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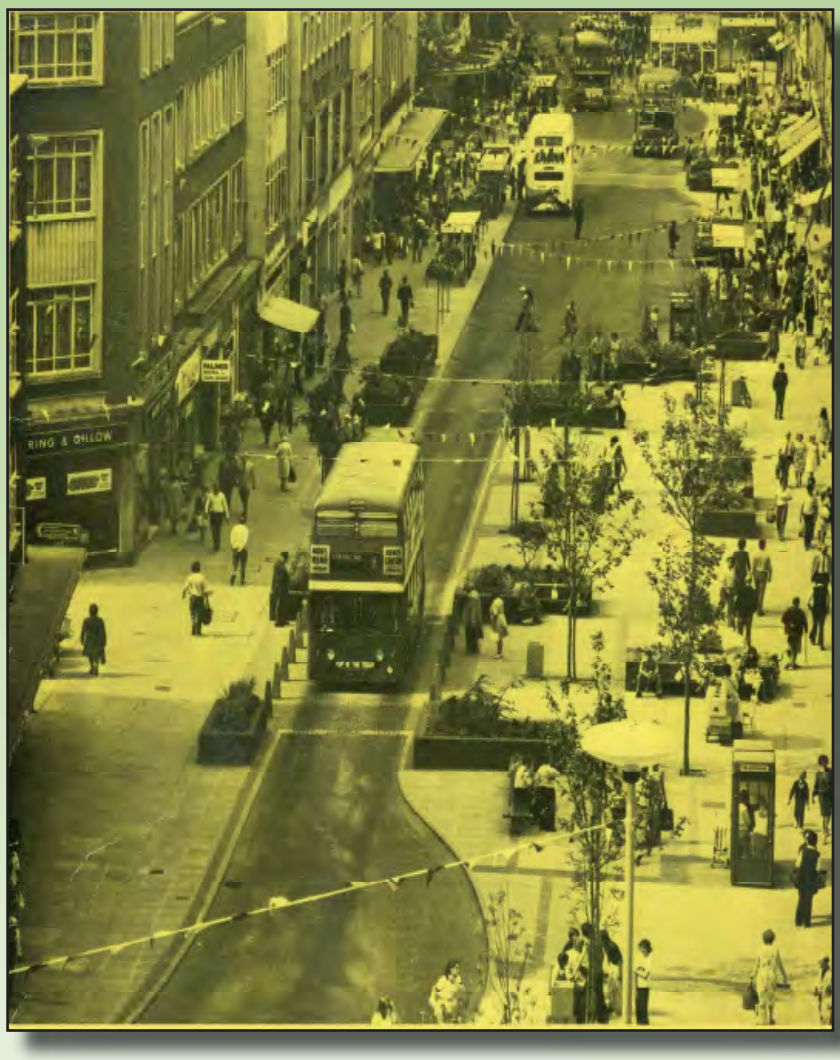

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PROFESSOR JOHN WHITELEGG
SCHOOL OF THE BUILT ENVIRONMENT
LIVERPOOL JOHN MOORES UNIVERSITY

PUBLISHER

WORLD TRANSPORT POLICY AND PRACTICE,
6 LONGNER STREET
SHREWSBURY
SHROPSHIRE
SY3 8QS
Telephone +44 (0) 1743 241955
E-MAIL:
johnwhitelegg@mobilitaetskultur.eu
WEB:
http://worldtransportjournal.com

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Dr. Joachim und Hanna Schmidt
Stiftung für Umwelt und Verkehr

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EDITORIAL

In this issue we publish another selection of the John Roberts reports from his London based consultancy TEST. These reports were decades ahead of their time and a salutary reminder that in many ways we have all the evidence we need to show that endless growth in vehicle numbers, car dependency and distances travelled is avoidable. Roberts calls this "trip degeneration". Like Mayer Hillman in the 1970s Roberts was well aware of the multiple advantages associated with increases in walking and cycling and the benefits for traditional retailing and high streets , ·- destrian areas.

The prolific output from the TEST consultancy is a reminder that in many ways we do not need more research on sustainable transport. We have known the full story for 4 decades and yet politicians still refuse to embrace the shift in priorities and spending and sustainable outcomes that Roberts advocated.

In many ways the political situation around the world is much worse than it was in the 1970s and 1980s. In the UK the example of Shropshire Council, the highway and transport authority for this English county, is typical. Shropshire Council refuses to adopt 30kph speed limits to protect children and other vulnerable groups, reduce road traffic danger and promote walking and cycling. The same council can find over £20 million to part fund a small section of road near the town of Shrewsbury and at the same time it cuts bus funding and talks about closing the bus station. Walking and cycling conditions in Shrewsbury are very poor quality and air pollution is a problem. Public Health England, a national public health government agency, reports that Shropshire has "a significantly worse record of killed and injured on roads than the England average". Shropshire Council which is responsible for road safety has done nothing to address this finding and refuses to accept World Health Organisation advice on the need to adopt 30kph/20mph as a scientifically proven method of reducing death and injury on roads.

Shropshire Council is a very clear example of the political rejection of sustainable transport insights and policies that will reduce congestion, pollution, death and injury and improve public health and this is unlikely to change.

We are very grateful to the Foundation for Integrated Transport for its financial support of the time consuming process of scanning and preparing for publication these TEST reports and grateful to Andrew Williams who has done this work

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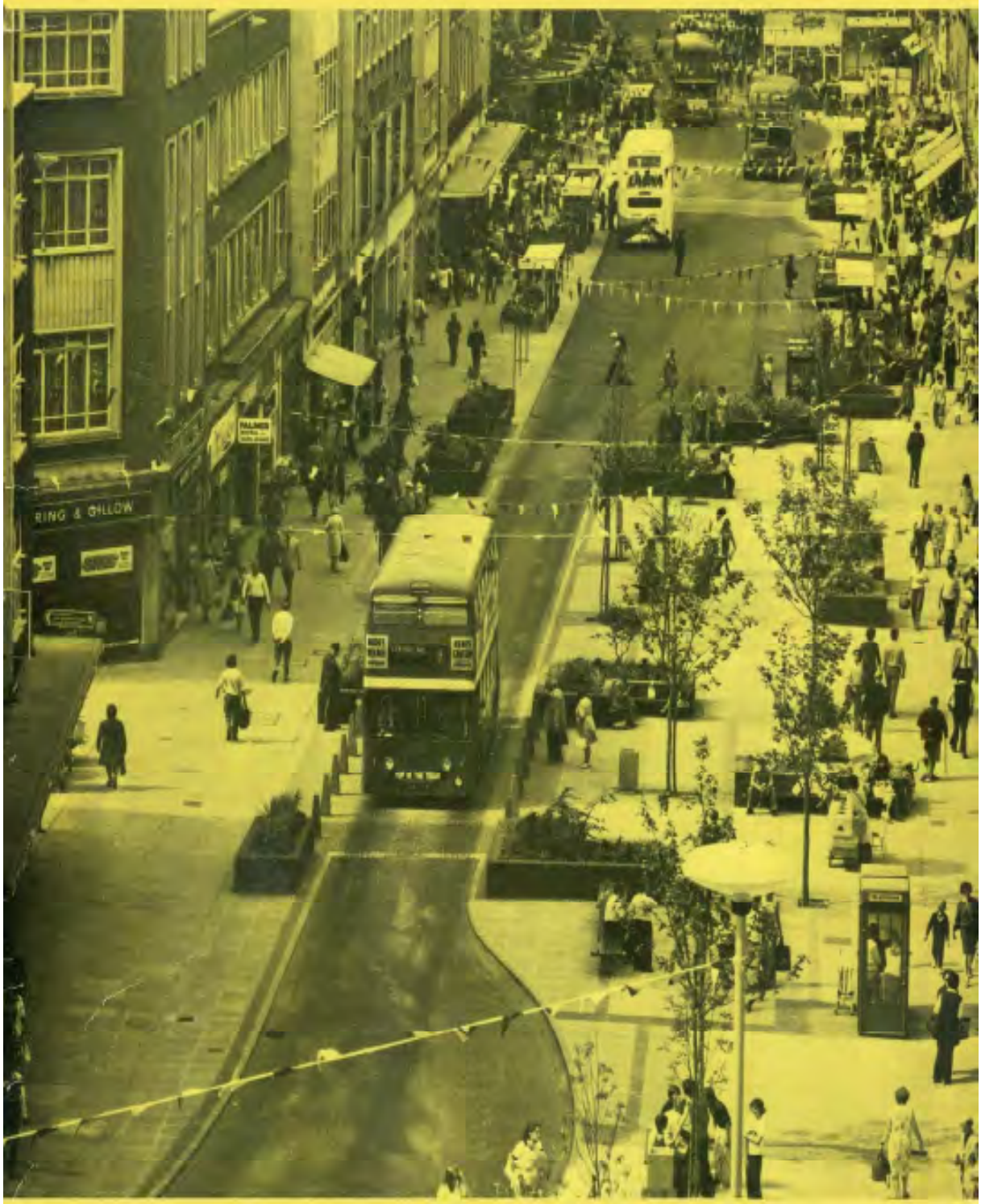
John Whitelegg
Editor

BUSES & PEDESTRIAN AREAS



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Photographs were kindly provided by these agencies: Cover and XIV, Western National Omnibus Company; I and II, Barnsley MBC Planning Department; VIII, IX, X, XI and XII, City of Durham Planning Department; XIII, Devon County Council. John Roberts took the remaining photographs.

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BUSES AND PEDESTRIAN AREAS

A REPORT FOR LONDON TRANSPORT
BY
TRANSPORT & ENVIRONMENT STUDIES (TEST)

ABSTRACT

Access to pedestrianised shopping areas is generally better, world-wide, for private cars than for buses. Indeed, this study calculates that in 183 of the UK's 500 or so pedestrian shopping precincts only 13% can be said to have access by bus as good as, or better than, access by private car.

This is difficult to understand when set against four statements. The first, by the Department of Transport in 1978, says 'In shopping areas access to buses should be at least as convenient as to car parks.' The second results from the West Midlands PTE study's finding that public transport users contributed 56% of the retail turnover in Birmingham City Centre in 1978. The third concerns the low energy use and road occupancy per passenger-km of buses. The fourth is that the bus makes very moderate demands on city centre parking space.

This study shows ten examples of cities that have consciously made access by bus at least as good as by car. It concludes that much could be done to improve present conditions for bus users elsewhere, when they are wishing to reach and leave pedestrianised shopping areas.

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0 SUMMARY

0.01
Several factors account for the exponential, worldwide, rise in the number of shopping streets, set aside primarily for the use of pedestrians, over the last thirty years or so. The most important are improvements in environment and personal safety; support for inner shopping centres against competition from outer area newly built centres; and the political significance of a prestigious city centre. (This is not to say that pedestrian shopping areas do not occur city-wide; rather that the majority are in older central areas). Influencing the above considerations are great increases in personal mobility - both a cause of environmental degredation and a support for all types of shopping centre - and, when the shopper has arrived at the centre, an increased spending power resulting from greater affluence.

0.02
If only conversions of all-traffic shopping streets to ones primarily for pedestrians are considered, within a limited time period, and omitting many schemes with inadequate data, then the findings are interesting. West Germany went from one such scheme in 1929 to 197 in 1973; USA and Canada from one in 1959 to 70 in 1976; UK from one in 1967 to 108 in 1980. These countries are then considered in more detail. While there are great differences in approach, a number of common themes emerged. Thus, both West Germany and UK had a similar proportion of networks (69% and 65% respectively of the total number of pedestrian schemes), while North America had only a tiny proportion of networks. The mean length of the scheme varied from 750m in West Germany, through 615m in UK to 513m in North America.

0.03
In terms of means of transport used to reach the shopping precinct, in West Germany 25% of the schemes had public transport running along at least part of them, while 76% had bus or tram stops either adjacent or within 50m distance. 9 of the 70 North American schemes had some form of public transport running along them. As with West Germany, UK has public transport on all or part of 25% of its schemes and a high proportion with bus stops within 50m of the scheme. In all countries car parking provision was normally elaborate, very close to the precinct, and generally providing a higher level of accessibility than did public transport.

0.04
After a brief review of the literature, the second chapter looks at problems of access to an improved shopping environment. The recent decreased patronage of bus services in UK (compared with increases in many other countries) has been caused by low subsidy levels, pricing policies that encourage people to transfer to private cars, and in some cases poor provision for buses near to pedestrianised shopping areas. These policies seem completely unrelated to the Department of Transport's 1978 statement 'In shopping areas access to buses should be at least as convenient as to car parks.' Some bus operators, including some PTEs, are nevertheless striving to maintain a standard approaching excellence: perhaps they have been influenced by the West Midlands PTE study's finding that public transport users contributed 56% of the retail turnover in Birmingham City Centre in 1978. Perhaps these operators wish to emphasize the low energy use, per passenger-km of the bus, and its extremely efficient use of urban movement space.

0.05
Five types of pedestrian precinct of both single streets and networks are displayed, and classified according to the means of access by bus. The classification is then applied to 183 UK places: the most frequently occurring type is a network on part of which a bus runs (30%); the next most frequent is a network where there is at least one bus stop within 51-200m of some part of that network (about 20%). However, the types regarded as having access by bus equal to, or better than, by car are representative of only 13.1% of the 183 schemes.

0.06
Sutton High Street in south London is explored as an example of a rather unsatisfactory compromise - while the High Street is gradually being pedestrianised (incrementally over several years), buses have largely been excluded from the whole street right from the outset, though cars still have access. In terms of accessibility by public transport, Sutton High Street is an object lesson of the difficulties facing operator, general public, and doubtless politician, alike. The advantage is gradually moving away from public transport toward the private car.

0.07
This chapter concludes with further discussion of the literature, on public preferences for shopping streets with and without buses sharing the movement space with pedestrians. The conclusions are equivocal, depending on street width, level of car ownership, other aspects of a network, the respondent's experience of pedestrianised streets elsewhere, and other variables. However, one author concludes that if people clearly understood the access problems connected with buses that are somewhat removed from pedestrian shopping streets, they might more frequently respond in favour of bus and pedestrian sharing schemes.

0.08
The most substantial part of this review considers examples of successful access by bus to pedestrianised shopping areas. The bulk of the discussion surrounds ten case studies - seven in England, and one each in France, Sweden and USA. The locations were chosen to show a wide range of urban characteristics, problems and solutions, and hopefully to illustrate some of the less publicised British schemes: thus, obvious contenders like Leeds and Norwich have been excluded.

0.09
Because of the differences between each of the case studies, judgement on their comparative performance is restricted. Population ranges from 21 000 in Durham to nearly 2 million in Minneapolis, and this seems to bear little relationship to the amount spent on, and the sensitivity of, the schemes. Nor does population relate to length of network: Newcastle has twice the population of Uppsala though their networks are very similar in length, while Durham's network is comparable to Exeter's, with four times Durham's population. Uppsala has the longest stretch of streets penetrated by buses, followed by Minneapolis; in the other case studies (except Besancon) it varies

between 250m and 455m.

0.10
Public attitudes to bus and pedestrian streets are split within those case studies reporting such information. In four cases the arrangement was approved, while in two it was felt the buses should be removed. In terms of accessibility, in a densely built-up area like Wandsworth a high proportion travel to the pedestrianised street on foot. Durham, with the lowest level of car ownership among the case study areas, had the highest percentage use of car for reaching the pedestrian area, among the five case studies providing modal split data.

0.11
A crude measure of accessibility was devised. This showed, on the one hand, the cumulative number of car parking spaces by distance from the nearest point of a pedestrian network. On the other hand, and in no way to be compared with the dissimilar features of the car parking graph, the cumulative number of bus stops by distance from the network was illustrated. Barnsley, Birmingham, Minneapolis and Newcastle had the best accessibility by car, on this basis, while Birmingham, Minneapolis, Newcastle and Uppsala had the best accessibility by bus.

0.12
The study concludes that there is strong theoretical support for excellent bus access to pedestrian areas (low energy use and low use of movement space per passenger-km, and small demand for central area parking). There are also the two very significant items mentioned in para 0.04 above: Central Government support and the economic benefits of good access by bus to pedestrianised shopping areas.

0.13
Why then do bus users have, in general, poorer accessibility to pedestrianised shopping centres than car users? Various possible explanations are suggested: political; the inertia of officers who have lived with a scheme for a long time; inadequate explanation given to the public when their views are sought on whether they should or should not share their street with buses; and lack of investigation of alternative ways of routeing buses close to a pedestrian street.

0.14
Many British shopping streets remain to be pedestrianised. Perhaps sufficient lessons have now been learnt to ensure that 'access to buses should be at least as convenient as to car parks' is not a pious hope, implemented in a few isolated, if splendid exceptions, but a concept to be applied widely. There appear to be much evidence to support it.

1 GROWTH IN NUMBER OF PEDESTRIAN SCHEMES

1.01

Over thousands of years people have exchanged goods, tokens or money for other goods that they needed to sustain or enhance life. The environment within which these transactions take place has become increasingly complex, the principal changes being a move from out of doors to indoors, a difference in the size of places for exchange to take place, and a greater concentration of the 'exchange' activity. Only relatively few such places, until recently, have provided adequately for the safety, convenience and enjoyment of those coming to buy goods.

1.02

The exceptions all have one similar characteristic - they allow people to shop in the general absence of other traffic. Before the twentieth century, arcades were built (many in the UK, or the Galleria in Milan, for example). Islands sometimes were not suited to vehicular traffic (Venice, for example) or climatic extremes created the need for enclosed and heated or cooled shopping centres (towns in northern Sweden or Canada, and various tropical towns).

1.03

During the twentieth century a number of causes have led to a dramatic growth in pedestrian only shopping areas. Among the causes are:

i the increase in disposable incomes, leading to more shopping activity;
ii the rise in car ownership, which has meant more congestion of shopping streets;
iii an increased density of people and vehicles has led to higher accident rates; it has also meant that more people have been subjected to unacceptable levels of noise and exhaust pollution emitted by vehicles;
iv a general decline in environmental quality;
v a desire to maintain or increase spending in shops (certainly in the majority of pedestrianised shopping streets, turnover has increased - see Figure A).

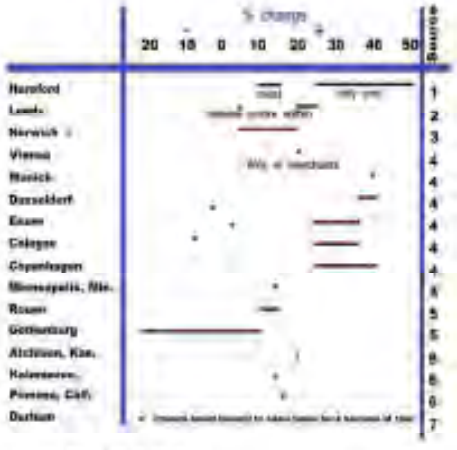


Figure A: *Changes in retail turnover attributable by traders to pedestrianisation. Sources: 1. Kerrie 1971; 2. Precast Concrete 1971; 3. Wood 1981; 4. GLC 1971; 5. OECD 1974; 6. Institute of Traffic Engineering 1966; 7. Municipal Journal 1976.*

Throughout this review the term 'pedestrian only' is used for simplicity: all streets generally require access for emergency traffic; some permit disabled persons' vehicles, others permit servicing on a restricted time basis.

If the demands for improved shopping conditions from both customer and seller are coupled with civic pride, it is not surprising that, (given a suitable economic environment) we have witnessed the great increase in pedestrianisation over the last fifty years. This has occurred in many countries of the world.

1.04

How significant is the change in the shoppers' environment that results from pedestrianisation? Apart from data in the case studies in Chapter 3, a few examples may be given. Table 1.01 shows some changes in noise level. A restricted document of OECD (1978) shows that in 105 OECD-area cities, noise levels were reduced in 86% of them, while there was a marked decrease in air pollution in 72% of them. As might also be expected, traffic levels, and therefore accident rates, also reduce substantially after pedestrianisation.

	dB(A) Before	After
WITH BUSES, CARS EXCLUDED		
Chichester, West Street	70.5	69.5
Leicester, Gallowtree Gate	76.79	70
Reading, Broad Street	82	68
NO BUSES, SERVICING RESTRICTIONS		
Chichester, North Street	72.5	61.5
Cologne	70	63
Gothenburg	74	67
Leeds	65-75	60-66
NO BUSES, TRAFFIC REDUCED		
Sutton High Street	80	74

Table 1.01: *Changes in noise levels resulting from reductions in traffic. Sources: GLC 1973 & 1979, TEST 1980, West Sussex CC 1976.*

1.05

In order to achieve these advantages of pedestrianisation, laws had to be enacted. In England the Local Transport note (Department of Transport 1978) outlines available legal powers. The choice is between the 1967 Road Traffic Regulation Act and the 1971 Town and Country Planning Act. Which is used is dependent on the number and type of vehicle to be excluded - the 1971 Act excludes more, and is therefore less flexible, than the 1967 Act. Choice of Act also influences the type and range of works permitted in the altered street; here the 1971 Act provides greater powers. The 1967 Act is more appropriate for experimental closures.

1.06

Given what has been said above, i.e., the high level of public demand for pedestrianised streets, the clear advantages in reducing environmental pollution and accidents to pedestrians, the benefits (usually) to traders, and available legislation, one might expect such streets to have appeared in ever increasing numbers. This has indeed happened. But there remain many cases where nothing very much has happened. The explanation is of course, political. Thus, in London, it seems that the strength of opinion in favour of cars must be a primary explanation for the limited number of streets that have been converted for pedestrian use. Internal conflicts over budget spending priorities have delayed or deferred schemes elsewhere. In West Yorkshire, which has an admirable record of pedestrianisation in Leeds, Wakefield and elsewhere, there are now pressures to change some pedestrian streets back to all-traffic ones. In many towns and cities strong feelings arise about bus access (to or within pedestrian streets), where politicians consider bus users as very much secondary to car users, or where a majority of street users say they do not want to share the space with buses (see the Newcastle case study, Chapter 3). In Oxfordshire the County wanted cars to have access to most of the City centre, while the City Council did not want this, and the City's view prevailed. In Nottinghamshire too the County's and City's views did not coincide, resulting in the demise of the City's policies for bus priority. Again, Wandsworth's traffic management scheme, allowing special routes for cyclists and a reduction of through traffic in residential areas, was thrown out after the GLC and Wandsworth changed political allegiance. Finally, in two of the case studies in Chapter 3, officers of the local authority concerned said that police conservatism had impeded development of their schemes. Thus, there seems to be a general attitude that it must be right to cater for the private car, whereas bus users are merely tolerated.

1.07

The growth in the number of pedestrianised shopping streets in the last 20 years has been exponential in several countries. (See Figure 8 which compares the cumulative growth of such streets in West Germany, North America and UK. Note the lists are incomplete).

Data prepared for the OECD Conference 'Better Towns with Less Traffic' show the increase in 100 OECD cities out of 444 to whom a questionnaire was sent:

OECD Member Country	Number of cities responding	Year pedestrian zones	% of cities considering pedestrian zones
[illegible]	[illegible]	81	17
[illegible]	[illegible]	80	18
[illegible]	[illegible]	74	59
[illegible]	[illegible]	67	33
[illegible]	[illegible]	63	47
[illegible]	[illegible]	62	38
[illegible]	[illegible]	58	40
[illegible]	[illegible]	53	9
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	73	21
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	68	11
[illegible]	83	71	12

Table 1.02: Proportion of OECD cities with or considering pedestrian zones. Source: OECD 1976

Many countries are excluded from Table 1.02 which therefore distorts the progress in pedestrianisation world-wide, including those schemes in less developed countries. Of those countries in the Table, the best data have been found for West Germany and North America. Research for this review has concentrated on UK, where no recent comprehensive listing and classification of pedestrian streets exists, and these three countries are now discussed.

West Germany

1.08

Monheim (1975) provides a thorough description of West German pedestrian areas up to 1974. The information covers a range of 140-200 towns and cities. Clearly many more schemes have become operational since then, though no more recent survey has been traced. Monheim's material, greatly summarised, is as follows. In 1974, 69% of the West German schemes were networks (two or more different streets connected to each other):taking proposed extensions into account, this proportion was forecast to rise to 98% by 1980. 94% of the pedestrian areas were forecast to increase in size by a factor of two or more. About 50% of the schemes were in towns with a population less than 50 000.

1.09

In 1974, the mean average length of street (or the total length of streets in a network) was 750m. 25% of the schemes had public transport

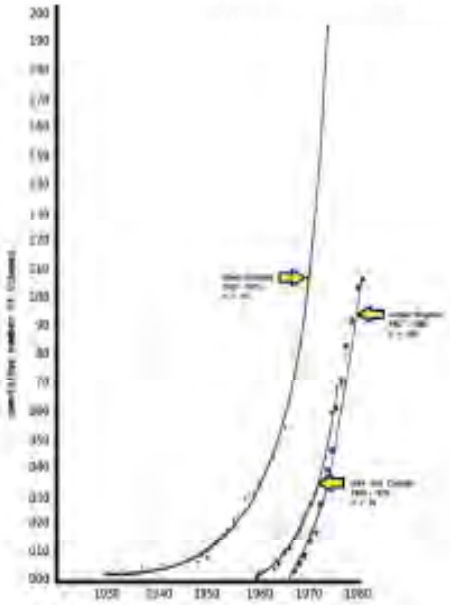


Figure 8: Cumulative increase in streets converted primarily for pedestrians. UK, USA and Canada, and West Germany variously between 1959 and 1980. Note: 'n' is not the total for each country, but those schemes for which data have been obtained.

running along at least a part of them, while 76% had bus or tram stops either adjacent or within 50m distance. The same proportion (76%) had car parking of 100 or more places either adjacent or within 50m. While it is very difficult to attribute new road construction to the displacement of traffic from pedestrian streets, about one half of the towns in 1974 had built new roads which appear to have been generated in this way; many of the remaining half had no new central area road schemes, and many could not be attributed specifically to pedestrianisation.

1.10

An important outcome of Monheim's analysis is that shop delivery and collection took place within the pedestrian street in 76% of the locations listed in 1974. The main reasons for introducing pedestrianisation were 'Timely for town planning and improvement of image' (36% of the schemes), 'Better for free time and evenings' (197%). 'Attractive to Shoppers' and 'Better traffic safety' (each 12.5%).

North America

1.11

Brambilla et al (1977) have produced a compendium on 70 American (67 USA, 3 Canada) urban malls established between 1959 and 1976. Their data are not as elaborate as Monheim's, but some comparable findings are given here. Two of them are networks, but the remainder are linear, single streets extending over one to twelve blocks. The mean average city population was 179 330, with about 37% of the schemes in towns with a population less than 50 000.

1.12

Up to 1976, the mean average length of pedestrianisation within each city was 513m. 9 of the 70 cities had some form of public transport running along the street, while virtually all cities had ample car parking, as would be expected. The American grid pattern of streets seems to provide some surplus capacity which displaced traffic can take up, for new road construction attributable to pedestrianisation is very rare.

1.13

53% of the North American schemes had unrestricted or restricted servicing access to shop fronts. Monheim's West German data do not include means of transport used by shoppers, but the North American mean, and some exceptions, are shown in Table 1.03 below:

	% means of transport used					
	Mean, 70 cities	Miami	Minne-apolis	East Lansing	Baltimore	Phila-delphia
Car	80.0	60.0	42.6	43.0	33.3	36.9
Bus, train, taxi	13.6	40.0	50.8	12.3	33.3	59.1
Walk, cycle	6.4	-	6.6	45.0	33.3	4.0

Table 1.03: Means of transport used by shoppers to reach North American malls. Source: Brambilla et al 1977.

1.14

It is notable in Table 1.03 that whereas the mean for the 70 cities was only 13.6% arriving by public transport, for shopping in Minneapolis and Philadelphia the street is a bus 'transitway' - i.e. pedestrians and buses share the movement space, and bus users have excellent accessibility (the public transport element of Philadelphia is 26.2% bus, 30.2% train, and 2.7% taxi).

United Kingdom

1.15

Data for the United Kingdom were partially derived from non-comprehensive lists prepared at various times by the Department of Transport, the Association of District Councils, the Civic Trust, the National Bus Company and OECD. Because there is no comprehensive list, TEST circularised all UK Chief Planning Officers at County or equivalent level (54 in England and Wales, 12 Scotland, 6 Northern Ireland, 3 Island authorities). Of the 75, 65 (86.6%) responded, in a few cases referring us to their District Councils (a further 62 letters, with 37 replies - about 60%). The replies, overall, ranged from extremely detailed reviews of a County's or District's provision, to short letters saying there were no pedestrian schemes in the area. All of these data will be tabulated in TEST's forthcoming publication (see paragraph 1.24); only the principal findings are presented here, essentially for comparison with the sections above on West Germany and North America.

1.16

From the total data set referred to above, TEST holds some details on pedestrian schemes in all English and Welsh counties, in 10 out of 12 Scottish Regions, in 2 out of 3 Island authorities, and some for Northern Ireland. Northern Ireland's pedestrian areas are considerably affected by security measures. The tabulation referred to in paragraph 1.15 will be organised by country; county, region or similar authority; district or similar authority; and finally 'place'. 'Place' in a sense is subjective and not necessarily a local authority area (though many were before local government reorganisation in 1974). However it is recognisable as a distinct location for shopping and its pedestrian area is quite separate from another 'place' within the same local authority (as an example, in the West Midlands County, Dudley, Halesowen and Stourbridge are all separate and recognisable places within the Metropolitan District of Dudley). The research has identified some 456 places in the UK with a pedestrian shopping scheme of some kind in 1980. It is unlikely that the total, if a complete data set were available, exceeds 500.

1.17

Of the UK schemes, about 65% are networks and 35% single streets. The mean average population of 324 of the places described in the previous paragraph was 64 758 in 1971 (of a total population of nearly 21 million). 61.7% of the 324 places had a 1971 population of 50 000 or less, a higher proportion than West Germany and a considerably higher proportion than North America, though there are differences in administrative area that determine the population.

1.18

For 77 UK schemes (17% of the total known), the mean average length of a scheme (a single street, or all the parts of a network) was 615m, a midway point between W. Germany, which has many extensive networks, and North America, which has few networks. A non-random sample - i.e. those places for which data are held - of 284 places

shows 25.4% having buses running along a pedestrianised shopping street or in part of a network, a quite remarkable correspondence with the West German proportion. For a sample of 79 places 96% had bus stops adjacent to, or within 50m of the pedestrian scheme; for 89 places, 84% had off-street parking within 50m.

1.19

Servicing arrangements for British schemes were investigated for a proportion of the 1096 streets identified. This total includes individual streets within a network, as well as isolated streets, but newly-built enclosed shopping centres count as one. While there are usually several 'streets' within such centres, our data on them are sparse. For these individual streets, data are held for 97, or 8.9% of the total. Of this relatively small proportion 54% allow unrestricted servicing to the shop front; 31% permit this, but within restricted time periods; 11% have rear servicing, and 3% have servicing below ground level.

1.20

This chapter concludes with a brief look at the literature which takes an overview of pedestrianisation and the processes leading up to it. OECD (1975) held a conference on 'Better Towns with Less Traffic' which investigated the effects of traffic restraint policies in various OECD countries. While many towns had already pedestrianised parts of their central areas, the Conference conclusions strongly supported continuity of this action. TRRL (1977) published the results of OECD's Special Research Group on Pedestrian Safety which, inter alia, defined and described examples of the various types of street in which pedestrians have preferential treatment. OECD's third important publication is 'Streets for People' (OECD 1974). Boeminghaus (1979?) must be considered high in the comprehensiveness and cost (£37) league table of general works on pedestrian areas, while Europa Nostra have provided an illustrated review of pedestrian streets in Europe (Perkin n.d.). TEST produced a review of pedestrian activities and problems, with a very large annotated bibliography (Elkington et al 1976), and Copley and Maher (n.d.) performed a similar, if less extensive service, while Garbrecht's paper of 1976 has an interesting bibliography. The GLC (1972) reported its study tour of Europe and North America. Hillman and Whalley (1979) followed many advocates in asserting that 'Walking is Transport' while Thomas and Potter (1977) speculated on a future without cars.

1.21

In terms of regional studies, in the USA the works of Brambilla and Longo (1976,1977), Rudofsky (1965) and Pushkarev and Zupan (1975) are particularly significant. Brambilla and Longo's 'American Urban Malls: A Compendium' provides much base data for paragraphs 1.11-1.14. Among publications on West Germany, Monheim (1975) provides perhaps the most comprehensive set of information for any country. Smith (1977) is far less ambitious, giving a British view of German developments.

1.22

There are many studies of British schemes and their background. The Multiple Shops Federation (1963) and its successor, the British Multiple Retailers Association (1980) have offered guidelines, and support, for the creation of pedestrianised shopping centres. Dalby (1973) also explored the relation between pedestrians and shopping centre layout. Parker and Hoile (1975) demonstrate the paucity of recently created or converted pedestrian areas in London, following the London Amenity and Transport Association's (1973) plea for a policy. This was preceded by a special issue of Official Architecture and Planning (1970) on pedestrian planning.

1.23

When considering the principal interest of this review, bus access to pedestrian areas, there have been several international studies (see for example Burco 1972, ECMT 1973, NATO 1976, OECD 1973, TRRL 1973). For Britain, the National Bus Company (1975a, 1978a) has reviewed bus priority schemes, among which are buses in pedestrian streets. Dalby (1976) investigated space-sharing by pedestrians and vehicles in Oxford, while Goddard et al (1977) advocated close links between buses and pedestrian areas for the Greater Glasgow PTE. A report was presented to the Planning and Communications Policy Committee on buses in town centres (GLC 1979), that advocated a concept previously put forward by the Department of Transport (1978): 'In shopping areas access to buses should be at least as convenient as to car parks'. Many believe that access to buses should be better than to car parks. The Association of District Councils (1978) published part of the response to a questionnaire circulated among its members. From this can be deduced a number of pedestrian areas that have bus penetration, though a high proportion of District Councils did not answer the question.

