to employees who ride their bicycles to work. These help to develop bicycle cultures at the work place which help to optimise the percentage of trips made by bicycle.

The City of Palo Alto has a bicycle mileage reimbursement policy. Employees and city officials are to be reimbursed for the use of a private bicycle while conducting local authorised City business or attending locally approved conferences, professional meetings or training sessions. Reimbursement is at the rate of $0.07/mile. The city also has bicycles available for use.

The City of Pasadena gives bicycle commuters a quarterly maintenance allowance and maintains a bicycle fleet for employees to borrow for use during the day for City or personal business, or for up to three months for employees who don't own bicycles and want to try bike commuting. Cyclists may use the city's shuttle on rainy days or use their own vehicles without losing their monthly stipend.

Nabisco in Los Angeles donates bicycles to an employee who uses it to bicycle commute.

Fleetwood Enterprises in Riverside supplies bicycle lockers, showers and clothes lockers. They have a fleet of bicycles for employees to trial and buy at discount prices. They have lotteries and prizes for bicycle commuters.

Zerox PARC in Palo Alto was one of the first incentive providers with their $1/day bonus to bicycle commuters and free towel service at their showers.

12.1 Davis

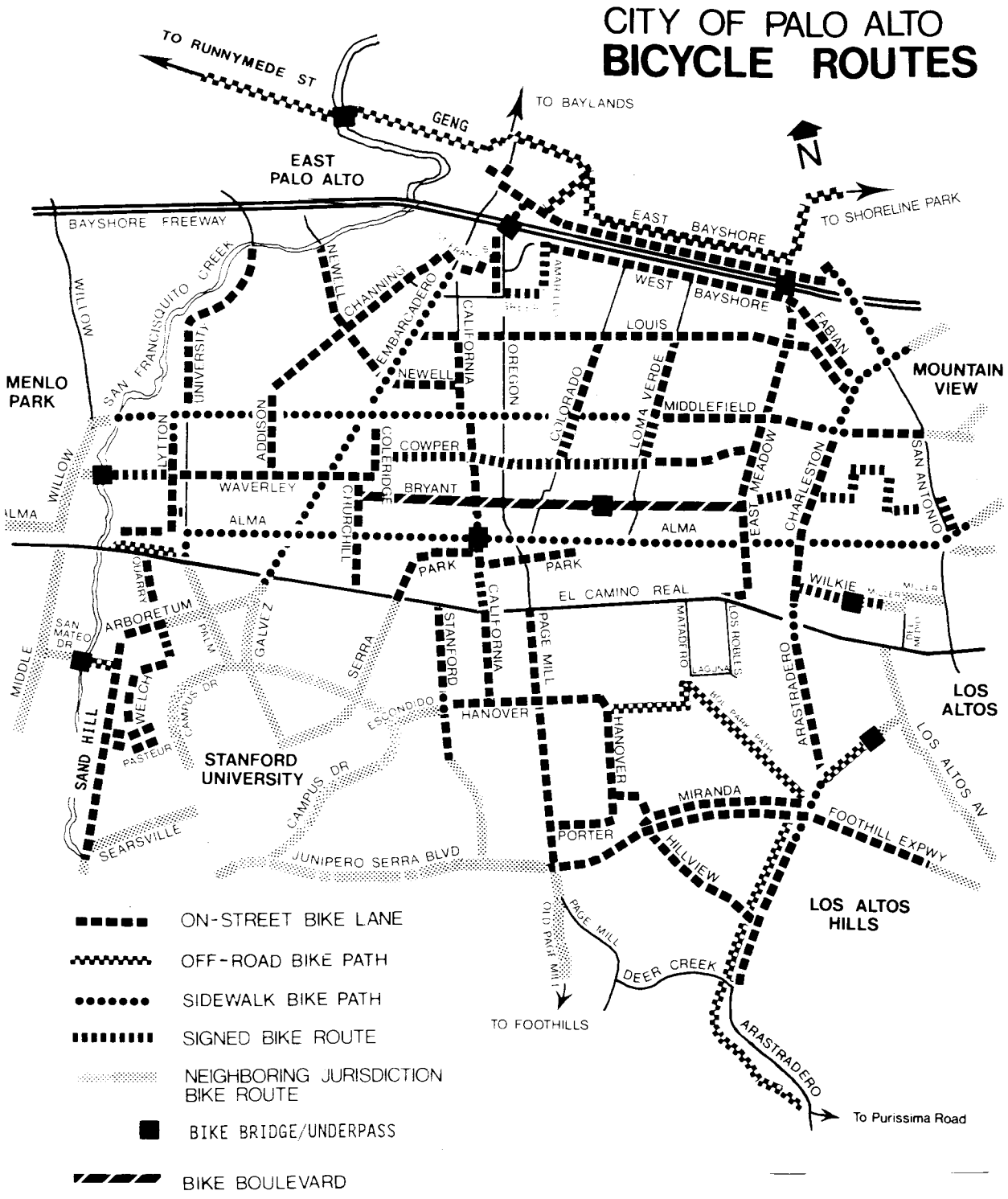
Davis, a university city on the east side of San Francisco Bay, has many miles of heavily used bike-lanes, dating from the 1960s, that are integrated into the street network. Davis provided valuable initial research into the effects of bicycle lanes on North American streets. This research from the mid 1970s confirmed a large overall reduction in bike-auto accidents in Davis following bike lane installation. Davis also trialed bicycle lanes that were separated from motor traffic by minor raised kerb-like barriers, similar to many Danish bicycle lanes. These were concluded to be dangerous and were pulled out. They can restrict cycling movement in avoidance situations, increase debris collection, and make proper vehicular-code right turns impossible. (Lott 1976)

12.2 Palo Alto, Santa Clara County

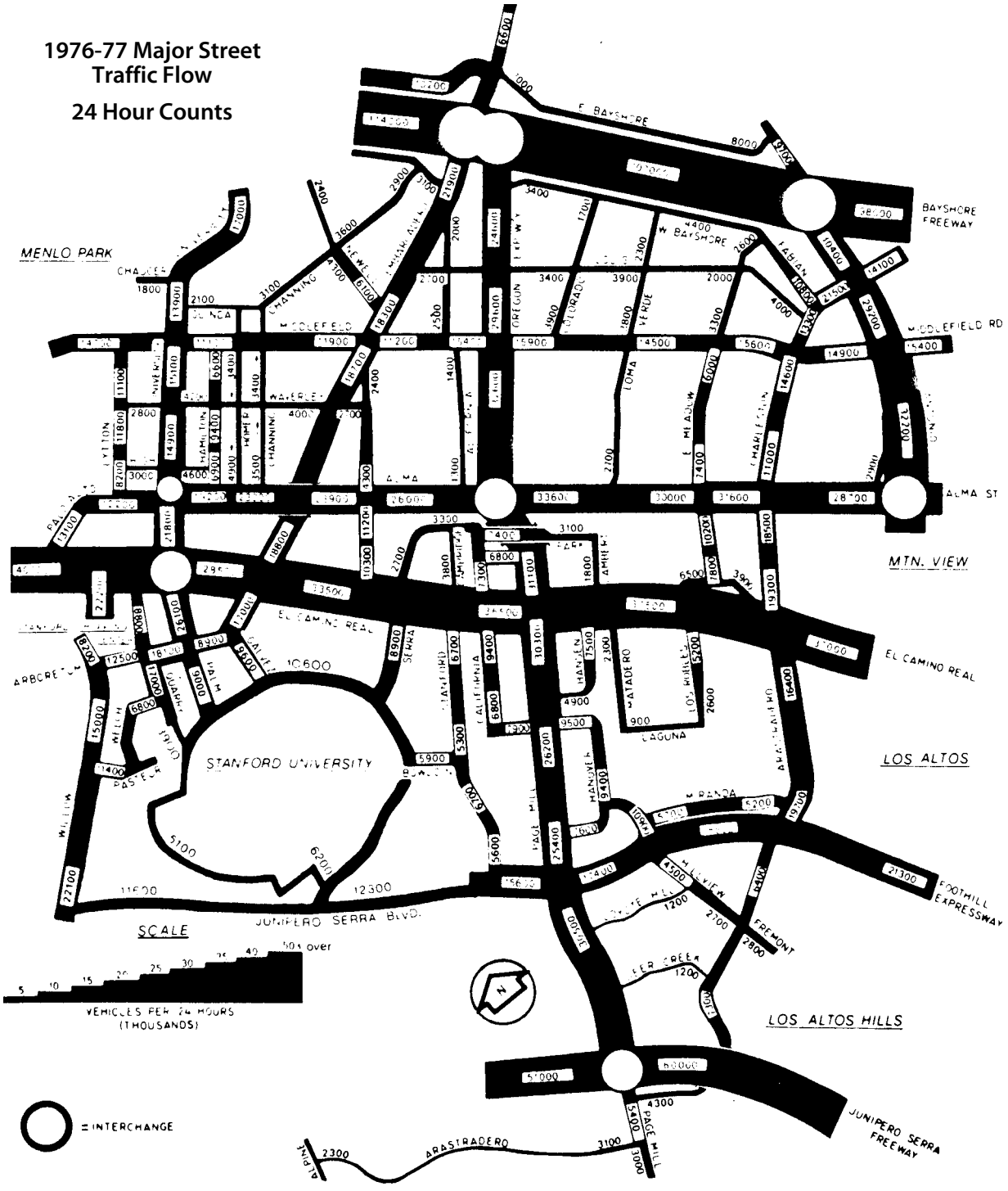
Palo Alto (population 55,000) is located in Santa Clara County in the San Francisco Bay Area. The County is home to Silicon Valley. The policy in the City of Palo Alto's general plan for two decades has been to promote and encourage cycling and to recognise it as part of the transportation mix. Planning for bicycles was incorporated into an overhaul of a comprehensive city plan in the 1970s. Ordinances were updated to conform with new policy, included provision of parking at work places. The city has no specific targets or objectives for percentages of trips made by bicycle aside from the simple target of promoting bicycling. (Fletcher 1990), (Likens 1992)

Palo Alto is responsible for most roads through their council area, with the exception of: Two freeways, and the El Camino Real Highway that are under state control and which have no provisions for cyclists; and the Foothill and Page Mill Expressways (35K vehicles per day) that are under Santa Clara County control and that have bicycle lanes over a majority of their length. Most arterial and collector roads remain under council control. (Likens 1992)

Bicycles are “institutionalised” into the Palo Alto planning process, and not only transportation planning. A comprehensive approach includes promotion, providing bicycle parking, bicycle education in schools and provisions for bicycles at traffic signals. Palo Alto has their own bicycle coordinator and a Bicycle Advisory Committee. The pro-bike policy works its way down through to transportation engineering and field personnel via the Bicycle Coordinator. The Bicycle Advisory Committee (BAC) was formed about 20 years ago. This committee is composed of cyclists interested in advising the transportation department, and is not appointed by council. The Planning Department takes issues concerning the 4 E's to the committee and the committee reviews all road improvement plans and advises on such matters as intersection treatments and other bicycle issues. Meetings with the BAC are monthly, involve a process of give and take, and are considered to be very productive. BACs are now a requirement for all counties in the Bay Area. (Fletcher 1990), (Likens 1992)



City of Palo Alto Bicycle Routes, Division of Transportation



"Daily traffic volumes have increased steadily during recent years and have reached a level unacceptable to many Palo Alto residents" (Palo Alto 1981).

Historical Background

(Palo Alto 1972)

In 1967 the Palo Alto Planning Commission approved a plan to sign 43 km of lightly travelled residential streets as *bicycle route* streets. It was envisioned that this would remove existing bicycle-automobile conflicts and confrontations on heavily travelled collector and arterial streets by encouraging bicyclists to use other parallel residential streets considered safer for bicycle travel. The Planning Commission did consider and recognise the desirability of the concept of special bicycle lanes on certain selected streets however the decision was to approve the bicycle routes on a one-year trial basis.