1.24

In 1981 we can expect TEST's 'Pedestrian Precincts in Britain' and P.D. Bradburn and D.I. Hurdle's 'Planning for Buses in Greater London: A Guide to Infrastructure Requirements for Buses' to be published by the Greater London Council.

2 PROBLEMS OF ACCESS TO AN IMPROVED SHOPPING ENVIRONMENT

2.01

In a short review like this it is impossible to look at every means of reaching a shopping area. Large cities have underground, surface and overhead rail systems, cars and taxis, buses and trams, cyclists and people walking. In small towns, while rail may be absent, all the rest are evident. This review therefore concentrates on bus access to pedestrian areas, though some comparisons with the private car are provided. In 1972-1973 and 1975 the average modal split for all shopping journeys during a week, compared with studies in Sutton in 1977 and 1979, were as shown in Table 2.01 below.

The National samples smooth out a very wide range of modal splits, which are greatly influenced by levels of car ownership, and the availability of a household car to those wishing to use it for shopping purposes, by region. (Further data on the means of transport used for shopping may be found in the case studies in Chapter 3, showing wide variations between localities.) The data in Table 2.01 also tell us nothing of temporal variations - a higher proportion of shopping journeys is made by car on Saturdays than during the week. It is interesting to note that in the National Bus Company's Market Analysis Project, greater than 50% of all shopping journeys are made on foot (Jones 1980). According to an OPCS survey in 1975, with 2621 fully completed interviews of persons aged 18 years and over in Great Britain, the mean walking distance per day for shopping purposes was 0.69km. People of 60 years and over walked somewhat shorter distances than the 18-59 group, but women walked over twice the distance that men walked. (Todd and Walker 1980).

%

	National sample 1972-73	National sample 1975-76	Sutton samples 1977	Sutton samples 1979
Public transport	14.2	16	27.0	21.7
Car, van or lorry	27.4	35	37.5	43.4
Walk	55.8	46	33.4	32.3
Other private transport	2.5	3	2.1	2.6
	100.0	100.0	100.0	100.0

Table 2.01: *Modal split for shopping journeys. Sources: Department of Transport 1975, Mitchell and Town 1977, [illegible] 1980.*

2.02

There is also a significant difference in the convenience of bus and car use for shopping. As a generality cars are much more easily reached than bus stops at the home end of a journey, while that situation often reverses at the shopping street end of the journey. Goddard et al (1977) in a paper prepared for the Passenger Transport Executives' Planning Officers Group, expanded on this theme. They noted that the construction of ring roads around central shopping areas tended to permit cars to reach car parks, and servicing vehicles to reach shops, while moving buses further away. However, as they point out, cars tend to be parked on high-value land. The bus, on the other hand, can carry a large number of people into a town centre with relatively few movements, a maximisation of movement space, and a minimisation of parking space; its environmental intrusion is also argued to be minor

2.03

Coupled with the relatively moderate national proportion of public transport for shopping journeys, there is a decline in bus and coach use for all purposes. Though this is not wholly unique to the UK, Kerridge (1979) points out that its average annual rate of decline 1966-1976 is greater than any other of 13 developed countries which he discusses. Kerridge shows that decline in the UK is not an unavoidable evil, and cites many examples where patronage of bus services is increasing: through policy decisions to subsidise bus operation, or through special road facilities that speed bus flow or make buses more accessible to users and their destinations. Town and Country Planning (1980) notes that since the 1973 oil crisis, the number of passengers on buses, underground and commuter railways in the USA has increased by an average of 4% a year, 'and public transport systems in cities such as New York, Chicago and Los Angeles. . .are now bursting at the seams' and Carter has called for £10 billion to go to public transport over the next 10 years. In Sweden, positive government action to reduce fare levels has resulted in a significant increase in public transport users. However, in Britain, Stuart (1980) shows how bus services have been hit by economic recession, and public policy. Of the largest operators, Greater Manchester Transport, West Midlands PTE and London Transport have all experienced substantial reductions in passenger journeys. Their remedies, of cutting services or raising fares are highly questionable at a time of energy shortages. However, the operators see no other solution when Central (and local) Government deny them levels of subsidy that begin to approach those in large continental European and North American cities.

2.04

While a national proportion of 15% using public transport for shopping journeys may not seem to merit special consideration, such a negative assumption needs to be countered on four grounds:

i with reduced availability and increased cost of vehicle fuels, buses are much more efficient than low-occupancy cars in terms of energy consumption per person-km. They occupy far less space per person moved and require much less parking space: these are important considerations for urban centres in terms of both high land values and quality of environment (see Taylor 1977).

ii As has been noted, bus patronage in other countries is increasing, and is also doing so in UK where there are positive policies in its

favour, as in the heavily subsidised fares of South Yorkshire (Bruyneel and Wheelock 1980).

iii) Mitchell (1977) shows that more shopping trips by bus are made by people in the 'lower' socio-economic groups, largely because of car unavailability. This finding was confirmed in the Sutton Study (TEST 1980) and by Taylor (1977) who also noted that for Argyle Street, Glasgow in April 1977 56% of weekday and 44% of Saturday shoppers came by bus. School age, retired, disabled, unemployed and low-income people will be suffering other types of deprivation. The National Bus Company (1978b) noted that between one tenth and one fifth of bus travel in 1976 was by the elderly.

iv) However, one of the most forceful arguments for good bus access to shopping streets is economic. The West Midlands PTE (1979) carried out a mode of travel/shopping turnover survey and showed that, for their sample in 1978, public transport (bus and rail) contributed 56% of the retail turnover in Birmingham City Centre. While this finding has to be seen against a modal split of 19% car, 56% bus, 9% train, and 15% walk, and against the lack of comparable data elsewhere, these factors do not diminish its significance. It is ironic to read that the Tory West Midland County Council want to off-load the loss-making Centrebus Services to the private sector (see Birmingham Case Study in Chapter 3 and Johnson 1980).

2.05

Without doubt, the case for convenient access by bus to pedestrianised shopping streets is very strong. However, what is found in actuality does not always measure up well to this desired state, as will be seen from the discussion here and in paragraph 2.06. Figure C shows ten types of layout, the principal ones to be found in the UK's diverse and numerous collection of pedestrianised shopping areas. The first five layouts, lettered A-E, are concerned with single streets, while the other five lettered AA-EE, are of pedestrian networks.

Type A, with buses sharing the shopping street with pedestrians, is deemed to give the best level of access by bus: accessibility decreases through to type E. Similarly, with type AA, the best level of bus access is found for a network when buses run on part or whole of the network, while type EE provides the worst level of access by bus. In comparison with off-street parking, a bus stop on a street of type A must give a better level of access than by car; however, in *all the other types* access by car could be at least as good, if not better, than by bus. The reasons for this are:

a) The car can set down and pick up passengers very close to the desired destination;
b) if buses run along only part of a network (by far the most common occurrence), then other parts of the network may be comparatively remote from a bus though not, normally, from a car.

2.06

183 of the UK places studied as a background for this review had adequate information to determine the type of pedestrianised area they represent. While this is not a random sample, it does represent 40% of the 456 places identified that

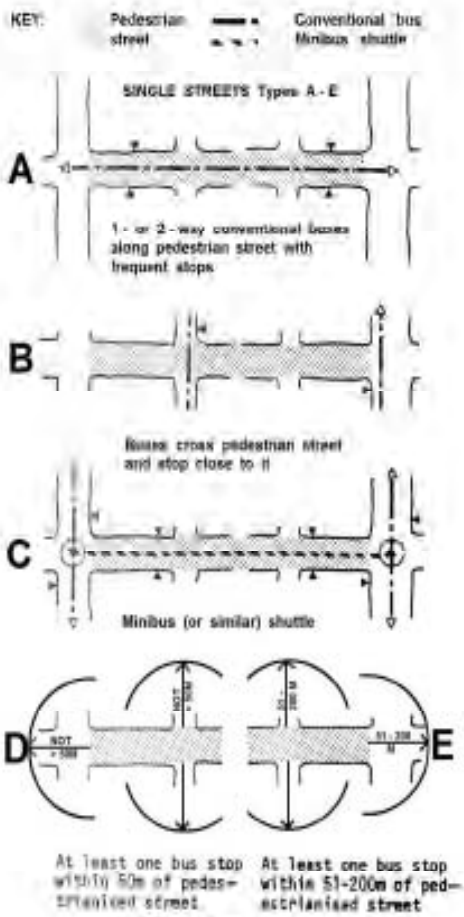


Figure C: *Type of Pedestrian Precinct Classified According to Means of Access by Bus*

have the same form of pedestrianised shopping area. The 183 places are analysed in Table 2.02. With the reservations in paragraph 2.05 clearly in mind, it is possible to say that access by bus is equal to, or better, than it is by car only for Type A and Type C (but there are no examples of this Type in the sample) or Type CC. *Types A and CC are representative of 13.1% of the 183 schemes.* Of course the objective is for this proportion (for all types of scheme) to be 100% in accordance with the Department of Transport's recommendation - see paragraph 1.23 above.

Taking the remainder of the Types, access by car is likely to be better than by bus for the following reasons:

Type	Reason for better car access
B D E	Setting down or picking up in side streets not penetrated by buses;
E EE	Setting down and car parking facilities, closer to pedestrianised area than bus stops;
AA BB DD EE	Network normally only partly penetrated by buses for AA; car parks above or below new shopping centres; other off-street car parks more central to, or specific to parts of, the network.

Type	Frequency	%	Ranked Frequency	Ranked level of accessibility of bus
A	22	12.0	5	1
B	2	1.1	8=	2
C	0			3
D	28	15.3	3	7
E	8	4.4	6	9
AA	55	30.0	1	4
BB	5	2.7	7	5
CC	2	1.1	8=	6
DD	25	13.7	4	8
EE	36	19.7	2	10
	n= 183	100.0		

Table 2.02: Types of pedestrian scheme represented in a non-random sample of 183 places in U.K.

2.07

Table 2.02 attempts to rank accessibility by bus to the various types of scheme; it endorses the evaluations in paragraph 2.06. However, this ranking cannot be used on its own to suggest how a proposed future scheme should be served by buses, for other factors influence the choice. To say, for example, that all future schemes should be chosen from the top six rankings, then four of these - Types A C AA or CC - present problems. Even though there have been few accidents in Type A schemes, public attitudes sometimes favour streets without any vehicular traffic (see the discussion in paragraphs 2.13-2.17). Very often this preference is conditioned by the width of the street - Exeter's and Birmingham's High Streets for example are amply wide enough to accommodate buses and pedestrians without conflict, but this is not always the case: Durham's Silver Street was an intolerable environment when buses, and other vehicles, shared the space with pedestrians.

2.08

So, where Types A, AA or CC are more difficult to achieve, some of the other types (B for single streets, BB for networks, for example) might provide a good level of accessibility by bus. However, to remain within the Department of Transport's recommendations (paragraph 1.23) and sensibly to answer Goddard's comments (paragraph 2.02), *whichever type - other than A or possibly AA - is adopted means some restriction on car access so the two modes become at least comparable in access terms.* Paragraphs 2.09-2.12 illustrate some of the problems in attaining 'equal opportunity' between bus and car: in Sutton High Street this has not been achieved.

2.09

The gradual pedestrianisation of Sutton High Street, in south London, was studied between 1977-1979 by TEST for London Transport, and a report of the three stages of the study is available (TEST 1980). Its principal interest lies in the progressive worsening of bus access against improving car access, for the amount of the High Street that has been converted to pedestrian use is only 6% of the total envisaged for 1979 when the study started. However, 'worsening' and 'improving' are relative terms: buses used to traverse the entire High Street and now only use a small proportion; the new bus stops are on a newly constructed gyratory system, parallel to each side of the High Street - these roads are about 100m in a straight line from the High Street (see Figure D)

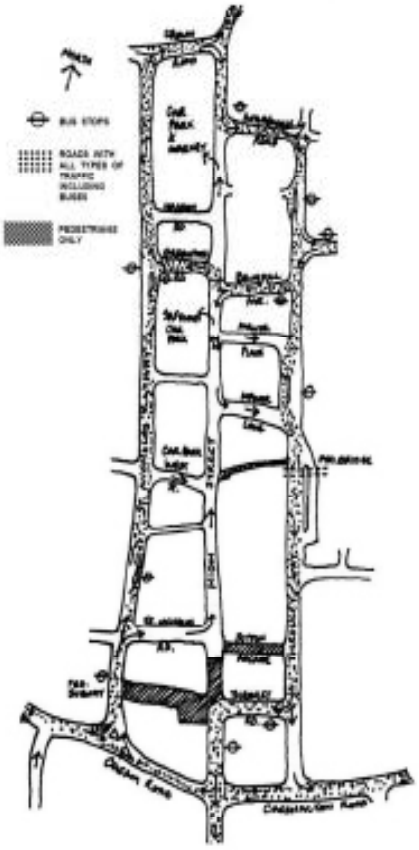


Figure D : Sutton High Street in 1979

From 1978 to 1979 - the period in which the majority of buses were displaced from the majority of the High Street, and new ground level car parks were established temporarily close to the High Street the average walking distance for bus users increased from 58m to 78m, while for car users it decreased from 134m to 119m. When the pedestrianisation scheme has been completed there may be no buses on the main part of the High Street (the fact that there are some in places gives the bus user a moderate advantage over the motorist) and three large car parks between the gyratory roads and the High Street will reverse the position and give the motorist the advantage.

2.10

It might be thought that these are niceties, and that bus users are reasonably well treated. There are two problems with this argument. First, as previously noted, bus users contain a higher proportion of disadvantaged people (elderly, infirm, children at risk from traffic, the poorer members of the community). Second, the operator - London Transport - has sustained disbenefits which, if repeated elsewhere in London, must affect fare levels whose higher cost would then be transferred to the 'normal' and disadvantaged bus users. While these results have to be treated cautiously, over the period 1978-1979 bus loadings in the Sutton area declined by 22.6%, while those for London Transport's entire bus fleet declined by 11.4% over the same period. Because of the additional distance that their buses have to run around the High Street, London Transport have sustained increased operating costs estimated at £30-40 000 per annum. The decline in bus use can hardly be contained when the operator - and its patrons - have to bear costs beyond those of inflation. Furthermore, as Social Trends 10 shows, motor vehicles have experienced declining costs in real terms from 1951 to 1977, while bus fares have increased substantially in real terms. It seems there is little encouragement politically for people to use buses, while quite the reverse may be said for the private car.

2.11

How have the users of buses in the Sutton High Street area responded to the changes? As shown above, some have stopped using the service. The results from those specifically using buses to reach the High Street are not as clear cut. In some ways their responses to street interviews are of dubious value. Bus users were interviewed at bus stops when leaving the High Street: while some were prepared to miss a bus in order to complete an interview, others were concerned that a bus might arrive, that children could dash into the road, or perhaps the weight of shopping purchases or traffic noise were nuisances that affected their concentration. With these thoughts in mind, it is possible that some respondents hurried through the interview, or gave the answers they thought the interviewer wanted to hear. Looked at another way, the results might reflect a real trade-off: that moderately worsened accessibility was considered a reasonable price for an improved shopping environment. Even though only a small proportion of the High Street had been pedestrianised, there were much lower traffic volumes in the remainder of the Street.

2.12

Whatever the explanation, when all samples (pedestrians as well as bus users) were asked whether they preferred, in the future, a High Street without any traffic, or with buses and pedestrians only, a majority favoured a traffic-free High Street. This result applied to all age groups, each sex, all social classes, and the mode of transport used. Throughout this range, those opting for a fully pedestrianised street varied between 48% and 82%. In an endeavour to obtain more accurate responses, made with the respondent's full knowledge of what a fully pedestrianised High Street or one with buses and pedestrians meant in terms of accessibility, a semi-structured in-depth household survey of 48 persons was carried out. 34 of these people had a car, yet 15 (amounting to about 31% of the sample) preferred a bus and pedestrian High Street.

2.13

Do the results reflect the 'up-market' nature of the High Street and its surrounding residential area? Not necessarily, for another study by TEST for London Transport in Kingston-upon-Thames produced quite different results (TEST 1979). Here bus users only were interviewed about the future of the main shopping street, whose conversion to a pedestrian-only street was under consideration. Out of 477 responses 18.3% wanted the street to remain with traffic as it then was, 38.7% wanted full pedestrianisation, while 44% wanted the street to have buses and pedestrians only. Similar results were obtained in the Gateshead Bus Demonstration Project (Dept. of the Environment 1972). From a sample of 1764 pedestrians interviewed in Jackson Street (where buses had been reintroduced because the previously pedestrian only street lacked convenient bus access) 41.4% preferred bus penetration, while 36.2% preferred a pedestrian only street. Conversely, in a study in Central Birmingham TEST (1976) found a ranked preference first for covered traffic free streets, then for uncovered traffic-free streets, then bus and pedestrian streets, with streets with all types of traffic least preferred.

2.14

A number of other studies have been undertaken which throw some light upon people's preferences regarding pedestrianisation, and some of the case studies in Chapter 3 contain interesting data: most of these studies could be influenced by the type of interviewing problem and people's responses discussed in paragraph 2.09 above. It is quite possible that no totally satisfactory study of user preferences has so far been undertaken, where bias of one kind or another has been virtually eliminated. However, the Leeds Institute for Transport Studies has investigated pedestrian behaviour and attitudes in Liverpool and Barnsley. The Barnsley study is referred to in the case study in Chapter 3 ; in Liverpool, Clyde (1976) discussed Church Street (all vehicles removed) and Lord Street (buses, servicing vehicles and pedestrians only). From a sample of 2362 persons, 285 said that bus users must walk further to Church Street and only 3 said it was not inconvenient for bus users; 43% of what may be another sample boarded the bus in Lord Street as against elsewhere because of 'dislike of road or bridge crossing to reach (gyratory) bus stops.' Hills (1976), discovered that in both

the Liverpool streets environmental gain was outweighed by accessibility loss:

	Overall Environment	Access-ibility
Church Street (all vehicles removed)		
Before	10.34	12.80
After	13.14	9.80
Difference	+2.80	-3.00
Lord Street (buses, servicing, pedestrians)		
Before	10.40	13.10
After	10.74	12.30
Difference	+0.34	-0.80

Table 2.03: Environmental gain outweighed by accessibility loss in two Liverpool pedestrian streets. Source: Hille 1976

2.15

London Transport (1974) reviewed a number of streets where buses and pedestrians share the movement space: as noted, this provides the best level of accessibility by bus. Bishop (1975) discussed a survey of an experimental precinct in Commercial Road, Portsmouth. There was no clear indication of whether buses were preferred in the pedestrianised street or not. While there was no specific question, only a small number of the large sample suggested that buses should go through the precinct. The City of Oxford Motor Services Ltd (1978) examined the use of streets in Oxford's central area by buses and then looked at the consequences of excluding buses from Queen Street and Cornmarket Street (which they currently share with pedestrians). Additional travel time, buses and crew substantially affected on 13 major routes of the Company. 12 additional buses, 21 more staff (at a cost of £300 000), and 100-110 bus diversions per hour would be necessary.

2.16

Stewart (1979) investigated user response to shopping streets of various types in four cities. While the statements eliciting responses were very direct ('I prefer to shop in a street in which there is no traffic' and 'Buses should be allowed to travel along this street, especially if it means a more frequent and reliable bus service') there was dominant agreement to the first question and dominant disagreement with the second question. A further commentary on the Table below is that only Birmingham of the four towns has bus and pedestrian streets, so the respondents in the other places would probably not have experienced such streets. However, the responses were as shown in Table 2.04.

Statement	% Birmingham	Bristol	Bolton	Hereford
Preference to shop in traffic free street - totally agree	84	84	84	82
Access for buses - totally disagree	64	66	81	71

Table 2.04: Responses in four towns to statements on traffic free or bus only streets.

2.17

The National Bus Company (1975b) surveyed bus passengers in Canterbury about the pedestrianisation of St. Georges, and transfer of bus stops to Gravel Walk. They found that 'on balance the advantages of the pedestrianisation scheme outweigh any disadvantages attached to the (transfer of the) bus stops.' Perhaps Baggaley (1977) should have the final words in this chapter. He says 'In any survey, if the question "Are you in favour of pedestrianising... ... Street?" is asked, the most likely answer is "Yes." If the full implications are explained to bus passengers the answer may well be more cautious. Where pedestrianisation is being considered, there is very often an "all or nothing" approach, and the view is taken that there is no environmental benefit in reducing the amount of traffic, if it cannot be eliminated. The best method of helping bus passengers can often be the removal of all traffic other than buses from the street..... with flows of even a hundred buses per hour such streets can be crossed with ease.'


N
NORTH
BUS STOP
BRITISH RAIL STATION
METRO STATION
BUS STATION
PEDESTRIAN STREET
COVERED PEDESTRIAN STREET
BUS ROUTE
MINIBUS ROUTE
ACCESS (SERVICE, ETC)
P
PARKING
S
SERVICING

12

3 SUCCESSFUL BUS ACCESS

3.01

From the analysis in the previous chapter of types of pedestrian area and access to them by bus a ranking, simply in terms of accessibility, was derived. This showed, not surprisingly, that the best accessibility was achieved from streets that had buses sharing the movement space with pedestrians. However, some reservations were stated: was this type of scheme favoured by all the street's users? The answer was equivocal: in some cases users had no doubt that they did not want other traffic on the street, and in others that they did want buses. It was then suggested there would be different responses if users of a pedestrian street fully understood the need for both a good street environment, and the best possible accessibility, for all means of transport, for all users and traders within the street.

3.02

For such streets or networks that are wide enough to accommodate buses and pedestrians without conflict, there may well be a mandate for Types A,C,AA and CC (those with buses) even if much of this mandate is latent and so far undetected. It is therefore interesting to note that of the 456 places identified with some form of pedestrianised shopping street 72, or 15.6%, have buses penetrating part or the whole of individual streets and networks. As the information on the 456 places is not entirely complete, this proportion may be somewhat higher, but is unlikely to exceed 20%.

3.03

14 of the 72 places with bus penetration are Type A (single streets) and almost half of these are in Greater London. The geographical location of places with bus penetration is widespread: they occur in 38 of the 66 UK Counties, Regions or equivalent level administrative areas that also were identified as having pedestrian shopping schemes. In time terms, the 72 places introduced their bus penetration from 1970 to the present time, rising to a peak between 1975-77, and falling off since then. 7 of the 72 places are studied in detail in the remainder of this chapter.

3.04

Seven English, two continental European, and one North American cities were selected for more detailed presentation. Two factors influenced the choice: suitability of available data, and an emphasis on bus penetration. All the case studies are networks, with the exception of Minneapolis and Wandsworth; while the networks are described, each case study concentrates on streets that share movement space between buses and pedestrians, and on accessibility to the entire scheme by bus and car users.

3.05

Each case study is structured similarly, and the section letters refer to the following information, rarely available in total for any particular case study:

Plan of the scheme. 'Before' and 'after' photographs

A. Street(s) covered by the case study. City population.
B. History: scheme origin; dates of experimental orders, public inquiries and permanent closures; special exemptions; reception of the scheme in 1980; future changes.
C. The Scheme: size and type of street(s); land use; modal split for passenger arrivals; financial costs of constructing the scheme.
D. Bus access: stop locations, services and frequencies. Operational changes. Patronage.
E. Car access: location and size of car parks; distance from the street.
F. Comparison of bus and car access. A separate study would be needed to determine meaningful accessibility measures, as a wide range of variables is involved, for which suitable data were not collected within the limitations of a study of this nature. Instead, two measures have been displayed, which cannot be compared, as they are different in kind. One graph shows the cumulative number of car parking spaces by distance walked from the centroid of the car park to the nearest point of the pedestrian network. The other shows the cumulative number of bus stops by distance walked to the nearest point of the pedestrian network. For each graph, the closer the curve to the vertical axis, the better the accessibility by that means of transport. A scale for city population is also provided.
It is important to note that on-street car parking is not included in the comparison, and that park and ride arrangements, either by normal stage services or by special shoppers buses, are also excluded.
G. Other vehicles: servicing arrangements, invalids; tourist coaches; alternatives for displaced traffic. It is assumed that all schemes have special arrangements for emergency traffic.
H. Attitudinal Surveys: of shopkeepers, pedestrians, bus users, bus operator and crew, police.
J. Behavioural aspects: observance of restrictions, pedestrian flows, out of hours use.
K. Environmental aspects: floorscape, vegetation, seats, lighting, shop fronts, recreation; accidents; noise and air pollution; litter; vandalism.
L. Conclusions and data sources.

3.06

A comparative analysis follows the case studies in sections 3.07-3.13 below.

BARNSLEY SOUTH YORKSHIRE

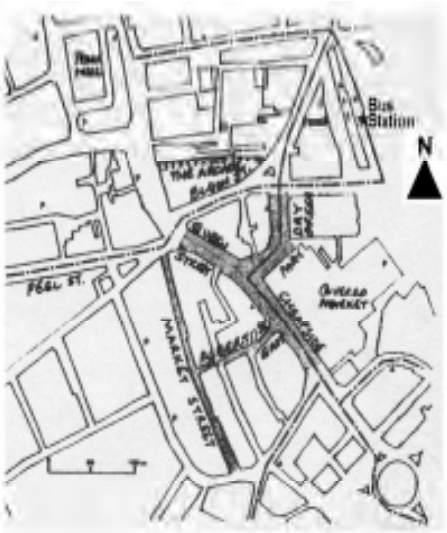


Figure E : Barnsley Town Centre

Plate I : Cheapside, Barnsley, before pedestrianisation

Plate II : Cheapside, Barnsley, after pedestrianisation and during experimental period without buses

A
South Yorkshire is renowned for innovations in environmental control and its unique public transport fare policies. It is therefore not surprising that Barnsley, the County Town, is a centre for experiments in pedestrianisation, and that these have been elaborately monitored. Covered areas include The Arcade and the Market; there is one pedestrian only street: Albert Street East; Market Street and Queen Street have restricted access for service vehicles; bus and pedestrian only streets are May Day Green and Cheapside, and these two streets will be the main concern of this case study. Monitoring has been undertaken both by the Borough Council and the Institute for Transport Studies, University of Leeds. Barnsley's population in 1971 was 74 215. Local Government reorganisation in 1974 led to different boundaries: Barnsley Metropolitan Borough had 222 100 people in 1978 out of a South Yorkshire population of 1 304 100.

B
In November 1974 Barnsley MBC undertook surveys as part of the Town Centre Local Plan preparation. A questionnaire survey revealed that 87% of respondents felt that there was a serious conflict between vehicular traffic and pedestrians, while 92% thought traffic-free areas would make Barnsley a more pleasant place to walk, work and shop. The Borough thought that completion of the Eastern Relief Road in the summer of 1975 would enable experimental introduction of pedestrianisation before the Local Plan was published. Three options had been prepared, the first of which was chosen: this proposed that Queen Street, Cheapside and May Day Green should be pedestrianised. This scheme was to be implemented in three Phases. Phase I was implemented in late November 1975: this included the bus and access vehicle only provision in Cheapside and May Day Green, and the full or part-pedestrianisation of streets mentioned in section A above. Access vehicles could only enter between 18.00 and 10.00.

In Phase II (March 1976) buses were restricted to a one-way (inward or roughly northbound) direction on Cheapside and May Day Green. Phase III was to have been implemented in July 1976: this involved the removal of buses from these streets. However, this was indefinitely postponed for two reasons. First, until completion of the Western Relief Road the diverted buses would cause unacceptable congestion on other streets and second, there would be a loss of bus accessibility in the central area.

C
Cheapside is about 120m long and May Day Green about 130m. Both are about 25m wide. They are flanked to the east by a new covered market building which also incorporates a number of small shops. About 16 small to medium sized shops form their western flank.

The modal split for passenger arrivals to the town centre in 1975 was derived from two surveys, on weekdays and Saturdays:

	%			
	Shopping Survey		Pedestrian Survey	
	TU W FR	SAT	W TH FR	SAT
Foot	[illegible]	[illegible]	[illegible]	[illegible]
Car / Motorcycle	[illegible]	[illegible]	[illegible]	[illegible]
Bus	[illegible]	[illegible]	[illegible]	[illegible]
Rail	3			

Table 3.01 : Modal split for passenger arrivals to Barnsley Town Centre 1976

This table shows a characteristic common to many shopping centres: the great increase in the proportion of car and motorcycle arrivals on Saturdays against the rest of the week. It also shows how important access by bus is.

No data were obtained on the financial costs of the scheme.

D
Public transport access to the pedestrianised shopping streets is good. Cheapside has a new bus stop near to Albert Street East and opposite the entrance to the covered market. May Day Green has a stop near its northern end. The Bus Station is close to the northern end of the covered and open air market complex while the BR Exchange Station adjoins the Bus Station. Bus routes pass the northern end of Market Street, which is also accessible from the May Day Green bus stops.

The Town Centre Local Plan shows that before pedestrianisation people had to walk longer distances, as public transport users, than did car users. 25% of car users set down or parked within 100m of their first destination, while the corresponding figure for bus passengers was 5%. The bus users' disadvantage was caused primarily by unsuitable bus stop location: now that this has been improved and the two bus-only streets introduced, bus users are closer to parity with car users.

E
Garton (1977) says that Barnsley is 'amply supplied with car parking spaces'. A multi-storey car park is on the eastern edge of the Covered Market and two car parks off Wellington Street are adjacent to Market Street. The map shows their, and other, locations with greater than 20 spaces within the Centre.

F
Barnsley has a large number of car parking spaces for a town of its size, and a comparatively small number of bus stops. However, the bus stops are used by many high occupancy buses and accessibility seems to be of a comparably high order between the two means of transport.

Figure F shows the cumulative number of car parking spaces by distance, while Figure G shows the number of bus stops by distance. As said earlier, these Figures cannot be directly compared.

Figures F and G appear on page 16.

15

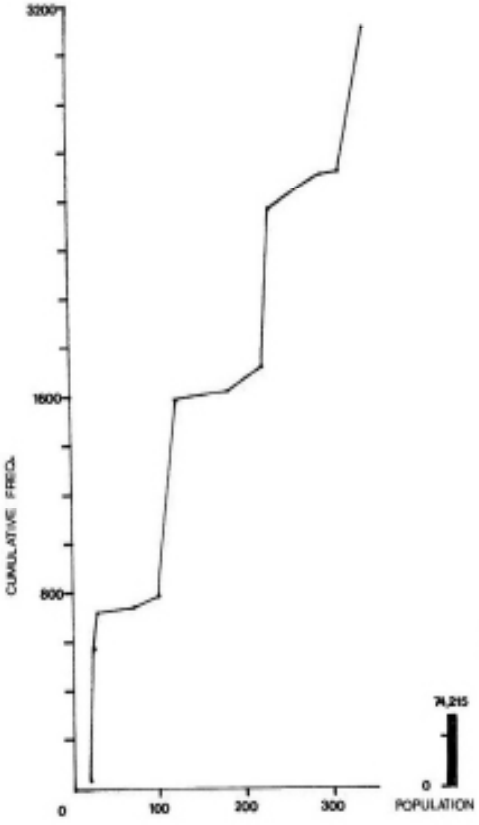


Figure F : Cumulative frequency of car parking spaces, by distance from nearest point of pedestrian network, in Barnsley

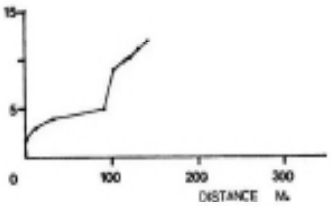


Figure G : Cumulative frequency of bus stops, by distance from nearest point of pedestrian network, in Barnsley

G

Servicing of shops is something of a problem in Barnsley, as there are few rear-servicing facilities. As already noted the two bus streets permit access of other vehicles between 18.00 and 10.00.

H

The Leeds Institute for Transport Studies undertook interview surveys in November 1975 and March 1976. Their analysis compared attitudes to groups of streets before and after initial pedestrianisation. A 21-point attitude scale was used, with 1=Bad and 21=Good. The mean responses are given in Table 3.02. The 'after' columns are Market Street and Queen Street ('full' pedestrianisation though restricted access for servicing), Cheapside and May Day Green (buses, limited access and pedestrians), and Eldon Street (all types of traffic permitted).

The $\bar{x}$ or mean scores of attitudes are of great interest, for such data are rarely available for pedestrianisation schemes. Thus, 'your safety' is considered to be highest in the two fully pedestrianised streets, quite reasonable in the bus only streets, and at the mid-point of the scale for the all-traffic street. 'Safety for pedestrians' shows a much more distinct decrease over the same range of street types, while 'Freedom to Cross' is even more pronounced. 'Access by Transport' is considered best in Eldon Street and the two bus streets are comparable; the pedestrian only streets are somewhat poorer. All the above comparisons are in the 'After' range; when we compare 'After' with 'Before' - though there is not direct comparability - all the variables show an improvement in the 'After' situation with the unexplained exception of 'Overall Appearance', though the difference in mean scores for Market Street is slight. Perhaps Queen Street, coupled with Market Street in the 'After' study, is not well liked.

The Institute's study concludes with some points of general relevance to this review. First, the removal of traffic from a street - either buses or cars or both - need not reduce physical or psychological accessibility to that street, provided that there is ample provision for car parking nearby and that bus stops are conveniently situated within a short walking distance of the pedestrianised area. Secondly, it is possible to increase accessibility simultaneously with pedestrianisation measures by the addition of extra bus stops in streets adjacent to the pedestrianised area (Cheapside e.g.). And thirdly, complete pedestrianisation of the central area (including May Day Green and Cheapside) would, on the basis of these results, have little effect on car users, but would significantly worsen accessibility for bus users.

J

No suitable data available.

TITLE	BEFORE 1	BEFORE 2	AFTER 3	AFTER 4	AFTER 5
SHOPS	15.98	15.96	14.08	16.11	15.48
OVERALL APPEARANCE	11.27	11.71	10.77	11.72	12.02
YOUR SAFETY	9.99	10.88	17.90	14.37	10.49
SAFETY FOR PEDESTRIANS	9.17	8.89	18.31	12.71	9.17
FREEDOM TO CROSS	8.43	14.47	16.88	14.67	8.33
EFFECT OF CROWDS	8.38	8.78	11.51	12.25	10.89
AMOUNT OF NOISE	6.16	12.97	14.48	11.63	8.21
ACCESS BY TRANSPORT	10.90	6.20	11.09	12.39	12.93
n. (usable questionnaires)	800	200	357	340	174

Table 3.02 : $\bar{x}$ (mean score) of attitudes to streets in Barnsley before and after pedestrianisation
Source: Garton 1977

Notes: 1 All streets except Market Street
2 Market Street
3 Market Street and Queen Street
4 Cheapside and May Day Green
5 Eldon Street

K

Cheapside and May Day Green were, to early 1980, not particularly pleasant environments for pedestrians. ' Cosmetic ' treatment was only moderately applied (planting boxes without plants, some seats), and there was a clear distinction between footpaths and carriageway. However, during 1980 the streets were paved over; while the construction works went on, buses were excluded, the concept being to return them after completion of the works. Because this offered an unique opportunity for measuring attitudes toward these streets without buses (albeit a far from perfect situation given the disturbance caused by the paving works) the Leeds Institute was invited to carry out a further survey of pedestrians during the construction period. Unfortunately the results were not ready in time to incorporate in this review.

L

Barnsley's particular interest is twofold. First, the Borough, County and Leeds Institute for Transport Studies have studied the needs, attitudes and behaviour of pedestrians in the shopping centre very thoroughly: pedestrian streets are the results of research rather than of ad hoc decisions as in so many other towns. Second, the bus-only streets undoubtedly provided a level of accessibility for shoppers which compared well with that for car users, and it may later be regretted if buses are permanently removed from those streets (compare with the experience in Gateshead, paragraph 2.13 above).

These reservations are made because, at the time of completing this study the temporary removal of buses from Cheapside and May Day Green, while paving works were carried out, apparently proved so popular with members of the public that the County Council took out a further experimental traffic order for a period of six months, at the end of which the position will be reassessed. It may be decided to seek a further experimental order but if it is recommended that the order be made permanent the local bus operator would be able to raise objections. If that happened, the final decision would rest with the Department of the Environment - the bus operator does not favour permanent removal because of the effect on an already overcrowded bus station. One wonders what view bus users have.

Data for this case study were obtained from officers of Barnsley MBC, and from Garton (1977), Barnsley MBC (1975,1977) and South Yorkshire CC (1979).

BESANCO FRANCE

Figure B : Besancon's Central Area

A
Pedestrian only streets: Grande Rue from the River Ououbs in the north west to Place du 8 Sept., and Rue Bersot from Rue des Granges to Rue Proudhon. Bus, taxi, servicing and inhabitants' access: Rue de la Prefecture, Grande Rue (remainder), Rue des Granges and Rue de la Republique.

Besancon had a population of 135 000 in 1975 which was growing at 3% per annum, one of the highest urban growth rates in France.

B
In comparison with the other case studies here, Besançon is similar in population to Uppsala with which is shares religious and university significance. Like Durham, the historic centre is contained within a loop of a river, has narrow streets often unsuited to vehicular traffic, and had traffic problems of such a scale that they threatened the very life of the centre. Unlike Durham, Besancon had a very high car ownership (74% of households). As the municipality determined to do something about traffic and impressed Central Government with their innovations and rapidity of action, the national Ministry of Transport made Besancon a special case, with central funding. Like Uppsala, it became one of OECD's case studies on 'Better Towns with Less Traffic'.

No roadworks in the historic centre could be contemplated. In 1971 a traffic plan was drawn up, whose main components were:

- Traffic restraint in the city centre by banning through traffic
- The construction of a ring road to take this diverted through traffic
- The creation of pedestrian areas
- Priority for public transport on certain streets, with prohibition of parking, but allowing all traffic between 20.30 and 07.00.
- Improved bus services in residential areas so that 80% of all families are within 350m of a public transport service
- The creation of four 'traffic cells' within the centre. Movement within the cells is relatively easy, facilitating servicing and residents' traffic, but difficult between them.

Traffic and public transport plans were adopted by the Municipal Council in January 1973. The scheme was largely complete and open by October 1974, though some works on the pedestrian areas had still to be finished.

There are no data in the report (OECD 1975b) on possible future extensions or changes to the scheme.

C
The pedestrianised and primarily bus streets are listed in section A above. The report does not describe them further, and the maps are without a scale so their length and width cannot be determined. It is assumed they mix shopping with other commercial activities, entertainments and perhaps administration. No modal split for passenger arrivals in the centre is given.

On the other hand, detailed financial costs are

provided. Roadworks and general improvements for the pedestrian areas cost FF 6 300 000. Improvements to the road system cost FF 7 920 000, signs and signals FF 800 000 and research work and the information campaign FF 800 000. Capital cost of the public transport plan, including construction of a depot, control equipment, and bus, minibus and ticket cancelling machine purchase cost a total of FF 15 400 000 - an almost identical total cost to that for the traffic plan. The overall cost of FF 31 270 000 was met by FF 19 789 000 from the city, and FF 11 81 000 from Central Government. The city's contribution was substantially in the form of loans, repayable over 15 years.

D
Not unnaturally, much of the report discusses changes in the public transport system. The streets with priority for public transport permit a surprising variety of traffic. They are 'restricted' to buses, local residents' vehicles, delivery vehicles, taxis and 'various other vehicles which cannot be kept out', and ambulances; public service, police and press vehicles; doctors' cars; emergency vehicles; breakdown lorries; security vehicles; tourist coaches and private cars going to the hotels on the reserved route; vehicles taking sick or disabled persons to a doctor, treatment centre or clinic; bicycles and mopeds. We are assured that 'entry permits are issued by the municipal authorities to persons entitled to exemption in these categories.' Doubtless this extension of the bureaucracy created employment.

Between 1968 and 1973 measures to improve public transport had increased the number of passengers by about 6.5% per annum. Later, an attempt was made to create a modal transfer from private to public transport with the goal, city-wide, of increasing the proportion of public transport trips from 15% in 1972 to 30% by 1977. This was seen to be desirable not simply as an exercise to improve urban conditions, but also to compensate motorists for restrictions affecting them - i.e., the more the modal transfer took place, the better the public facilities would be.

Like Uppsala, bus routes tend to originate and terminate in suburban areas, having passed through the centre. The new network contains 8 regular lines, with ten-minute headways throughout the day on six routes, and six-minute headways on two major routes. Suburban areas also have feeder services to the main routes. The regular network buses operate from 06.00 to 20.00. From 20.30 to 24.00 and on Sunday mornings collective taxis, running every 30 minutes, take over from the buses. There is also an 'intramural' minibus service connecting the city centre with park and ride terminals, the railway station and the main car parks. In 1975 these minibuses ran at 8-minute intervals from 07.00 - 20.00.

26 large buses and 10 mini buses (probably later to be replaced with electric vehicles in accordance with environmental objectives) had to be bought and 11 large buses 'renewed'. They are equipped with radio-telephone. Some traffic signals are priority-activated by buses.

In 1975 the Besançon Transport Company had an operating deficit of FF 9 787 000, of which FF 5 600 000 was met from the Commune budget. Towns with over 100 000 inhabitants could, from about that time, tax payrolls in order to finance public transport and the Municipal Council decided to levy such a tax at 1% from 1 April 1975. That should have yielded FF 7 million.

E
There are about 1500 parking spaces adjacent to the Grande Rue, and 1200 adjacent to the Rue Bersot, pedestrian streets. As noted earlier, it is not easy to move from cell to cell within the centre. Car parks further away are connected with the centre by the minibus service, noted in section D.

F
Data on access are not suitable for graphic display. The peculiar conditions in Besançon make it not comparable with the other case studies, but it may be that the bus user has some overall advantage over the car user in gaining access to the pedestrian, and bus, streets.

G
As seen earlier, virtually any vehicle other than through traffic can reach the pedestrian, and bus, streets without undue difficulty. The ring road is the only facility for diverted through traffic.

H
Shopkeepers were enthusiastic about the proposals, and asked for one street to be pedestrianised ahead of schedule. No other attitudinal data are quoted in the report, nor are there behavioural data.

K
The Grande Rue was improved and decaying buildings were purchased and demolished in the Place Parbour. Because of differences in level part of the square was stepped to make seats; a green space with trees, a fountain, and a stainless steel sculpture were also provided. Toilets and telephones were built below ground level. Limestone paving has been used in the pedestrian streets, to match the stone on the surrounding buildings. In the Place du 8 Septembre, which is crossed obliquely by the public transport route, basins, masts, and streamers flank the route. It has trees and a fountain with a water sculpture. In the Rue Bersot reliance seems to have been placed on the traders, who were renovating their shops.

The report has no data on accidents or changes in noise and air pollution.

L
Besancon has achieved much through its own innovations, through their careful planning, and through the central government funding that the policies induced. Like Uppsala, it has attempted, with some success, to satisfy all interest groups rather than opt for a grander (and unworkable in French terms) concept such as the removal of all private vehicles.

This case study derives entirely from Andre Regani's 'Plan de Circulation et de Transport' of the Ville de Besançon, reproduced as OECD (1975b).

BIRMINGHAM WEST MIDLANDS

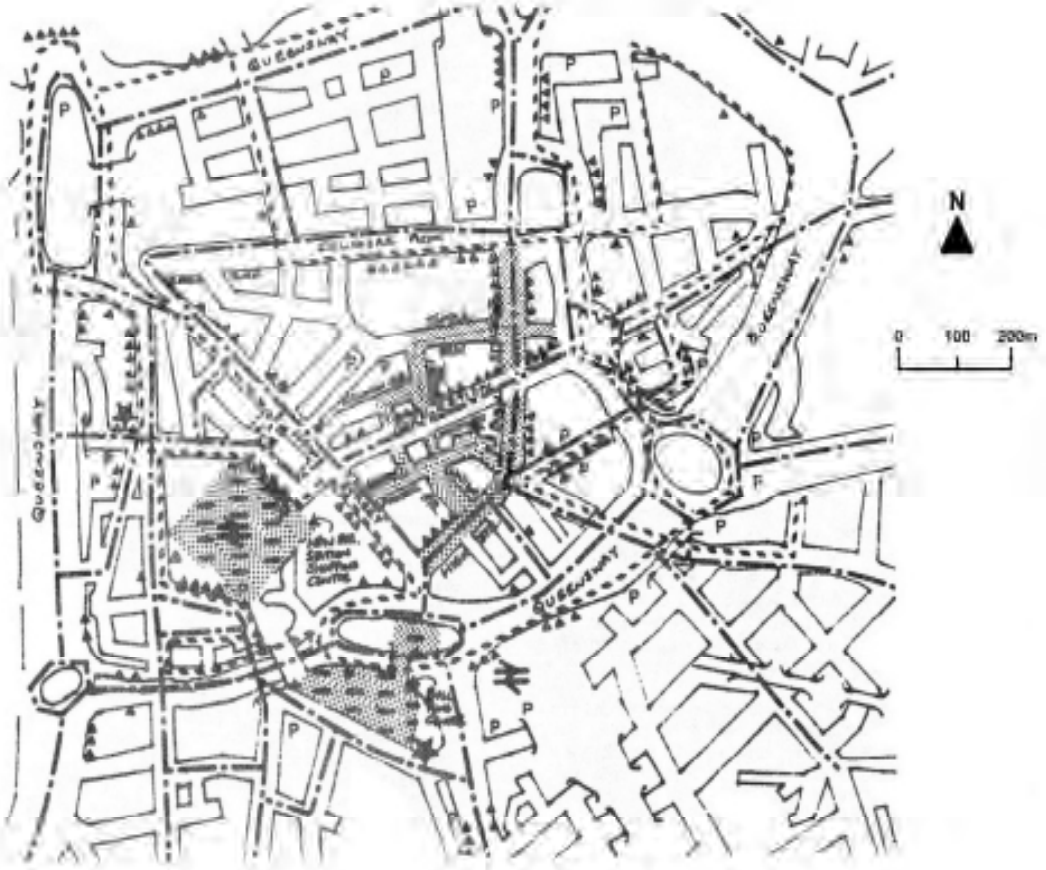


Figure 1 : Birmingham's Central Area

III

V

IV

Plate III : View north-west along High Street
Plate IV : View north along Bull Street
Plate V : View north along Bull Street beyond Corporation Street

A
Birmingham's central area pedestrian network includes the New Street Station Shopping Centre, the Bull Ring Shopping Centre and several Victorian Arcades in the covered or largely covered purpose built category. Streets converted for pedestrians include Temple Row (part), Cherry Street, Union Street, Union Passage, Martineau Square and part of Cannon Street. Two streets combine buses and pedestrians: High Street and Bull Street. New Street and Corporation Street have all types of vehicle. Thus, all types of shopping street are represented within the Inner Ring Road (Queensway). The City of Birmingham had an estimated population of 1 087 660 in 1979, and its strategic centres had approximately 200 000 m^2 of retail floorspace in 1977, twice that of the next largest centre in the West Midlands (West Midlands PTE 1979).

The complexity of Birmingham's pedestrian network precludes a full analysis here (see Stewart 1979 for such detail) so this case study concentrates on the bus and pedestrian streets - High Street and Bull Street - and on access to the rest of the network by bus and car.

B
Pedestrianisation of parts of the City Centre was first considered in 1963 by the Public Works Committee. Following visits to the Leeds scheme in 1971 and to Germany, this Committee approved various actions and the first phase of the Birmingham scheme was opened on 1 May 1973. The Committee remained active toward the scheme up to local government reorganisation in 1974. Some years before this the West Midlands Passenger Transport Executive was formed, taking over the function of the Corporation-operated bus service (who were doubtless influential in maintaining buses on the two streets we are studying). In 1974 the West Midlands County Council became highways authority, and the City Council's Planning Department became separated from the Engineer and Surveyor, though by this time most of what can be seen today had been achieved. In the early 1970s the Inner ring road was substantially completed and linked to the national motorway network via the Aston Expressway. Thus, the change from Birmingham City's status as an all-purpose, and all-powerful City and County Borough to a Metropolitan District with fewer powers coincided with dramatic changes both for the motorist and for the pedestrian. Because of local government reorganisation, monitoring of the pedestrian network has been done by the City Council though, as we shall see, several other organisations have shown great interest.

In 1980 there are those who believe, despite these changes, that conditions for the motorist are better than for pedestrians. For the 29% of shopping trips that were non-home based (i.e. from City Centre workers, generally) conditions for the pedestrian are better than in many comparable areas in Britain. For the 71% of trips that were home-based, access to the Centre as a pedestrian can produce problems: negotiating the stops and subways of Queensway when walking from car parks or the bus station (outside Queensway) to the Centre (within Queensway).

There are no plans for extending the pedestrian network, though there are desires to improve conditions for pedestrians in New Street and Corporation Street. The problems in each of these streets are quite difficult to solve, however: they both have large numbers of buses and both have problems of servicing some of Birmingham's largest stores. The PTE is strongly opposed to removal of the buses. Nevertheless, the City feels it would have partly pedestrianised these two streets by now had there not been local government reorganisation.

C
High Street and Bull Street are effectively the same street but their characteristics are different. High Street (New Street to Dale End), 250m long and about 25m wide, contains various sizes of multiples, including department stores. Bull Street is split by a partly elevated Corporation Street: the section from the High Street to Corporation Street is about 110m long and a similar width to the High Street; this section has smaller stores than High Street though there is a Tesco within its own type of precinct. Bull Street from Corporation Street to Colmore Row is about 50m long, again similar in width to High Street, and contains shops and offices in rather forbidding buildings. None of these sections of the length High Street - Bull Street has the intimacy of scale particularly suited to a pedestrian environment that characterises Union Street, for example.

West Midlands PTE (1979) is a good source for information on transport used by shoppers to reach these City centre streets, though it does not give the size of the sample:

	%		
	All shopping trips	Non-home based	Home-based
Car	19	10	22
Bus	56	33	66
Train	9	6	10
Walk	15	51	1
Other	1	1	1

Table 3.03 : Means of transport used to reach Birmingham City Centre shops

There is a high-level of office and shop employment in the centre, which largely accounts for the 51% of non-home-based trips on foot. As noted earlier, 29% of shopping trips were non-home-based. Taken together, these findings explain the lack of comparability on the car-user proportion between Birmingham and other West Midlands strategic centres (Wolverhampton 41% car, Coventry and Walsall 29%; Dudley 34%, Walsall 35%; the wealthy areas of Sutton Coldfield and Stourbridge have 55% and 45% car respectively, a low bus, and a high walk proportion; in all the strategic centres except the last two, the bus proportion is 51% or more).

City of Birmingham (n.d.) provides data on expenditure on the network 1972-1974. Thus, a pilot landscape scheme in 1972 cost £2500; the works for the first phase were estimated, in 1972 to cost £125 000. In 1973, pedestrianisation of lower Bull Street and Phase II of the High Street were approved at a cost of £55 000. All these sums were provided by the City, without recourse to the Department of the Environment or any other agency.

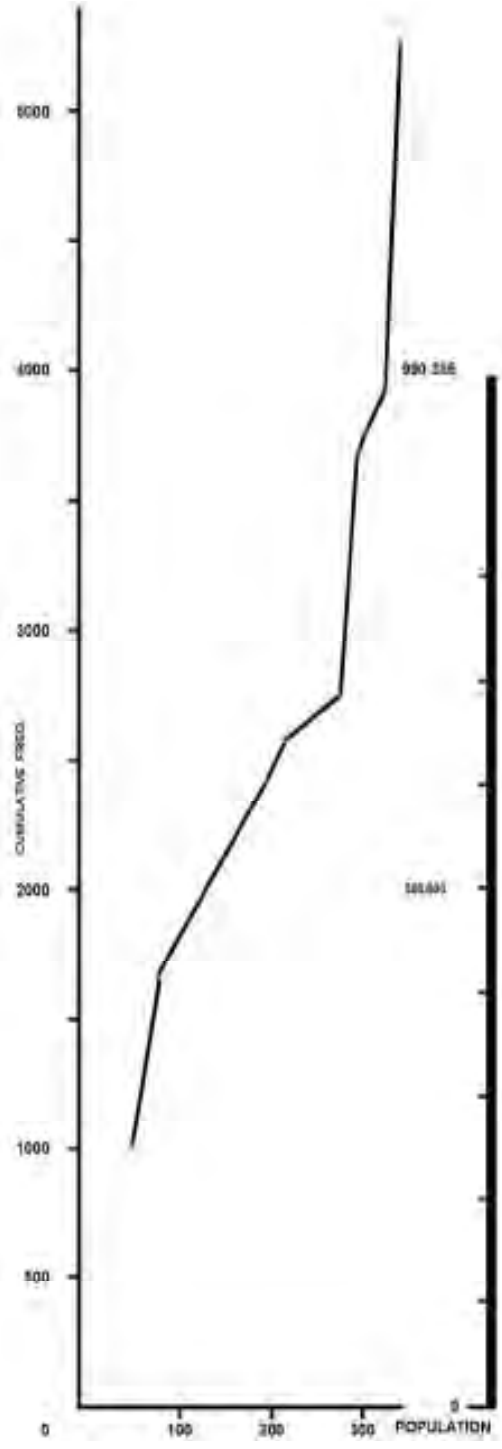


Figure K : Cumulative frequency of car parking spaces by distance from Birmingham's pedestrian network

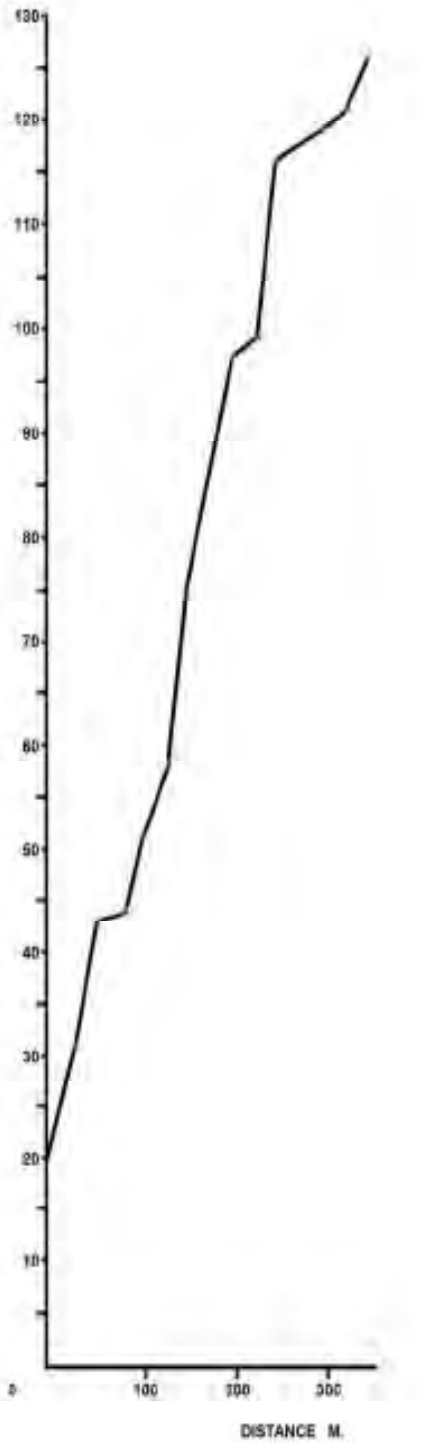


Figure L : Cumlative frequency of bus stops by distance from Birmingham's pedestrian network

D
Although there are buses in and around the pedestrian network, many buses (and trams before them) terminate in Navigation Street. This is west of New Street Station and inconvenient for bus users, incurring walks of 300-400m to parts of the pedestrian network. The financial cost of providing one or more new terminals is daunting, but the PTE are trying to make improvements.

The nearest bus routes are on New Street, on the southern edge of the network, on High Street-Bull Street and Carr's Lane on the eastern edge, and on Corporation Street, through the centre of the network. According to Stewart (1979) there are 267 peak hour buses northbound on Corporation Street and 88 southbound which turn into Bull Street. Frequencies on High Street cannot be read from his map.

In the early 1970s a 'Centrebus' (midibus) service initially ran along some of the pedestrian streets, on a low fare basis, subsidised by WMPTE and the City of Birmingham. While it still runs, it has been re-routed to operate on a 'more commercially attractive basis'. At the earlier period, buses and service vehicles shared the space with pedestrians on Union Street, Cherry Street and Temple Row.

Johnson (1980) wrote about the Centrebus. In that year it was losing £160 000 a year, and apparently the Conservative West Midlands County Council wanted to sell the service to a private operator 'when the new Transport Act comes into force.'

In 1974 there were about 30 WMPTE local services and certain Midland Red services serving the pedestrian area. There are several, unsheltered, stops on the Western side of High Street (one-way north) and similar provision on Bull Street (south of Corporation Street) on its eastern side, as this section of Bull Street is one-way south.

While the midibus has a special low step, normal service buses with their higher front or rear platform have caused problems because of differing floorscape treatments (see section K). There is an advisory 5-10mph speed limit for buses on High Street-Bull Street which is fairly well observed.

E
Access to car parks needs a thorough knowledge of the Centre's one-way system, and the larger off-street ones do not provide as good a level of access to the pedestrian streets as do the bus. However, there are 300 private parking spaces within the pedestrian area, and access has had to be maintained to these.

F
Birmingham is Britain's second largest city, so it is not surprising that its Centre has a large number of car parking spaces, and of bus stops. 19 of these bus stops are at zero distance from a pedestrian shopping street and there are 1000 car spaces within 50m of such a street. Overall, the advantage in accessibility probably lies with the bus user, though many vehicle users do have a special advantage where they park in one of the large number of car parks associated with office buildings.

However, ignoring these office car parks and the on-street spaces, the cumulative car spaces, and bus stops, by distance, may be discerned from Figures K and L.

G
There are no restrictions on servicing shops from the pedestrian streets, where no rear servicing is available.

Concerning displaced traffic, no new roads have been built within Queensway, though of course this ring road to some extent fulfills this function.

H
Shopkeepers were initially against the scheme though insufficient made formal objections to require a Public Inquiry.

The Centrebus was introduced on its original route partly to diminish traders' fears of the scheme. Now it appears that they are satisfied with the scheme and some shopkeepers are moving in to the Centre (e.g. Tesco) because out of town centres are suffering the effects of more expensive vehicle fuels. In 1980 apparently a hypermarket in such a situation is laying off staff.

An interesting exercise was undertaken in 1978 by the West Midlands PTE (1979). This looked at the modal split for shopping trips to all the West Midlands shopping centres (the study has already been referred to in Section C above) and then attempted to relate mode of arrival to the proportion of retail turnover this represented. From an unspecified sample size the study noted that those arriving by bus in Birmingham's centre spent £3.66 per capita on average, at a particular shop, while those arriving by car spent an average of £7.55. The study says '. . .those that travel by car generally spend more on shopping. This points to the greater load capacity of the car and the need for more frequent trips to a shopping centre is using bus or walking. Consequently car contributes proportionately more to the turnover of a shopping centre than the modal split information suggests.' Nevertheless, the study concludes for Birmingham City Centre that public transport users account for 56% of retail turnover. These findings point to the utmost importance of planning a high level of public transport access to shopping, and by inference pedestrianised shopping, streets.

Stewart (1979) and TEST (1976) are the main references on pedestrian response to the Birmingham network. Stewart studied Bolton, Bristol and Hereford in comparison with Birmingham. TEST undertook studies in London as well as in Central Birmingham. The particular interest of the present study lies in user responses to buses in pedestrian streets. Stewart's interview team asked for responses to two statements: 'I prefer to shop in a street in which there is no traffic' (84% totally agreed) and 'Buses should be allowed to travel along this street, especially if it means a more frequent and reliable bus service' (64% totally disagreed). It is not clear in which streets respondents gave these answers, so it may be more sensible to see them in the context of the PTE findings above. TEST asked people in 1975, to state their preferences for different types of street used by pedestrians. The ranked order was: 1 covered streets (e.g. arcades); 2 uncovered traffic free zones; 3 uncovered streets with buses and pedestrians only; 4 all-traffic streets.

J
One or two car users still infringe the restrictions though this is not a particular problem.
There are no data on changed pedestrian flows.

K
Much attention has been paid to civic design aspects of the pedestrianised streets, with the notable exception that there are no bus shelters on High Street-Bull Street. In these streets the carriageway has been narrowed so the footpaths could be enlarged; sufficient space is retained for one bus to pass another. On the side where buses stop there is a raised curb. On the other side the footpath has a gentle brick-paved ramp to the carriageway, which is generally tarmac-surfaced. At cross-roads the carriageway is paved similarly to the footpaths.

Seats, brick-enclosed flower beds, trees, pedestrian-scale lighting and a fountain have been introduced.

There are no formal crossing facilities for pedestrians until Corporation Street is reached. This is raised, with a carriageway ramp up from Bull Street, and there are pedestrian subways leading to the other half of Bull Street. At only point there is a Pelican crossing.

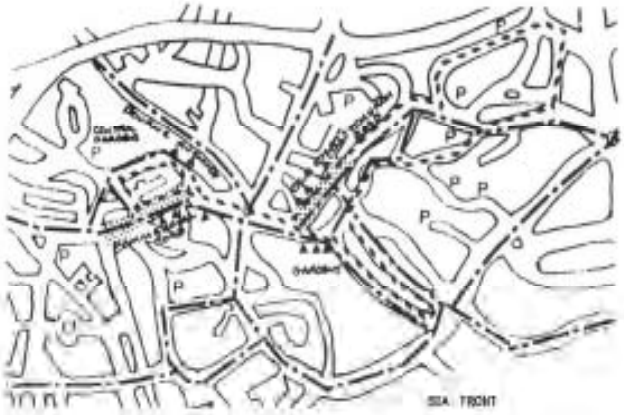
Litter appeared moderate when the area was visited.

There are no readily available data on accidents, noise and air pollution.

L
The City Centre of Birmingham has a large network of pedestrian streets, of one form or another, comparable in extent to only two or three other cities in Britain. Access by bus seems, on the whole, to be better than by private car and there are no pressures to change this. If, however, the shopper arrives by a bus that does not penetrate or stop very close to the pedestrian area, then the car user has the advantage. Less usual in provincial cities is the good access by train - both from inter city services, and the recently introduced cross-town services.

Data for this case study were provided by officers of the City Council and the references cited.

BOURNEMOUTH DORSET



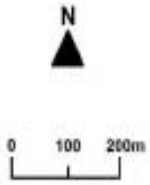


Figure 8 Bournemouth - central area

Plate VI : Old Christchurch Road looking northwest

Plate VII : Commercial Road looking east - Centerlite buses on right

A
Commercial Road, Old Christchurch Road (part), 2 arcades. Population 1971 South East Dorset 360 000, Bournemouth 139 720.

B
Bourne Avenue and the Central Gardens, from north-west to the Pier, separate the two main central shopping streets, because of their traffic and the covenants under which the Gardens were bequeathed to Bournemouth on a long lease. An east-west by-pass of Central Bournemouth is nearing completion and may lessen the traffic levels that bisect the two areas. Lack of rear servicing in places, and of suitable alternative routes for buses, led to the present scheme of bus, some servicing and pedestrians in the two streets. The carriageways were narrowed to about 6m on Commercial Road and the scheme in its present form was opened late in 1972.

Old Christchurch Road may have an extension of the present arrangement in the next few years, though there is already opposition from local businesses such as estate agents who do not want to lose their on street parking. There are longer-term ideas for possibly part-pedestrianising Exeter Road.

It seems that Dorset CC are more enthusiastic about pedestrianisation, on the grounds of road safety, passengers in public transport, and environment, than are the District Council.

C
Commercial Road is 275m long, about 15m wide, and one-way westbound. Part of the southern side was redeveloped in recent years with a parade of small shops. The northern side has department stores and the larger multiples. The bus and pedestrian section of Old Christchurch Road scheme is 180m long but narrower, and one-way eastbound. There are banks, specialist shops, some multiples, a department store and offices. Old Christchurch Road has two pre-war arcades running approximately north-south and a small area of totally pedestrianised street running north from the western end.

No data were available on modal split for passenger arrivals or on the financial costs of the scheme.

D
There are two bus shelters in Commercial Road near the new shopping parade. In Old Christchurch Road the bus stops, without shelters, are spread along the northern side of the carriageway.

On Commercial Road there are six bus routes of the Corporation's Transport Department, representing 12 vehicles/hour during peak periods on town services. In addition, there are approximately 13 vehicles/hour of Hants and Dorset Motor Services (longer distance stage services).

Old Christchurch Road is served by 9 bus services, with total frequencies of 27 buses during peak periods and 18 off-peak.

The 'Centeride' route, introduced in 1979, serves both shopping precincts and the principal central area car parks. It has 10 minute frequency at all times during the day, with a 10p flat rate for adults and children. Bournemouth Transport have one electric, and about seven diesel, midibuses to run this service. It receives subsidies of £7000 each from the County and District, and collects about £9000 in fares. About 2-3000 people a week use the service. On a mid-day 10 minute road trip on the electric midibus there were 10 passengers in all, of whom 7 made the complete circuit from and to Commercial Road. The driver was asked why the 6 other than the author made the circuit, and he thought it was because it was good value for money.

E
While some on-street parking is still permitted near to the two precincts, off-street car parks are not particularly close to the bus and pedestrian streets. This is theoretically offset by their connectedness with these streets via the Centeride Service.

F
Bournemouth's off-street parking spaces are more distant from the two bus and pedestrian streets than in any other of the case studies. On the other hand, bus access is understandably good: in fact the ratio of bus access to car access is among the best for all the case studies.

Figures N and O show respectively the cumulative number of car parking spaces and of bus stops by distance from the bus and pedestrian streets.

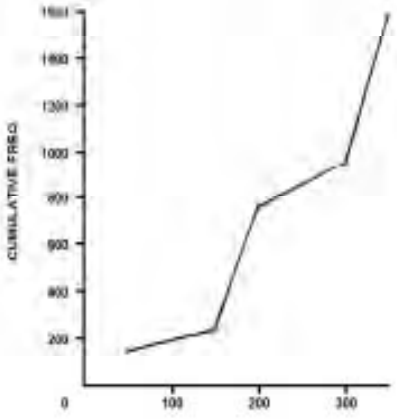


Figure N : Cumulative frequency of car parking spaces by distance from the bus and pedestrian streets

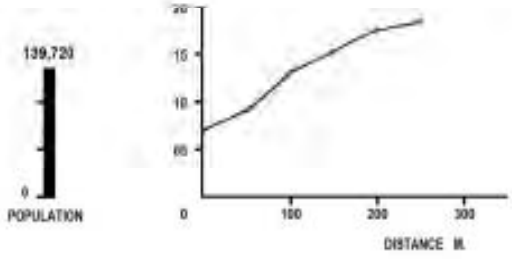


Figure O : Cumulative frequency of bus stops by distance from the bus and pedestrian streets

G
Servicing of the Commercial Road shops is mainly from the rear, while the Old Christchurch Road shops tend more to be serviced from the street. The arcades have trolleyed deliveries.