Results from the bicycle route trial were discouraging, with more than 65% of bicyclists surveyed reporting that they seldom or never used the bicycle routes. It was apparent that the routes did not lead to or end at desired activity centres and use of the uninterrupted arterial and collector routes continued to be preferred. A 24% increase in city wide bicycle-automobile accidents during the trial was also noted (though no reasons for this increase were given).

In 1968 Palo Alto city council approved experimental bicycle lanes that "proved conclusively that the concept of bicycle lanes was not only workable but certainly offered a more promising solution to the bicycle safety problem". Cyclists demonstrated that they would choose to ride within the bicycle lane even when legally permitted to do otherwise. The bicycle lanes also significantly reduced confrontations and antagonism between bicyclists and motorists. A city-wide bicycle lane system was recommended.

Palo Alto approved and adopted an *Urban Bicycle Route System - Master Plan* in 1971. The primary stage of this plan indicated immediate development of bicycle lanes on those major arterial and collector streets that had the most bicycle usage, with the secondary stage calling for completion of the UBRS.

The biggest problem in the development of the bicycle lane/path system was and is clearly the impact that bicycle lanes have with respect to on-street parking both in residential and business districts. Unlike Davis, California, where most of the bicycle lanes could be accommodated within the roadway without loss of on-street parking, narrow Palo Alto streets cannot reasonably and safely accommodate such bicycle lanes without resorting to on-street parking bans.

Three alternative bicycle lane/path plans were submitted to council in 1972. Plan 'C' utilised the basic and unworkable concept of two-way bicycle lanes on one side of public streets and was therefore rejected. Plan 'A' provided an ideal solution from a cyclists viewpoint because all on-street parking was prohibited on a 24 hour basis on both sides of 72 km (25%) of Palo Alto roadway with bicycle lanes on both sides of the street. This was considered drastic because of the severe hardships that would be imposed on residents and merchants. Plan 'B' proposed all day parking restrictions on one side of the street only so that bicycle lanes could be installed on both sides of the street. This plan was considered a compromise plan since it attempted to accommodate both the inherent demands for on-street parking and the legitimate needs for bicycle lanes.

Council chose to advance with Plan 'A' to gauge public reaction which was predictably negative from many people. Plan 'B' became more palatable to the public when compared with Plan 'A', however there was still vigorous opposition from many residents and Plan 'B' was reduced to Plan 'E' which called for bicycle lanes on only those arterial and collector roads with proven accident history and problems, thus reducing the number of local dwellings affected in the debate from 5600 to 750 and reducing the network from 108 km to 67 km, with parking bans on 29 km instead of 72 km. Parking bans became 7 am to 7 pm on one side of the street only to allow a dedicated bicycle lane, while all day parking was accommodated in a wide, shared bicycle/parking lane on the opposite side of the street, with the road centre line appropriately skewed. A five minute loading period was permitted in specific instances when other on or off-street parking was not available.

Field surveys indicated that the average commuter cyclist (excluding school children) rides 6 km round trip per day and that 50% of their riding was on Plan 'E' streets, that is 50% of cycling occurs on 20% of all city streets. Another survey found more than 12,000 bicycles passed through intersections during a 12 hours period. This later number was “surprising beyond belief” probably only because no comprehensive survey had previously been performed to bring attention to the fact that there were so many cyclists. The number “clearly justified and quite dramatically demonstrated” the need for the bicycle lane system based on existing bicycle usage.

Implementation of Plan 'E' was approved and begun in 1972 and made possible only because of funding assistance through the Federal Land and Water Conservation Act of 1965. Physical accommodation of bicycle lanes on public streets is considered as one part of a comprehensive approach to the problem of bicycle safety that includes education and enforcement as integral elements.

Surveys to May 1973 indicated a 13% increase in the number of cyclists during the previous 12 months. There was an 18% decrease in the accident rate on roads with bicycle lanes during this same period. More up to date data is not available.

Urban Bicycle Route System Experience

The Urban Bicycle Route System (UBRS) that was developed consists largely of bicycle lanes on arterial and collector roads. Much of the impetus for the bike lane system came from the important safety concerns associated with access to schools; 50% of cyclists using the bike lanes are school aged. Expertise with bicycle facilities has developed along with the UBRS. (Likens 1992)

In the late 1970s bicycle paths on designated sidewalks of certain roads where bicycle lanes could not be established were officially trialed. Use of the sidewalks was initially deemed compulsory. Assessment of field observations and an analysis of accident data indicated that this particular concept presented an undesirable high-risk situation, increasing the accident rate 2.7 times. Ordinance were therefore amended to allow cyclists to choose either the roadway or sidewalk and sidewalk bicycle paths are no longer considered a viable option. (Palo Alto 1972)

A summary of the measures introduced by Palo Alto over the years to improve cycling in the city

(Fletcher 1991b)

- An extensive bicycle lane and bicycle path system.
- Bicycle/pedestrian bridges and under crossings permitting bicyclists to bypass major arterials.
- A bicycle boulevard providing a throughway where periodic barriers prevent through motorized traffic and where there are a minimum number of stop signs.
- A Comprehensive Plan calling for a network of such boulevards.
- Straight-through bicycle lanes to the left of right-turn-only lanes at some intersections, with pavement signal detector loops for bicyclists to trip.
- Bicycle-responsive, marked signal detector loops, and guidelines calling for the use of the diamond (D) design for easier detection by bicyclists.
- Signal cycles are timed to permit adequate clearance by bicyclists.
- The installation of a rubber railroad crossing pad at one crossing, and scheduled plans for two more.
- Asphalt pavement replacement must be of high quality. These replacements are inspected up to one year after installation and must be replaced if found defective.
- Asphalt pavement overlay must be flush with the concrete gutter pan, and utility covers are raised to be flush with the new pavement.
- A bicycle traffic school for juvenile bicycle vehicle code offenders.
- An on-road bicycle in traffic (effective cycling) class for year sevens.
- The Police Department has a bicycle patrol unit.
- Drive-through facilities must serve bicyclists.
- City employees are reimbursed 7 cents per mile for official bicycle travel.
- New employment sites of over 1000 m^2 must install showers.
- New non-single family developments must provide bicycle parking, at a ratio of 10% of auto parking at employment sites, one per unit in residential projects. Design standards calling for class I (bicycle lockers or their equivalent) apply in most instances.
- A bicycle advisory committee works effectively with staff on a wide variety of bicycle-related issues, and is consulted by staff on all roadwork early in progress.

Experience with bicycle lanes indicated that "a reserved area for most cyclists on streets with considerable motor vehicle traffic achieves the physical separation between motor vehicle traffic and bicycle traffic needed and demanded by most of the bicycle public to improve bicycling safety". Though statistical data was minimal, there was "strong and positive indications as well as increasing evidence to suggest that bicycle lanes play a significant role in providing both real safety improvements, as evidenced by bicycle accident rate reductions, and psychological safety improvements as reflected by the increase in the number of daily bicyclists travelling on those public streets with bicycle lanes". Initially there was mandatory confinement of cyclists to bicycle lanes. Ordinances were later modified to make bicycle lane use discretionary because "it was concluded that overall operations could be significantly improved by changing the use of bicycle lanes to discretionary mode". (Palo Alto 1972)

East Meadow Street, Palo Alto

Four lane road was reduced to two lanes plus separate bike and car park lanes. Note that cars may park partially onto footpath.

author 1994

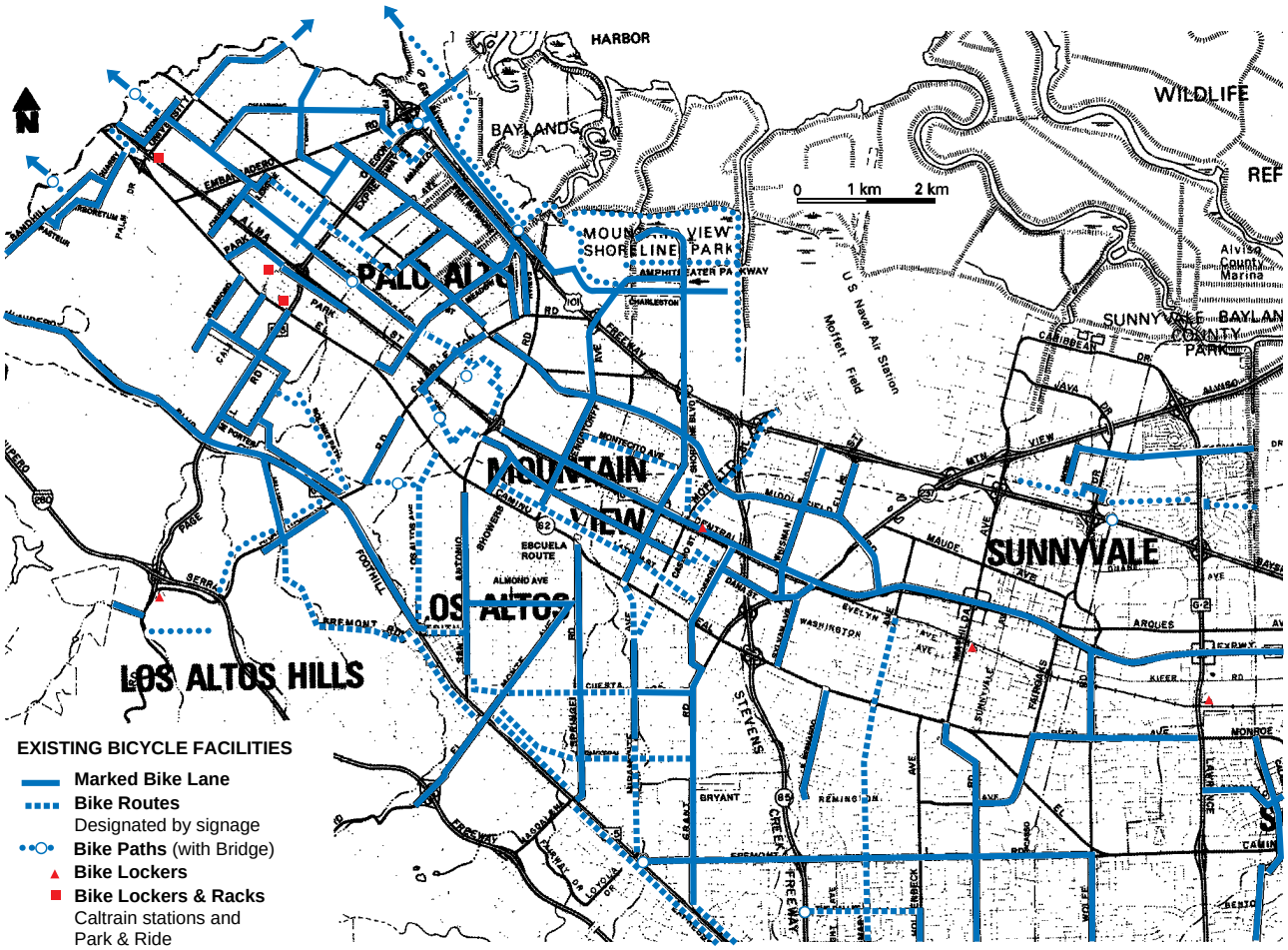
Intersections on routes with bicycle lanes invariably provide lane marked space for bicycles to queue and pass stopped motorists. The Palo Alto Bicycle Advisory Committee published a list of intersection design guidelines in 1992 (Palo Alto 1992).

There is an acknowledgment of the need to provide high quality surfaces within bicycle lanes. Standards for road patching are high and roads are frequently swept for debris. Part of the incentive for this quality bicycle lane maintenance stems from liability issues.