No alternatives have been provided for displaced traffic.

H
Shopkeepers were originally against the scheme, but now favour it. Some would prefer the buses to be removed from the two streets but the operator, principally Bournemouth Transport, has always strongly advocated having buses within the streets. In its view, adjacent streets that used to be one-way are now two-way, so bus loading would be difficult; there is no real alternative to the present arrangement.

Results from more general attitude surveys in SE Dorset show that there is a demand for further pedestrianisation, with greater restrictions in service traffic and the removal of buses (in Dorchester, the County town, South Street has buses and pedestrians only, but the buses will be removed when a new bus station has been built). Public participation for the SE Dorset Structure Plan (Dorset CC 1978) had a survey of 1800 households with a 30% response rate, and this determined ranked priorities on transport issues: road safety (50%) passengers in public transport (21%), and environment (17%). Preferences for transport policy (including the option of new road building) were to maintain present balance between public and private transport (30%), and to make public transport a better way of travelling (26%).

While Bournemouth Corporation have apparently carried out no user response surveys, they believe that buses in pedestrian streets constitute a danger. On servicing of shops one problem of trying to restrict this to specific time periods that multiple chains have sequential deliveries from large vehicles: this fact is in conflict with the desire of many nearby towns each to have deliveries restricted to the period before, say, 10.00.

J
The occasional car ignores the entry prohibition signs.

K
In Commercial Road some facilities have been provided. The footpaths have been widened and paved, and there is a tree at the western end. There are one or two seats. In neither precinct can one find lighting sympathetic to pedestrians; both have a few tubs with flowers. In Old Christchurch Road these are used as seats because of the scarcity of other places to sit.

There are no data on noise, air pollution or pedestrian flows. Accidents are said to have decreased considerably (County) or not to exist (Bournemouth Transport). The high proportion of elderly retired people and the fact that 'pedestrians tend to take over road space requiring bus drivers to proceed with considerable caution' (County) make this a significant achievement.

L
Bournemouth's moderate attempt to improve conditions for pedestrians, and the almost circumstantial achievement of better access for bus users than for other transport users, make this scheme interesting. It could, nevertheless, be more attractive visually, particularly in a resort town and it could be greatly enhanced by a pedestrian only, or bus and pedestrian only, link between the two precincts across the Gardens and Bourne Avenue.

Data for this case study were derived from discussions with officers of Dorset County Council, Bournemouth District Council, and Bournemouth Transport.

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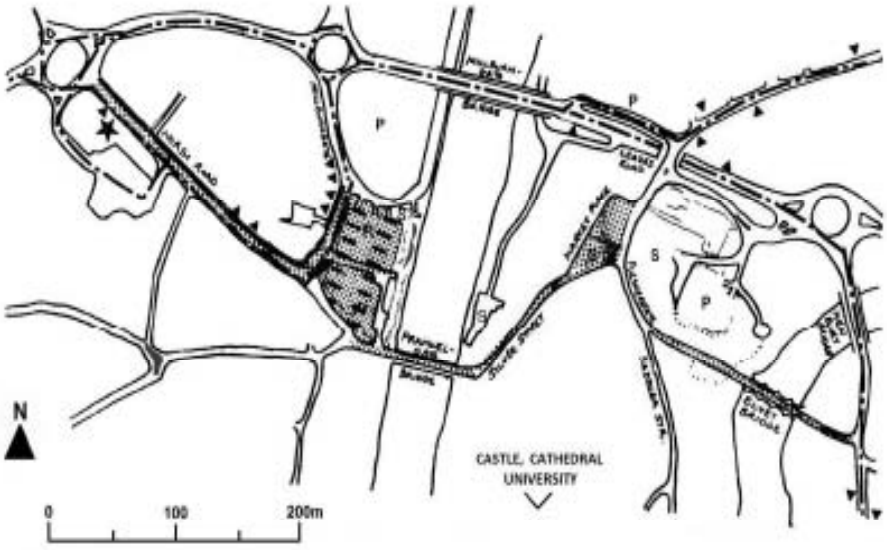

Figure P : Durham Central Area

Note this is drawn to a larger scale than the other city plans because of the narrowness of Durham's shopping streets.

Plate VIII : Silver Street in 1974

Plate IX : Silver Street in 1978

A
From west to east the areas covered by this case study are North Road, Millburngate (part), Millburngate Shopping Centre, Framwelgate Bridge, Silver Street, Market Place, Fleshergate, Saddler Street, Elvet Bridge. Durham City's population in 1971 was 21 160.

B
The centre of Durham has many listed buildings and its peninsula, with the Castle, Cathedral and University, is an outstanding part of Britain's heritage. (Professor Pevsner: 'One of the great experiences of Europe'). The areas attract large numbers of tourists. Any solution in favour of pedestrians had to contend with the River Wear on each side of the peninsula, with two different kinds of shopping area which are linked by a bridge, with servicing problems, and with the accommodation of displaced traffic.

In the early 1930s the A1 trunk road still meandered through the streets that have now been pedestrianised in one way or another. At that time new roads were planned, ultimately to take the form of the northern by-pass of the centre, with two new bridges, Millburngate Bridge and New Elvet Bridge. This by-pass experiences some delays at peak periods, particularly to buses which otherwise now move more freely where permitted. Design of the new roads (without which 'pedestrianisation would have been impossible') started in 1963 and their construction was facilitated by Government 'North East White Paper' funds. Construction of the A1(M) to the east of Durham City removed much through traffic.

The reasons for wishing to introduce pedestrianisation are eloquently stated in the Inspector's report for the Public Local Inquiry in 1974 (Allan 1974). Indeed, in retrospect, the case was overwhelming. Durham's historic core contains, inter alia, one very narrow street (Silver Street) with several large multiple shops. Traffic levels were heavy and footpaths so narrow that in places people had to step into the carriageway to pass a lady pushing a pram. Buses sometimes overhung the footpath and pedestrians were brushed by passing vehicles. A traffic controller was sited in the Market place to control traffic entering it from various directions, and resolve some conflicts caused by poor visibility. A compelling reason for completing the scheme was that 1975 was European Architectural Heritage Year.

Plate X : Market Place in 1974

Plate XI : Market Place in 1977

The Inquiry was held as a result of objections to Traffic orders whose purpose was to remove most vehicular traffic from the streets now pedestrianised. Most objections were from traders concerned with adequacy of servicing arrangements. Solutions were found and pedestrianisation went ahead, the scheme opening in June 1975.

In 1980 the scheme appears very successful. A moderate extension of the loading restrictions in Saddler Street, an access restriction of vehicles allowed to use the Market Place, and possible environmental improvements in North Road (a partial narrowing of the street with landscaped seating areas, or further traffic restrictions), are proposed for the future.

C

Nearly all of the various types of pedestrian scheme are represented in Durham's City Centre. Working from west to east we find:

a . North Road. An undistinguished street with the larger food shops, supermarkets, electricity showroom, hotel, cinema, shoeshops, bus station. About 220m long, 13m wide. Eastbound half of carriageway in total is a bus-only lane, while Westbound half is bus and access vehicles only. Traffic very moderate so pedestrians use whole street with some freedom.

b . Millburngate from North Road to river access road. While wider than North Road, rather less attractions for pedestrians. About 70m long, 15-20m wide. Buses, access and pedestrians two-way.

c . Framwelgate (known as North Road). Smaller shops and side entrance to shopping Centre. 150m long, 10-15m wide. Essentially pedestrian only, servicing 23.00-10.00 except Sundays (as with e,f,h.)

d . Millburngate Shopping Centre. Built by Durham City Council. Part enclosed, part open pedestrian streets of various widths, and total length of about 190m. Car park under shopping centre with at grade servicing bay.

e . Framwelgate Bridge. 100m long, 9m wide. Pedestrians, westbound exit for servicing vehicles, as (c)

f . Silver Street. Marks and Spencer, Woolworth, Boots, clothing, shoe and furniture shops. About 110m long, 4-10m wide. Pedestrians and servicing as (c), but some rear servicing.

g . Market Place. Town Hall, Statue, various shops. About 65m x 35m. Approximately half the area devoted to servicing (trolleyed from this point to shops) and access vehicles at all times, one quarter to traffic needing access to Saddler Street and the Peninsula, and one quarter to pedestrians only.

h . Fleshergate. Small shops. About 60m long and 6m wide. Pedestrians effectively confined to footpaths.

i . Saddler Street. Small shops. Peninsula access vehicles only, but unofficial. Plans for further restrictions that would mean no public parking available on the Peninsula.

j . Fleshergate to Elvet Bridge. Small shops. About 70m long and 8m wide. One-way East. Pedestrians and servicing as (c).

k . Elvet Bridge. About 100m long by 10m wide. Pedestrians, eastbound exit for servicing vehicles as (c)

The modal split for passenger arrivals in various years (1974 being pre-scheme) was as follows:

	%			
	1974	1975	1976	1979
Foot	23.5	24.5	24.5	21.3
Car	32.2	31.8	33.5	41.5
Bus	42.1	42.0	40.8	30.3
Train	01.1	01.2	01.0	02.8
Motorcycle	00.5	00.5	00.0	03.9

Table 3.04 : Means of transport used to reach Durham Town Centre, 1974 - 1979

The rise in the proportion of car users and the fall in the proportion of bus users are notable. This may be largely attributable to a rise in car ownership, Durham having a very low ownership level in comparison with the rest of England, but may be partly due to a moderate decrease in bus accessibility since the scheme was opened.

Resurfacing the scheme's streets cost £190 000. 50% of this came from a DoE Section 10 Conservation Grant, £30 000 from the County Highway authority, and the balance from the City Council.

D

Bus access post-1975 is shown in the map on page 26.The bus station, owned by the National Bus Company and used by United and Northern buses only, is situated near the western end of North Road and has 11 platforms. It was opened in 1976 and is not large enough to accommodate independent operators who terminate in Millburngate. There is some conflict between bus and service vehicles there.

It is County policy to locate bus stops a maximum of 200 metres from pedestrian areas, which has virtually been achieved for the centre of Durham. Relative popularity of the stops is shown below:

	North Road	Leazes Road	Claypath	Millburngate	Elvet
1975	65.7	12.6	13.3	5.9	2.4
1976	61.7	11.7	10.6	12.4	3.5
1979	57.4 (58.2)	16.4 (13.6)	20.3 (22.3)	3.7	1.8
% satisfied with stop locations	89.2	88.9	81.8	100.0	100.0 (Elvet & others)

Table 3.05 : Popularity of bus stops in Durham City Centre.
Notes: n=54 for 1975 and 1976; n=183 for 1979, and the rows 1975-1979 represent proportion of arrivals using stops in a particular area.
Figures in parentheses are results from a later survey in October 79 where n=148

In 1979 there was an increase in bus user penetration of the area from the north (Leazes Road and Claypath stops) at the expense of the west (North Road and Millburngate) while approach from the east (Elvet Bridge) remains slight.

The Bus station, North Road, and Millburngate together have 64 bus arrivals per hour, during the day Monday-Friday. Over 50 different routes are involved, some being town services and others longer-distance services. The stops in Claypath cover 4 routes, those in Leazes Road cover 18 routes, while those in New Elvet cover 3 routes about 100m from Elvet Bridge (probably accounting for its popularity as an entry point).

E

Percentage use of car parks, probably in 1979, is as follows:

	%				
	Millburn-gate	Leazes Bowl	Ice Rink	Clay-path	Other
Locals	26.2	21.2	17.5	12.5	22.5
Tourists	15.7	47.3	21.0	5.2	10.5

Table 3.06 : Preferences for Durham City Centre car parks

The Millburngate car park is directly under the shopping centre. It is notable that while the Leazes Bowl car and coach park is most favoured by tourists, there is currently no way of stopping coaches (particularly from continental Europe) driving right through to the Cathedral via the Market Place and Saddler Street.

F

Considering Durham City's small population (though its centre serves a wide catchment area) the number of bus stops within 200m is quite high. Overall, bus users seem to have better accessibility to the pedestrian shopping area than do car users.

Figures Q and R show the cumulative number of car parking spaces, and of bus stops, by distance from the pedestrian network.

G

Servicing arrangements have been outlined in section C above. The police decide exceptions outside the general restrictions, and will licence for a delivery or withdrawal worth more than about £2000 (for example, jewellers). All but one of the servicing problems have been satisfactorily resolved.

The City Council are attempting to exclude 'orange badge' disabled drivers from the Market Square as the present system allows, in the view of the police, too liberal a distribution (present estimates suggest 1 driver in 100 in Co. Durham has an orange badge). The objectio-

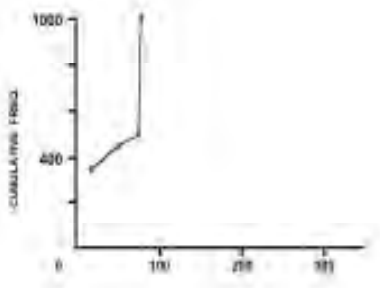

Figure Q : Cumulative frequency of car parking spaces by distance from the pedestrian network

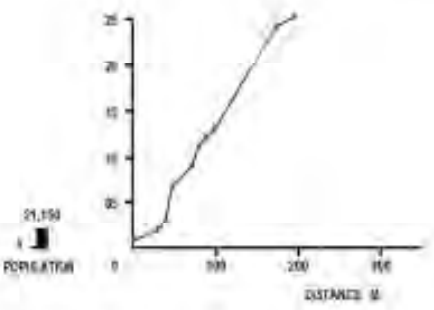

Figure R : Cumulative frequency of bus stops by distance from the pedestrian network

concerns congestion, not the right to park. (see the Newcastle case study for a similar problem, exacerbated there because non-disabled people, within a family one of whose members legitimately has a badge, are using the car illegitimately).

H
One person in the Chamber of Trade wanted buses removed from North Road, and there is no pressure for changing pedestrian streets back to all-purpose streets. A survey of all shopkeepers in pedestrianised and nearby non-pedestrianised streets produced a 50% response. 37 shopkeepers agreed that the scheme could be improved, while 47 thought it could not. 100% thought the scheme was generally successful. On changed trade June 1975 to end 1979 3% thought it had decreased, 44% that it had remained the same, and 52% that it had increased. There has been a substantial increase in shopping floorspace - the County Council's Structure Plan initially tended to limit this to an extra 10 000 square feet, though this has since been reconsidered - the 10 000 square feet have been built, approval has been given by the City to a further 55 000 square feet, and applications for another 16 000 square feet are pending.

Regarding pedestrians' attitudes we should first note that the number of tourists visiting Durham rose from 450 000 in 1974 to 750 000 in 1978, though not all of these would use the shopping area. In a street survey pedestrians were asked what they most liked about the City Centre: 50% said 'Historic Environment', 35% 'Pedestrianisation' and 33% 'Shops and Shopping' (multiple response). Dislikes included lack of entertainment (32.3%), Traffic (15.3%), Shops and Shopping (14.1%), Parking and Bus Services (12.0%). 75.6% thought service vehicles should not have unrestricted access to the pedestrian areas.

Bus operators were not very happy with the proposed scheme, and their objections occupied much of the time of the 1974 Inquiry. In 1980 they tried to seek small improvements, though the inadequate size of the bus station remains of concern to independent operators. The police are cooperative but conservative.

J
The restrictions are generally observed. A few users try to circumvent them by parking on double yellow lines or using orange badges as noted earlier.

According to the City Council pedestrian flows since 1975 have increased on average by 29%. Elvet Bridge shows the greatest increase of about 47% and Silver Street shows 11.5%

K
Great efforts were made to achieve a floorscape in harmony with the historic buildings. The use of York Stone paving and setts has been described in The Surveyor (1977) and Scott (1979). There is little vegetation, perhaps because of the shortage of space, but lighting and direction signs built in to walls are sympathetic to the surroundings. The peninsula streets received a Civic Trust award in 1978. However, the appearance of North Road is quite depressing, for little has been done there to signify greater priority for the pedestrian.

Accident figures are given below. All exclude North Road, but include the other pedestrian areas.

	Personal injury (all accidents) Serious	Slight	Buses involving personal injury
1971-73	3	41	11
1976-78	0	8	0

Table 3.07 : Accidents in Durham City Centre before and after pedestrianisation

Noise levels pre-scheme were very high, with L_{10} dB(A)* peak period values in Silver Street uphill of 87 and downhill of 81, while HGVs and buses were individually creating levels of 100 and 94 uphill, and 88 and 85 downhill, respectively. Again in narrow and congested Silver Street the mean lead measurement ($\mu g/m^3$) was 0.83 with 43 vehicles per hour, while it rose to 1.23 on Elvet Bridge with 710 vehicles per hour. In 1979 there were <0.1 $\mu g/m^3$ of lead in Silver Street, while the smoke measurement in Silver Street was <4 $mg/100m^3$ (as against a mean level of 22.6 $mg/100m^3$ on Millburngate Bridge.

L
Durham's centre changed over five years from a dangerous, highly congested, and environmentally decadent area to one where, on the peninsula and its bridges and the new shopping centre, it is a delight to walk, shop, and admire a townscape of distinction. North Road, however, needs to be improved considerably. Access by both bus and car is perfectly adequate: to improve either would be to invite environmental deterioration. If it were ever seriously considered to remove bu from North Road, then bus access would similarly deteriorate.

Plate XII summarises some of the lessons of this case study. It shows that Durham started with the advantage of an historic townscape; from this they removed all extraneous traffic and let the pedestrian dominate. Despite this, they were able to maintain car parking and many bus stops close to the shopping centre.

Figure 5 shows the plan of Durham City Centre to approximately the same scale as the other case study plans.

This case study derives from discussions with County and City officers, from a wealth of material and photographs they provided, and from the other references cited above.

*L_{10} dB(A) means the noise level in decibels, on the A scale, that is exceeded for 10% of the time. The index is often averaged for each hour of 18 hours, from 06.00 to 24.00.

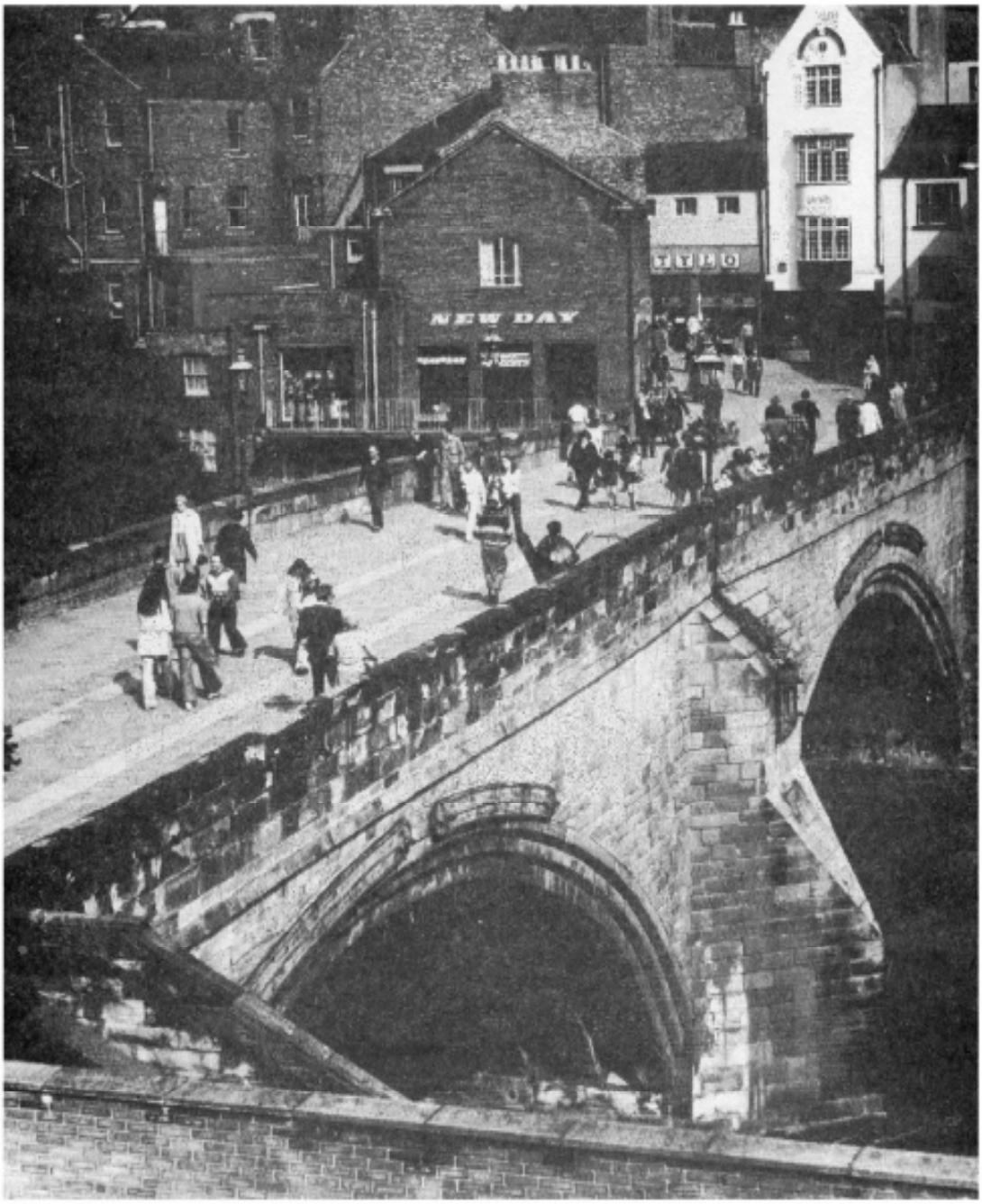

Plate XII : Framwelgate Bridge looking toward Silver Street

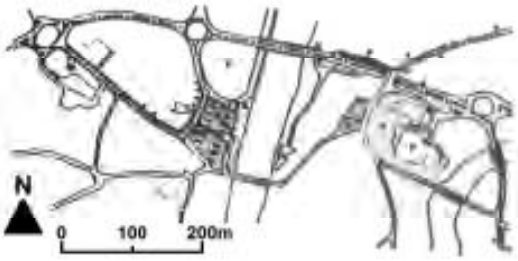

Figure 8 : Durham City Centre

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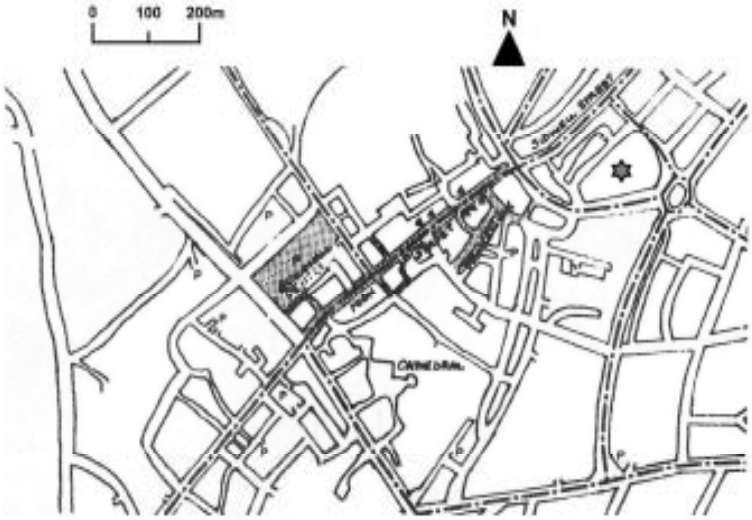

Figure T : Exeter City Centre

Plate XIII : Exeter High Street as an all-purpose street

A
The High Street carries buses and pedestrians, plus out-of-hours servicing traffic. It is situated between the recent Guildhall Centre which is mainly enclosed, but has some surrounding uncovered pedestrian streets of small scale, and the Princesshay development. Princesshay and three associated streets are pedestrian only and result from rebuilding perhaps 25 years ago. There are further pedestrian streets near the Cathedral and NW of the High Street (see map). Exeter had a population of 89 500 in 1971.

Plate XIV : Exeter High Street adapted primarily for buses and pedestrians

B
Exeter's central area suffered bomb damage in the second world war. This was an incentive toward pedestrianisation, though this was to take many years to reach its present form. A close working relationship between County, City and Bus Company undoubtedly helped the High Street (the principal interest of this case study) conversion to reach fruition. Another important factor was new road construction: an inner ring road, the outer Exeter by-pass, and the M5 motorway, were all operational before the High Street's

scheme was completed.

In the rebuilding of parts of central Exeter the High Street became a dual-carriageway for all types of traffic, with many new retail and commercial buildings, moderate footpaths, and partial bus lay-byes. Bus queues and shelters further restricted the space for walking. In 1967 the SW direction carriageway was restricted to buses only, with the NE direction carriageway retaining all types of traffic. In June 1975 the present scheme was introduced experimentally through the 1967 Road Traffic Regulation Act; until December 1976, when the order became permanent, the bus share of the street was only indicated by white lines.

Alterations to the carriageway were made with single-lane bottlenecks intended to reduce bus speeds and provide safer crossing points, and wider areas where the bus stops were. The scheme, in its present form, was completed in July 1977.

The scheme is well accepted in 1980, and there have been virtually no complaints. The Chamber of Commerce initially wanted full pedestrianisation, on the grounds of safety, and would still ultimately like to see the buses removed if satisfactory alternative routes were available. A proposed extension to the remainder of the High Street to the SW will not be accomplished as easily, for the street there is narrower and there are no rear servicing facilities. There are no current proposals to extend the scheme elsewhere, but what has been achieved provides a virtually continuous pedestrian area across much of the City Centre.

C
The High Street has most of Exeter's department stores, several multiples, banks, restaurants, and other smaller shops. There are some offices above shops. The section with restricted access is 23m wide over most of its length but narrows to 13m in the SW section, and is about 330m long. Thus it was already amply wide enough to achieve good bus and pedestrian movement.

No data were obtained on the modal split for passenger arrivals, or on the financial costs of constructing the scheme.

D
Western National Omnibus Company operate the City bus network for which the High Street serves as the focus, and is used by 17 routes; there are about 25-30 buses an hour in each direction. The operator considers that this 'one operator, one depot' arrangement significantly contributes to the success of the scheme; a mix of operators would complicate matters, and Western National have deliberately diverted some buses away from the street, for it is generally felt that they should not dominate it. Among these are country bus services which used the High Street, but did not stop, en route to and from the bus station. While this increased route distances a little, it helped political acceptance for the concept of retaining buses on the High Street.

Reliability and punctuality have improved on the City network, and 1979 showed a slight increase in patronage of these services, perhaps partly attributable to the scheme. The safety record is good (see section K on the reduction in accidents) for there is an understanding that buses travel at about 16 kph. Elderly people crossing the street, and the quietness of rear-engined buses, create occasional problems. The Company disciplines drivers who are clearly driving at what is considered to be an excessive speed through the High Street, but the Trade Union in no way condone drivers who do so, and do not support them in any disciplinary action. The Branch realises that the retention of buses on the street is a sensitive issue; if they were removed, public, Company, and Union members would suffer.

Bus stop locations are shown on the plan above.

E
There is a car park over the new Guildhall centre. In Sidwell Street (the continuation of the High Street to the NE) limited on-street parking is allowed. There are further car parks near the bus station, and at two locations near Princesshay.

F
Exeter has 7 bus stops at zero distance from a pedestrian shopping street, and 440 car parking spaces within 20m of the new Guildhall Centre. What the graph does not show is that most parts of the pedestrian network are preferentially accessible by bus than by car.

Figures U and V show the cumulative number of car parking spaces and bus stops by distance from the pedestrian network.

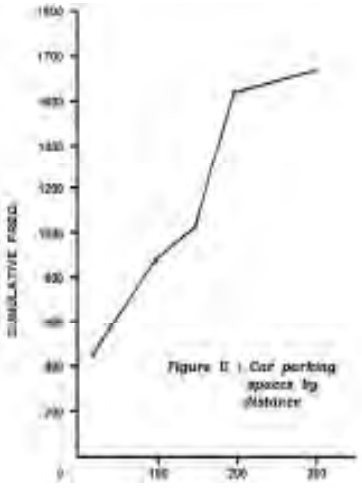

Figure U : Car parking spaces by distance

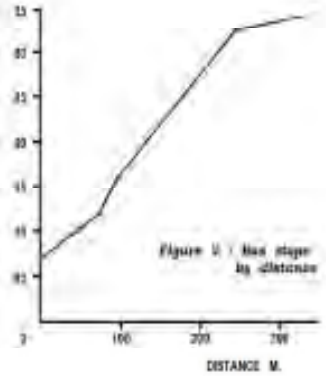

Figure V : Bus stops by distance

G
Servicing the High Street (hours is restricted to the period 24.00-08.00, though this does not disadvantage delivery vehicles as there is rear servicing within the converted section of the street.

Displaced traffic may use the various new roads described in section B above.

H
No data were obtained on the attitudes of various users of the street, though the Chamber of Commerce's views were mentioned in section B above, and some views of the bus operator in section D. There are no empty shops, which is indicative of a general acceptance by shopkeepers, though there may be a problem when Marks and Spencer move from their present large High Street store to very much larger premises under construction in the street.

J
Section D noted the general compliance of bus drivers with an 'understood' speed limit.

Pedestrian flows on the High Street were counted on 17 November 1979 from 10.00 to 14.00 at one location near Bedford Street. The results are as follows:

	Towards Paris Street		Towards Queen Street	
	North Side	South Side	North Side	South Side
10.00 - 11.00	1820	1009	2216	1519
11.00 - 12.00	2513	1279	2912	2073
12.00 - 13.00	2625	1478	2802	1886
13.00 - 14.00	2778	1493	2621	1772
Total, 4 hrs	9736	5259	10551	7250

Table 3.08 : Pedestrian flows on Exeter High Street in 1979

The north side is clearly more heavily used than the south side. The north side has more major department stores and is closest to the Guildhall Centre, though the south side connects with the Princesshay network and the Cathedral precinct.

K
The footpaths were widened everywhere within the scheme (see before and after photographs). A comprehensive landscaping scheme was introduced, including special paving at the single-lane points. Vegetation, seats and special lighting generally make the street's environment pleasant. Some of the architecture of reconstructed buildings is distinctly uninteresting 'post-war modern' but this is not attributable to the scheme.

Accident data are available from 1969 to 1979, as shown in Table 3.09.

Noise levels at various locations in the High Street were measured before and after pedestrianisation, between 11.20 and 15.00 on each occasion. The results are shown in Table 3.10.

From the measuring points within the bus and pedestrian only High Street (points 3-8) it can be seen that the L_{10} value decreased between 10 and 5 dB(A). No data were obtained on changes in air pollution.

Year	Fatal	Serious	Slight	Total	Comment
1969	-	2	12	14	
1970	-	-	10	10	
1971	1	-	11	12	Prior
1972	-	3	10	13	to
1973	-	2	9	11	
1974	-	2	6	8	Scheme
Jan-May 1975	-	-	6	6	
June-Dec 1975	-	1	5	6	During
1976	-	1	7	8	experimental
Jan-Jul 1977	-	-	2	2	order and temporary layout
Aug-Dec 1977	-	-	2	2	Since
1978	-	-	4	4	completion
Jan-Nov 1979	-	1	1	2	of scheme

Table 3.09 : Accidents in Exeter High Street from Queen Street to Eastgate Square, 1969m - 1979

Measurement Position	Noise Levels Before	L10 db (A) After	Position
1	78.5	75.3	High Street, Opposite Waterbeer Street.
2	78.2	75.4	Outside C & A Queen Street.
3*	82.0	76.9	Outside Austin Reed, High Street.
4	79.1	71.4	Outside Dingles, High Street.
5	79.5	71.3	Outside Maynards, High Street.
6	78.5	70.8	Outside Woodhouses, High Street.
7	82.6	72.5	High Street, Opposite Castle Street.
8	79.7	71.4	Outside Marks and Spencer, High Street.
9	74.8	73.8	Outside new Boots shop High Street.
10*	78.5	68.8	Outside new Boots shop

* first floor position

Table 3.10 : Noise levels before and after partial pedestrianisation of Exeter High Street.

Notes: Points 1 and 2 are outside the bus and pedestrian section of the High Street while points 9 and 10 are affected by their proximity to Eastgate Square.

L

Exeter is one of the UK's best resolved pedestrian city centres. It has a large network of pedestrian streets, well-served by both buses and cars. The arrangement whereby buses run along the central spine between pedestrian areas to either side could scarcely be bettered. While the architecture of the rebuilt High Street and Princesshay area is of a low quality in comparison with the many historic buildings nearby (including the Cathedral and its houses, the Guildhall and the Castle), Exeter is certainly a very pleasant place to shop.

All the data for this case study were provided by officers of the County and City Councils, and the Western National Omnibus Company.