As previously indicated, implementation of the bicycle lane network required compromise, particularly on roads with parking. Bicycle lanes do exist on arterial roads and parking issues have been successfully resolved. Trade-offs are often possible with parking moved to side streets or off street. Skewed centre lines with parking on only one side of the street was a frequent though not ideal solution. This solution is not ideal because car drivers were more likely to open their doors without first looking for bicycle traffic in the wider lanes. Guidelines have been recently updated to require a separating line between bikes and cars in these lanes. (Fletcher 1990)

In another situation 4-lane roads were reduced to 2 lanes with bike lanes and parking on both sides of the street. This made cyclists and motorists happy because of the increased convenience of parking. In one example situation it is not likely that the same solution would have been accepted today because of increased motor traffic. (Fletcher 1990)

Palo Alto has provided a lead that has been taken up by most of the other councils in Santa Clara County. The result has been an UBRS that spans over 20 km and makes cycling a comfortable experience. The county itself is in fact becoming more pro-bike with time, although their engineers are apparently "not yet up to scratch". Other councils have Bicycle Advisory Committees and new legislation at the state level will require every city and county to have a BAC. There is new regional direction to deal with congestion and air quality. Everyone in the area is being asked to promote commuting alternatives and clean transportation: bicycling, car pools, and Light Rail Transport. (Likens 1992)



Santa Clara Valley Bikeways
(Santa Clara County Transportation Agency 1991)

(Santa Clara County Transportation Agency 1991)

The Santa Clara Valley Urban Bicycle Route System consists mostly of roads with bicycle lanes. To more expert commuter cyclists riding 7 to 20 km per day, speed is important and arterial streets are attractive because of the relatively few if any stop signs and signals spaced at greater intervals. The expert cyclist is comfortable riding with traffic though they would often prefer less trafficked roads.

A function of the bicycle lanes is to make roads more attractive to novice cyclists. However it is recognised that some cyclists are not comfortable with the busier main roads regardless of whether they have bicycle lanes. Few younger cyclists use Middlefield Road, for example, because of its heavier traffic. The *Bicycle Boulevard* provides an alternative for these cyclists as well as providing a quality route for more expert cyclists that is as equally direct as main roads. At present Bryant Street is the only bicycle boulevard in Palo Alto. There are plans to develop and implement a network of bicycle boulevards as a component of the UBRS. Some other roads act as defacto bicycle boulevards only they have not been modified to remove stop signs and stop through motor traffic.

Innovations - The Bicycle Boulevard (Bryant Street)

(Palo Alto 1982)

A 1982 innovation was the introduction of a *Bicycle Boulevard* along a 3 km stretch of a residential street. The pilot scheme used Bryant Street - a road with considerable linear continuity that already carried significant bicycle traffic (between 200 and 300 bicycles per day). To create the bicycle boulevard, stop signs were removed or turned to stop side traffic and barriers installed to stop through motor traffic while allowing unhindered flow of bicycles.

Bicycle traffic along Bryant doubled as a result of the bicycle boulevard with volumes of bicyclists becoming comparable to other well established bike routes. A significant portion of the cyclists were secondary school students accessing a nearby school. Traffic volumes within the overall Bryant Street bicycle boulevard corridor remained fairly constant indicating a shift of users from other roads serviced with bicycle lanes during the study period.

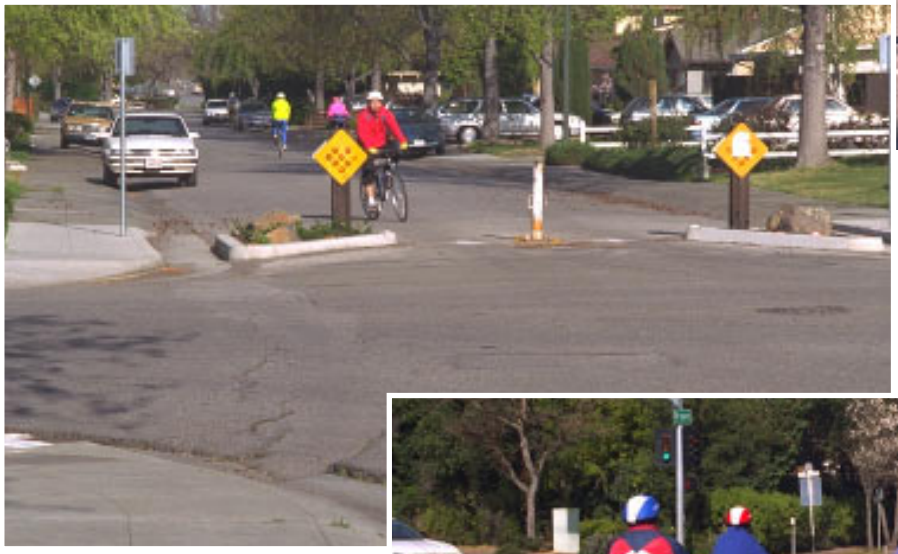
Problems anticipated prior to the Bryant Street demonstration failed to materialise. Accidents remained at a low level; traffic did not create a problem on adjacent streets; and neighbourhood reaction to the inconvenience of the barriers, and bicyclist and motorist behaviour, was at a minimum.

Local residents reported fewer complaints of speeding motorists after the bicycle boulevard installation. The number of moped and motorcycle access violations through the barriers was minimal. Observations at one stop sign that interrupts the route showed that most cyclists scanned for cross traffic as they approached the intersection, some scanned and slowed down, and a few came to a full stop.

A shortcoming of the Bryant Street bicycle boulevard was that it serviced a residential and school area only and could therefore not reach full usage potential. To improve the performance of the Bicycle Boulevard Council voted to extend the service an additional 2 km, beginning in September 1992, through the downtown and to a bike/pedestrian bridge adjoining a neighbouring council. [This extension has been completed, and bicycle traffic flow along the route has increased as a result].

The Bicycle Boulevard
Bryant Street,
Palo Alto
(photos by author 1994)

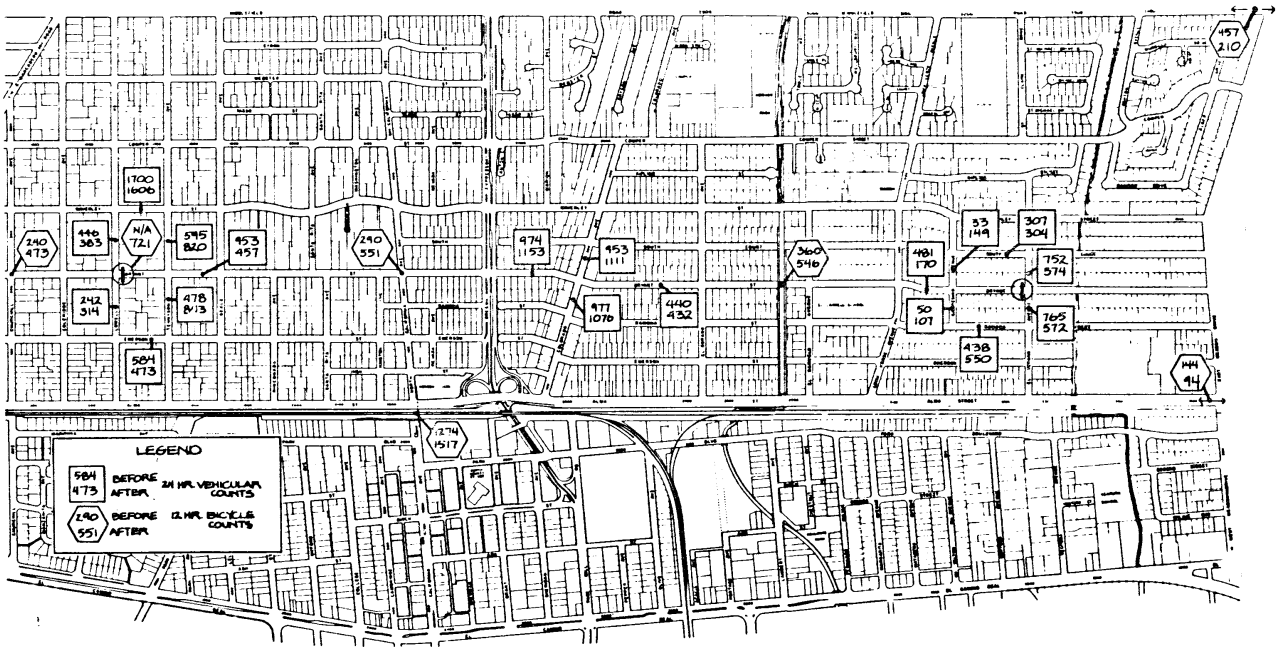
Stop signs have been turned to favour traffic along Bryant Street (Stop sign reads *Caution – Cross Traffic Does Not Stop*).



Road closures allow bike through traffic (1.7m wide opening), Traffic on cross streets face stop signs.

Crossing at Embarcadero Road: Motor vehicles on Bryant must turn right; Bicycles have signalled through crossing.

Separate bicycle and pedestrian bridges were built to cross Adobe Creek, a natural block to through motor traffic.



Comparison of Traffic Volumes and Bicycle Volumes
Bicycle Boulevard Demonstration Study (Palo Alto 1982).

The Relative Merits of Bicycle Lanes

(Ciccarelli 1992)

In November 1991 the San Francisco Bicycle Advisory Committee hosted a panel discussion called *The Relative Merits of Bicycle Lanes*. Highlights from this discussion are worth reprinting here because they represent the knowledge of people with over two decades of involvement with bicycles in the Bay Area. The five speakers at the discussion included:

- Ellen Fletcher, longtime bicycle advocate and former Palo Alto city council member for 12 years, largely responsible for that city's reputation as one of the nation's most bike-friendly cities.
- Bruce Couchman, Caltrans planner and project reviewer, most recently involved in evaluating Proposition 116 bicycle/pedestrian projects.
- Rick Blunden, Chief of Caltrans Office of Bicycle Facilities (California's first full-time state-level bicycle planning official since 1983), co-author of Caltran's Chapter 1000 bikeway design standards which serve as a nationwide example.
- John Forrester, past president of the League of American Wheelmen (LAW) and author of the books Effective Cycling (basis for the LAW's "driver training" courses for bicyclists) and Bicycle Transportation (a cornerstone in the field of bicycle transportation engineering).
- Tom Nolan, pro bike Novato City Engineer since 1982.

Advantages and disadvantages of the three bikeway types listed in Caltrans's Chapter 1000, plus a fourth category - bicycle boulevards, were discussed:

Table 12-1 : Bike Paths – Caltrans Class 1
Pathways separate from motor vehicle roads

Plus	Minus
Useful as shortcuts, especially between dead-end streets.	Intersections create confusing and unsafe situations, especially if the path closely parallels a road that has its own intersections.
Includes bike/pedestrian bridges and under crossings that restore access by freeways and other obstacles.	Vehicles drive out of driveways without stopping.
Includes riverside and converted rail right-of-ways.	Sight lines, grades and tree roots are often problems.
Most useful when there is minimal pedestrian interaction and roadway intersections	Pedestrians use the path as a sidewalk, and wrong-way cyclists are common.
	If the path closely parallels a road, motorists sometimes demand that cyclists use the side path (with some states having mandatory laws in this regard).

Table 12-2 : Bike Lanes – Caltrans Class 2
Bike-only lanes on roads, separated from the right most motor vehicle lane by a solid stripe.

Plus	Minus
Give legitimacy to bicycle transportation.	Often striped improperly at intersections.
Two-lane streets with wide, unmarked lanes are often treated as defacto 4-lane streets by motorists; adding bike lanes restores true 2-lane behaviour and safety.	Motorists expect cyclists to stay there, even when a hazard exists in the bike lane.
Keeps young cyclists out of traffic, and encourages straight riding.	Cars don't merge into the bike lane before turning right [left], cutting off through cyclists.
Both parents and adults report feeling safer, adult cyclists often say that they would drive if there were no bike lanes to their destinations.	Encourages left [right] turns from the bike lane, instead of *vehicular* left [right] turns.
	Cars sweep debris into the bike lane (but this happens even without bike lanes).
	Political problems of getting bike lanes on roads where there is parking.
	Some experienced cyclists dislike them precisely because they encourage inexperienced riders

Table 12-3 : Bike Routes – Caltrans Class 3
Streets signed as travel routes but without bike lanes.

Plus	Minus
Useful if continuous and signed	Often don't go anywhere useful. Easy way for cities to say they are doing something for bike transportation without making substantive improvements.