MINNEAPOLIS USA

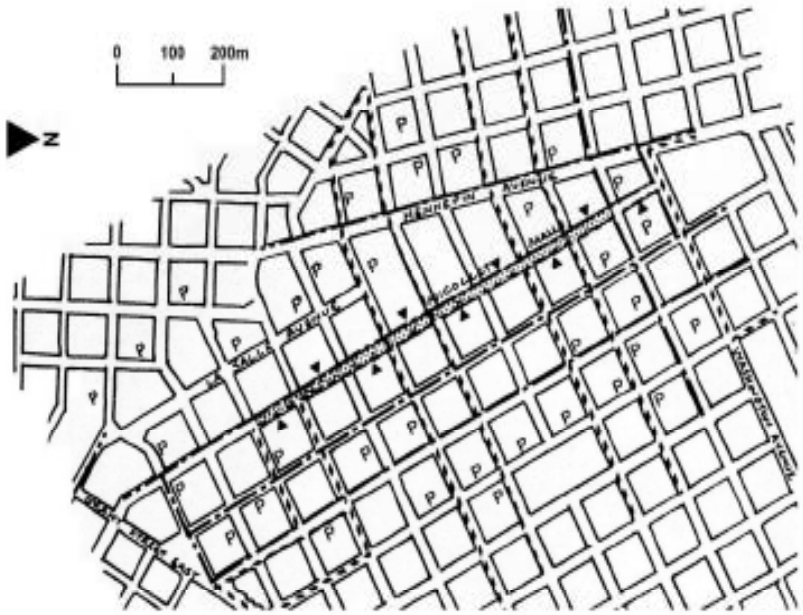

Figure W : Dowtown Minneapolis

A
Nicollet Mall Transitway. Minneapolis and St. Paul constituted a metropolitan area with a population of 1.8 million in the early 1970s.

B
A consultants' report in 1960 recommended pedestrianisation of Nicollet Avenue. The scheme was designed to improve the retail sales climate, presumably against the competition of suburban centres, and any transit benefits were regarded as a secondary reason. The major sponsor was the Downtown Council, a local businessman's group, who were also responsible for the elevated pedestrian walkways or 'skyways'. Originally a dual 3-lane road (the inner lanes used for on-street parking), the scheme was opened in 1967. It allows for pedestrians, a sinuous two-lane strip for transit buses, bicycles, taxis, occasional servicing by permit, emergency vehicles, and cars at one ot two points for access to car parks fronting on the Mall. A four-block extension should have been completed in 1975.

C
8 blocks of the 12 block Avenue were converted into the Mall. The 8-block length is about 930m and the overall width is about 23.5m. The Mall is the 'quality center' of Minneapolis, with four major department stores, other shops, hotels and offices. In 1976 the transport used to reach the Mall was (multiple response) 33.1% car, 61.6% bus, 1.9% bicycle (there are bike racks in each block), 0.4% taxi, 14.6% on foot. Funding the scheme was a problem initially, solved by a federal Urban Beautification grant (13%), an UMTA demonstration grant (13%), and the Assessment District (74%). The total cost of the 1967 scheme was $3.8 million, or $15/square foot including the roadway area. The four-block extension was expected to cost $2.8 million, or $22/square foot.

D
Standard transit buses, some of which were rerouted onto the Mall, and shuttle minibuses serve stops in every block. In the peak-hour there are 60 buses each way, compared with 20 each way before 1967, and some bus routes cross the Mall. The downtown shuttle runs with 9-minute headways. There have been increases in bus patronage, and reliability has improved, though there is no evidence that overall trip time has decreased.

E
Car users have 10 000 parking spaces within two blocks of the Mall and a 6-storey garage on the Mall has links to the skyway system.

F
Material available for this case study is not suitable for graphic display of car parking spaces and bus stops. There appear to be two bus stops for each of the eight blocks - that is, 16 stops at zero distance; there are also bus stops on Hennepin Avenue and on parallel Avenues to the east of Nicollet Mall. According to the GLC (1972) five of the streets crossing Nicollet Mall carry bus routes. The main car parking lots are toward the northern end of the Mall. It seems on balance that there is better access by bus than by private car.

G
Most servicing of stores is by rear alleys or cross streets. No new road construction is attributable to the scheme; Nicollet Avenue

had a lower vehicle flow than some other downtown streets before the scheme, and these other streets anyway had spare capacity. Some traffic signal changes were made to enlarge capacity of the surrounding streets.

H
Trading changes as a result of creation of the Mall are not wholly positive, though some think the decline prior to 1967 was halted. On the negative side, Metropolitan area residents who shopped downtown within a month of interview fell from 48% to 42% in the period 1965-7. In 1969 this fell further to 33%, but in 1975 it stablized and may even have been rising since then. More positively, Dayton's high quality department store reports the strongest sales performance in a nationwide chain of 20 such stores. Among 17 long-established firms all but one thought the Mall was a good financial investment, and 12 thought it was a good reason for staying in that location. Overall, a very moderate decline of turnover in real terms 1970-1976 was in parallel with city-wide trends. Specialist middle class stores and those for the young have moved in, there are low vacancy rates, increasing rentals and rises in public and private sector investment. In a 1977 survey of the Mall's 145 retail stores, 23 responded of whom 22 said the Mall was a good financial investment. 13 thought the bus service benefitted business, 1 that it was detrimental and 8 that it had no effect. All 23 were favourable toward the Mall.

Pedestrians were asked in a survey whether a ban on buses would encourage them to shop more on the Mall. 28% thought it would, 48% saw no change in their patterns, and 22% thought it would discourage them. Among bus users, 19% were in favour of banning them and 47% were against this. Among non-bus users, 30% would shop more if there were no buses and 19% less.

J
Unlike Britain, where pedestrians in streets penetrated by buses are given a tacit priority in use of the whole street, in Minneapolis crossing the transitway randomly is regarded as jaywalking. The flow of pedestrians (and buses as noted above) has increased, at 12th Street, by 46% between 1964 and 1975. However there have been reductions at sidewalk level, probably in favour of the skyways. In the best outdoor conditions one third of the pedestrians in the Mall are at skyway level. On hot summer and cold winter days this proportion rises to between two thirds and three quarters.

K
There are 'extensive amenities' for people walking and waiting for buses (whose stops are not in lay-byes, a feature also of the bus and pedestrian malls of Philadelphia and Portland). The amenities include electric snow-melting mats, heated bus shelters, special street lighting, between 7 and 20 trees per block, and flowers in beds and tubs.

Data on accidents, air pollution and noise level changes are a little sparse. Jaywalking and bus speeding contribute to the accidents, though in the mid 70s Nicollet Mall had 23 pedestrian injuries against 52 on adjoining Hennepin Avenue. Bus-pedestrian conflicts of 1.71 average conflicts per bus run in Nicollet Mall however need to be compared to 0.38 in Hennepin Avenue (doubtless fewer buses and greater care by pedestrians in the latter street). Apparently there has been some reduction in carbon monoxide and noise levels, but an increase in NO_2.

L
In conclusion, the Nicollet Mall seems to be a continuing success. It was inexpensive to produce, in comparison with other traffic schemes, and provides a generally attractive and accessible environment for shoppers. The data for this case study are derived from Edminster and Koffman (1979 and GLC (1972).

NEWCASTLE UPON TYNE TYNE AND WEAR

Figure X : Newcastle's Central Area

Plate XV : Northumberland Street Looking South

Plate XVI : Northumberland Street entrance to the Eldon Square Centre

A
Central Newcastle has a network of pedestrian streets, with all the types that are normally found. The recently completed Eldon Square Shopping Centre, one of the largest enclosed centres in Europe, is a late twentieth century version of the nineteenth century arcade, also represented in Newcastle (Central and Handyside Arcades). Uncovered pedestrian and service only streets are Clayton Street (North) and Saville Row. About 1970 Princess Square and Northumberland Place were purpose-built as pedestrian streets with servicing below. Uncovered streets converted essentially for bus and pedestrian use only are Northumberland Street and, unofficially, Blackett Street. This case study concentrates on Northumberland Street. Newcastle had 215 085 people in 1971; local government reorganisation in 1974 created the new Metropolitan County of Tyne and Wear, which had 1.2 million people in 1975.

B
The southern two-thirds of Northumberland Street was converted to a bus, service traffic, and pedestrian only street in 1971. The northern one third has all types of traffic. There is a strong local desire (see section H below) to remove the buses from the southern part of the street, possibly influenced by Metro stations at Haymarket (now open) and Monument (anticipated to open in 1981), approximately at the northern and southern ends of the street. In 1981-2 it is intended to pedestrianise Blackett Street near the top of Grey Street.

C
The bus and pedestrian only section of Northumberland Street is approximately 250m long and about 25m wide. It is one of the most important shopping streets in northern England and has virtually all the major department stores and multiples. It also has one of the principal entrances to the Eldon Square Shopping Centre. No data on means of transport to reach the street, or costs of its conversion, were obtained.

D
Several bus routes traverse the street, north-south on a moderate downward incline. There are about 60 buses per hour. Because of the incline they occasionally reach speeds of 30 kph. Buses also run on Blackett Street (across the southern end) and on other nearby streets. British Rail's Central Station is about 600m from the southern end and, as previously mentioned, opening of Metro stations is progressing.

E
There are multi-storey car parks at the northern and southern extremities of the Eldon Square Centre, and others near John Dobson Street. These vary from 70m to 350m from Northumberland Street.

F
Newcastle Centre's graph for car park spaces is perhaps the best of all the case studies (Figure Y), while that for bus stops (Figure Z) is at least in equal first position with Birmingham. Bearing in mind the Metro stops, the nearness of Newcastle's Central Station, and the four bus stations whose distance varies between 200m and 20m, accessibility by public transport to Newcastle's pedestrian network may be the best of all the case studies, and among the best anywhere. In terms of sheer volume, access by public transport seems to be better than by private car.

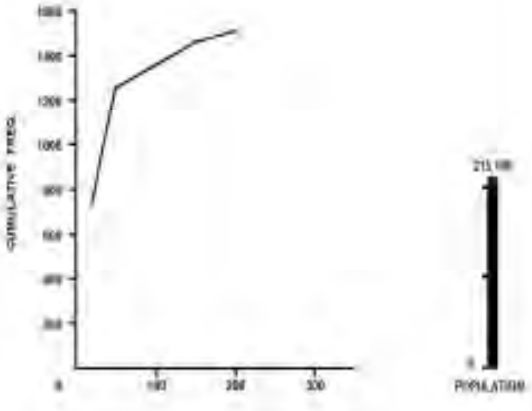

Figure Y : Cumulative number of car spaces against distance from Newcastle's pedestrian network

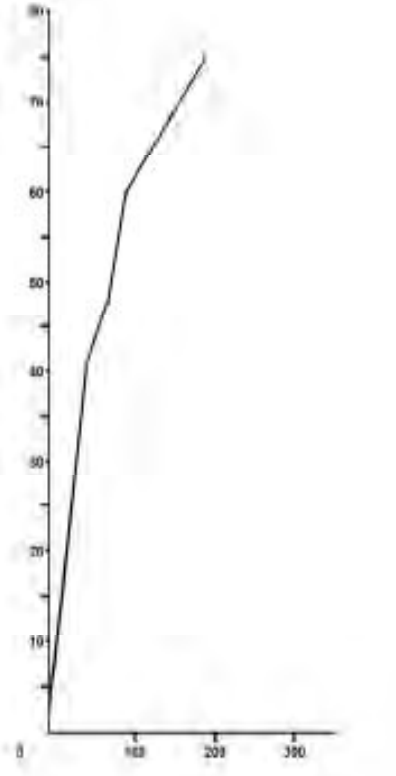

Figure Z : Cumulative number of bus stops against distance from Newcastle's pedestrian network

G
On-street servicing is supposed to take place outside the weekday period 11.30-17.30, though violations occur. This arrangement of unrestricted bus access and restricted servicing access (to Northumberland Street) followed traders' objections to the original scheme which had buses only. Since exemption from parking restrictions for disabled persons was introduced, many such vehicles came in for 2½ hours and there is considered to be much abuse of the permit system: the loading lay-byes have been filled and there has even been penetration by disabled person vehicles into the Eldon Square shopping malls. Northumberland Street has recently been improved by traffic orders restricting all but buses and servicing traffic outside the weekday period 11.30 to 19.30.

All of Newcastle's pedestrian schemes have benefitted from construction of the Central Motorway to the east. This and John Dobson Street are thought to carry most of the traffic diverted from Northumberland Street.

H
Pedestrianisation is highly favoured in Newcastle. It ranked first among the number of responses to a wide range of topics in the elaborate City Centre Local Plan public participation exercise, mounted by the City Planning Department. (73% of respondents wanted more pedestrian priority areas). Participation was encouraged through a household survey, a broadsheet, an item in 'City News', a booklet, and management and employee surveys. Feelings also ran high on what type of street Northumberland Street should be: it ranked first on average among all the media used for participation as an 'area interest' and 66% of 1791 respondents wanted buses removing, with the Street paved right across.

Nearby, to the south, 55% of 1690 respondents for the Blackett Street area wished 'to keep buses and make a pedestrian area around Grey's Monument' (after which the new Metro station was named). Further west along Blackett Street, tacitly buses and pedestrians only as we have noted earlier, the street opens out to Eldon Square. This too has a monument in the centre, and is surrounded by the buildings of the new shopping centre and some earlier ones in terraces.

There seem to be parallel desires in the minds of the respondents - they want a pleasant and safe shopping environment (and are probably constantly reminded of Eldon Square's 800m of totally pedestrianised malls), yet do not want to move the buses too far from the shops.

Transport and Road Research Laboratory, and Newcastle University's Department of Geography, are separately monitoring changes in the city centre which result from the opening of the Eldon Square Centre, and the introduction of the Metro. A paper by Bennison and Davies (1977) discussed the influence of Eldon Square on retail performance changes, and noted that the adverse effects are most felt by those in the southern half of the central area, though Northumberland Street is not among those experiencing the most adverse change. Again, of those shops that relocated in 1976-77, but not to Eldon Square, there was a pronounced movement toward the north of the Central Area. In 1977 there were only three vacant shops in Northumberland Street. Finally, the authors note the importance of newly established pedestrian routes, because of the new foci, on trade peripheral to Eldon Square.

J
As noted earlier, there are violations of the restrictions placed on Northumberland Street. Regarding pedestrian flows, some comment has been made in the previous paragraph. Before Eldon Square opened Northumberland Street had the greatest volume of movement. After opening in 1976, the Square attracted volumes similar to Northumberland Street. That Street's volumes remained constant near the entrance to Eldon Square, but reduced in the southern-most third of the Street.

K
The main environmental changes to Northumberland Street concern special lighting, signposting for pedestrians, and vegetation enclosed in boxed structures. The photograph shows special banners celebrating Newcastle's 900th anniversary. The design of shop facades is unexceptional, while the new Metro stations have more lively exteriors, as does the mirror glass facade of the entrance to Eldon Square.

L
Newcastle's Central Area is an exciting place, and contains an astonishing collection of facilities within close proximity: County and City offices, University, Polytechnic, Eldon Square, main library, Central Station and five existing or future Metro stations, a motorway, Cathedral and Castle. Pedestrianisation is strongly supported while the presence of cars in the centre is widely disliked. In this context, it is not surprising that there is an antagonism toward buses on Northumberland Street. If they are removed, there there will still be buses nearby, there will be two Metro stations adjacent, and Newcastle's propensity to walk, will together make this not too regrettable a step.

Data for this case study were derived from discussions with City, County and Passenger Transport Executive officers, from the public participation report (City of Newcastle upon Tyne 1979), and from the other reference cited in the text.

UPPSALA SWEDEN

Figure AA : Uppsala's Central Area

A
Fully pedestrianised, Svartbäcksgatan-Kungsangsgatan (and the Central Square, Stora Torget) from St. Olofsgatan in the north to Bavernsgrand in the south. Bus only on Dragarbrunsgatan (some local car traffic allowed) and the east west street Vaksalagatan - Drottninggatan, from a park in the west to Dragarbrunsgatan in the east, crossing the previously mentioned north-south streets.

Uppsala's population is 105 000. It has been the seat of an archbishop since 1164 and in 1477 the first Scandanavian University was founded there.

B
Before the advent of the motorcar the City's planning policies were concerned with the scale of the human being and the horse-drawn carriage. The present city planning solution had as its aim to restore this human scale factor as the primary one and thereby also preserving the old city pattern and environment while attaining acceptable levels of accessibility.'

Various post-war city plans were produced. That of 1967 was too ambitious and was superseded by the 1969 plan with different objectives:

- to maintain the majority of vehicular traffic outside the city core and to restrict private car traffic within the core.
- to give priority in planning. . .the operation of city buses.
- to form an unbroken system of separate routes for pedestrian and cycle traffic within the city core as well as to residential and recreational areas and places of work.
- no provisions should be made for through traffic diverted from the central area, except for pedestrians and cycle traffic.

In 1973 these objectives were confirmed in the Municipal Development Plan which stressed environmental and economic aspects. 'Economic' meant low-cost improvements as well as safeguarding commercial interests. 'The rich 1960s were out, the poor 1970s were in' (a relative statement for Sweden).

Also in 1973 the Municipal Transportation Policy Committee stated that 'the private motor car has a built-in tendency to counteract itself. For its necessary accessibility it demands so much from the traffic apparatus that this simply cannot be satisfied within the central urban area. . .retail trade will be tempted to move out to external sites where the car accessibility is larger. The bus and the cycle. . . have the opposite effect - they rise (sic) the accessibility of the inner urban core.' The Committee's second point was that traffic volume rises faster than the number of population (the rate was estimated to be almost double). The Municipality then found it had political unity on its progressive policies.

In 1972 a city-wide experimental traffic order was effected, renewed in 1973, and made permanent in 1974.

The 1975 report gives no indication of future extensions to the scheme.

C
The various pedestrian streets appear to mix shopping, other commercial uses, and administration. The report says that the main pedestrian street is 'an unbroken mall of about 550m running north-south with some adjacent small square, only interrupted by the main bus axis running east-west through the Central Square with its terminal. There are also a few short pedestrian side streets.' The north-south bus street appears from a map to be about 750m long, while the east-west one is about 600m long.

The total cost of the experimental phase amounted to 435 000 kroner of which 75,000 kr were for informing the public and no less than 200,000 kr

(46%) for a research programme.

D
Apart from the cross-shaped bus only streets, the Central Square was transformed to a central bus terminal and interchange bus station. The report says 'By way of this measure (and compromise with the pure theory of pedestrian areas) people could easily reach the focus of the pedestrian centre. The mean walking distance was thereby kept at its practical minimum.'

The municipal buses all pass or start from the city centre. As the Central Square is not large enough to accommodate them all, a subsidiary terminal 75m west of the Central Square is also used. Most routes are cross town - suburb to city centre to suburb. There are 17 city bus routes and 3 express services. The total number of city bus trips has steadily risen, with a monthly average of 1 800 000 or 60 000 trips per day - a public transport rate second only to Stockholm among Swedish cities. A city-wide flat fare of 1.5kr, a 10-trip ticket amounting to 1.25kr per trip and a monthly season ticket are used, while children and the elderly benefit from reduced rates.

The level of fares is designed to reduce the operating deficit, but is not particularly cheap. Two concepts underlie this policy: 'the important factor for the car-owner in changing to public transport is not the fare level, but the comfort and high frequency of a well kept bus service of high standard'. If you really want to save money on commuting and are not elderly, then you cycle. The total subsidy in 1975 was 25% of costs and was increasing.

Travel time in the city core reduced by about 6%, corresponding to an increase in average speed of about 2km/hr. With small additional measures the reduction in travel time is expected to go up to 10%. Service regularity has also improved. While bus patronage was decreasing prior to the scheme, in 1972-73 it increased by about 7%, allowing for population increase.

E
Car traffic to the reorganised area reduced by 10%, but remained much the same in surrounding streets. After the experiment car speeds reduced moderately.

There were no changes in intensity of central ground level parking. Such parking lots and multi-storey car parks, appear from the maps to give a level of accessibility to the pedestrian area comparable to the bus, with about 1000 car spaces adjacent to the pedestrian streets. None however, are as close to the centre of the scheme (Central Square) as the buses.

Some on-street parking remains, but all central parking is metered in three zones, with charges increasing close to the most central points. In 1975 the fee varied from 0.25 to 2kr/hr. 450 on street and nearby spaces were removed to facilitate smooth traffic flows.

F
The graphs show 19 bus stops at zero distance from the pedestrian streets. Car parking approaches this convenience level, though bus users seem to have, overall, the best accessibility.

G
Retail servicing appears to be from side streets, but the report is not explicit about this.

As noted above, no arrangements were made to accommodate displaced traffic though various peripheral roads are being built for through traffic.

H
Shopkeepers were initially strongly against the scheme, and one of their reasons may be unique: '. . .serious conviction that many customers were derived simply because of the noise a d fumes of the existing car-filled street. . .people rushed into the shops, buying whatever was at hand. . . to escape the prevailing street conditions.' Opposition ceased when it was found that the

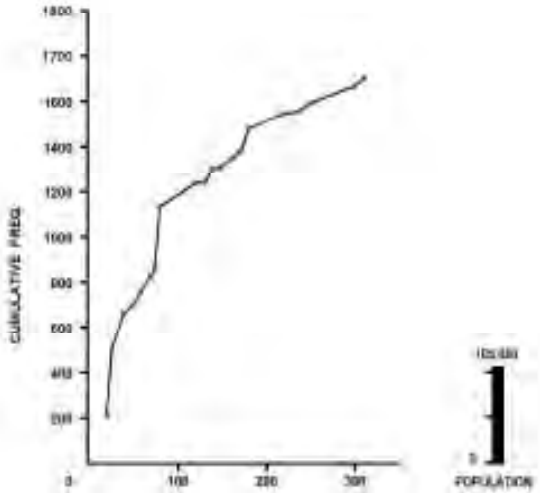

Figure BB : Cumulative number of car spaces by distance from Uppsala's pedestrian network

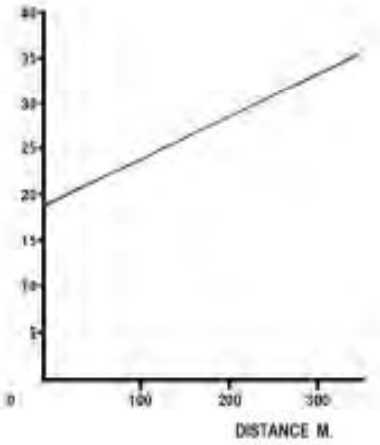

Figure CC : Cumulative number of bus stops by distance from Uppsala's pedestrian network

retail trade volume rose substantially after the pedestrian area came into effect.' The scheme could then be extended almost without further difficulty.

This initial rise of trade may have slackened off later, perhaps as people became accustomed to using two external supermarkets built in 1970-71, and because of shops constructed in newly-built parts of the City. Economic recession and other factors affect the following survey data:

	%	
	Feb. 72 to Feb. 73	July 72 to July 73
Food producers	-1.6	-0.1
Other shops	-5.0	-2.5

Table 3.11 : Turnover changes before and after Uppsala's pedestrian programme

It appears that effects of the external supermarkets and other new suburban shops have been neutralised by the Centre's pedestrian streets.

A thorough survey programme was carried out before the scheme started (May and September 1972), immediately after its implementation (October - November 1972) and some time after the new transport situation had settled down (April-May 1973).

In May 1972 total traffic volume was considered entirely or partially unacceptable by between 84% and 65% of residents of two city centre streets. In November 1972 60% of respondents found the circumstances better. 58% of those interviewed favoured more bus streets with about 35% against this concept.

In the 1973 survey 2 300 people in 20 places (city centre, the two external supermarkets and in residential area shopping centres) were interviewed. 63% were positive toward the traffic reorganisation experiment, while 22% were negatively inclined. Bus passengers (79%) and cyclists (67%) were more positive than car drivers (54%). Those living outside the centre of the city were more positive than those living in the centre, which may be explained by the increased traffic flows on the centre's non-pedestrian streets.

J
The report contains no data on observation of the restrictions or on changed pedestrian flows.

K
Although no photographs are available, the report says 'the curbstones have been removed and the total street width' (of the pedestrian only street) 'is paved with concrete slabs. The environment has been made more attractive by the addtion of trees, flowers, benches, etc." The snow is melted by a street heating system. No information is provided about the floorscape or general environment of the bus streets.

Traffic accidents decreased by 47% in the traffic reorganisation and increased by 4-12% on adjacent main streets.

The ambient noise level was high both before and after the scheme, when set against Sweden's recommended maximum 24-hour Leq* of 55 dB(A) outdoors in daytime. The greater decrease was in a central one-way street from 77.5 dB(A) to 73.4 dB(A) during the day and from 67.2 to 54.3 dB(A) at night.

Air pollution levels appear to have reduced only moderately, though they were low before the scheme was introduced.

L
The outstanding features of Uppsala are the clear statement of objectives, the radical ways in which their achievement was sought, and the monitoring of the scheme before and after its introduction. Overall it seems to have been a considerable success, though this comment is based on information published in 1975. Access for all forms of transport to the pedestrian streets appears to have been equitably resolved, and the excellence of the bus access has attracted an increased patronage.

This case study is entirely based on an English language version of a report by the Uppsala Municipal Planning Office, published as OECD (1975c).

*L_{eq} is the Equivalent Sound Level, favoured in many continental European countries. It can be regarded as a notional sound level which would cause the same A-weighted sound energy to be received as that due to the actual sound over a period of time.

WANDSWORTH GREATER LONDON

Figure DD : The location of St. John's Road at Clapham Junction, London Borough of Wandsworth

Note: the width of St. John's Road is exaggerated

Plates XVII and XVIII : Two views of St. John's Road as a bus, servicing and pedestrian only street, but before environmental improvement

A
St. John's Road, Clapham Junction, SW11. Of several London pedestrian streets penetrated by buses, it was selected in view of its interim state of development: from a street where little has been done to the environment to one where the surroundings will be made more attractive for people shopping. Wandsworth's population in 1971 was 302 000, while that of Greater London was 7 452 000.

B
While the Greater London Council has strategic responsibility for Metropolitan Roads, Planning, Public Transport and pedestrian schemes, the London Borough of Wandsworth is responsible for other roads. St. John's Road is one of these, but to transform it into a bus and pedestrian street required the approval of the GLC and London Transport, and consultations with traders, local residents and the Metropolitan Police. Administrative complexities in London doubtless contribute to its paucity of shopping streets in which the pedestrian has precedence. Wandsworth's political swing from Labour to Conservative in recent years meant that many schemes at an experimental state - special routes for cyclists and pedestrians, management of residential areas to remove through traffic, for example - were short-lived, but the conversion of St. John's Road for buses and pedestrians has remained intact.

A scheme to aid bus movement was originally proposed in 1973. Several years later, a public consultation leaflet says: 'The Council is aware of the need to smarten up the Borough's Town Centres, nowhere more so than Clapham Junction.

This statement followed the first experimental closure, in February 1977. The experimental Order was renewed and consultation then began on making the Order permanent (achieved late in 1978), and on a programme of environmental improvements, now approved and due for completion during 1980.

C
St. John's Road extends from Lavender Hill at its northern end to Battersea Rise at the southern end, a length of about 800m. The width between building facades is 20-25m. It has one department store, three large multiple stores, a bank and about 50 smaller shops. Before the 1980 improvements, the Road had footpaths with curbs and a carriageway of one lane in each direction; there were no trees or any of the other accoutrements of a fully-pedestrianised street; most shoppers felt free to wander about the carriageway when there were no buses around though some have complained about bus speeds.

The environmental improvements involve removal of curbs and reconstruction to achieve footpaths and carriageway at the same level: the carriageway will be surfaced in a coloured material, while the footpaths, ends of St. John's Road, and junctions with side roads will be repaved in buff-coloured slabs. There will be trees, raised brick planted areas incorporating seats and litter bins, new lighting, and a raised curb at bus stops to facilitate entry and exit from buses. Shopkeepers will be encouraged to implement their own schemes to improve the appearance of their shop fronts, with aid from the Council.

In a survey of pedestrians (see section H below) the means of transport to reach St. John's Road was:

	%	
	Weekday	Saturday
Walk	48	47
Bus	32	28
Train	06	06
Car	14	19

Table 3.12 : Means of transport to reach St. John's Road

The estimated cost of the current improvements to St. John's Road is £80 000.

D
Buses will continue to run two-way along the improved road. Southbound there will be three stops near Lavender Hill and one near Battersea Rise, while northbound there will be one stop opposite each of the southbound locations. Bus routes serving roads at each end of, or traversing, St. John's Road are the 19, 37, 39, 45, 49, 77, 168, 249, and 295. Bus journey time savings in each direction along St. John's Road are nearly one minute at peak periods. One of London's largest British Rail stations, Clapham Junction, is about 100m from St. John's Road.

	Total in both directions Frequency / one hour	
ROUTE	PEAK	OFF/PEAK
19	20	10
37	12	06
49	10	05
77	6	06
249	5	05

Table 3.13 : Scheduled (not actual) bus frequencies for some routes derving the area

E
There is a ground level car park near Clapham Junction Station with 120 spaces. Permission has been granted for two further car parks nearby, each with 100 spaces, within redevelopment schemes. Whether they will be used is debatable because there is no on-street metering in the area, and no traffic wardens patrol the area. The surrounding streets tend to be full of residents and visitors parked cars, a situation which has been evident before and after introduction of the scheme for St. John's Road. It may take the car user some time to find a parking space.

F
Differences in accessibility by bus and private car are not as clear-cut in St. John's Road as they are in some of the other case studies, partly because there are few restrictions on on-street car parking. However, because five London Transport services run along the street, and other bus stops are very close to it, there is little doubt that bus access is better than by private car.

G
Servicing of shops is from Comyn Road, Barnard Road, and the street itself; these vehicles leave by the ends of St. John's Road. There are no restricted hours. No special arrangements have been made for traffic diverted from the Road. Some lobbying to permit taxis and bicycles to use the road was not accepted by the Council, principally because of the difficulty of finding appropriate signs. Exemption signs can only have one exemption (for example, buses only are permitted); otherwise the sign has to be an advisory one, which can be very confusing for the various classes of road user.

H
Extensive consultation has been carried out by the LB Wandsworth. There have been public meetings, encouragement to contact local councillors and Council officers, and opinion surveys. A questionnaire was distributed to 1384 local households in 1977, to which 41% of households responded. 84% of these thought conditions for pedestrians had improved since the experiment began, though 53% thought traffic in their residential street had increased and 50% that parking in that street had increased. While 33% also thought conditions for pedestrians in that street had

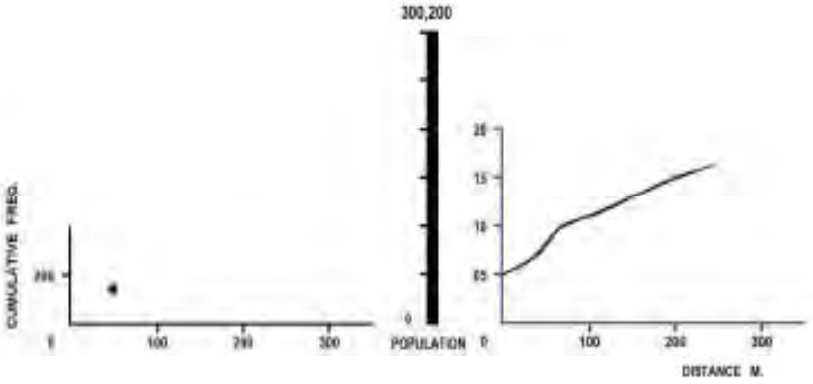

Figure EE : Number of off-street car spaces by distance from St. John's Road

Figure FF : Cumulative number of bus stops by distance from St. John's Road

become worse, 78% still considered that the St. John's Road scheme should not be abandoned. 65% thought that neither taxis nor delivery vehicles should be allowed in the Road.

Also in 1977 332 traders were approached in St. John's Road, Northcote Road and other roads; 43% responded. When asked if the scheme should be abandoned, 42% in St. John's Road, 69% in Northcote Road, and 49% elsewhere agreed. This seems to indicate that a network of pedestrianised streets, rather than the solitary St. John's Road, would be advantageous to traders. All the traders disagreed (65%-69%) with a suggestion that St. John's Road should be closed for only a proportion of the day.

Pedestrians were also interviewed at that time, with 308 responses on a weekday and 296 on a Saturday. Approximately half the respondents lived locally while 66% on the weekday, and 83% on the Saturday, were there for shopping.

74%-75% of respondents thought pedestrian safety had improved, while 25%-28% thought the Road was quieter. 76%-81% thought the scheme should remain.

Consultation was taken further in 1979, this time about the proposed improvements. In October 1515 households received questionnaires but only 162 (11%) responded. Of these 68% thought the scheme was a good idea, and many suggestions were made for its further improvement. 18% remained concerned about traffic in residential roads. 9% only, of 326 traders and businesses who received a questionnaire, responded. Of these, 2/3 thought the scheme was a good idea.

J
A few unauthorised vehicles violate the scheme, some of which may not have seen the signs at entry points to St. John's Road.

K
The improvement scheme underway at the time of writing has been described earlier. There is little evidence on changed environmental conditions since the scheme was introduced, except for accidents.

Accidents involving pedestrians from 1974-mid 1980 in St. John's Road and its junctions at either end are as follows:

	Slight	Serious	Fatal	Total	St. John's Road only all types
1974	9	2	0	11	
1975	10	2	0	12	
1976	13	0	1	14	
1977 *	2	5	0	7	1 serious
1978	6	0	0	6	2 slight
1979	3	1	0	4	1 slight
1980-30 June	3	0	0	3	2 slight

* Scheme introduced in February

Table 3.14 : Accidents before and after introduction of the St. John's Road scheme

The reduction in accidents to pedestrians notably includes a reduction at the junctions between St. John's Road and roads at either end.

L
St. John's Road used to be congested with all types of traffic. Since it was converted to a bus+pedestrian only street the congestion has been removed, but the generally unattractive appearance of the street has remained. By the end of 1980 this too should have changed for the better. Then one will find a case where environmental improvement has gone hand in hand with the maintenance of a high level of accessibility by all transport modes, with only one remaining qualm: the traffic levels and parking on some nearby residential streets.