Table 12-4 : Bike Boulevards
Modified bike routes with few stop signs in the travel direction, stop signs on cross streets, and motor vehicle barriers, resulting in a throughway where bicycles have precedence over motor vehicles

Plus	Minus
Light auto traffic due to barriers. Good way to get people started using bicycles for transportation	Speed problem with cars if no barriers. Politically difficult to create through established ares due to residents' opposition to motor traffic diversion onto parallel streets, and unfounded fears of speeding bicycles hitting kids

Rick Blunden noted that because off-road paths are high visibility projects, they tend to attract political support regardless of their cost or hazards, even when more modest road improvements or bike lane systems might better improve transportation.

John Forrester indicated that the best way to reduce bicycle accidents is to educate cyclists as *drivers of vehicles* and that people who ride regularly to school and work will learn to cycle correctly and safely. The success of bicycle education programs will be jeopardised by programs that "encourage the bicyclist to think of himself as anything other than a vehicle". Riding on the sidewalk, making "bikeway left turns" and other behaviour fostered by standard bike ways are counterproductive.

12.3 Los Angeles

(Snyder 1992c)

Los Angeles County is broken up into 5 or 6 different areas that are presided over by the County Transportation Commission. Together these areas form a continuous urban area. Currently LA County is getting $4 million of $11 million that is available state-wide for bicycle facilities each year. This money usually goes towards separate bikeways (paths). There are mixed feelings about this allocation of limited funding, with it being felt that the money would be better spent on bicycle lanes – 10 miles of bicycle lanes costs the equivalent of only 1 mile of bike path.

The network of bicycle paths is fairly good and is along flood control channels and the beach, and there are quite a few bicycle lanes on city streets as well. The separate paths are useful for some commuters – those served by the location of these routes – and can be nice to ride on as they go on for fairly long distances. The paths are often not well maintained, and at certain times are overrun with rollerskaters, dogs, baby carriages and the like, though these users are not supposed to be on the paths. This is especially true of the beach path. There are instances of cyclists being stopped and robbed along the flood control channel paths.

Recognition of bicycles is definitely on the up swing, with the situation improving significantly in the past year or two. All levels of government are becoming much more receptive. There is a lot more money now for bicycles aside from the regular sources. The new federal ISTEA legislation opens up all sorts of funding for bicycles, and gives more eligibility for bicycles. In addition LA County voters are now accessing themselves an additional 0.5% sales tax for transportation (Proposition C), and the county can use this money for bicycles.

It is thought that there is a big latent demand for bicycle facilities, and that showers, bike routes and parking will increase the number of cyclists. Facilities are justified based on this perceived potential and the fact that so many car trips are short enough to be made by bicycle.

The City of Los Angeles has its own Bicycle Advisory Committee, but does not yet have a Bicycle Coordinator. The positive experience of San Diego and Palo Alto indicates that Bicycle Coordinators are a big help and it is a high priority for LA to hire one. Through the Bicycle Advisory Committee an ordinance was drafted and passed in 1991 that required all new places of employment in LA to provide showers, lockers and parking.

Los Angeles County will be awarding a contract in June 1992 to have a comprehensive regional bicycle plan produced. This bicycle plan will be in two parts. The first part will set county-wide bicycle policies, goals, priorities and establish a process for evaluation of projects as they come in. The second part will be a bicycle route plan for the west area, a region with a number of cities bunched together. This will be a regional plan with regional routes for the cities to plug their own bicycle route plans into. The plan will not go down to the level of specifying what exactly will need to be done on each individual bike route – this is up to the cities. The county will look at the width of the right of ways and give the cities a number of available options for providing bicycle lanes on their streets. The regional plan will also propose regional routes that use additional flood control channels and railroad right of ways that are now owned by the transportation commission. As well the plan will encompass issues of connecting public transport to bicycles, bicycle lockers and policies about bicycles on buses and rail.

There are a number of reasons why the regional bicycle plan will not just sit on the shelves and collect dust. First off ISTEA has made more money available to cities and counties, but in order to get this money proposed projects and planned transportation corridors must be consistent with other plans. City plans must be consistent with County plans, and the County would have to fit into regional transportation plans, which are part of mandated Air Quality Management Plans (AQMP). This provides strong encouragement for the cities to follow in with the County plans, since the County Transportation Commission controls the money and can suggest to the cities what they do.

The second reason that the plans will be implemented is because the cites want to do more for bicycles, only they do not know how to plug in, they don't know if money is available, and they don't know where to plan bicycle routes. The cities will all have their own local bicycle plans which are more detailed than the county plan, but which will plug into the regional plan. The route system will be hierarchical with regional routes on perhaps a 2 km grid, and local routes splitting these routes to provide a grid of 0.5 or 1 km. It could and will be the case in some places that bicycle lanes are on major roads, and in other places on collector streets that are not major arterials but which have the right conditions for a bicycle route without the very large amounts of traffic. Bicycle routes need streets that are continuous and that have traffic-control-lights at arterial road crossings. Neigbourhood or minor streets are not useful bicycle routes for these reasons, unless there is a long residential street that can be made into a bicycle priority street with signals provided at arterial crossings.

The local governments will have to work with the issues of fitting the bicycle lanes on streets. There are a lot of different ways that space can be created. Some streets already have room and only need to be striped. Other streets, say 4-lane roads, can have the centre lanes narrowed to allow more space in the kerb lane. Beyond these two options more commitment is required from the cities, like removing turning lanes from the centre of the street, or cars from the side of the road. Generally on streets with parking on both sides of the road the parking stops before the intersections, so extra space exists at the intersections to provide the bicycle lanes and storage lanes; Intersections are easier to deal with than mid block conditions.

Innovations – The West Los Angeles Veloway

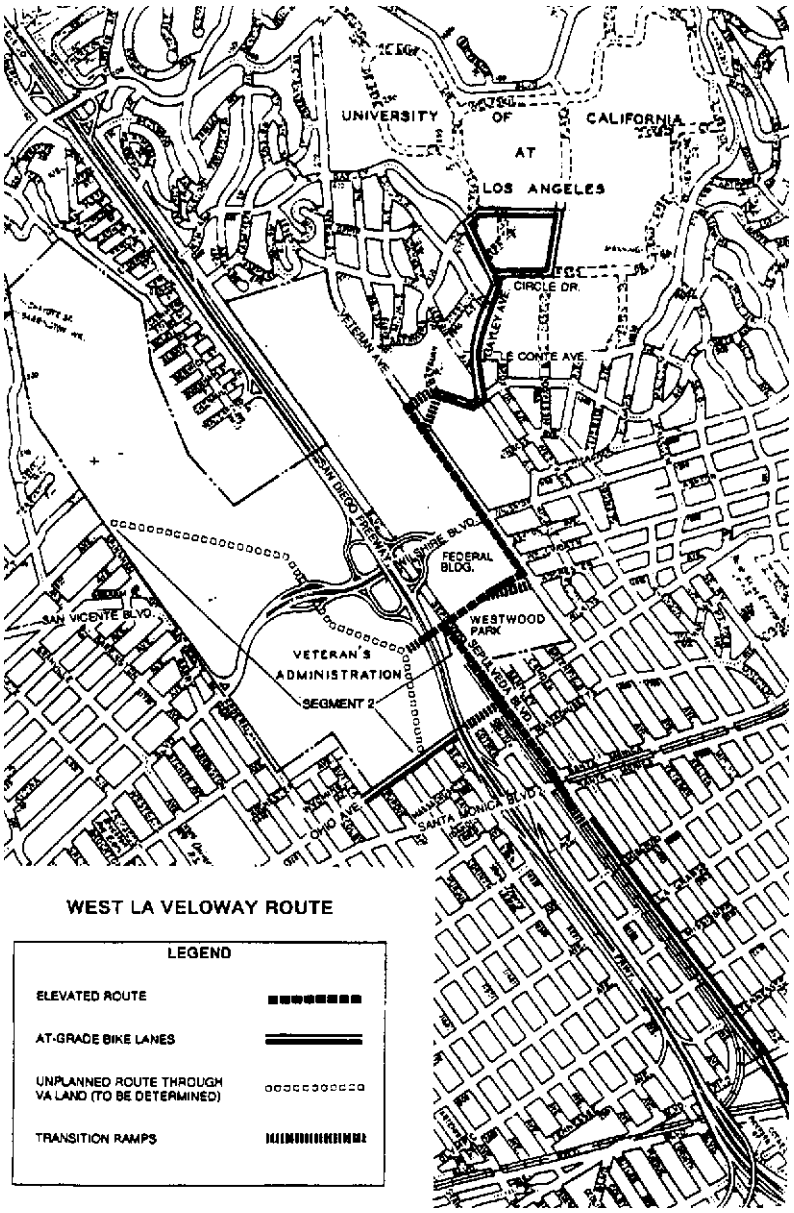
(Snyder 1992b), (Snyder 1992c)

The West Los Angeles Veloway is a proposed elevated bikeway from the campus of the University of California, Los Angeles (UCLA) and the adjacent retail/commercial district of Westwood to residential areas to the south and west, namely West Los Angeles and Brentwood. The UCLA campus has 34,000 students and a 60,000 day time population, and the neighbouring Westwood district employees 20,000. The veloway will span some 3 km with five entrance/exit ramps. The veloway will be 4.9 m wide, enough for 4-lanes of bicyclists, and will be lighted for night travel. By bridging over 4-lane to 8-lane wide arterial streets it will enable people to bicycle over the worst traffic in the Westwood area.

One of the intersections the bikeway will bridge over is Wiltshire Boulevard at Veteran Avenue, which in many years has the highest traffic counts of any intersection of Los Angeles. This stretch of Wiltshire Boulevard has been called the busiest surface street in the world, carrying over 90,000 vehicles per day. The West LA Veloway will also traverse the San Diego Freeway, which has only a few crossings in the area. The first two are Sunset and Wiltshire Boulevard, very busy streets with freeway ramps on both sides. The third is Ohio Avenue which is easier for bicyclists, but is too far south for people coming from communities directly west.

Bike lanes on several surface streets will feed the veloway, creating a network of bike routes. Some of these will connect with the city of Santa Monica, which has drafted plans for a complete grid of bicycle routes. Together these will bring the westside of Los Angeles much closer to having a network usable to people travelling to most local destinations. The Veloway will be accompanied by improved bicycle parking on the UCLA campus and in Westwood, as well as an attempt to improve rider education.

(Snyder 1992b)



By 1980 $45,000 has been committed for a planning study. The resulting study by the Urban Innovations Group (UIG) projected a ridership at nearly 10,000 per day, although forecasting this with a high degree of reliability is not yet possible due to lack of experience with such a structure. The study estimated a construction cost of $7 to $10 million. This was very cost effective compared to the preferred concept of providing more parking in the area. Construction costs for required parking in the Westwood area was $6 million, plus a considerable amount of land space and the purchase of land. (Moser 1987)

The study also categorised benefits by group. Commuters switching to bicycles, and cyclists who would prefer safer rides were factored. Not factored were the costs of accidents saved by the increased safety. Another benefit would be the decreased demand for neighbourhood parking by the 3000 estimated students and staff at UCLA who are expected to switch to bicycle commuting. In the commercial areas long term parking used by employees would be released to shoppers, benefiting the merchants. Employers would benefit from the approximately $1.2 million a year in reduced employee parking subsidies. Benefits to the community in noise and air pollution from reduced traffic volumes would be nominal relative to the total volume. The study concluded by saying that the costs per trip (including operating and capital amortisation costs) compare very favourably with corresponding costs for other publicly supported transportation facilities. (Moser 1987)

Perhaps more significantly the report theorises that "a successful system of bicycle facilities in West Los Angeles will probably prove to be the catalyst to a bicycle commuting trend and motivate other initiatives toward the development of bikeway systems; this in turn may, with time, encourage resettlement of employees in areas closer to their employment location, and thus... shift from a two-car way of life to a one-car condition, then the overall level of travel by car in the region would tend to diminish, and overall levels of congestion would be reduced." (Moser 1987)

In 1983 $95,000 was granted for an environmental impact review that will meet requirements of both the State of California and the federal government, making the project eligible for state as well as federal funds. This report indicated that there were no significant impacts that could not be mitigated. The only important impacts identified were aesthetic concerns, concerns over historical properties and land use planning. To address aesthetic concerns, a special design selection process will be set up, likely involving the mayor's design committee and the local design review board. The proposed Veloway route has been altered to avoid impacting historical property.

Negotiations with the Veterans Administration over use of their land for part of the route have not progressed. Implementation will be staged with segment through VA land being built at a later date. If all goes well, a design selection process will be held in late 1992, engineering will be done in 1993 and the first segment of construction in 1994. UCLA has already committed $113,000, the Los Angeles Department of Transportation $100,000, and LA County Transportation Commission $100,000 towards design/engineering. Construction funds will be assigned once the environmental impact report/statement are complete. Future extension of the network along an abandoned railroad right-of-way that stretches 3 km to a large high-rise commercial centre employing 40,000 employees is being investigated.

12.4 San Diego

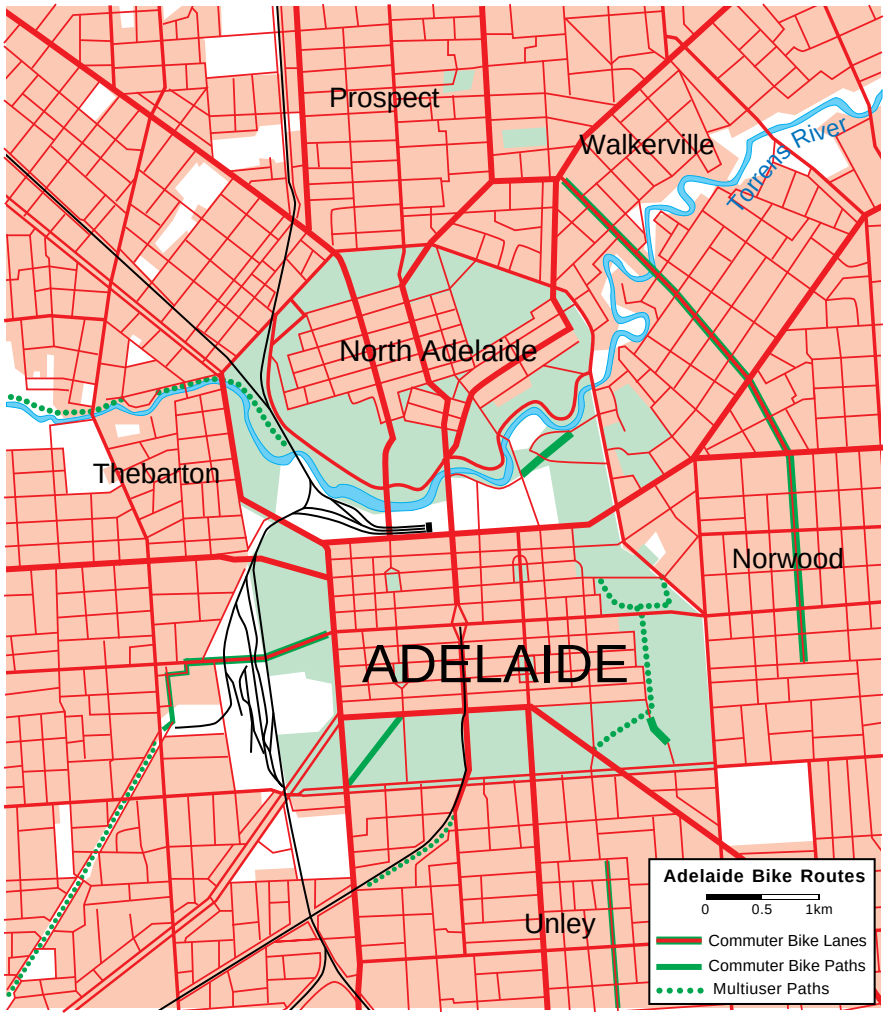
(Snyder 1992c)

San Diego has its own bicycle coordinator and is doing a great deal for bicycles. Several years ago they passed a 0.5% sales tax for transportation, of which some of this money is earmarked for bicycles. Thus they have been operating on more than just state funds. San Diego has a number of bicycle routes, several bike on bus situations, they are numbering routes and putting destination signs up, and ensuring that loop detectors are sensitive to bicycles.

13. Australia

13.1 Adelaide

The Adelaide metropolitan area (population 1 million) is sprawled over 60 km from north to south and 20 km from east to west. Currently 2.7% of all trips are made by bicycle. Adelaide is the only major city in South Australia and, as such, the State Government acts in the role of regional coordination. The metropolitan area is governed by almost 30 independent councils that are bunched together. The State Department of Road Transport (DRT) controls all arterial roads through the metropolitan area and highways throughout the remainder of South Australia. Councils control local roads, some collector roads, and kerbside parking along DRT arterial roads. Adelaide City Council, which includes the central business district, is an exception, in that they control all roads through the central area (refer to map in section 2.2).



Cycling became a political issue in the late 1970s. A State Bicycle Committee (SBC) was formed in South Australia in the early 1980s, at about the same time that SBCs were formed in other Australian states. The SBC was provided $250,000 per annum to subsidise local government bicycle facility construction, with most of this money going towards dual use paths near schools.

Also in the early 1980s the Adelaide Bike Plan was commissioned. This document outlined state policy and also proposed bicycle facilities for the western metropolitan area. The Bike Plan had very little impact, with almost no implementation of the proposed facilities. The SBC did not have a pro-active role and, as such, little was done in the way of providing safe bicycle routes for commuters during the 1980s. As of 1990 metropolitan Adelaide had 30 km of recreational paths, a few roads with bicycle lanes, and a large number of roads with wide kerbside lanes (though without adequate parking restrictions to create safe cycling routes). Bicycle access for commuters and university students to the city-centre remained poor.

In 1991 several significant changes occurred in Adelaide. A turnover in personnel in the SBC, greater activity on the part of advocacy groups, a change in the organisational culture by DRT to now provide for all road users, and a major Metropolitan Planning Review project, has led to potentially dramatic changes in conditions for cyclists. The Metropolitan Planning Review recommended that cycling should be encouraged as one means of controlling motor vehicle use and that an extensive urban bicycle route system should be developed.

The Department of Road Transport still only has two full-time staff in its bicycle unit. They have incorporated bicycle lanes into several yet-to-be-constructed projects, including bicycle lanes at intersections. They are also implementing four new bicycle arterial projects that have been initiated and funded by the State Minister of Transport. The routes project in a radial direction from the city border using a combination of on and off-road facilities, though mostly on-road bicycle lanes along quieter streets, that will provide much improved conditions for those served by these new arterials.

This bicycle planning group is also looking at future routes and ways to incorporate bicycle routes into railroad reserves – beside existing train lines. They are also looking at ways of providing bicycle lanes along several major arterial roads, using clearway (peak traffic) parking restrictions, and by incorporating bicycle lanes into plans for an arterial where traffic may be reduced from 4 lanes to 2 lanes.

A number of the new arterial routes follow roads controlled by local government. This has resulted in problems because of lack of commitment from the local authorities. For example, one of the new arterial bike routes was inconveniently deviated to a back street over a 600 m stretch where bike lanes were most needed, even though there was adequate width for the bike lanes. Local government would not grant even peak period parking restrictions.

The cooperation of local governments and integration of bicycle needs into local area traffic management are areas of poor performance. Local roads that have been good routes for cyclists have been, and continue to be, closed off or *traffic calmed* in ways not favourable to cyclists, so few good alternatives to the arterial road system exist for longer trips. Several councils have had stand-alone local area bike plans prepared during the last two years, with a few of these plans being coordinated across council boundaries. Some of the easier routes suggested in these plans have been implemented, but most along low priority routes.

Environmental developments and pressure from advocacy groups has resulted in the State Government undertaking a complete review of cycling in South Australia that is to be completed in July 1992. Consultants with significant interstate bicycle experience have been employed to help define the strategies that will be necessary to implement policy and to progress cycling in South Australia.

It seems possible, judging from recent changes that institutionalising cycling at the State transport authority level (DRT) may be possible in the near future. Perhaps as a result of the review this process will be aided and greater gains can be made in bridging the difficult communication gaps with the many, independently operated, local governments.

Brighton, South Australia
Exclusive right turn pocket for cyclists.

author 1992

14. Conclusions

The European experience shows that widespread bicycle use in everyday travel is possible, and the implementation of strategies to substitute bicycle use for auto use can be encouraged. These strategies include: creating a positive image for the bicycle and cyclists; establishing an extensive bicycle network that is superior to the auto network (including bike-and-ride facilities with public transportation); introducing restrictions on auto use; and focusing urban planning on reducing travel distance. (Bracher 1988a)

The Trend

It is now becoming more widely recognised that increased bicycle use brings real benefits to European cities that are being faced with increased urban sprawl, decreased quality of urban life, and daily smog problems caused by dependence on the automobile. The costs of bicycle infrastructure are considered by some countries as minor in comparison with the costs of infrastructure to support alternative and more costly modes of transportation.

During the 1950s and 1960s bicycle use declined with the spread of the motor car. Planners did not question this trend as universal car ownership was anticipated to soon arrive and environmental consequences had not emerged. In the 1970s it was the Netherlands and Denmark who first decided to arrest this trend. The Dutch used a 10 year, $A360 million subsidisation program to demonstrate and support a change in policy that called for increased infrastructure for bicycle transportation. This program has been very successful with bicycles having the fastest growth rate amongst the various modes of transportation, almost 29% over six years.

The list of cities and countries that are increasingly regarding cycling as a legitimate mode of transport has expanded greatly just in the last few years and there is no doubt that the image of bicycling is rapidly moving from being a problem to being part of the solution. In the car-culture country of France, for example, a club has formed of over 30 cities that want to make cycling more popular. The Austrian city of Graz has implemented a policy specifically to achieve a modal shift from cars to bikes (CTC 1991a). The Netherlands is stepping up their support with a National Bicycle Policy which aims to increase bicycle use by 30% by 2010. Certain counties and cities in Britain have taken their own initiative to reverse that countries trend towards auto dominance. Some Swiss cities are devoting more money to bicycle facilities. More and more German cities, faced with continual degradation by cars, are promoting bicycles.

While western European cities try to head off North American style urban sprawl, Canadian and US cities are showing an increased tendency towards promoting bicycle transportation based on environmental and equity reasons. A few US regions (e.g. Santa Clara Valley, Oregon, Seattle) have advanced programs of bicycle facility development. Other cities that formerly trivialised bicycle transportation issues are also becoming aware of the need to promote bicycles for transportation and are in the early stages of developing bicycle policy.

Federally the US Department of Transport's policy has recently been changed from one of accommodating bicycles to one of increasing bicycling. They are currently preparing a national bicycle and walking study that will develop an action plan to increase cycling. Federal legislation has recently been passed that requires all states to plan for bicycles as an integral part of the transportation system and to prepare long range bicycle plans and appoint bicycle coordinators. General transportation funds formerly earmarked for highway construction have been made available to bicycle and pedestrian projects. City and county plans will also be required to conform with new air quality management plans, which will result in decreased emphasis on cars for transportation.

The experience of many cities is that a shift towards greater use of bicycles can only be successful as part of a broader traffic restraint policy. Politicians often do not do enough to promote cycling because, to really promote cycling, car driving must be made less attractive, perhaps by giving lanes over to bicycles.

The push to integrate cycling into transportation planning will not be easy, particularly in North America and Australia where cities have been built around the automobile. A major hurdle is the required education of engineers and planners by those *few people with foresight*. Seattle gives what is perhaps the most advanced example of where this has happened. Their comprehensive bicycle policy makes clear and very detailed statements that pertain to institutionalising bicycles into policy and planning documents, regulations, design manuals, consultation and review processes, training and data collection.

Government support

It will be up to Governments to decide which of two future development directions their cities will follow. The trend to date is undoubtedly towards a motor-favouring city with long travel distances. The second and of course more complicated possibility is towards a city favouring the use of bicycles and pedestrians. The latter is more arduous because it requires reorientation.