Data for this case study were obtained from LB Wandsworth and from a number of papers, of which LB Wandsworth (1977 and 1979) appear in the bibliography.

A Comparison of the Case Studies

3.07

Table 3.15 collects together the principal information contained in the ten case studies. Not every column is complete, for the data either do not exist or were not made available. Perhaps the first impression is the wide difference in population, from 21 000 in Durham to nearly 2 million in Minneapolis metropolitan area: population seems to bear little relationship to the size of the achievement, for Durham's pedestrian area required substantial road construction, and much expenditure on very careful design of the streetscape - as befits an historic city - while Minneapolis's grid plan could absorb the displaced traffic, and the 20th century street design only needed to live with roughly contemporary building architecture. Minneapolis was the first of the case studies' pedestrianisation to be opened for public use.

3.08

Minneapolis and Wandsworth are the only schemes that are not part of networks. This influences comparisons of the size of the entire scheme - Birmingham is considerably larger than any of the others, as befits its population and regional centre status, Newcastle's network, with twice the population, is only moderately longer than Uppsala's. Durham's network is comparable in length to Exeter's, which has over four times Durham's population. Turning to servicing there is no clear message, though mostly it is to the frontage, frequently within a restricted time period.

3.09

For the seven schemes with data, public response to pedestrianisation is generally approving. While it would be useful to have more data on environmental change, there are, as might be expected, palpable reductions in accidents, noise and air pollution levels. In general, bus drivers in streets dominated by pedestrians seem to drive very carefully and accidents involving pedestrians are correspondingly low.

3.10

Uppsala has much the longest stretch of streets penetrated by buses, followed by Minneapolis. In the other case studies (except Besancon) the length of bus+pedestrian street varies between 250 and 455m. The width of the street varies between 13 and 25 metres. Public attitudes to bus+pedestrian streets are split between the four case studies where they are approved, and the two where it is felt the buses should be removed.

	NETWORK															BUS PENETRATED PART			
	Population 000 Year	Year scheme first introduced	Approx. length of network m	[illegible]	Modal split for arrivals %: Walk	Car	Bus	Rail	Servicing arrangements	Altern. for displaced traffic	Attitudes toward scheme in general	Environmental change: Accidents	Noise	Air Pollution	Cosmetic	Approximate length m	Approximate width m	Number of bus stops / vehicles p.h.	Attitudes to bus penetrated part
BARNSLEY	74.7 1971	1975	730	3500/300	26 / 19	47 weekday / 43 Saturday	37 / 36	1 / 1	10.00 - 16.00 on bus streets	Inner Ring Road	General Approval		n.a.		moderate	250	35	12/140	n.a.
BESANCON	120.3 1975	1974	n.a.	2500 within c.c.		n.a.			Relatively unrestricted	Ring Road	Shopkeepers Enthusiastic		n.a.		elaborate	n.a.	n.a.	n.a.	n.a.
BIRMINGHAM	1006.5 1971	1972	[illegible]	5000/300	15	49	35	1	[illegible]	Inner Ring Road	Shopkeeper satisfaction		n.a.		elaborate	350	25	126/360	Some preference for busless streets
BOURNEMOUTH	120.7 1971	1971	500	800/300		n.a.			Commercial Rd rear, Old Christ Church Road frontage	None	n.a.	Reduced	n.a.		moderate	455	13-18	16/150	Shopkeepers favour
DURHAM	21.2 1971	1975	1115	1000/300	21	46	18	1	22.00 - 10.00 some rear access & sp. permit	Inner Ring Road	General Approval	Substantial reductions			elaborate	280	13-28	25/300	n.a.
EXETER	95.5 1971	1975	1120	1700/300		n.a.			Mainly rear + 24.00 - 09.00 frontage	Inner ring road outer by-pass	n.a.	[illegible]	[illegible]	n.a.	moderate	320	13-23	32/150	Chamber of Commerce would like buses removed
MINNEAPOLIS	1900 early 70s	1967	730 (single street)	10000/240	15	36	62	—	Rear or cross streets	None	General Approval	Some reductions			elaborate	650	23.2	16.0	General approval [illegible]
					multiple responses														
NEWCASTLE	215.1 1971	1971	1660	1500/200		n.a.			Frontage 17.30 - 11.00	Central motorway	Highly Favoured		n.a.		moderate	330	25	75/300	Majority [illegible] buses removed
UPPSALA	135 ?	1972	1960	8840/270		n.a.			Possibly from side streets	None	Majority Approve	47% Less	[illegible]	[illegible]	n.a.	1300	n.a.	20/150	n.a.
WANDSWORTH	302 1971	1971	380 (single street)	150/300	48 weekday / 47 Saturday	14 / 15	33 / 28	8 / 3	Unrestricted	None	—	[illegible]	n.a.		elaborate in 1980	335	20-25	15/300	Majority Approve

Table 3.15 : Principal data of the ten case studies

46

3.11

In transport terms, six of the case studies had an inner ring road or other new route which could accept diverted traffic, while four had made no provision. This comment should be interpreted with care, for inner relief roads are built for a number of reasons, among which pedestrianisation may not be foremost. The means of transport used to reach the shopping area are displayed for five of the case studies: local conditions strongly influence choice of transport. In a densely built up area like Wandsworth a high proportion walk. Use of a car is surprisingly highest in Durham (with the lowest car ownership level for any of the case study areas). Relatively high proportions of bus users can probably be correlated with the particularly good facilities provided for them in each case study area.

3.12

There are wide variations in the number of nearby car parking spaces, and in the number of nearby bus stops. Minneapolis's vast number of car parking spaces is to be expected in a North American city, and the 62% using bus to reach Nicollet Mall comes as a surprise. In England, Birmingham has the largest number of car parking spaces, and of bus stops, which emphasises the need to relate these figures to population. Three summary Figures are provided to clarify these relationships. Figure GG shows the cumulative number of car parking spaces by distance for all the case studies except Besançon; bearing in mind the comment in paragraph 3.05F that the optimum curve is the vertical axis, this is most closely approached by Barnsley, Birmingham and Newcastle (and probably Minneapolis if the data were available),

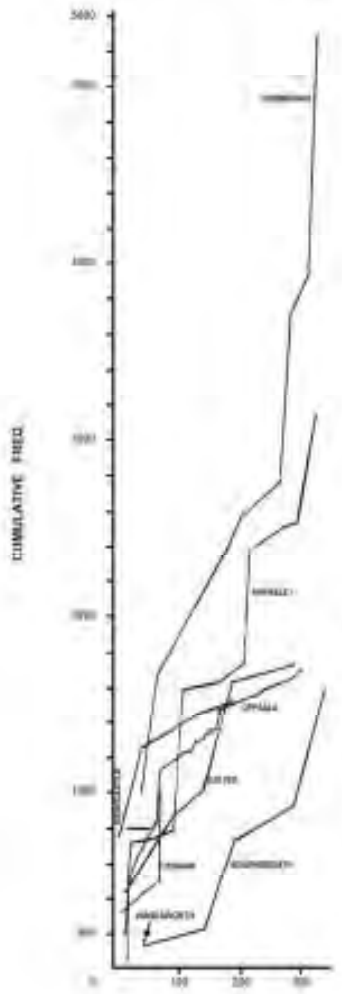

Figure GG : Cumulative number of car parking spaces by distance from pedestrian precinct, in nine case studies.

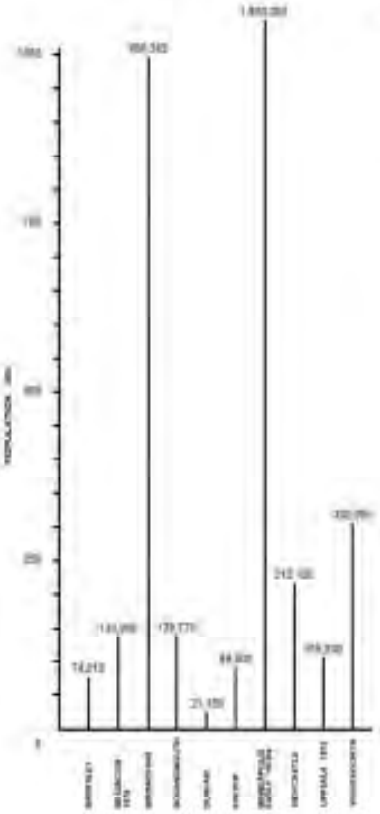

Figure JJ : Population of the ten case study areas, generally for 1971

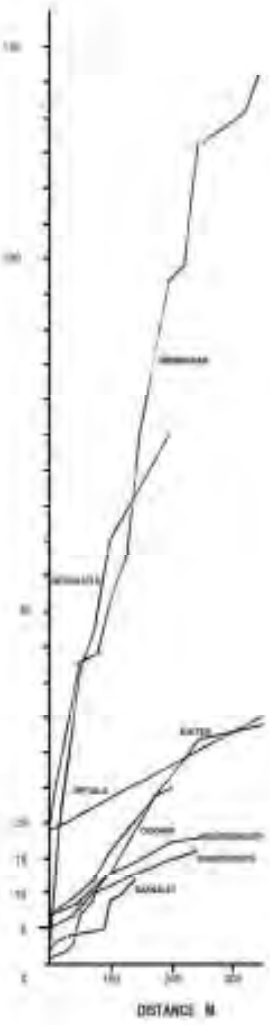

Figure HH : Cumulative number of bus stops by distance from pedestrian precinct, in nine studies.

while Bournemouth and Wandsworth do not perform very well (though we should recall that Bournemouth's car parks are linked to the shopping centre by a mini bus). Figure HH shows the cumulative number of bus stops by distance for each of the case studies except Besancon; while this Figure cannot be compared with Figure GG, Birmingham, Minneapolis, Newcastle and Uppsala perform considerably better than the other six case studies: again, it is important to relate these comments to population levels (Figure JJ) and to note that the measure is number of bus stops, rather than number (frequency, occupancy) of services using these stops.

3.13

It would be invidious to state preferences, or attempt to rank the case studies, for the measures used are different and cannot be summated. Thus, one tends to applaud Newcastle in terms of accessibility (the first Metro station in the shopping area opened in 1980 as an addition to existing high levels of accessibility); Birmingham for sheer scale and pleasantness of the shopping environment, and levels of accessibility close to Newcastle; Durham for a sense of carefully conserved history; Exeter for an ad hoc solution which appears highly rational; Minneapolis for expediency within a characterless environment; Barnsley for the reflection of a highly innovative public transport policy. Besancon and Uppsala were not visited; Bournemouth and Wandsworth have each solved problems in contexts which could hardly be more different. All the case study schemes have demonstrated a concern to provide public transport accessibility as good as, and often better than, the private car's. Patronage of this public transport is at a high level and these policies appear wholly justified.

4 CONCLUSIONS

4.01
This study has been concerned with the accessibility of pedestrianised shopping areas by various means of transport, dominated by the conditions for buses and bus users. One might ask why there should be a detailed study of this nature: what is so special about the relationship between buses and pedestrianised areas that deserves this treatment? The answer to this question is in several parts.

4.02
First of all, the creation of a pedestrianised area is almost invariably accompanied by a major improvement in that part of the urban environment. Noise levels, air pollution and accidents reduce; visual appearance and amenity increase; perhaps shop fronts, and sometimes shop contents, become more attractive. These moves toward a heightened quality of life are laudable, as long as all users can easily reach the precinct that has been created.

4.03
There is usually little problem for the motorist. Every new supermarket, department store, row of shops, or air-conditioned precinct seems to be associated with many parking spaces above, below, or immediately alongside. This results not just from the desire of the developer to get his customers as close as possible to the shops: it is normally a condition of planning consent too. Older established shops have also tended to find spaces nearby that can be crammed with cars, though this is far less of a universal rule.

4.04
Bus users, however, far less frequently experience the kind of door-to-door accessibility accorded to the motorist, for a bus stop (unlike a parked car) will only rarely be outside where the bus user lives, and a walk at that end perhaps heavily laden with shopping and children will echo the walk near the shops. Of course there are some enlightened exceptions to this statement, though Chapter 2 noted that only 13% of a large sample of British precincts could be said to have accessibility by bus at a level that was equal to, or better, than that for the private car.

4.05
If we lived in a rational world, such a disparity between the comfort and convenience of car and bus users would not be countenanced. For, is it not true that energy use per passenger-km is far less for a well-occupied bus than it is for a private car? Is it not also true that buses require very little road space per passenger carried, and equally little central area parking space? And that good bus access therefore requires a much lower level of investment than do the disproportionate amounts of parking and roadspace demanded by the private car? Bus operators and users are caught in a declining spiral - as buses are moved away from pedestrian areas, so their operating costs increase, fares go up, and patronage declines. This decline is exacerbated if the bus user's level of accessibility to a shopping precinct is worse than that for the car user; it should be better.

4.06
Rationality apart, there are two other strong arguments for high levels of bus accessibility to pedestrianised shopping areas. First there is the Department of Transport's statement 'In shopping areas access to buses should be at least as convenient as to car parks.' We have seen that it patently is not so, over Britain as a whole. Second, there is the finding by the West Midlands PTE that public transport users contributed 56% of the retail turnover in Birmingham City Centre. As both of these pronouncements are from 1978 they were of course not known to those planning the great majority of British pedestrian schemes, though they are crucially important to future schemes.

4.07
If there are strong arguments in favour, why do buses not figure more prominently in the planning of pedestrian areas than they have done? There are several possible answers:

a. Elected members of a Council want to see action that will attract votes at the next election: they will not be attracted to complex solutions or to those that might not be endorsed by the electorate.
b. At officer level, among planners and engineers, there has been a vast amount of research on how to accommodate the private car in cities: this impetus cannot easily be swept aside. Similarly, some schemes may have had a long gestation period and there will be strong reluctance to change it. Valuation, estates and financial officers will support the scheme most liked by businesses; businessmen in their turn correlate profitable operations with the greatest ease of access by car, rightly or wrongly. In all these situations, the needs of bus users may have been overlooked.
c. When elected members or officers or even independent researchers have approached the public for their views, it seems that the environmental aspects (and the alleged dangers) of buses in pedestrian streets have been uppermost, while accessibility by bus has been insufficiently considered. Not only that, the worsened accessibility for bus users (as it frequently turns out) has not been made clear to those being interviewed.
d. Alternative methods of bus access have not been sufficiently studied: it is not imperative (and is often quite impractical) to run buses along a pedestrian street. But they can often be routed so they cross that street, or run extremely close, or connect with a minibus shuttle along the street.

4.08
Hopefully some lessons have been learnt, and others will be culled from this study. For there remain many shopping streets that ought to be converted primarily for enjoyment of the pedestrian; the non-car users will still have to reach these future streets and demonstrate that they account for a large proportion of the shops' turnover. Those cities that have done little can now show what could have been done nationwide, rather than in a few isolated, if splendid, exceptions.

50

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END

TRIP DEGENERATION

A Literature Review

Report by TEST for the Rees Jeffereys Road Fund

TEST Report No 99
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TEST staff involved in the production of the review were Nicola Brown, Liz de Lange, Nicholas James, Sheena Maclean, Alex Reid, John Roberts, Mark Shayler.

Note

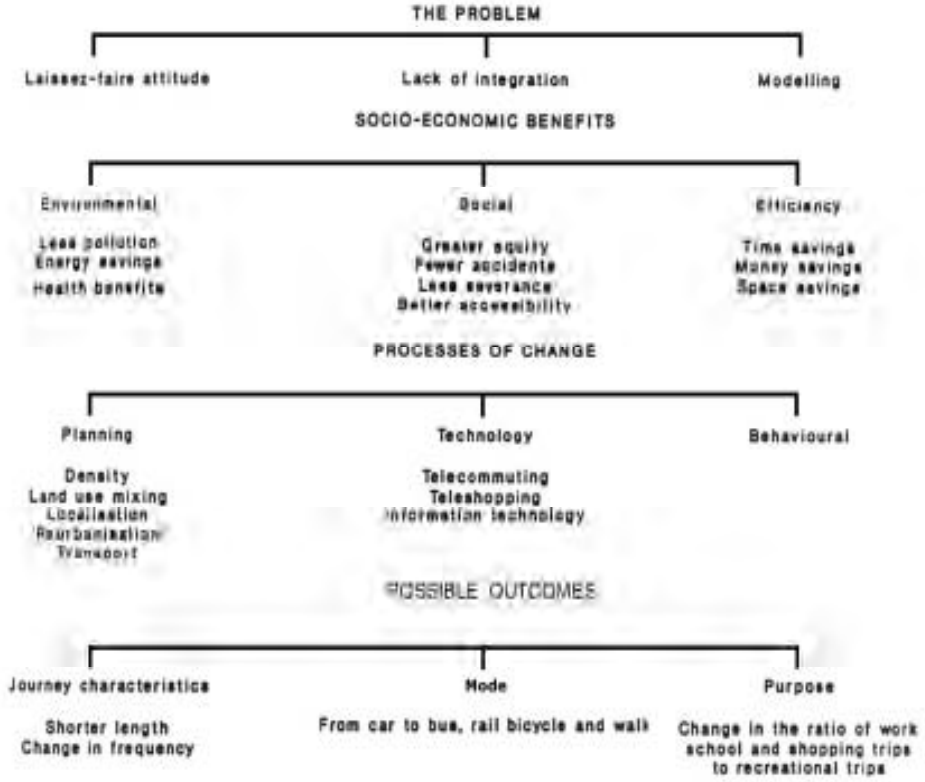
The word 'transportation' appears only where an original text is being quoted. TEST believes many 'ations' to be superfluous.

TRIP DEGENERATION
A Literature Review

0 BACKGROUND

The structure of this review is shown below.

Figure 1: Structure of this Review



Since Mitchell and Rapkin (1954) first wrote about the interaction between land use and transport, numerous studies and reports have been produced on this subject. While Mitchell and Rapkin's article, and the great majority of related work, have used this relationship to predict traffic growth from land use, few have investigated how land use can be used to *reduce* the need for travel and dependency on the car. This literature review looks at problems associated with predicting traffic growth and work related to the latter view.

Useful bibliographies include Banister and Pickup (1989), Kenton (1980), and Lewis (1986b). General texts about land use and transport are Blunden (1971), Blunden and Black (1984), Daniels (1980), and Heinzpfel (1986).

1 THE PROBLEM

1.1 The Laissez-faire Attitude to Land Use Planning: Out-of-town Development and Suburban Sprawl.

TEST have investigated problems of traffic generation associated with the proposed Westminster and Chelsea Hospital (1988).

The traffic generation caused by out-of-town developments has been studied by Bellamy (1976), Kamali (1988), the London Borough of Brent (1986) and TEST (1989). Traffic generated by employment parks is investigated by Brown and Gilbert (1987).

Sanderman (1980) looks at the trip generation caused by town centre development in Cwmbran.

Another prominent problem addressed by the literature is that of suburban development. Cervero (1986 and 1989) looks at this problem in the USA. Ingram (1980) predicts that suburban growth will continue, and employment might spread to the suburbs.

The effect that transport location has on land use has been studied by Khasnabis and Babcock (1977), Mackett (1983c) and Malvyn and Olsson (1975).

Nerad (n.d.) looks at the interrelation between traffic and land use in urban areas, while Newby (1990) comments on the urbanisation of rural areas.

Middleton (1991) examines the type of governmental structure necessary to achieve the environmental objectives that we set ourselves and stresses the need for public participation.

1.2 Land Use and Transport Planning: Models

The conventional land use/transport process is criticised in Atkins (1986), Barnard and Brindle (1985), Bracken (1984), Brown (1981b), Couroy (1976), Hutchinson (1975), Local Government Operational Research Unit (1979), Mackett (1976), and White (n.d.). The OECD (1974) look at ways to simplify urban traffic models. Berechman (1981) considers various approaches to linking an activity model with a transportation network model. De La Barra (1989) compares traditional land use models with recent spatial interaction models.

Brand (1973) and Senior (1977) look at the problems of integrating activity (land use), and travel demand (transportation) models. Putman (1976) reports the first successful attempt at full integration of land use and transportation models. Integrated models have been prepared by Echenique (1977), Mackett (1983a) and Putman (1976), and reviewed by Mackett (n.d.), and Putman (1983). Nine integrated land use transportation models are described and applied in seven study areas, in a volume edited by Webster, Bly and Paulley (1988) for the International Study Group on Land Use/Transport Interaction. This project is ongoing, and it is hoped that the models will be tested in one study area to discover their similarities and differences.

Ansah (1974) looks at destination choice modelling. Using a model of locational choice, Borukhov and Hochman (1977) compare a competitive city with a social optimum city. Burnett (1974) reviews disaggregate and behavioural models. Jones et al (1980) produced, and Jones (1983, 1990) discussed, behavioural models.

Modelling the impact of transport location on land use is examined by Button (1983) while Banister et al (1990) examine the role of models in understanding

the impacts of land use on travel demand. Attempts to incorporate accessibility into transportation models have been made by Conroy (1978), Greuter (1977), Kellogg (1974) and Koenig (n.d.). Last and Daly (1975) attempted to model the walk mode. Duffield (1977) produced a model of recreational travel.

Dale (1977), Gerardin (1980), Kanafani (1983), Lichfield (1981), Sagona (n.d.), Schaechterle (n.d.), Taylor and Young (1966), and Zahavi, Golob and Beckmann (1980), also investigate various aspects of modelling.

1.3 Land Use and Transport Planning: Integration

Buchan (1990) and White (n.d.) stress the need for integration between land use and transport planning. The Association of County Councils (1991) suggests a six point plan aimed at achieving such integration.

1.4 Transportation Studies and Trip Generation Data

Summaries of trip rate data can be found in: Arnold (1985), Brodie (1978), Brown and Gilbert (1987), California Business and Transportation Agency (1974), Chang and Wolny (1983), Hasell, Holloway and Johnston (1973), Hensen (1988), Institute of Transport Engineers (1987), Krummes (1985), New South Wales Traffic Authority and Environment Commission (1980), Ogden Ritchie and Dumble (1980), Peacock (1971), San Diego Association of Governments and California Department of Transportation (1988), South Australia Department of Transport (1987), Vaughan (1985). Leake and Gray (1975) review industrial traffic generation studies.

2 SOCIO-ECONOMIC FACTORS

2.1 Environmental

2.11 Pollution

The Australian Environment Council (1983) investigates various forms of pollution control, other than direct emmission control. Naroff and Ostro (1980) use a two-step model to examine the relationship between urban spatial development, the journey to work, and central air quality.

2.12 Energy

Hodgkin (1980) remarks that investigations in the fuel conservation field should take into account the total land use/transport situation. Simkowitz (1979) looks at problems and possibilities, for transport and energy use.

Illich (1974) argues that limiting traffic would solve the energy crisis. Hill (1991) agrees that planning strategy can reduce energy use.

Urban spatial arrangements have been investigated, to find the most fuel efficient, by Edwards (1977), Keyes (1982), and Lichfield (1981). There is agreement that denser linear spatial arrangements are more fuel efficient than concentric sprawled arrangements. Potter (1984) warns that due to low fuel costs, sprawled urban structures have developed, which are virtually incapable of adapting to minimise travel needs in less than 50-100 years.

Owens (1979), and Sharpe (1980), have written about how energy could be conserved by land use planning in order to reduce trips. Banister (1991) believes we need to establish conditions for an energy efficient settlement.

Edwards (1977), Moriarty (1981), and Newman and Kenworthy (1980), look at relationships between public and private transport, and fuel consumption.

Kostynuik (1976) and Romanos (1981) look at how energy constraints would affect the urban grocery shopping trip, and city growth respectively.

2.2 Social

Borukhov and Hochman (1977) use a locational choice model to investigate spatial differences between a competitive city and a social optimum city, and find that the social optimum city has a denser spatial arrangement than the competitive city.

2.21 Equity

Daor (1981) looks at the effects of income on travel behaviour. Dick (1972) looks at the out-of-town development, and whether car-oriented shoppers should benefit at the expense of the rest of the population. Hillman et al (1976) study the travel patterns of a variety of social groups and conclude that proper regard should be given to all groups in the population and the travel methods they use. Kostynuik (1976) shows that when constraints were put on fuel availability for the urban grocery trip, differences in perceived mode acceptability for population categories existed. Maunder (1984) looks at the travel problems of low income groups in Delhi. Illich (1974) and Town and Country Planning (1991) argue that energy intensive transport causes social inequities, and that limiting travel would redress this. Ripa de Meana (1991) states that car use gives rise to undesirable social effects and concludes that we need to redefine our priorities of access and mobility. Schlabbach (1991) outlines transport improvements which would reduce the polarisation of society.

2.22 Health and Safety

Plowden and Hillman (1984) examine how land use policy could contribute to reducing road accident: '...transport planners tend to think of the land use pattern as something that they have to know about in order to predict travel patterns, rather than as something they can change in order to help solve transport problems, including road safety.' Kent (1990) suggests that physical activity should be '...woven into the fabric of daily life, by using muscle power to travel less than a mile or two.'

2.23 Accessibility

Hautzinger and Kessel (1977) look at the concept of mobility, its influence on land use and how it is changing. Rigby (1978) reviews access to hospitals. The case for accessibility, instead of mobility, is put forward by Hillman and Whalley (1975), Owen (1972), Ripa de Meana (1991) and the Green Party (1991). Accessibility is used as an alternative measure to travel demand, in Conroy (1978) and OECD (1977). Davidson (1978) relates accessibility to density, for use in metropolitan strategic planning. The use of accessibility in urban models has been investigated by Greuter (1977), Kellogg (1974) and Koenig (n.d.).

2.3 Efficiency

Hillman and Whalley (1975) stress the need for '...economies of travel rather than economies of scale'. The Toyota Motor Corporation (1991) examines macro-level strategies for combatting urban traffic congestion.

3 PROCESSES OF CHANGE

3.1 Planning

The concept of reurbanisation is closely related to trip degeneration. Van Den Berg and Klaassen (1982) describe the policy of 'reurbanisation' as '...the contraction of the distance between living and working places and the efficient use of infrastructure for public and private transport.' Klaassen et al (1981) introduced this concept and have produced a thorough investigation into it. Various works have been written in a similar vein to this including: Bendixson (1977) '...opening of shops within houses', Dantzig and Saaty's (1973) 'compact city', Krell's (1981) 'rejoining working and living places', Lewis (1988b), Klassen and Van der Meer (1987), Newman and Kenworthy (1980 and 1989), Renner (1988), Simpson (1988), Owen (1972), Owens (1979), Plane's (1986) 'urban village' concept, London Research Centre (1991), Lowe (1991), Plowden (1983 and 1985), and Plowden and Hillman (1984). Tanghe et al (1984) illustrate the concept of reurbanistion using European case studies. Baillieu (1991) briefly describes recent views on rural development in Cambridgeshire. The European Conference of the Ministers of Transport (1976) discusses the possibility of classifying activities according to their capacity for deconcentration.

Melbourne and Metropolitan Board of Works (1979) and Schneider and Beck (1973) consider various land use scenarios and urban spatial structures with a view to reducing travel requirements.

Schonfield and Chadda (1985) suggest land use planning as a 'travel reduction option'. Deakin and Suhrbier (1988) define 'trip reduction' as being 'a demand oriented approach to traffic management', and show the extent to which it is being used in the USA. Schaeffer and Schlar (1975) look at the 'land managed city' of Edmonton and endorse the view that travel mileage must be reduced by land use control. Cervero (1989) identifies the problem of 'suburban gridlock' and suggests planning solutions. Mackett (1983b) uses the LILT model to analyse the effects of various policies on the city of Leeds, and Voorhees (1972a) looks at alternative land use/transportation policies. Harris (1987) looks at the possibility of linear development along rural railway lines.

Potter (1976) draws attention to the potential new-towns have for travel minimisation. Authors who have advocated Christaller's central place theory as a basis for land use planning include Huth's (1983) multinodal urban structure, and Klaesener (1987).

Black (1990) examines the relationships between walking to work and working at home, density, land use mixing, proximity, socio-economic variables and climate. Glancey (1991) notes the movement of business parks back towards town centres.

Gustafson (1973) shows that the primary influences of travel in the Detroit metropolitan area are car availability, density of destination, and income.

3.11 Density

There have been many advocates of high density development, and for various reasons: change in mode and journey characteristics, energy saving, efficiency, and urbanity.

Dunn (1981) argues the case for high density, similarly Sharpe (1980) argues for high density sub centre development, Simkowitz et al (1977) for infilling and high density corridors, and Wiedenhoeft (1981) for high density central areas.

Barber (1982) believes that the possibility for compact high density living is found through examining demographic, public policy and economic factors.

Betz (1978) examines land use density as a factor in urban transportation. Cervero (1991) does the same for suburban areas.

Black (1990) argues that high density development is a sensible option to encourage walking. The results of the LUTE model (Bland 1983), predict that high densities would not be an effective way of decreasing car ownership. Sammons and Hall (1977) look at the relationships between modal split and the journey to work and conclude that, although car ownership affected modal split, population and employment densities also imposed limitations.

Goodwin (1975) looks at variations in travel between individuals living in areas of different population density. Jordan (1972) found that the residents of suburban communities generated twice as many vehicle miles as residents living in the denser urban areas.

Keyes (1982), and Lichfield (1981) suggest that medium size cities, with clustered residential densities, are needed to reduce fuel consumption.

Real Estate Research Corporation (1974) argues that the cost of high density development would be less than low density sprawl.

3.12 Land Use Mixing

Simkowitz et al (1977) argue for land use mixing. Betz (1978) looks at land use pattern as a factor of urban transportation. Transnet (1991) found that better land use planning had beneficial impacts on CO emissions. Stewart and Mihalcin (1983) study housing in the central area of Toronto, similarly Wiedenhoeft (1981) uses examples of Vancouver and the Barbican centre. Cervero (1991) analyses the effect of land-use mixing on travel demand.

3.13 Localisation / Proximity

The Swedish National Board of Physical Planning (1975) states that every home should be within 500 metres walking distance from a convenience store. The Second Chamber of the States-General (1989) in the Netherlands wants to call to a halt the growth in travelling distances as the true costs of mobility are high.

Macnab (1984) looks at the provision of local shopping facilities in an urban area of restraint.

Hillman et al (1976), Menke (1984), and Naroff and Ostro (1980) also put the case for localisation.

3.14 Traffic Planning – Traffic Calming, Pedestrianisation etc

Schonfield and Chadda (1985) investigate 'travel reduction options' such as ride sharing, van pooling, traffic calming, public transport improvements, and parking price increases. Lowe (1991) comments on proposals for a 'pedestrian oasis in Manhattan'.

Noguchi (1982) looks at shaping an activity centre through public transport and pedestrian incentives, while Pushkarev and Zupan (1977) look at public transport and land use policy. Dunn (1981) argues the case for public transport versus the car. Klaesener (1987) suggests public transport should be made more attractive and traffic free pedestrian zones should be promoted.

Monheim (1990) argues for traffic calming. Powell (1972) finds that traffic restraint is necessary in large conurbations where city centres generate too much traffic. Rowley and Opacic (1985) compare 26 historic towns for their parking provisions and traffic restraining policy. Schlabbach (1991) states that improvements in public transport, cycling, traffic calming etc can help reduce the polarisation of society and cites European examples.

Lewis (1988a) offers increasing vehicle occupancy as an option to increase efficiency.

3.2 Technology

The Council for Science and Society (1986) investigates the impact of technological developments on the demand for movement, and Ogden et al (1985) and Owen et al (1983) technology's effect on travel. Lefèvre (1980) examines the impact of microelectronics on transport.

The substitution of telecommunications for transport has been studied by International Association of Traffic and Safety Sciences 633 Project Team (1984), European Conference of Ministers of Transport (1982), Miller (1980), Nilles et al (1976), Salomon (1984 and 1985), Wilkes (1981).

Eason (1984) looks at the potential for computerised shopping points in the community.

3.3 Behaviour

Daor (1981) looks at the effects of income on travel behaviour. Hallett (1990) examines people's attitudes to cars and driving. Hanson (1980) studies the importance of the multi-purpose journey to work in urban travel behaviour. Holzapfel (1986) looks at people's behaviour over distance. Madden (1981) examines why women work closer to home. Ogden (1985) looks at demographic and lifestyle effects on urban travel patterns, and Salomon (1983) the effect of life-style on travel behaviour. Zuckermann (1991) outlines some ways to change the way people think about and use their cars. Madhav (1970) believes there will always be a unique human response to any planned combination of home and work place.

4 POSSIBLE OUTCOMES

Das (1978) reviews research on modal split, modal choice, journey length and time, spatial distribution of homes and workplaces, and broad patterns of movement in urban areas, for the journey to work. Similar topics are covered by Plowden (1985).

Rigby (1979) compares journey characteristics, and mode, for the journey-to-school. Sammons and Hall (1977) look at urban structure and modal split in the journey-in-work. Van Den Berg and Klaassen (1982) analyse the relationships between car use and changing space-time patterns. Reasons for developing an urban policy aiming at control of urban development, and the corresponding use of cars, are examined.

4.1 Journey Characteristics

Schonfield and Chadda (1985) assess travel reduction options.

Brog (1981) argues, if journey duration and costs were increased, there would

be a reduction in the frequency of all, except recreational, trips. For recreational trips, the type of trip would change. Hillman and Whalley (1975) show that car use increases with distance between origin and destination. Holzapfel (1980) relates time space and people's behaviour over distance. Jones (1977 and n.d.) says that distance is the most important factor affecting childrens travel to school patterns, and proposes solutions. Lewis (1988a) and Roberts and Rawcliffe (1991) look at why and how distances travelled should be minimised. May (1990) found that the largest single cause of traffic growth is not the number of journeys, but journey length, and investigates various solutions.