Research by John Pucher, Rutgers University associate professor of urban planning, of transportation systems in 12 European and North American countries confirmed that it is not levels of income, technology, urbanisation or differences in terrain or climate that influence people to ride bicycles. It is strong government support which makes the difference (Lowe 1990). This review of developments in Western Europe and North America supports this claim.

Most sources have indicated that government support must involve more than providing bicycle infrastructure. It must be backed by a genuine commitment to increase bicycle use as an alternative to the private car, a positive attitude, promotion (marketing, free maps, signs, frequent publications in the local press) and education.

It is interesting to note the mechanisms by which a change in government policy in favour of bicycles has been fed through the different levels of government hierarchy. In the Netherlands the national government supported this change through its 10 year state subsidisation program that brought the entire country up to date and helped to standardise the quality of facilities. In Ontario (Canada) and the United States local government plans must be consistent with the plans of their regional

government – funding can depend on this consistency. When there is direction from the top this can be effective, however it has been the case in North America in the past that support for cycling has normally grown from the bottom-up. Local governments have provided bicycle facilities and the effect has been for neighbouring cities and regional governments to *see the light* and follow in step. Now it looks at though the situation will be changing in the US and more direction will be coming from *above*.

Design

International developments show clearly that priority and comfort for bicyclists are very important. Various countries have provided these features in their bicycle facilities in different ways:

- The Netherlands' extensive system of bicycle paths is separate from the roads and pedestrian facilities and provides good comfort, while managing at the same time to provide adequate *priority* for cyclists.
- Detmold, Germany teaches the lesson that creating bicycle paths that remove cyclists from the road without providing priority access is not effective.
- On the other hand, a *priority for the bicycle* slogan, coupled with traffic restraint and facilities separate from the road network, worked well in Erlangen, Germany, increasing cycling from 15% to 30%.
- Frankfurt is combining bicycle lanes with bicycle priority routes through tempo 30 zones and off-road paths in isolated areas in their more recent attempts at retrofitting bicycles into their transportation system.
- The trend in California is to provide cyclist priority and comfort mostly with on-road bicycle lanes, and also using *bicycle boulevards* (a recent innovation), or elevated veloways (possible future innovation).

Whatever the technique of providing for cyclists, the underlying principle is to make the cycle route faster, safer and more convenient. The most important step to improving traffic conditions in favour of bicycle traffic is to enlarge the amount of road space for cyclists and therefore create a situation where the bicycle's utility relative to the car's is increased. Obligatory bikeways which simply serve to remove bicycles from the road may limit the bicycle's useful flexibility and in the end have a discouraging effect on would-be cyclists. On the other hand measures which make a cycle route faster, safer and more convenient, be it through construction of special bikeways or the favouring of bicycles on the existing roads, may increase the number of cyclists.

There is not one solution that is always most appropriate when providing bicycle facilities. There must be an understanding of local conditions in determining the type of facility to employ. For example, bicycle lanes in central Paris tend to command little respect from cars, while in California they are very effective. Shared use (bicycle and pedestrian) facilities in Europe are rare. Bicycle paths in North America and Australia tend to be shared use and engineered for low speeds and are thus often not appropriate for bicycle transportation. Special traffic lights and other innovative traffic control devices can and should be used to give priority to bicycles over private motor vehicles.

Two underpass designs, one by the British Department of Transport, and the other in the Netherlands, provide interesting examples of how priority and comfort are perceived by a nation with a poor record of providing for cyclists and a nation with an exemplary record. The shared bicycle/pedestrian path in Britain curves as it descends and a set of fences are placed across the path to form a chicane which would slow cyclists to a virtual (and safe) stop. The Dutch underpass provides wide surfaces and open construction (no tunnel effect) to allow the cyclist to proceed without any losses in speed and with the full safety afforded by excellent visibility.

Cycling in Europe seems to be an ordinary daily activity; one in which cheap bicycles are used for transportation, and cyclists do not wear special clothes, shoes or helmets. Bicycling in the US, however, seems to have more the character of sports. This could be due partly to the urban sprawl in many parts of the US, which means cyclists may have to travel long distances at comparatively high speeds. European cities tend to be more concentrated and bicycle speeds slower. (Bracher 1988a)

To affect modal splits it is demonstrably more important to provide a comprehensive network of bicycle facilities rather than isolated routes. Amsterdam is providing a route system by first fixing problem *bottleneck* spots and, over time, connecting its entire network. In Delft a network was completed by fixing poor connections. Santa Clara Valley built its network rather quickly, and is continually expanding the network through new regions and with a finer grid of routes. In Britain isolated routes were built with little success as part of a national cycle routes program. Experiments in the Netherlands also indicate that isolated infrastructure are not as effective.

The grid of bicycle paths in the Netherlands is hierarchical and very fine at its lowest level – suitable for short trips in a dense environment. Their hierarchy supports the idea of urban level bicycle networks that provide a higher priority system of bicycle routes that are across and through towns and cities. More expensive engineering solutions are concentrated at the urban level network. Even their urban level routes are typically used for trips that are shorter than in Australian and North American cities. At the bottom of the Dutch hierarchy is the neighbourhood-level where cyclists use the existing (traffic calmed/restrained) road system and shared-use paths in neighbourhoods and near schools.

The grid of bicycle facilities in Copenhagen is also fairly dense. This grid is a good and safe proposition, but only to cyclists riding at moderate speed and over short distances, up to 4-5 km. It is acknowledged that for longer trips, necessitating faster speeds, better facilities with less stops are needed. The Chief City Engineer of Copenhagen calls for more of these special routes to attract cyclists from outer regions.

In North America and Australia the predominant type of cyclist is one who must travel relatively longer distances. Those cities in the United States that are considered examples of bicycle friendly cities provide urban-level systems and have ordinances requiring showers and secure parking facilities for bicycles. In the Santa Clara Valley the Urban Bicycle Route System is a system of bicycle lanes along a grid of roads at 1 or 2 km intervals that extend over 20 km. Seattle uses abandoned railroad right-of-ways and are introducing more bicycle lanes on roads. Both locations are also creating Bicycle Boulevards: bicycle priority roads along quieter streets. Bicycle facility design in the US is becoming more pragmatic.

European cities have reported problems with faster cyclists on some bicycle facilities, and complaints of restrictions to bikeways which limit trip flexibility. A faster cyclist can be regarded as a cyclist who is travelling more than 15 km/h and over distances greater than a few kilometres. The *faster* cyclist may not mix well because of design limitations of facilities, or because they are required to mix with slower traffic on limited width facilities. North America and Australia have far greater proportions of *faster cyclists* than in Europe. It is therefore especially important to design for these cyclists, otherwise adjacent roads will be favoured by some cyclists over purpose-built bicycle facilities, or the bicycle facilities can become a safety burden. By using a combination of urban level bicycle route design and local traffic management design to cater for shorter trips, and for children near schools, the transportation needs of all cyclists should be met.

The urban design of North American and Australian cities will make it difficult to attain the modal splits in favour of bicycles that occur in some European cities. A kilometre of bicycle path in a European town or city serves (or has the potential to serve) many more thousands of residents than a kilometre long path in our low density cities. Providing bicycle facilities will make cycling safer for present-day cyclists (equity), tap the latent demand of those who have previously considered the road system too dangerous for cycling, and can help influence denser urban development. The European experience shows that bicycle development is significantly advanced when provided in conjunction with general motor vehicle traffic restraint strategies.

Safety

Many debates on cycling have centred on safety. Providing more bicycle facilities will increase the number of cyclists and therefore the number of bicycle accidents. However overseas experience shows that proper bicycle facilities can *decrease* the accident rate.

The visibility between cyclists and motorists is considered most important (Laursen 1989b). Many of the facilities in Europe and North America, such as advance stop lines, bicycle lanes continued across minor/major intersections, use of line markings and special coloured surfaces for bicycles, increase visibility.

Other issues such as mobility, health, individual and public economy are also important and must be weighed against safety issues. A report commissioned by The British Medical Association, for example, shows that the ratio of life years gained against life years lost because of cycling is about 20:1 (Hillman 1992a), (Hillman 1992b). When discussing safety and bicycles it must first be accepted that we want to increase the numbers of cyclists, then consider how these cyclists should be made safer. If techniques for safe cycling discourage bicycle use then they are not ideal. Since cars represent the greatest danger for cyclists, motor car speed reductions, traffic calming and techniques of channelling and controlling car and bicycle interaction are necessary.

Data on safety, taking exposure into account, is not available, but data on accidents is. The group of countries with the least bicycle accidents – the Netherlands, Great Britain, and Sweden, with around 100 fatal accidents in 1985 – are countries with both high and low levels of cycling. Thus bicycle accident rates and bicycle use do not seem to be positively or negatively correlated. Likewise, there is no evident correlation between bicycle accident rates and traffic law enforcement. The Netherlands, where cyclists seem to be subject to the least enforcement of all European countries, are comparatively safe for cycling. (Bracher 1988a)

Around the world in 30 days – A personal note (edited July 1995)

The thirty days that I spent preparing this report took me around the world by bicycle for the second time in my life. The first was a bicycle tour of Europe after I had graduated from university in 1985. On the 1985 trip I passed through the Netherlands and a few other regions with good bicycle facilities and was amazed to find that cycling in a city or on rural roads did not have to be stressful as I had been brought up in Canada to expect. I managed to traverse the whole of the Netherlands on their system of bicycle routes, and found these routes to be no less comfortable to ride on than neighbouring roads for automobiles (though admittedly the flagstone pavers used on many of the older Dutch paths could be tiring).

Coming back to Ottawa, Canada, I puzzled over why we did not have equivalent facilities and why the path system in Ottawa was uncomfortable enough that I usually preferred to ride on the parallel roads. Was it that the Canadian urban structure could not be made to accommodate bicycles, were there too few cyclists to justify the facilities, or was it *something else* (the answer was *something else* of course)? In 1988 I spent three months working in Mountain View, California, prior to moving to South Australia. It was in California that I first realised that there *was* a solution that could work in North American and Australian cities. Riding on the many bike lanes in this area of California was significantly more comfortable and less stressful than cycling in the parts of Canada that I was familiar with.

Preparing this report, my second trip around the world, was a behind-the-scene look to see what government support and planning existed for bicycle transportation. As with the first tour I found that there were many important lessons to be learnt from Europe. Of particular interest was Dutch hierarchical route design (Delft), the popularity of bike/train travel, and some of the many important characteristics of bicycle facilities that were discussed (the major characteristics being priority and comfort). The resurgence of interest by European countries in bicycles, brought about by an urgent need to minimise the negative impact of automobiles, was also striking.

For Australia the most interesting lessons again came from the US. The similar urban nature of American and Australian cities means that similar solutions are needed. The unique solutions of the US – urban bicycle route systems of bike lanes on roads and bicycle boulevards – are the types that we will need to employ in Australia. Some of the very new efforts to combine bicycles with traffic management will need to be watched closely as Australia moves towards restricting neighbourhood motor traffic while, hopefully, encouraging bicycle travel.

Australia should follow the lead of those that have been successful in the US rather than trying to relive and relearn their twenty years of experience. For bicycling to grow, people need safe places to ride. Government agencies determine the development and management of safe places to ride and in those places in the US where opportunities are growing – for example the Bay Area of California, Seattle, San Diego, Eugene, Oregon, Florida, and North Carolina – certain common characteristics are identifiable: first the presence of a bicycle coordinator or bicycle program manager in the transportation department; second, a strong citizen's group, usually active on a Bicycle Advisory Group; third, a receptive government.

The US Federal Department of Transport's policy to increase bicycling in the US is going to have an accelerating effect on bicycle developments in the US. The new Intermodal Surface Transportation Efficiency Act (ISTEA) makes large funding sources, formerly reserved for federal highway projects, available for bicycle projects. For the first time state and metropolitan areas are required to plan for bicycling as a vital part of the nation's transportation system. Every state must develop a long range bicycle plan and must appoint a bicycle/pedestrian program coordinator in its transportation department. Inter-consistency of local, regional and state plans and new air quality management programs are likely to put even greater emphasis on the need to restrict auto use and provide alternatives.

A Final Note: Around the World Once Again (July 1995)

In August 1992 I travelled again through Europe by bicycle, this time with my wife and my fifteen month old son sitting on the back of my bicycle. I was armed with the information contained in this document, and sought out many of the places that I had read about. A number of the photos from this trip are in this July 1995 edition of this report.

What stood out the most from this latest trip was the government commitment to bicycles and the quality of the facilities in certain regions. For the most part, and there were exceptions, the most recently built facilities provided a level of priority and comfort equal to the level enjoyed by motorists. Newer facilities, having been based on greater design experience, were better. It is from these newer facilities that we should base our design experience. There were many excellent solutions: great bicycle paths; great bicycle lanes along roadways; great *integration* with the transportation system.

We in North America and Australia are so accustomed to poor bicycle facilities that we tend to discount certain types of solutions. As an example, I had begun to doubt that a bicycle path separate from the roadway could ever work. I was reminded in the Netherlands that it was not that separate bicycle paths did not work, but instead it was the commitment to and quality of the facility and its integration with the transportation system that was at issue. I still believe that in the short term bicycle paths are in general not a good solution in North America and Australia. With more experience and commitment perhaps this can change[1].

1. To be fair I should point out that I have seen a few good bicycle paths in North America; notably along the American River in Sacramento, California, and in nearby Davis where you can find a time line of experiments with bicycle facilities (not all good) in a city with a clear commitment to bicycles in transportation.

Switzerland was the biggest surprise of my 1992 trip to Europe. The regions between and including Basel and Biel-Bienne showed a great commitment to providing bicycle infrastructure. Unlike the Netherlands where a long history of bicycle ridership exists, in this region of Switzerland, cycling is a newer phenomena. The cyclists were more like those in North America and Australia, riding modern bicycles and sometimes sporting helmets (virtually all cyclists in the Netherlands do not wear helmets). I learnt later when talking with Oscar Balsiger at Vélo Mondiale in Montreal in September 1992 that cycling had not always been so popular, but had grown in recent years as a result of increased government commitment to this mode of transportation.

The facilities in Switzerland are of a design suitable for integration into North American and Australian road systems. The bicycle facilities were little different than automobile facilities, only that motor vehicles were not permitted. The bicycle paths were like roads, and the bicycle lanes like any other lane on the road (of course the bicycle roads and lanes could be made narrower). All the same pavement markings and signage associated with normal roads could be found on the Swiss bicycle routes. My regret is that there is so little written about Switzerland in this document.

I am once again working in Mountain View, California, and experiencing the joy of cycling on the many well-maintained, quality bicycle lanes in this and neighbouring council areas. It is clear in my mind the infrastructure and commitment that is required from our transportation engineers to make bicycle riding more popular. And it is possible to include this infrastructure in every city that I have ever visited. Whether this infrastructure exists depends on the government: *It is government support for bicycling that makes the difference*.

Author with son Andre during 1992 tour of Europe.

15. References

† denotes recommended reference source with extensive information not duplicated in this document.

Aggernæs Gretter, 1989, *How to Create a Consistent Bicycle Policy*, President of the Danish Cyclist Federation, Proceedings of VeloCity 89.

Ahlström Olle, 1989, *Cycle Planning in Malmö*, Traffic Engineer, Sweden, Proceedings of Velocity 89.

Balsiger Oskar, 1987, *Bicycles on the Road – On bicyclists' Resistance to Bikeways*, Bicycle Coordinator, Canton of Bern, Switzerland, Proceedings of VeloCity 87.

BikeReport, 1992a, *Washington Notebook by Andy Clarke, Magazine of Bikecentennial Inc.*, Missoula MT, Dec/Jan 1992, Vol. 18, No. 1.

BikeReport, 1992b, *New Bill Offers Golden Opportunities , Magazine of Bikecentennial Inc.*, Missoula MT, Feb/Mar 1992, Vol. 18, No. 2.

Bloecher Peter, 1992, *Transcript of telephone conversation at 01h00 on 3 June 1992*, Bicycle Commissioner for the City of Frankfurt Germany.

Bracher Tilman, 1988a, *Policy and Provision for Cyclists in Europe*, Results of a European Commission Research Project on order of the European Cyclists' Federation, Berlin/Barcelona, June, (IVU GmbH, Bundesallee 128, D-1000 Berlin 41, (004930) 850006-29).

Bracher Tilman, 1988b, *European cycling issues: Major approaches to bicycle policy*, IVU GmbH West Berlin, ADFC West Germany, Proceedings of Pro Bike 88.

Briese Volker, 1989, *The fast bicycle – an important political demand or a safety risk?*, Professor, University of Paderborn, Western Germany, Proceedings of VeloCity 89.

Brindle Ray, 1992, *Something good in the State of Denmark,* Australian Road Research Board, Melbourne, Australia, Proceedings of Ausbike 92.

Byers Jim, 1991, *Bay St. lanes speed traffic*, TTC service, report says, in Toronto Star newspaper, Monday 3 June.

Ciccarelli John, 1992, *Bikeway merits debated in San Francisco*, in Spinning Crank, newsletter of the Santa Clara Valley Bicycle Association, California, January-February 1992, Vol. 5, No. 6.

City of Amsterdam, 1987, *Cycling in Amsterdam*, Brochure published by the Traffic and Transport Policy Department, September.

Clarke Andy, 1987, *A Comparison of European experimental cycling projects in Nottingham (UK), Delft (NL) and Detmold (FRG)*, in Proceedings of VeloCity 87, Friends of the Earth, European Cyclists Federation, London, UK.

Clarke Andy, 1990, *Pro-Bike – A cycling policy for the 1990s*, Friends of the Earth, UK.

Clarke Andy, 1991, *The three percent solution: A review of US bicycle policy and Programs*, Bicycle Federation of America, paper presented at Velocity 91.

Clarke Andy, 1992, *Transcript of telephone conversation at 23h50 on 23 June*, Bicycle Federation of America.

Coates Nigel, 1992, *Transcript of telephone conversation at 23h00 on 15 June*, Oxford Engineering Department, UK.

Cooly Glenn and Lazier Kate, 1992, *Province shifts gears on bicycling*, in *Now Magazine*, Toronto, April 9-15, Vol. 11 No. 32.

Copenhagen, 1989, *Copenhagen and the cyclists*, City Engineer's Department, Road Office, August.

CTC, 1991a, *Bikes not fumes – The emmission and health benefits of a modal shift from motor vehicles to cycling*, A report for the Cyclists' Touring Club by Andy Rowell and Malcolm Fergusson of Earth Resources Research (£ 8.00 from CTC, 69 Meadrow, Godalming, Surrey GU7 3HS, tel +44 483 41 7217, fax +44 483 426994).

Danish Vejdirektoratet, 1981a, *Cykel- og knallerttrafik (Bicycle and Moped Traffic)*, Vejdirektoratet, Vejregeludvlget, Projektgruppe N, February.

Danish Vejdirektoratet, 1981b, *Cykel- og knallerttrafik – Bilag (Appendix)*, Vejdirektoratet, Vejregeludvlget, Projektgruppe N, February.

Danish Vejdirektoratet, 1988a, *Cykelruter i 4 buyer (Bicycle Routes in Four Towns)*, January.

Danish Vejdirektoratet, 1988b, *Cykelruter i 4 buyer – Sammenfatning (Bicycle Routes in Four Towns)*, January.

Davies David G, 1987, *Planning for cycling in the West Midlands*, June.

de Wit T, 1987, *Standard for design and maintenance*, Centre for Research and Contract Standardisation in Civil and Traffic Engineering, Ede, The Netherlands, Proceedings of VeloCity 87.

de Wit T, 1988, *Proceedings of Velocity 87 International Congress – Planning for the urban cyclist*, Editor, Netherlands Centre for Research and Contract Standardisation in Civil Traffic Engineering (CROW, PO Box 37, 6710 BA Ede, The Netherlands, phone (0) 8380-20410). †

Denmark Road Directorate, 1991, *Safety of cyclists in urban areas*, Road Data Laboratory, Information Sheet 50, Ministry of Transport (Road Data Laboratory, Stationsalleen 42, DK-2730 Herlev, Denmark, phone +45 42 91 96 33).

Desplats Helene, 1989, *Villavelo: Let's share the* road, Councillor, Municipality of Bordeaux, France, Proceedings of Velocity 89.

Dreber Agneta, 1989, *An ambitious plan for reducing the car traffic in Stockholm*, Vice Mayor, City of Stockholm, Sweden, Proceedings of Velocity 89.

Dutch Ministry of Transport and Public Works, 1987, *Evaluation of the Delft Bicycle Network, final summary report*, Ministry of Transport and Public Works, Transportation and Traffic Engineering Division, The Hague, Netherlands, July 1987.

ECF (European Cyclists' Federation), 1991, *Cities for Cyclists*, Bremen, Germany.

Erlangen, 1991, *Radfahren in Erlangen*, Herausgegeben von der Stadt Erlangen.

Fechtel Hans W, 1989, *German guidelines for cycle facilities and how they should be changed*, Civil engineer, Braunschweiger Forum C.V., Western Germany, Proceedings of VeloCity 89.

Fegan John, 1992, *Transcript of telephone conversation at 22h30 on 23 June*, Federal Highways Administration, Bicycle program manager.

Fletcher Ellen, 1990, *Transcript of telephone conversation at 8h30 on 8 Nov 1990*, former Palo Alto Council member.

Fletcher Ellen, 1991a, *Employer goes all out*!, in *Spinning Crank*, newsletter of the Santa Clara Valley Bicycle Association, California, July-August 1991, Vol. 5, No. 3.

Fletcher Ellen, 1991b, *Bicycling in Palo Alto*, in *Spinning Crank*, newsletter of the Santa Clara Valley Bicycle Association, California, September-October 1991, Vol. 5, No. 4.

Frost Bente, 1989, *A politician's and cyclist's vision about cycling in Copenhagen*, Chairman Transport and Town Planning Committee, Municipality of Copenhagen, Proceedings of VeloCity 89.

Gaul Don, 1992, *Transcript of telephone conversation at 23h30 on 2 june*, Bicycle Coordinator for the Regional Municipality of Ottawa-Carleton.

Grotenhuis Dirk H.ten, 1989, *Safer cycling in Delft after realising the bicycle plan*, Civil engineer, City of Delft, The Netherlands, Proceedings of Velocity 89.

Harreman PJ, 1987, *Traffic lights and cyclists; The Delft Project, new developments*, Stadsontwikkeling, Delft, The Netherlands, Proceedings of VeloCity 87.

Harris, 1992, *Louis Harris Poll results*, to appear in 30 June 1992 issue of Bicycling Magazine.

Haugmark Lone, 1989, *Discussions in workshop "Safety"*, Vice chair of workshop, Danish Cycling Federation, Proceedings of Velocity 89.

Hillman Dr. Mayer, 1992a, *Cycling: towards health and safety*, published by the British Medical Association.

Hillman Dr. Mayer, 1992b, *Letter to Mr. Harry Good of Bicycle Victoria*, Senior Fellow Emeritus, Policy Studies Institute, London, 3 June.

Holzapfel, 1987, *The bicycle as an element of integrated transport planning*, Institute for Research in Urban and Rural Development, Dortmund Germany, Proceedings of VeloCity 87.

Hope Daphne, 1992, *Transcript of telephone conversation at 2h45 on 24 June*, Bicycle Coordinator, City of Ottawa.

Huyink WGM, 1987, *Cycling policy in the City of Groningen*, Traffic Department of Groningen, The Netherlands, Proceedings of VeloCity 87.

Hülsmann W, 1987, *The first international presentation of the final results of the German Model Project 'Towns for Cyclists'*, Umweltbundesamt, Berlin, Proceedings of VeloCity 87.

Jacobsen H Jul, 1989, *Results from experimental bicycle route schemes and derouting car trafffic from the city centre of Odense*, Chief City Engineer, Municipality of Odense, Denmark, Proceedings of Velocity 89.

Jansen Dick 1987, *Comfort and speed versus safety. A dilemma in design of cycling facilities?,* Dutch Cyclists' Union ENFB, Amsterdam, The Netherlands, Proceedings of VeloCity 87.