Goodwin (1975) assesses variations in travel between individuals living in areas of different population density. TEST (1991) examine the different travel patterns of residents of two new cities with very different urban structures. Hensher (1976) examines the implications of changes in land use on the structure of journeys at a conceptual level. Klaassen et al (1981) suggest that their reurbanisation policy would reduce traffic volumes. Malvyn and Olsson (1975) review how transportation variables are influenced by metropolitan form. Maunder and Fouracre (1981) look at household and travel characteristics for two residential areas in Delhi. Roberts and Rawcliffe (1991) compare the travel patterns of Milton Keynes and Almere, two new cities. Walmsey (1972) investigates the impact of types of centre on the length of the journey-to-consume. The International Bank for Reconstruction and Development (1976) explores the systematic components of travel characteristics in cities of developing and developed countries.

4.2 Mode

Bland (1983) uses the LUTE model to test how land use patterns affect modal choice. Brog's (1981) model shows that the number of people who would change mode if travel duration and costs were altered is comparatively small. Hanson (1980) shows the importance of the multi-purpose journey-to work in urban travel behaviour related to mode. Jones (1977 and n.d.) investigates children's mode to school. Kellogg (1974) developed and analysed accessibility measures for their importance in explaining the number of trips by mode. Kostyniuk (1976) perceived acceptability of modes for the urban grocery trip, in the event of a fuel shortage.

Dick (1972) asks should car-oriented shoppers benefit at the expense of the rest of the population?. Dix (1983) studies car use and the role of the car. Hallett (1990) looks at attitudes to cars and driving, and Jordan (1972) at car travel in the New York Metropolitan Area. Cervero (1991) suggests that limits should be placed on car usage.

Hillman et al (1976) argue that consideration should be given to the relevance of non-motorised travel. Illich (1974) calls for limiting energy intensive transport and reducing speed. Mackett (1983b) investigated policies affecting the cost of car and bus travel using the LILT model. Melbourne and Metropolitan Board of Works (1978) estimates for various land use strategies are given for trip generation by car, and by public transport. Moriarty (1981) studies fuel conservation and modal shifts for Melbourne's passenger transport. Newman and Kenworthy (1989) examine car dependence in 32 cities, and suggest how to remedy this.

Aerni and Surti (1976) investigate public transport and suburban shoppers. Dunn (1981) argues the case for public transport along high density corridors. Klosener (1987) suggests that public transport be made more attractive, and pedestrian zones promoted. Pushkarev et al (1977) look at public transport and land use policy. Noguchi (1982) studies transit and pedestrian incentives' effect on land use. TEST (1991) examine in detail the travel patterns of two

new cities with very different land use structures.

Black (1990) looks at walking to work, and Stewart and Mihalcin (1983) at walking to work in Toronto. In Danzig and Saaty's (1973) 'compact city' all activities are placed within walking distance. Hasell (1974) investigates pedestrian traffic generated by nine central London stores. Kent (1990) suggests that people should use their own 'muscle power', instead of fuel power, for health reasons. Labaugh and Demetsky (1974) study pedestrian planning in suburban areas and Lowe (1991) describes proposals for a 'pedestrian oasis in Manhattan'.

4.3 Purpose

The Council for Science and Society (1986) predict that work travel is likely to decline and leisure travel is likely to increase, as does Salomon (1985). The International Association of Traffic and Safety Sciences 633 Project team (1984) suggest that business travel will be replaced by electronic communication. Teleshopping could reduce shopping trips, but it was not clear which activities would replace them in the time saved, according to Keyzers and Wagenaar (1990). TEST (1991) examine trip data by purpose for Milton Keynes and Almere.

Hanson (1980) emphasizes the importance of multi-purpose journeys.

5 FUTURES

Levinson and Barbe (1981) imagine that by 2020, there will be new clustered cities where the need for travel is minimised, and solar energy is widely used. Unfortunately he gives little evidence for this prediction. Ogden, Taylor and Sewed (1985) look towards the year 2000, at factors likely to influence traffic generation and urban travel patterns. Deakin and Suhrbier (1988) look ahead towards year 2020. Owen et al (1983) look at transport futures. Keyes (1980) looks at the effect of energy on future patterns of development.

6 PLACES

Wiedenhoeft (1981) discusses an example of land use mixing at the Barbican Centre in London.

In the USA ordinances which require 'trip reduction' exist in Washington, Virginia, New Jersey and Florida, according to Deakin and Suhrbier (1988).

In Vancouver and Toronto, residential land use has been encouraged within the CBD - see Wiedenhoeft (1981) and Stewart & Mihalcin (1983).

High density land use around a fixed rail link can be seen in Kista, a new town outside Stockholm (Simkowitz [1977]). Denser land use around improved bus routes was considered for Korea's satellite towns, according to Lichfield (1981).

Shortening trip lengths to encourage non-motorised travel was investigated in Hanover by Menke (1984), while Moriaty (1980) looked at Melbourne's potential for non-motorised travel.

Van Den Berg and Klaassen (1982) used Rotterdam to show how 're-urbanisation' can work.

7 CONCLUSION

It may be concluded from this literature review that 'trip degeneration' (arranging land use so that distances between activities are decreased, and 'environmentally friendly' modes of travel are more viable) is a field which has not received the attention it merits. This is strange at a time when safeguarding the environment, reduction of personal injury accidents, and conservation of energy supplies, are high in political agendas and the perceptions of individuals.

The land use/transportation modelling process has many failings, and there is dispute about many aspects of it. Some authors single out fine points of the models to improve upon, others criticise the manner in which they are used by transport planners, and some argue that transportation modelling is an impossible task which is not worth pursuing.

The planning process is the most effective way by which the land use/transport system could be changed. Telecommunications have great potential to reduce the need for travel, but their effect on land use and transport is unpredictable. Thus, the process of 'reurbanisation', which entails high density central area revitalisation and land use mixing, has been experimented with successfully in the Netherlands.

This review therefore underlines the concern of many, in a continuum from the Commission of the European Communities to the media-educated individual, that research on land use dispositions, residential density, and associated transport facilities is overdue. But it must be action-oriented research; possible implementation methods should be paramount.

Aerni, DR and VH Surti (1976) Analysis of a Suburban Shopper Market for Public Transit: a Case Study **Transportation Research Record** n590 pp17-20
Reviews the feasibility of instituting local shopper-oriented transit services to major shopping centres or districts, comparable to that provided for CBD's.

Ansah, JA (1974) **Destination Choice Modelling and the Disaggregate Analysis of Urban Travel Behaviour** Joint Highway Research Project 74-15 Indiana USA Purdue University

Arnold, ED Jr (1985) **Trip Generation at Special Sites** Virginia USA Virginia Highways and Transportation Research Council
Traffic patterns were determined for several land uses throughout Virginia, and used with Institute of Transport Engineers trip rates to make conclusions about valid trip rates for those land uses.

Association of County Councils (1991) **Towards a Sustainable Transport Policy**
The Councils support an integrated transport policy and restraint of demand for travel. The six point plan makes clear the need for a better coordination of land use and transportation decisions at central and local government levels.

Atkins, Stephen T (1986) Transportation Planning Models - What the Papers Say **Traffic Engineering and Control** v27 n9 pp460-467
A compilation of quotes which criticises many aspects of UK transportation modelling practice.

Australian Environment Council Supplementary Strategies Working Group (1983) **Reducing Pollution from Vehicles in Urban Areas; a Report on Supplementary Strategies to Control at Source** Griffith Australian Environment Council Report 11
The report investigates various forms of control, other than direct, on emissions, focusing on passenger vehicles in urban areas. Control measures include decreasing road traffic demand, and influencing the generation and distribution of traffic.

Baillieu, A (1991) Cambridge Changes Mind on Out-of-town Retail Centres in **Planning Bulletin** 1st November 1991
Heseltine has blocked the application for four new out-of-town shopping centres in Cambridgeshire because they do not meet environmental concerns - they would all require new highway works.

Banister, D and L Pickup (1989) **Urban Transport and Planning - a Bibliography with Abstracts**

Banister, D et al (1990) **The Impacts of Land Use on Travel Demand** Working Paper 3 London Planning and Development Research Centre
The paper addresses the issue of the role of transport models in understanding the impacts of land use on travel demand and then considers the research and modelling strategies which may provide a more appropriate framework within which travel demand may be analysed.

Banister, D (1991) UK Policy on Transport and the Environment Paper Presented to **ESRC/SERC Conference on Transport and the Environment, Pembroke College,** Oxford, 12-13 September 1991
Says we need to establish the conditions under which a settlement pattern is energy efficient and environmentally efficient.

Barber, BK (1982) **Demographic Factors, Metropolitan Growth, and Trip Generation** Transportation Research Board Unpublished Report n30 pp20-23
The possibility of compact, high density living is found through examination

of demographic, public policy and economic factors.

Barnard, PO and RE Brindle (1985) Traffic Generation Estimation - Suggestions on New Research Directions in **10th Australian Transport Research Forum** v1 pp43-62 Vermont South Australia Australian Road Research Board
Conceptual problems in measuring traffic generation are outlined. Residential and retail land uses are highlighted as these demonstrate the best and worst of current practice. Recognises that traffic generation methodology is essentially flawed.

Bellamy, PH (1976) **Changes in Traffic Flow Following the Opening of a Hypermarket** SR 194 uc TRRL
Looks at changing traffic flows. Found that the hypermarket generated a considerable amount of extra traffic - about 70% of traffic in the area was generated by this new development. Distance travelled was not investigated.

Bendixson, T (1977) second edition **Instead of Cars** Pelican
In chapter 3 'There Will Always be a Neighbourhood' Bendixson argues the case for '...the opening of shops amongst and within houses...', and similar 'human scale' development, instead of regional developments.

Berechman, J (1981) Analytical Problems in Linking an Activity Model with a Transportation Network Model **Environment and Planning** A v13 n4 pp449-62
Considers various approaches to linking an activity model with a tranportation model.

Betz, Mathew J (1978) Land Use Density, Pattern, and Scale as Factors in Urban Transportation **Traffic Quarterly** 32 April pp263-72

Black, Alan (1990) Analysis of Census Data on Walking to Work and Working at Home **Transportation Quarterly** v44 n1 pp107-20
The author uses census data to examine hypotheses concerned with walking to work, working at home, and their relationships to density, land use mix and proximity, socio-economic variables, and climate. He suggests that high density development, and mixed land use planning, are sensible options to encourage walking.

Bland, BH (1982) **The 'LUTE' Land Use and Transportation Model** SR 716 TRRL
This report describes a mathematical model which can be used to study a specified land use pattern.

Bland, BH (1983) **Land Use Patterns and Travel** LR 1092 TRRL
The 'LUTE' model is tested on a number of hypothetical towns. The model found that car-ownership is lower where congestion and parking difficulties, or good access by public transport or on foot, make car-ownership less worth while. Walking is an important mode. Neither public transport subsidies nor higher density development seem to be effective methods of reducing car ownership or use. The suggestion that travel can be reduced by moving homes and jobs closer together is not supported by the model.

Blunden, WR (1971) **The Land Use/Transport System. Analysis and Synthesis** Oxford Pergamon
Basic concepts of, and problems with, land use and transport interaction.

Blunden, WR and JA Black (1984) second edition **The Land Use/Transport System** Rushcutters Bay Australia Pergamon
Land use and transport interaction theory is explained, including concepts such as equilibrium, feedback, steady state solutions analyses and planning approaches. The concepts are expanded for analysis of urban, local and regional areas, and to optimise the efficiency of land use and transport interaction.

Barukhov, E and O Hochman (1977) Optimum and Market Equilibrium in a Model of a City without a Predetermined Centre **Environment and Planning** A v9 n8 pp849-56
In this model, individuals choose locations that minimise their transport ation and housing expenditures. Results are obtained for a social optimisation and a competitive equilibrium. In both cases there is a centre where land values and density are higher, but the social optimum city is more dense owing to externalities which are not taken into account in the competitive city.

Bracken, I (1984) An Integrated Policy Based Forecasting Framework for Land Use Planning **Environment and Planning** B v11 n4 pp455-75
Forecasting methods in planning are criticised and alternatives given.

Brand, D (1973) Theory and Method in Land Use and Travel Forecasting **Highways Research Record** n422 pp10-20
Concludes that separate modelling of short-run travel demand from long-run activity location, introduces structural and statistical problems whose imp lications require further research.

Brodie, M (1978) **Traffic Generation** GLC
A bibliography with 115 references, arranged by methodology and land use.

Brog, W (1981) Application of the Situational Approach to Depict a Model of Personal Long-distance Travel **Transport Reseach Record** n890 pp24-33
A behavioural model showing that in personal long distance travel the potent ial number of persons who would change mode, if travel duration and travel costs were altered, is comparatively small. For vacation trips the type of trip may be modified, and for 'other' trips restrictive measures would result in a reduction in trip frequency.

Broughton, J (1981) **An Empirical Test of a Model for the Choice of Home and Workplace Location** LR 995 TRRL

Broughton, J and JC Tanner (1983) Distribution Models for the Journey to Work **Environment and Planning** A v15 n1 pp37-53
This model is applied to several idealised urban geometries, and then to the 1971 census data for the Manchester area, where the model satisfactorily re produces the observed pattern of choices.

Brown, N and D Gilbert (1987) Trip Generation and Distribution associated with Employment Parks **PTRC Summer Annual Meeting** University of Sussex 7-11 September
A review of trip generation rates, and a study of 19 employment parks and their traffic generation. The traffic generation characteristics of modern out-of-town developments are described.

Brown, RJ (1981a) The Role of Transport in the Management of the Total Urban System **Traffic, Transportation and Urban Planning**, v1&2 International Forum Series London Godwin
This is about planning and management of the urban system.

Brown, RJ (1981b) A Rational Approach to Trip Generation **Traffic, Transportation and Urban Planning** v1&2 International Forum Series London Godwin
A criticism of traditional four step modelling.

Buchan, Keith (1990) The Case Against (London's Road Building Scheme) **Environment Guardian** p27 February 2
Criticism of the use of models and cost benefit analysis. Argues that the crucial point is to improve accessibility instead of mobility. This would require co-ordination between land use and transport planners.

Burnett, P (1974) **Disaggregate Behavioral Models of Travel Decisions other than Mode Choice: a Review and Contribution to Spatial Choice Theory** Washington DC USA Transportation Research Board Special Report
Apart from mode choice, other variables account for travel decisions, these include perception of time, comfort, safety, convenience and others.

Buttke, CH (1983) Trip Generation in NA David (ed) **Transportation: an International Overview.** Compendium of the Technical Papers Presented at the 53rd Annual Meeting Washington USA Institute of Transport Engineers

Button, KJ (1983) **Transport Location and Spatial Modelling**
Examines how decisions in transport affect spatial policy at a regional and city level. Several case studies show how roads, airports, and ports have had effects on location.

California Business and Transportation Agency (1974) **Traffic Generators**
Data from major traffic generators are summarised.

Cervero, Robert (1986) Unlocking Suburban Gridlock in **APA Journal** Autumn
'Our best hope for forestalling suburban gridlock lies with redesigning workplaces into high-density, mixed-use clusters, strategically siting and phasing jobs and housing, introducing traffic impact fee and trip reduction programs, and encouraging employer-initiated flex-time work schedules.'

- (1989) **America's Suburban Centres - the Land Use/Transportation Link** London Unwin Hyman
The problems of suburban office growth and congestion are studied for (Suburban Employment Centres) 'SEC' groups, and three case studies. Suggestions are given for solutions to these problems.

- (1991) Land Uses and Travel at Suburban Activity Centres in **Transportation Quarterly** October 1991
He concludes that suburban residents and workers will opt for mass transit if a supportive land-use environment is provided, if transit service is quick and efficient, and if some limits are placed on automobile usage. His analysis examines the influence of density, land use mixing and parking facilities on transport demand.

Chang, H and A Wolny (1983) **Fifteenth Progress Report on Trip Ends Generation Research Counts** USA California Department of Transportation
Report of the current year's research, and summary of all research to date on trip ends generation research.

Commission of the European Communities (1990) **Green Paper on the Urban Environment. Communication from the Commission to the Council and Parliament** Luxembourg Office for Official Publications of the European Communities
'Strategies which emphasize mixed use development are more likely to result in people living close to work places and the services they require for everyday life. The car then becomes an option rather than a necessity. Strategies of this kind have already been put into motion in countries such as the Netherlands; they merit wider consideration.'

Conroy, M (1978) Accessibility and the Evaluation of Land Use Transport Plans **The 9th Australian Road Research Board Conference Proceedings**
A systems approach is used to evaluate the faults of the conventional land use transport process. Accessibility measures the choice of opportunities, instead of traffic demand. Sydney census data are used in a case study.

Council for Science and Society (1986) **Access for All? Technology and Urban Movement** Report of a Working Party London CSS
Chapter 5 investigates the impact of technological developments on the demand

for movement. Concludes that work travel is likely to decline, leisure travel is likely to increase, multi-purpose journeys are likely to increase, movement to and from the city centre is likely to become less important and people will have greater choice about when to travel. IBM, ICL, F International and Rank Xerox are a few of the companies involved in work at home activities.

Dale HM (1977) Trip Generation: What Should We Be Modelling? in **Urban Transportation Planning. Current Themes and Future Prospects** Tunbridge Wells Abacus Press

Daniels, PW (n.d.) **Office Location and the Journey to Work**
A comparative study of five urban areas concentrating on office land use. Looks at the residential locational behaviour and journey to work, of the staff from several offices in five 'decentralised' locations.

- (1980) **Movement in Cities. Spatial Perspectives on Urban Transport and Travel** London Methuen
This book describes various aspects of urban travel, i.e. distance, mode, and frequency. It draws material from various surveys of British towns, with occasional reference to the USA and Australia.

Dantzig, GB and TL Saaty (1973) **Compact City: a Plan for a Liveable Urban Environment** San Fransisco W H Freeman
A three dimensional unit, within which all activities are placed within walking distance, is suggested.

Daor, E (1981) The Effect of Income on Trip Making Behaviour in **Traffic, Transportation and Urban Planning** v1&2 International Forum Series London Godwin

Das, Mira (1979) **Travel to Work in Britain; a Selective Review** LR 849 TRRL
Reviews research on modal split, modal choice, journey length & time, spatial distribution of residences and workplaces, and broad patterns of movement in urban areas. The information is supplemented with 1975/76 travel survey data, and findings are discussed.

Dasgupta, M (1980) **Manchester Travel to Work Survey: Survey Method and Preliminary Results** SR 538 TRRL
Three areas with different socio-economic characteristics were studied. Although car ownership and license holding were similar in the inner area and outer area, workers living in the inner area used public transport more and car use was much higher in the outer area. Journey distances were higher in the outer area. In the traditional suburb, where the local employment base was strong, journey distances were shorter than those in the inner area and the proportion of walk journeys was high.

- (1983a) **Young Workers' Travel to Work: a Survey in Manchester** SR 764 TRRL
Young workers had low levels of vehicle ownership, spent more time but travelled shorter distances on their journey to work.

- (1983b) **Employment and Work Travel in an Inner Area Context** SR 780 TRRL
In inner areas there is a mismatch between the skills of the resident labour force and the types of job available. A better spatial allocation of employees to employers would be beneficial.

Davidson, KB (1978) Use of Accessibility in Metropolitan Strategic Planning **The 9th Australian Road Research Board Conference Proceedings**
The conceptual, and experimental development of a relationship between accessibility and density, together with utility measures that can be derived from it.

De La Barra, Tomas (1989) **Integrated Land-use and Transport Modelling - Decision Chains and Hierarchies** Cambridge University Press
Looks at Von Thunen, Christaller, Losch, Wingo, and Alonso models of land use, then looks at spatial interaction models, and compares these with the traditional models.

Deakin, EA and JH Suhrbier (1988) Environmental Considerations in a 2020 Transportation Plan: Constraints or Opportunities? In Transportation Research Board (1988) **A Look Ahead Year 2020** Washington DC USA National Research Council
The term 'trip reduction' is explained. 'This is a demand oriented approach to traffic management that is being increasingly utilised to manage the transportation impacts associated with commercial activities.' 'Ordinances requiring trip reduction now exist in Washington, Virginia, New Jersey, New York, and Florida, and are under consideration in many other areas.'

Dick, AC (1972) **Sixth Symposium on the Future of Conurbation Transport. Out-of-town Shopping Centres v. City Centres** pp59-66 Department of Extra Mural Studies University of Manchester
The fundamental question concerning hypermarkets is whether car-oriented shoppers should benefit at the expense of the rest of the population.

Dix MC et al (1983) **Car Use: a Social and Economic Study** Aldershot Gower
Household activities, trip generation, car use for work journeys, use and non-use of cars for journeys to school, patterns of shopping among car-owning households, travel for school and leisure activities and the role of the car are discussed.

Dorfwirth, JR (n.d.) Interrelation between Traffic and Land Use in Urban Areas **12th International Study Week** Traffic Engineering and Safety 2-7 September 1974 London World Touring and Automobile Organisation

Duffield, Brian S (1977) **Traffic Mix Model: a Methodolgy for Estimating Recreational Traffic Flows** Tourism and Recreation Research Unit University of Edinburgh.

Dunn, James A Jr. (1981) **Miles to Go: European and American Transportation Policies** pp87-90 London The Massechussetts Institute of Technology
Notes that land use strategy in the USA is '...close to the nub of the problem'. Argues the case for high density and public transport, verses low density and the car.

Dyckman, John (1965) Transportation in Cities in **Cities - a Scientific American Book** Penguin
'There is in fact no isolated 'transportation problem' in the modern metropolis; there are problems of spatial organisation of human activities.'

Eason, D A (1984) Computerised Shopping Points in the Community **PTRC Summer Annual Meeting** University of Sussex 10-13 July

Echenique, M (1977) An Integrated Land Use and Transport Model **Transactions of the Martin Centre for Architectural & Urban Studies** v2 pp195-230 Cambridge Woodhead-Faulkner
An integrated land use and transport model. The fundamental idea behind the paper is that land uses determine the traffic generation and hence transport demand in a city, and the transport, in turn, influences the location of land uses.

Echenique, M and T De La Barra (1977) Compact Land Use/Transport Models in **Urban Transportation Planning: Current Themes and Future Prospects** Tunbridge Wells Abacus Press

Edwards, JL. (1977) Use of a Lowry-type Spatial Allocation Model in an Urban Transportation Energy Study **Transport Research** v11 n2 pp117-26
This paper describes the structure of the model and the results of using it to evaluate several hypothetical urban forms with respect to energy consumption. It suggests that the 'compact' city uses less energy than the 'sprawled' city, and that non-auto-oriented cities use less energy than auto-oriented cities.

Elkin, T and D McLaren (1991) **Reviving the City** London Friends of the Earth
Contains a chapter on suggestions for a transport system for a sustainable urban environment. The strategy is to move towards compact, self-contained urban settlements, to discourage commuting, to avoid over-centralisation in metropolitan areas and to develop public transport corridors within them.

European Conference of Ministers of Transport (1976) **Impact of the Structure and Extent of Urban Development on the Choice of Modes of Transport** Paris ECMT
The study agreed that while the existence of a centre was an essential feature of almost every town, there was a level of concentration at which dispersal becomes necessary. The study tried to address whether activities could be classified according to their capacity for deconcentration. Type of economic activity has a major impact on transport, particularly affecting the operation of public transport.

- (1982) **Report of the 59th Round Table on Transport Economics: Transport and Telecommunications** Paris ECMT
Defines the concept of telecommunication, looks at its traditional applications - demand management and traffic control, and the prospects for its application in paratransit and freight transport. Rules out the notion that telecommunication could be a complete substitute for transport. How far telecommunications become a substitute for transport will depend on profitability, comparing economic costs and energy consumption. In terms of cost and energy, telecommunication has a viable potential. Social and political effects of telecommunication should not be ignored. Assesses levels of substitution for various kinds of communication.

Gerardin, B (1980) Interrelationships between Land Use and Works Transport in France **PTRC Summer Annual Meeting** University of Warwick

Glancey, J (1991) in **The Independent**, 6th November 1991
The business park is moving from the outer reaches of the suburbs towards town centres, where it will no longer be dependent on the car.

Godard, X (1983) Presentation of Some of the Results of the Dijo Survey: Linkage between Activities and Mobility in **Recent Advances in Travel Demand Analysis** Hampshire Gower

Goodwin, P (1975) Variations in Travel between Individuals Living in Areas of Different Population Density **PTRC Annual Summer Meeting** University of Warwick 7-11 July

Green Party (1991) **Road to the Future** London The Green Party
Takes as its starting point, 'our current transport system is in a mess'. Examines the present transport problem and suggests policies for alleviating it; focusses on reducing 'the need for transport, providing for the needs of the community...on a much more local level..(to) substitute mobility for the few with accessibility for all.

Grenter, B (1977) Accessibility and its Application to a Dynamic Model of Spatial Land Use Distribution **Transport Decisions in an Age of Uncertainty Proceedings of the 3rd World Conference on Transport Research** 26-28 April

pp559-85 Rotterdam Netherlands Martinus Nijhoff
The methodology, and some results of an investigation into interrelationships between transport and urban development in monocentric urban areas, are given. The model was tested for two types of land use, and several policy measures were analysed with respect to their long-term impact on access (bility.

Gustafson, RL (1973) Empirical Study of Factors Influencing Trip Attraction and Trip Generation **High-speed Ground Transport** v7 n3 pp307-21
An investigation of person movements in the Detroit metropolitan area show that the number of trips, and the distance individuals are willing to travel, are primarily influenced by the automobiles available, the urban density of the destination, and the income of the traveller.

Hallett, Sharon (1990) **Drivers' Attitudes to Driving, Cars and Traffic – Analysis of the Results of a National Survey** Rees Jeffreys Road Fund
This paper is a survey of people's reactions to the forecast growth in traf fic. Indentifies key variables determining people's attitudes to driving and car ownership. Drivers appear to recognise the problems vehicles cause. How ever, the attachment of most people to their car is such that it will take some positive action from outside to force any real reduction in traffic.

Hanson, S (1980) The Importance of the Multi-purpose Journey to Work in Urban Travel Behaviour **Transportation** v9 pp229-48
The study shows the importance of the multi-purpose work trip in the overall travel pattern of the urban household. A large proportion of many house holds' total travel is undertaken in conjunction with the journey to and from work. Many types of urban establishments depend heavily upon stops made in connection with the work trip. The study examines the implications of the multi-purpose journey to work, for policies regarding mode use and the viab ility of centrally-located urban functions.

Harris, P (1987) Linear Villages Could Revive the Railways in Surveyor 22 October 1987
Using rural railway lines as a focus for the development of linear villages, where no-one lives more than a 10 minute walk from the station, can counter the economic domination of major conurbations, as well as improving and maintaining some aspects of the quality of rural life. Uses the example of the Milton Keynes to Oxford line.

Hasell, BB (1974) Pedestrian Traffic Generated by Retail Stores in Central London **Traffic Engineering and Control** v15 n12/13 pp566-70
A study of pedestrian traffic generated by a sample of 9 large and medium-sized stores in Central London. Found that the pedestrian generation rate varies with store size and type. The generation rate is lower for the department stores and tends to decrease as the size of the store increases.

Hasell, BB JL Holloway and KGC Johnston (1973) **A Summary of the Results of Traffic Generation Studies** GLC: Department of Transportation and Planning
Traffic generation studies for different types of land use in the UK are compared to those overseas.

Hautzinger, H and P Kessel (1977) The State of Mobility Research **Transport Decisions in an Age of Uncertainty, Proceedings of the 3rd World Conference on Transport Research** pp551-58 Rotterdam Netherlands Martinus Nijhoff
The concept of mobility is defined and described. The influence of land use is discussed, and the changes of mobility with economic progress, social developments, and transport supply conditions are examined.

Hensen, RJ (1988) Trip Generation Rates for Different Types of Grocery Store **Institute of Transport Engineers Journal** v58 n10 pp21-22
Disputes the trip generation rates for superstores and warehouse grocery stores reported in the Institute of Transport Engineers' publication 'Trip Generation'.

Hensher, DA (1976) The Structure of Journeys and Nature of Travel Patterns **Environment Planning** v8 n6 pp655-72
At a conceptual level, and with limited empirical evidence, the implications of changes in land use configurations on the structure of journeys are examined. Policy implications are given for urban areas.

Highways Research Board (1973) **Land Use and Transportation Planning; 5 Reports** Washington Highways Research Board
Reports on the following subjects are included: theory and method in land use travel forecasting, practical implications of some fundamental properties of travel demand models, use of TOPAZ for generating alternate land use schemes, use of random search technique to obtain optimal land use plan design.

Hill, S (1991) **Energy Conscious Planning** London CPRE
The main political parties agree that planning strategy can reduce energy use and global warming by discouraging car-intensive developments; however the government has taken an ambivalent attitude and authorities are worried about whether they can treat energy-efficiency as a planning issue. The report suggests that planning policies could restrict traffic growth and encourage public transport, cycling and walking.

Hillman, M (n.d.) Interrelationship between Traffic and Land Use in Urban Areas **12th International Study Week** Traffic Engineering and Safety 2-7 September 1974 London World Touring and Automobile Organisation

Hillman, Mayer and Ann Whalley (1975) Land Use and Travel **Built Environment Quarterly** v5 n4 pp105-11
Car use increases with distance between origin and destination. Emphasizes the need for '...economies of travel rather than economies of scale', and discusses accessibility verses mobility.

- (1977) The Interactions of Lifestyles with Residential Location in **A Policy For Transport.** The Nuffield Foundation

Hillman, Mayer Irwin Henderson and Ann Whalley (1976) **Transport Realities and Planning Policy** London Policy Studies Institute
An in depth study of the travel patterns of a variety of social groups. Recommends proper regard to be given to all groups in the population and the travel methods they use. '...adequate consideration should be extended to the local nature of much daily activity, and to the relevance of proximity and non-motorised travel.'

Hodgkin, KE (1980) Real-life Influences on Action and on Long Term Benefits **Can Traffic Management Reduce Vehicle Fuel Consumption and Affect Vehicle Design Requirements. Two Day Seminar and Workshop** 1-2 July Australia
Comments on the influence of land use policies on transport. Concludes that the investigation of individual problems in the fuel conservation/emissions field should take note of the total land use/transport situation.

Holzapfel, H (1980) Time, Space and People's Behaviour Over Distance **PTRC Summer Annual Meeting** University of Warwick 7-10 July

- (1986) **Trip Relationships in Urban Areas** England Gower

Hurst, MEE (1970) An Approach to the Study of Non-residential Land Use Traffic Generation **Annals Association of American Geographers** v60 n1 pp153-73
Discovers a functional relationship between land use and traffic volume, with location and intensity of use also important variables.

Hutchinson, BG (1975) Tools for Urban Land Use - Transport Strategy Planning **Canadian Journal of Civil Engineering** v2 n1 pp85-97
Because transport studies are directed toward demand, this study attempts to isolate those concepts which might lead to costly and intractable infrastructure problems. A model is described.

Huth, M (1983) Toward a Multi-nodal Urban Structure **Transportation Quarterly** v37 n2 pp245-62
Gives examples of Denver, and Minneapolis-St.Paul. A 'Christaller'-like approach is taken.

Illich, Ivan D (1974) **Energy and Equity** London Calder and Boyars
Illich argues energy intensive transport causes social inequalities and environmental disbenefits. He advocates the limiting of traffic to solve the energy crisis and redress social inequalities.

Ingram, GK (1980) The Interaction of Transportation and Urban Land Use in Solomon, A (ed) (1980) **The Prospective City** London MIT Press
Predicts that suburban growth will continue. Employment may spread to the suburbs.

Institute of Transport Engineers Technical Council Committee 6A 32, (1987) **Trip Generation** fourth edition Washington DC USA Institute of Transport Engineers
This edition contains data from approximately 1950 individual trip generation studies. Trip generation rates were calculated for weekday Saturday and Sunday, peak hours of the generator, and for one hour when the adjacent street traffic is at its peak. Includes 219 references.

International Association of Traffic and Safety Sciences 633 Project Team (1984) The Substitution and Complementary Relationships between Traffic and Communication. **IATSS Research** v8 pp3-13 Tokyo Japan IATSS
The project attempts to clarify the problems and possibilities of traffic substitution by communication. Business generated traffic can be substituted by electronic communication to create more efficient information flows. Focuses on work-at-home aspects.

International Bank for Reconstruction and Redevelopment (1976) **Travel Characteristics in Cities of Developing and Developed Countries** Staff Working Paper No 230
The paper explores the systematic components of cities in developing and developed countries; it aims to contribute to a better understanding of the interaction between travel demand, the transportation supply system and urban structure.

Jefferson, TR P Walsh RW Gibberd and CH Scott (1978) Forecasting the Effects of Changes in the Work-place Locations on the Residential Development and Trip Generation **Australian Transport Research Forum, 4th Annual Meeting, Forum Papers** pp549-66
An entropy model is developed which gives the most probable residential development for given changes in work-place. When applied to a sample city, the model gives estimated residential location changes and imputed trip origin and destination costs.

Jones, P MI Clarke MC Dix and I Heggie (1980) **Understanding Travel Behaviour** Oxford University Transport Studies Unit Report
Produces a model of travel behaviour. Critical of the four step model because it has limited behavioural assumptions.