Jensen Niels and Larsen Jens Erik, 1989, *Cycling in Denmark - from the past into the future*, Road Directorate, Ministry of Transport and the Municipality of Copenhagen, 4th Department.

Collin Jürgen, 1989, *Tempo 30: Results from a traffic restraint program carried out in a number of German citites*, Professor, Technical University, Hildesheim, Western Germany, Proceedings of Velocity 89.

Jutzi Peter J, 1992, *Cycling in Switzerland*, Bienne, Switzerland, Proceedings of Ausbike 92.

Keswick Simon, 1992, *Transcript of telephone conversation at 23h30 on 15 June*, Department of Transport (Policy), London, UK.

Krag Thomas, 1989, *Safety - An Achilles' heal for cycling*, Head of Secretariat, Danish Cycling Federation, Proceedings of Velocity 89.

Lagerwey Peter A and Lehman Joshua D, 1985, *Seattle Comprehensive Bicycle Policy*, Seattle Bicycle Program, City of Seattle Engineering Department, April. †

Lagerwey Peter, 1988, *Institutionalising bicycling in the transportation planning process*, Bicycle Coordinator, City of Seattle, Washington, Proceedings of Pro Bike 88.

Lagerwey Peter, 1992, *Transcript of telephone conversation at 8h30 on 18 June*, Bicycle Coordinator, City of Seattle, Washington.

Larsen Leif, 1989, *Bicycling in Denmark*, Chief of Section, Ministry of Transport, Denmark, Proceedings of VeloCity 89.

Laursen Jan Grubb, 1989a, *Measuring comfort and speed to estimate the quality of experimental cycle routes*, Associate Professor, Institute of Roads, Transport and Town Planning, Technical University of Denmark, Proceedings of VeloCity 89.

Laursen Jan Grubb, 1989b, *Discussions in workshop "Facilities"*, Vice chair of workshop, Technical University of Denmark, Proceedings of Velocity 89.

Likens Gayle, 1992, *Transcript of telephone conversation at 8h30 on 30 May*, Bicycle Coordinator, Palo Alto Planning Department.

Ljungberg Christer, 1989, *Design of bicycle facilities from a cyclist's point of view*, Licentiate in Civil Engineering, Department of traffic planning and engineering, Lund, University of Technology, Sweden, Proceedings of VeloCity 89.

Lott Dale F and Lott Donna Y, 1976, *Effect of bike lanes on ten classes of bicycle-automobile accidents in Davis, California*, Journal of Safety Research, December , Vol. 8, No. 4.

Lowe Marcia D, 1990, *Reinventing the wheels*, MIT Press Technology Review, May/June (this paper has been adapted from Worldwatch Paper 90, The bicycle: Vehicle for a small planet). †

Maher Michael, 1991, *Study tour report – Planning for cyclists, pedestrians and traffic management in Europe and the United States of America*, Transport Planning Branch, Department of Planning and Urban Development, September. †

Martin, Scott, 1992, *The world's best cities for cycling*, in Bicycling Magazine, May.

Matthew Don, 1992, *Survey of bicycling in 150 British towns and cities (title unknown)*, New Cyclist Magazine, Britain, March.

McClintock Hugh, 1989, *Lessons arising from the experience of urban bicycle planning in England and some current issues*, Paper presented to Institute of British Geographers' Conference, January 1989, Institute of Planning Studies, University of Nottingham.

Meilof RW, 1987, *Townplanning, Ways to stimulate bicycle use. How to Plan Urban Developments*, Bureau Goudappel Coffeng, Deventer, The Netherlands, Proceedings of VeloCity 87.

Miller Phil, 1988, *Workshop #26 – Bicycle paths and trails*: *Practical approaches to resolving user conflicts,* Workshop pannelist, King County Roadshare Program, Seattle, Proceedings of Pro Bike 88.

Mills Judy, 1990, *Clearing the path for all of us where trains once ran*, Executive editor of Washington Magazine, Seattle, circa 1990.

Moses PJ, 1988, *Traffic management and safety in Europe and North America 1988*, Investigations Engineer Traffic, Main Roads Department, West Australia, December. †

Mozer David, 1987, *The West L.A. Velo-Way – A solution to UCLA's traffic congestion*?, in Bicycle Forum, Spring.

Nöske, 1984, *Radfahrtrassen, Stadtplanungsamt Erlangen*, Sonderdruck aus der Schriftenreihe "Unfall- und Sicherheitsforschung Straßenverkehr" Heft 49/1984.

Ontario, 1992, *Review and update of bicycle policy – List of issues*, Ministry of Transportation, Municipal Transportation Policy Office, Ontario, Prepared by Marshall Macklin Monaghan.

PABAC (Palo Alto Bicycle Advisory Committee), 1992, *Recommendations on intersection design*, (reprinted in Pedal Update 88 and 89, newsletter of the Bicycle Institute of South Australia).

Palo Alto, 1972, *The Urban Bicycle Route System for the City of Palo Alto*, author unknown, California, 1972.

Palo Alto, 1981, *Palo Alto Comprehensive Plan*, Transportation Section, California, circa 1981.

Palo Alto, 1982, *Bicycle Boulevard demonstration study - Evaluation*, Palo Alto Staff Report, California, 9 Dec 1982.

Parker Harry W and Robinson Robert A, 1983, *The world's largest diameter soil tunnel – Report on Mt. Baker Ridge*, Underground Space, Vol. 7, pp 175-181.

Pronovost Jean-François, 1992, *Transcript of telephone conversation at 23h00 on 23 June*, Executive Director, Vélo Québec.

Public Innovation Abroad, 1992, *National bicycle policy is adopted in Netherlands*, Published by the International Centre, Academy for State and Local Government, Transportation Issue, March, Vol 16 No 3, pp 2-3.

Ricardi Luigi, 1989, *Restrictions on car traffic in Milan, Visions and preliminary results*, Chairman Ciclobby, Cyclists Organisation, Milan, Proceedings of Velocity 89.

Richard Jochen, 1987, *Special facilities for cyclists in the cycle friendly town of Detmold*, Planungsbüro Richter-Richard, Aachen - Germany, Proceedings of VeloCity 87.

Rørbech Jens, 1989, *Planning for bicycling in Copenhagen*, Chief City Engineer, Head of Transport Department, Copenhagen, Proceedings of VeloCity 89.

Simons WJ, 1987, *Social status and position of the bicycle in the Netherlands*, Stichting Fiets!, Amsterdam, The Netherlands, Proceedings of VeloCity 87.

Snyder Ryan, 1992a, *An overview of bicycle planning efforts in California*, Ryan Snyder Associates, Transportation Planning, Los Angeles, California.

Snyder Ryan, 1992b, *The West Los Angeles Veloway,* Ryan Snyder Associates, Transportation Planning, Los Angeles, California.

Snyder Ryan, 1992c, *Transcript of telephone conversation at 8h30 on 22 June*, transportation planning consultant, Los Angeles, California.

Spiegel, 1991, *German traffic – Learn and be startled*, in *Der Spiegel* 25/1991. Translated in Pedal Update 88 (newsletter of the Bicycle Institute of South Australia).

Squarcialupi Vera, 1987, *Cycling in Italy*, Member of the European Parliament, Milano, Italy, Proceedings of VeloCity 87.

Stockholm, 1991, *Stockholms Cykelkarta, 1:20,000 scale*, Södra Delen, Esselte Kartor AB, ISBN 91-7058-409-5.

Trevelyan Peter, 1976, *Bicycle planning in Sweden*, Alastair Dick and Associates, Traffic Engineering and Control, February.

Tschopp J, 1987, *Bike and ride, and the Introduction of the Green Reduction Card. Basel. A Success Story in Stimulating use of Public Transport and the Bicycle*, Verkehrsclub der Schweiz, Basel, Switzerland, Proceedings of VeloCity 87.

Weilenmann Theo, 1989, *More space for bicycles – less space for cars: Swiss examples*, Verkerhs-Club der Schwiez, Zurich, Proceedings of Velocity 89.

Wellemand AG and Dijkstra A, 1987, *Cyclists and road safety in the Netherlands*, Institute for Road Safety Research SWOV, Leidschendam, The Netherlands, Proceedings of VeloCity 87.

Wilmink A, 1987a, *The effects of state-subsidising of bicycle facilities*, Ministry of Transport and Public Work, The Hague, The Netherlands, Proceedings of VeloCity 87.

Wilmink A, 1987b, *The effects of an urban bicycle network – Results of the DELFT PROJECT*, Ministry of Transport and Public Works, The Hague, The Netherlands, Proceedings of VeloCity 87.

Winterthur, 1988, *Zweirad Verkehrs Anlagen Innerorts*, Winterthur-Versicherungen, Abt. IK, Schweiz, Postfach, 8401 Winterthur (date of publication unknown).

16. Supplementary References

Jensen, 1990, *Velocity 89 Proceedings*, International Bicycle Conference, Copenhagen, 21 to 23 August 1989, Printed January 1990, Edited by Niels Jensen.

CTC, 1991b, *Cyclists and roundabouts – A review of literature*, A report for the Cyclists' Touring Club by Allot & Lomax, Consulting Engineers, February 1991.

Federal Highways Administration, 1974, *Bikeways - State of the art - 1974*, Department of Transportation, Federal Highways Administration, FHWA-RD-74-56.

AASHTO, 1992, *The guide to the development of bicycle facilities*, The American Association of Highway and Transportation Officials, a design manual for highway engineers (recently updated). Copies are available for $8 plus $3 postage and handling from AASHTO, 444 N. Capitol Street, NW, Washington, DC 20001.

CALTRANS, 1990, *Chapter 1000 – Bikeway Planning and Design, Highway Design Manual*, California Department of Transportation, Fourth Edition, 1 July, (prices and copies available from State of California, Department of Transportation, Central Publication Distribution Office, 1900 Royal Oak Drive, Sacramento California 95815).

17. Thanks

I am indebted to the following people, all of whom have voluntarily and graciously given of their valuable time to help in the research of this report:

Peter Bloecher, Bicycle Commissioner, City of Frankfurt

John Fegan, Bicycle Program Manager, US Federal Highways Administration

Ryan Snyder, Transport Planning Consultant, Los Angeles

Peter Lagerwey, Bicycle Coordinator, City of Seattle

Gayle Likens, Bicycle Coordinator, City of Palo Alto

Andy Clarke, Bicycle Federation of America

Don Gaul, Bicycle Coordinator, Regional Municipality of Ottawa-Carleton

Daphne Hope, Bicycle Coordinator, City of Ottawa

Simon Keswick, Policy Department, Department of Transport, UK

Nigel Coates, Engineering Department, Oxford, UK

Jean-François Pronovost, Executive Director, Vélo Québec

In addition, I would like to thank the following people for providing reference material or photos:

Micheal Maher, Transport Policy Branch, Department of Planning and Urban Development, Perth, Australia

Hans Penning, Bicycle Institute of South Australia

Margaret Day, Bicycle Institute of South Australia

Hero Weston, Bicycle Institute of South Australia

Ron Shepherd and Harry Good, Bicycle Victoria, Melbourne

18. Last Word

This document was originally published by the Government of South Australia in June 1992. It has been reprinted with the purpose of making a portable electronic document. The written content of the current edition is exactly as appears in the original edition, with the following exceptions: additional photographs have been added; many of the original photographs were not available and had to be scanned from the original copy of the report, with a subsequent loss in image quality; the last few pages of the conclusions, beginning on page 136, have been edited and appended as indicated.

This report was created using Apple MacIntosh computers. The original report was edited using Microsoft Word 4.0. The current version was edited and composed with FrameMaker 4.04 and 5.0. Photographs were edited and composed with Adobe™ Photoshop 3.0. Illustrations were created with Adobe Illustrator 5.5. Electronic proofing and the final electronic *Portable Document Format* (pdf version 1.1) were created from FrameMaker PostScript output, then processed using Adobe Acrobat Distiller 2.1 for Unix and Exchange 2.1 for Mac.

Type used is from the Adobe Myriad and Minion Multiple-Master families.