Jones, P (1983) The Practical Application of Activity-Based Approaches in Transport Planning in **Recent Advances in Travel Demand Analysis** Hampshire Gower

- (1990) (ed) **Developments in Dynamic and Activity-Based Approaches to Travel Analysis** Aldershot Avebury

Jones, TSM (1977) **Young Children and their School Journey. A Survey in Oxfordshire** SR 342 TRRL
Distance is the most important factor affecting childrens' travel to school patterns. For distances less than 0.8 km 80% walked, but for distances more than 1.6 km 94% travelled by bus or car.

- (n.d.) **The School Journey: an Approach to the Study of Local Trip Behaviour** Oxford Polytechnic Department of Town Planning
There is a problem, that children are often transported small distances to school by car. This report attempts to discover why and find some solutions.

Jordan, JD (1972) Distribution Patterns of Automobile Travel in the New York Metropolitan Area **Transport Research Record** n392
A home interview survey revealed that the supply of expressways had a minimal effect on the generation and distribution of automobile trips. The residents of suburban communities generated twice as many vehicle miles as residents living in the denser urban areas.

Kamali, AR and GP Crow (1988) Additional Journeys Generated by Out-of-Town Retail Developments **Highway Appraisal and Design** p307 PTRC Education and Research Ltd
Results of a study done at Imperial College to determine additional traffic generated by out-of-town supermarkets.

Kanafani, A (1983) **Transportation Demand Analysis** New York McGraw-Hill
Demonstrates that traffic estimation is not an exact science and reviews models.

Kellogg, MH (1974) **An Investigation of the Use of Accessibility in Direct Generation Models** Virginia USA Virginia Polytechnic Institute and State University
The primary objective of this study was to determine how characteristics of transport systems affect travel demand. Only car driver and bus passenger data were investigated. Number and mode of trips were related to socio-economic, land use, demographic and modal accessibility measures. Accessibility measures were developed and analysed for their importance in explaining the number of trips by mode.

Kent, Anne (1990) Dump Iron, Jump off the Treadmill... and Keep Fit **The Sunday Correspondent** p44 February 4
People rely on wheeled transport instead of using their legs. Physical activity should be woven into the fabric of daily life, by using muscle power to travel less than a mile or two.

Kenton, E (1980) **Multimodal Transportation Planning June 1972-1980 (A Bibliography with Abstracts)** Virginia USA National Technical Information Service
Areas covered include passenger and freight for urban and intercity corridors, multimodal systems, planning and programming, models, forecasting and management. Contains 102 Abstracts.

Keyes, DL (1980) The Influence of Energy on Future Patterns of Development in AP Solomon (ed) **The Prospective City**

- (1982) Energy for Travel: the Influence of Urban Development Patterns Transportation Research 16A (1) pp65-70
New urban development needs to be located to reduce the demand for travel, and to conserve energy. 49 US metropolitan areas were tested. Results suggest that medium size cities with clustered residential densities, are associated with lower per capita petrol consumption.

Keyzers, ECM and PJM Wagenaar (1990) Teleshopping in **Research Notes from the Netherlands** p35 Amsterdam SISWO
Study looks at the main motives for, and the population groups which are teleshopping. Found that the total number of shopping trips appear to have decreased, but there is not a clear substitution of other activities during the time saved.

Khasnabis, S and WF Babcock (1977) Analysis of Freeway Impact in Five Urban Areas in North Carolina in **Transport Research Record** n638 pp26-32
The impact of highway facilities on land use changes and traffic generation is studied. The study showed that the these new facilities had a definite impact on the overall shaping of urban structure.

King, RJ (1990) Urban Housing Market Change as a Context for Transport Change: Some Approaches to Analysis **Transport Reviews** v10 n1
Explores residential location decisions as a context for transport and communications change. Policy implications are developed, including those for reducing travel.

Klaassen, Leo H Jan A Bourdrez and Jacques Volmuller (1981) **Transport and Re-urbanisation** Aldershot Gower
Investigates the demand and the supply side of this concept. Instead of the polarisation of work places and homes in the central area and the suburbs, the authors advocate the centralisation of residences and the decentralisation of industry, so that distances between the two reach equilibrium, therefore reducing traffic volumes.

Klassen, L and J Van Der Meer (1987) Urban Change and Public Transport in **International Journal of Transport Economics** Volume XIV No 2
Travel-to-work behaviour is strongly dependent on the dynamic geography of homes and workplaces. A more efficient use of the transport system could be reinforced by an urban policy emphasising the importance of the central metropolitan area for location of high-grade services and activities, whilst offices should preferably be located in 'decentral business districts'.

Kloesener, R (1987) Growing Danger in the Inner City **PTRC Annual Summer Meeting** University of Bath 7-11 September
The results of a survey on retail travel in Germany. The study examined changes in car ownership, changes in the distribution of the population and housing, and the increase in floor space. How these changes affected retail turnover (of shops, department stores and shopping centres), mode of travel and catchment area were investigated. It argues for retaining the 'hierarchical concept of central places' in planning, public transport made more attractive, traffic free and pedestrian zones promoted, and accessibility improved.

Koenig, G (n.d.) Urban Accessibility; a New Concept in the Interrelation of Urban Traffic and Land Use **12th International Study Week** Traffic Engineering and Safety 2-7 September 1974 London World Touring and Automobile Organisation

Kostynuik, LP (1976) Effect of Gasoline Shortage on Acceptability of Modes for the Urban Grocery Shopping Trip **Journal of Environmental Systems** v8 n1 New York Beywood Publishing Company
Differences in perceived acceptabilities of modes for the urban grocery shopping trip, brought about by imposing a constraint on the availability of gasoline, are examined. Results show that differences exist between popula tion categories.

Krell, K (1981) Using Urban Planning Concepts to Reduce Travel and Improve the Environment in **Traffic, Transportation and Urban Planning.** v1&2 International Forum Series London Godwin
'Rejoining work and living places.' If work places, stores and parking areas were built in a ring around living areas, travel demand would reduce, the living environment improve, and transport become more efficient. An illust ration is provided.

Krummes DC (1985) **Trip Generation: a Bibliography** Berkeley USA University of California
This bibliography presents trip generation case studies and estimates arrang ed by land use type. Works are cited from 1965 to 1985.

Labaugh, WC and MJ Demetsky (1974) **Pedestrian Planning in Suburban Areas - a State of the Art Review** USA Virginia Highway and Transportation Research Council
This study develops general guidelines for planning and evaluating suburban pedestrian systems. A review of literature was used to evaluate the effec tiveness of walking as a means of transport. Total walking distance emerged as the dominant constraint to pedestrian demand, with few people willing to walk more than one mile, and a majority unwilling to walk more than half a mile. These findings are tested in volume 2 of the report.

Lalani, N (1986) Trip Generation for Mixed Use Developments in **Planning For Special Event and Multi-use Facilities** Institute of Transport Engineers District 6/District 7 Joint Annual Meeting Canada ITE

Last, A and AJ Daly (1975) Modelling the Walk Mode **PTRC Annual Summer Meeting** University of Warwick 7-11 July.

Leake, GR and JE Gray (1975) Industrial Trip Generation - An Overview **PTRC Annual Summer Meeting** University of Warwick 7-11 July

Lefèvre, Bruno (1980) The Impact of Microelectronics on Town Planning in Tom Forester (ed) **The Microelectronics Revolution** Oxford Blackwell
Discusses the availability and growth of various technologies. Describes the range of microelectronic services and discusses their potential impact on society.

Levinson, HS and HB Barbe (1981) 21st Century Metropolis: A Land Use and Trans port Perspective **Traffic, Transportation and Urban Planning** v1&2 Inter national Forum Series London Godwin
A subjective view of how the land use and transport system will have changed by the 21st century.

Lewis, JP and Bridges (1974) The Two-Stage Household Shopping Model Used in the Cambridge Sub-Region Study **Regional Studies** v8 n3/4 pp287-97 Oxford Pergamon
A detailed survey of where households, in sample settlements, do different kinds of shopping. This was used to predict the distribution of all households in the Cambridge sub-region.

Lewis, Sherman (1988a) Travel Demand Modelling - The Failure of Public Policy **The Quarterly Journal of the Neighbourhood Systems Association** v3 n1
'Computer models take land use and subsidized travel demand as a given', and determine how much extra capacity is needed to meet that demand. There are three ways of increasing efficiency without increasing capacity: increasing vehicle occupancy, relocating people within the existing land use pattern, improving patterns of land use in order to minimise distances travelled.

- (1988b) Bibliography on Neighbourhood Systems **The Quarterly Journal of the Neighbourhood Systems Association** v2 n4
This bibliography looks at literature for the purpose of '...systematically comparing and evaluating dispersed, car-dependant suburbia with dense, walking/transit-based urbia.'

Lichfield, N (1981) Transportation and Land Use Planning **Traffic, Transportation and Urban Planning** v1&2 International Forum Series London Godwin
Suggests that denser linear urban patterns are more fuel efficient than sprawling concentric patterns, and points out that land use planning is likely to achieve more in developing countries due to their high city growth rates.

Local Government Operational Research Unit (1979) **Interaction Analysis in Structure Planning. A Transport Case Study** RR 28 LGORU Report c262 London DoE DTp
This study investigates ways of detecting and analysing interactions between transport and other land uses, and criticises conventional transport modelling. It is accompanied by a literature review, selected to demonstrate the need for simple models of interaction and justify the need to break away from conventional models.

London Borough of Brent (1986) **Tesco, Neasden: A Study of the Retail Impact** London Borough of Brent

London Research Centre (1991) **Traffic Growth and Planning Policy** London The Royal Town Planning Institute
The paper contains a chapter examining the relationship between transport, land use and the environment. In particular it identifies issues which will need to be addressed in future planning ventures, if transport and environmental problems are to be avoided.

Lowe, MD (1991) Taming New York's Mean Streets in **World Watch** Vol 4 No 2 Washington Worldwatch Institute
Comments on proposals put forward by the Auto-Free New York Committee to create a 'pedestrian oasis in Manhattan', with reference to other pedestrianisation schemes.

- (1991a) **Shaping Cities: The Environmental and Human Dimensions** Washington Worldwatch Institute
The number one way to make cities liveable - and to keep them from continually sprawling into the surrounding countryside - is to make them more compact, allowing building only within existing urban boundaries.

Mackett, RL (1976) A Re-examination of the Transport Demand Model **Transport Engineering and Control** v17 n6
Criticism of traditional four step modelling, in favour of a model integrated with a dynamic model of urban activity, and stock allocation.

- (1983a) **The Leeds Integrated Land-use Tranport Model (LILT)** SR 805 TRRL
Description of this model.

- (1983b) **The Impact of Transport Policy on the City** SR 821 TRRL
This report describes the effects of policies used in the Leeds model. The LILT model was used to predict their likely effects. Policies affecting the cost of car and bus travel, and for alleviating inner city problems, are tested.

- (1983c) The Inter-relationships between Travel and Locational Decisions in **Recent Advances in Travel Demand Analysis** Aldershot Gower

- (n.d.) **Integrated Land Use Transport Models**
A review of computer models. Criticises 4 model types: regression, mathematical programming, aggregate spatial interaction, and individual choice.

Macnab, MA (1984) The Provision of Local Shopping Facilities in an Urban Area of Restraint. **PTRC Summer Annual Meeting** University of Sussex 10-13July

Madden, JF (1981) **Why Women Work Closer to Home** Urban Studies p169

Madhav B (1970) **Public Transport and High Density Housing** University of London
However the best possible combinations of work places and housing locations are planned, there will always be a unique response from the people, mainly influenced by the interaction of house prices and transport costs.

Melvyn, D and ML Olsson (1975) **Transportation and Metropolitan Development** Washington DC USA The Urban Institute Working Paper 5049-07
Reviews the interrelationship between transportation and urban development.
Part 1 covers the effects of transport on land use, and discusses how travel times and costs influence locational choices and metropolitan form.
Part 2 reviews how transportation variables are influenced by alternative land uses and metropolitan form.

Maunder, DAC PR Fouracre MG Pathak and CH Rao (n.d.) **Household and Travel Characteristics in Two Residential Areas of Delhi, India 1979** SR 673 TRRL
The results of a survey undertaken in 2 contrasting socio-economic areas in Delhi.

Maunder DAC (1984) **Trip Rates and Travel Patterns in Delhi, India** RR 1 TRRL
The objective of this research was to analyse the factors affecting trip rate and modal choice in Delhi, and to identify the travel problems of low income groups.

May, Anthony (1990) Demanding Too Much of Transport? in **Local Transport Today Conference - Environmental Policy in Local Transport**
Found that the largest single cause of traffic growth has not been people making more journeys, but people travelling further to carry out the same activities. Ways of reversing this trend, should enable journey purposes to be satisfied closer to home and by less intrusive means. Potential solutions require integrated land use/transport planning.

Melbourne and Metropolitan Board of Works Planning Branch (1979) **Some Transport Implication of Containment** Australia Melbourne and Metropolitan Board of Works
The report examines the transport implications of various land use scenarios for Melbourne. The 4 strategies examined are: continuing dispersal of central area activities to the suburbs, centralised city, decentralised city, and balanced growth city. Estimates of trip generation and distribution for cars and public transport are given.

Menke, R (1984) Man and His Transport Behaviour. Part 2b - Non-Motorised Travel and the Regional Structure of Land Use **Transport Reviews** v4 n2 pp189-200
Out-of-town development has resulted in additional trip generation. To minimise the use of private transport, good conditions for walking, cycling and public transport must be offered. Mobility will increase if destinations are nearby and can be reached with little time and expense. The hypothesis that the inhabitants of favoureble locations have shorter trips to reach most destinations, and make less use of cars through using non-motorised modes, is made. A case study of the Hanover region is presented.

Middleton, G (1978) Prediction of Pedestrian Traffic **Joint ARRB/DOT Pedestrian Conference Sydney** South Vermont Australia Australian Road Reserch Board
This paper indicates the procedures developed for estimating pedestrian trips. Examples include predicting central city walkway flows, pedestrian movements across cordons in urban areas, and the likely pedestrian activity in the vicinity of a major unit generator.

Middleton, M (1991) **Cities in Transition** London Penguin Group
Examines the type of governmental structure necessary to achieve the environmental objectives that we set ourselves and stresses the need for public participation in the planning of the urban environment.

Miller, CE (1980) **Telecommunications Transport Substitution; some Empirical Findings** Socio-Economic Planning Sciences

Mitchell, R and C Rapkin (1954) **Urban Traffic - a Function of Land Use** New York Columbia University Press
Pioneer of a mass of literature on the relationship between transport and land use. Traffic is a function of activities and their location.

Monheim, R (1990) Reorienting Traffic Planning in German Cities, in **Alternative Transportation Network** v1 n1

Moriaty (1981) Fuel Conservation and Modal Shifts in Melbournes Passenger Transport **Australian Road Research** 11

MTRU (1990) **Wheels of Fortune**
Says that one of the objectives of transport planning should be to co-ordinate transport planning with land use and economic development with the aim of minimising the overall need to travel.

Nairn, RJ JF Field and GR Parker (1977) Land Use/Transport Interaction Modelling with TRANSTEP **Forum Papers of the Australian Transport Research Forum: Third Annual Meeting** 24-25 May Melbourne Victoria Australia Victorian Ministry of Transport
The TRANSTEP model derives changes in travel due to land use or transportation changes, and is suitable for impact evaluation. It graphically outputs contours, showing zones of imbalance between employment and potential employment.

Naroff, JL and BD Ostro (1980) The Impact of Decentralisation on the Journey-to-Work and Pollution **Economic Geographer** v56 n1 pp63-72
This paper examines the relationship between urban spatial development, the journey-to-work, and central air quality. A two-step model examines the effects of population/employment dispersion on car-trip generation, and the effects of this generation on central pollution. One suggestion made is that both population and job dispersal are significant in determining trip making activity.

Nerad, Z (n.d.) Interrelation between Traffic and Land Use in Urban Areas 12th **International Study Week** Traffic Engineering and Safety 2-7 September 1974 London World Touring and Automobile Organisation

Newman, P and J Kenworthy (1980) Public and Private Transport in Australian Cities. The Potential for Energy Conservation through Land Use Change. **Transport Policy and Decision Making** 1 (2/3) pp149-67
Attempts to explain the difference between public and private transport, and per capita energy consumption, by reference to a number of land use and non-land use variables in 5 Australian cities. The non-land use variables were not considered adequate to explain the differences in transport and energy patterns, but density, centralisation and traffic restraint characteristics correlated with the seven key transport parameters. A policy was recommended to promote energy conservation.

- (1988) The Transport Energy Trade Off: Fuel Efficient Traffic verses Fuel Efficient Cities **Transportation Research** 22,3 pp163-74
In Perth, though vehicles in the central areas have a 19% lower fuel effic iency due to congestion, the central area residents use 22% less fuel, on average, due to locational advantages.

- (1989) **Cities and Automobile Dependance: an International Source Book** Gower
Data on urban form, transport and fuel consumption for 32 cities in the developed world. Describes the concept of 'reurbanisation' which involves more intensive land use. It emphasises city centres and sub-centres, less car dependance and more walk/bike/bus useage.

Newman, P, J Kenworthy and T Lyons (1990) **Transport Energy Conservation,** Policies for Australian Cities, Strategies for reducing automobile dependence Perth Murdoch University
One of the recommendations for the Australian government is that the Federal Government should develop an integrated approach to urban policy and transport policy in order to reverse the patterns of automobile dependence facilitated by the past decade of road funding. Ideas include: rail-land use integration, increasing population densities and the changing philosophy of urbanism.

New South Wales Traffic Authority and Environment Commission (1980) **Land Use Traffic Generation; Data and Analysis - Summary** Rosebery Australia New South Wales Traffic Authority
Summary of the results at thirteen land uses. Information was gathered on peak vehicular flows, the vehicular flows at the peak time of the adjacent street system, and the parking provision necessary if the parking demand is to be met without constraint. Detailed reports for each specific land use are available.

Nilles, Jack M et al (1976) **The Telecommunications Transport Trade-off - Options for Tomorrow** USA Wiley J & Sons
Summary of a research programme begun in 1973 in the University of Southern California. Expands and revises existing research which investigates public policy aspects of potential telecommunications, as an alternative to transportation.

Noguchi, T (1982) Shaping a Suburban Activity Centre through Transit and Pedestrian Incentives - Bellevue CBD Planning Experience **Transport Research Record** n861

Norris, BB and GA Shunk (1986) Special Purpose Travel Surveys **Transport Research Record** n1097 pp20-22
An average household made 8.68 trips per day, a rate that has remained fairly

stable since 1964. Person trips per person and vehicle trips per person, however, have had a pronounced increase since 1964 reflecting the smaller household size and lower vehicle occupancy rates of the recent decade.

Ogden, KW (1977) An Analysis of Urban Commodity Flow **Transport Planning and Technology** v4 n1 pp1-9
This paper is concerned with the demand for urban freight, and analyses the characteristics of commodity consignments. Data for Melbourne, Australia, is used. The mass and length of consignments, by commodity and land use, are reviewed.

Ogden, KW SG Ritchie and PL Dumble (1980) An Analysis of Truck Trip Generation in Melbourne, Australia **10th Australian Road Research Board Conference, University of Sydney Proceedings** v10 n5 pp131-43 Vermont South Australian Road Research Board
Reviews freight generational and operational characteristics, in particular - daily trip generation rates and distances travelled. Implications for transport authorities are discussed.

Ogden, KW MAP Taylor and N Szwed (1985) **Traffic Analysis Towards 2000** Civil Engineering Working Paper 86/1 Clayton Australia Monash University
This paper considers some factors likely to have a significant effect on traffic generation and urban travel patterns. These are considered under three headings - demographic and lifesyle, economic, and technological.

Organisation for Economic Co-operation and Development, Road Research Group (1974) **Urban Traffic Models: Possibilities for Simplification** Paris
Contains an evaluation of the major model components such as changes in land use, public transport, new modes, traffic restraint, parking and pedestrians. It also reviews conventional transportation models and demand/supply equilibrium models.

- (1977) **Transport Requirements for Urban Communities: Planning for Personal Travel** Paris
The group studied transport 'needs' based on realistic measures, rather than on 'demand' measures. '...there is no guarantee that greater mobility leads to greater satisfaction...'.

- (1979) Background Report 8: Land Use in **Urban Transport and the Environment** Seminar Organised by the OECD in Cooperation with ECMT.
If less land was devoted to transport and more to other land uses, the environment would be improved.

Owen, Wilfred (1972) **The Accessible City** Washington DC USA The Brookings Institution
Chapter 3, 'Urban Goals and Community Design', describes examples of clustered land use e.g. the Pepys estate on the Thames. The chapter argues in favour of changing land use to minimise travel and increase access.

Owen, W et al (1983) Changing Concepts of Transportation **Transportation Quarterly** April v37 n2 pp166-93
This paper sets a perspective for looking at the past and future of transport, then goes on to look at evolving issues, the impact of communications and finishes with a discussion.

Owens, Susan E (1979) Energy and Settlement Patterns **Built Environment** v5 n4
By seeking land use patterns which reduce the need for energy, and into which energy saving technologies can be introduced, planners can aid energy conservation.

Peacock, A (1971) **Traffic Generation by Land Use. A List of References** GLC: Planning and Transportation Branch
51 references under the headings - Land use and transportation, methodology, surveys, and traffic generators.

Pickup, L (1981) **Housewives' Mobility and Travel Patterns** LR 971 TRRL

Pickup, L and SW Town (n.d.) **A European Study of Commuting and its Consequences** TRRL
This report includes a background to commuting patterns and policy, some possible effects of commuting, a summary of the processes that affect travel behaviour, and a discussion of wider contexts and future research.

- (1983) **Commuting Patterns in Europe; an Overview of the Literature** SR 796 TRRL
Summary of a study carried out by TRRL on behalf of the European Foundation for the Improvement of Living and Working Conditions. It describes commuting patterns and policies in each member state of the EEC. Research is examined on the processes involved in modal and residential choice.

Plane, David (1986) Urban Transportation: Policy Alternatives in Susan Hanson (ed) **The Geography of Urban Transportation** New York Guilford
'Decentralize centralisation' zoning plans need to be rethought. Cites Phoenix Arizona, as a case study which used 'A polycentric city plan following the urban village concept...'. Political boundaries prevented this plan from being effective.

Plowden, Stephen (1983) Transport Efficiency and the Urban Environment. Is there a Conflict? **Transport Reviews** v3 n4 pp363-98
The excessive use of vehicles can be reduced by paying attention to policies encouraging walking, cycling, and improving goods distribution. Also locational policy, development control, vehicle design and taxation could be used to reduce vehicle dependance. Notes that new towns provide an excellent opportunity to use land use policy for reducing travel.

- (1985) **Transport Reform; Changing the Rules** London Policy Studies Institute
Chapter eight on 'Land Use and Locational Policy', outlines the importance of minimising journey costs, and hence lengths, mode change etc., and describes opportunities for implementing such a policy. The chapter also looks at locational policy and freight transport.

Plowden, Stephen and Mayer Hillman (1984) **Danger on the Road: the Needless Scourge** London Policy Studies Institute
Chapter 7, 'Land use and locational policy', shows that the excuse often use to reject land use reform as a means of reducing traffic - that it takes too long and is costly - is invalid. The chapter explains the objectives of land use policy, its means of influence, and current practice.

Potter, Stephen (1976) **Transport and New Towns** Milton Keynes The Open University New Towns Study Unit
Case studies of new towns in Britain illustrate the (in)flexibility of the current land use pattern, and why land use and transport systems, capable of accomodating widely different transport needs, have not been used in new towns when it is clearly possible.

Powell, AE (1972) City Centres and Parking Policies **Sixth Symposium of the Future of Conurbation Transport** pp44-58 University of Manchester
Describes the importance of the city centre as a traffic generator. Details are given for the three largest English conurbations of the number of trips associated with the city centre, as compared with the rest of the conurb-

ation. Argues that a policy of traffic restraint by parking control will be necessary.

Pushkarev, B and Jeffrey M Zupan (1977) **Public Transportation and Land Use Policy** Indiana University Press

Putman, SH (1976) Further Results from the Integrated Transportation and Land Use Model Package (ITLUP) **Transport Planning and Technology** v3 n3 pp165-73
This paper reports the first successful attempt at a full integration of land use and transportation models.

- (1983) **Integrated Urban Models - Policy Analysis of Transportation and Land Use.**
Reviews various models.

Real Estate Research Corporation (1974) **The Costs of Sprawl** Washington DC US Government Printing Office
The cost of a planned high density community - 19 units per acre - would be 44% lower than the costs of unplanned low density sprawl.

Reilly, WK (ed) (1973) **The Use of Land: a Citizen's Policy Guide to Urban Growth** New York USA Thomas Y Crowell Co

Renner, M (1988) Rethinking the Role of the Automobile **Worldwatch Paper 84** Washington Worldwatch Institute
He gives a full account of the influence of the car on all aspects of society and says that the reorientation of transport priorities can only be successful within the framework of a comprehensive urban policy; this is because there is a symbiotic relationship between land use patterns and transportation networks. Public transport systems can facilitate more compact land use, while land use patterns frequently determine transportation needs. If suburb communities are to become sustainable, they need to become more self- contained.

Rigby, JP (1978) **Access to Hospitals; a Literature Review** LR 853 TRRL
Examines literature from the fields of transport, town planning and medical care, to determine the current pattern of hospital accessibility and expected result for access and location.

- (1979) **A Review of Research on School Travel Patterns and Problems** DoE DTp TRRL SR 460
Compares research on journeys to primary and secondary schools. About four fifths of journeys to primary schools are short and made on foot, while journeys to secondary schools are longer and are more likely to use motorised transport. Travel mode is influenced mainly by journey length, school type and location, and household car ownership.

Ripa di Meana, C (1991) Mobility and the City Environment: Scenarios for a Sustainable Future in **Mobility and the Urban Environment** Fiat
Concentrates on the car and its impact on city development. States that car use gives rise to undesirable social, environmental and economic effects. Acknowledges the conflict between the desire to reduce these impacts and society's present 'addiction' to cars, and outlines four scenarios for future mobility. Concludes that 'our priorities of access and mobility need to be redefined.'

Roberts, J and P Rawcliffe (1991) Fission or Fusion? in **Civilising Transport, Proceedings of Seminar A of the PTRC 19th Summer Annual Meeting** pp37-45 London PTRC Education and Research Services Ltd
Gives a brief review of settlement evolution and the influence that the car

has had on it. Takes the view that cities should be centripetal rather than centrifugal; the length of journeys needs to be decreased and a modal shift encouraged from the car to 'greener' modes. Outlines a recent study by TEST comparing Milton Keynes with Almere in the Netherlands, in order to see what influence land use has on travel patterns.

Romanos, MC M Hatzmaker and P Prastacos (1981) Transportation Energy Conservation and Urban Growth **Transport Research** v15a n3 pp215-22
Using a land use/transportation model based on TOPAZ, the role of transport energy consumption constraints of an urban system, and its related land use allocation, is investigated. Reveals that transportation energy cost is important in determining urban structure.

Rowley, P and S Opacic (1985) Traffic in Historic Towns: the Winchester Perspective **PTRC Annual Summer Meeting** University of Sussex
The study assesses measures used to deal with traffic in 26 historic towns in England. Each town was compared by parking provision, policies - including traffic restraint and restrictive land use policies, and any studies of economic/commercial effects of traffic restraint policies.

Sagona, PL (n.d.) Interrelation between Traffic and Land Use in Urban Area **12th International Study Week** Traffic Engineering and Safety 2-7 September 1974 London World Touring and Automobile Organisation

Said, GM (1985) Transport Impacts of Public Housing Developments in Kuwait **Australian Road Research** v15 n3 pp163-73 Vermont South Australia
An urban growth and change model, formulated to assess transport impacts of public housing developments, is presented. The use of the model indicates that any possible housing development strategies would generate traffic exceeding present capacity. New town developments seem the only sensible alternative.

Salomon, I (1983) Life-Styles - a Broader Perspective on Travel Behaviour in **Recent Advances in Travel Demand Analysis** Hampshire Gower

- (1984) Man and his Transport Behaviour - Part 1a. Telecommuting - Promises and Reality **Transport Reviews** v4 n2
This paper takes the view that although social benefits from a shift towards telecommuting would be large, the non-monetary costs borne by the individual telecommuter are likely to discourage such a shift.

- (1985) Telecommunications and Travel. Substitution or Modified Mobility? **Journal of Transport Economics and Policy** v19 n3 pp219-35
The substitution of travel by new telecommunications technologies, and the interactions between physical and electronic communication modes, is considered. It is suggested that enhancement of travel will offset travel reduction through substitution. Psychological considerations suggest that new travel would be generated, and that substitution of travel by telecommunications will be minimal.

Sammons, R & P Hall (1977) **Urban Structure & Modal Split in the Journey to Work**
Investigates the relationships between modal split for the journey to work and patterns of social and economic activity in large urban areas. Data from 6 land use transportation studies were used in conjunction with 3 models. Concludes that car ownership affects modal split, but also demonstrates the limitations imposed by urban stucture, in the form of employment and population densities.

San Diego Association of Governments, California Department of Transportation (1988) **San Diego Traffic Generators** Washington USA Department of Trans-

portation Department of Housing and Urban Development
Summary of data collected at major regional traffic generators.

Sandeman, I) (1980) Town Centre Development & Trip Generation **Highway Engineer** 27,2 pp15-8
The effects on trip generation of large scale town centre development in Cwmbran are examined. Developments include a 1200 space multi-storey car park, and a 50% increase in gross leasable area. Trips generated from both the internal and external area had increased, and the new town is rising to the status of a regional shopping centre.

Schaechterle, K (n.d.) Interrelation between Traffic and Land Use in City Regions and How It is Taken Into Account in Traffic Planning **12th International Study Week** Traffic Engineering and Safety, 2-7 September 1974 London World Touring and Automobile Organisation

Schaeffer KH and E Schlar (1975) **Access for All. Transportation and Urban Growth** Penguin
Chapter 9, 'The Land Managed City', explores the reasons why the city of Edmonton in Canada has been able to sustain 'a very high rate of growth, extensive car ownership, a good public transport system, little if any decay in its core, and no significant sprawl at its outskirts...'. Chapter 10, 'A Look Ahead', endorses the view that travel mileage must be reduced. Land use controls can be used, but fiscal policies are more likely to be effective. The idea that all moves which reduce the commute distance should be tax deductable (p175) is introduced.

Schlabbach, K (1991) Social Cohesion - The Real Problem of Transport Planning Policies **European Workshop on the Improvement of the Built Environment and** Social Integration in Cities Shankhill Ireland European Foundation for the Improvement of Living and Working Conditions
'The improper use of cars .. damages the total society and polarises the society'; he suggests that improvement can take place in six sectors: public transport, cycling, pedestrians, traffic calming, parking restraints and land use. Cites examples of many European towns which are testing different measures.

Schneider, J (n.d.) **Transit and the Polycentric City**

Schneider, J and J Beck (1973) Reducing the Travel Requirements of the American City. An Investigation of Alternative Urban Spatial Structures **Research Report** 73-1 Washington DC USA US Department of Transport

Schonfield, P and HS Chadda (1985) An Assessment of Urban Travel Reduction Options **Transportation Quarterly** v39 n3
Gives a methodology for assessing travel reduction options, and includes a review of the literature. The conclusion recommends ridesharing and vanpooling, restricting parking or increasing its cost, improving public transport, and promoting land use decisions that reduce trip lengths and vehicle miles travelled.

Second Chamber of the States-General (1989) **Second Transport Structure Plan,** Part D: Government Decision Netherlands
The government of the Netherlands recognises that the need to ensure accessibility in major urban areas forces us to restrain the increase in road traffic. However they want to go a step further by calling to a halt the growth in travelling distances, including by public transport to reduce the demand for travel. The low price of mobility is not commensurate with its true costs in terms of infrastructure, environment and the health impact of accidents.

Senior, ML (1977) Problems in the Integration of Land Use/Transportation Models in **Urban Transportation Planning: Current Themes and Future Prospects** Tunbridge Wells Abacus

Sharma, SC and AH Soliman (1976) Traffic Generation from Land Development Proposals **Transport Engineering Journal of the American Society of Civil Engineers**
This study is concerned with developing a residential location distribution model, with emphasis on socio-economic factors and travel time. Low income workers live closer to their work-places for a variety of socio-economic reasons.

Sharpe, R (1980) Improving Energy Efficiency in Community Land Use Transportation Systems **Environment and Planning** A 12,2 pp203-16
Higher density development and shorter trip behaviour, together with sub-centre development, would reduce energy consumption. Savings of 40% are possible in larger Australian cities.

Sherlock, Harley (1990) **Cities Are Good For Us. The Case for High Densities, Friendly Streets, Local Shops and Public Transport** London Transport 2000
Discusses city growth and transportation problems, and suggests solutions. High-density low-rise housing, traffic restraint, and good public transport would make cities places where people would want to live. Strategic planning and transport authorities are needed in cities. Accessibility is more important than mobility.

Simkowitz, H C Kissling and A May (1977) **Land Use** Seminar Urban Transport and the Environment OECD
This report suggests 'limiting urban sprawl, infilling and redeveloping the central areas at higher densities, development of high density corridors, promoting mixed use developments so that residences, shopping and recreation facilities are all within walking or bicycling distance or within convenient reach by transit, and encouraging denser development around fixed rail facilities'.

Simkowitz, H (1979) Transportation and Energy: Problems and Possibilities in **Built Environment** v5 n4

Simpson, B (1988) **City Centre Planning and Public Transport** Cornwall T J Press (Padstow) Ltd
The central issue of the book is the decline of the city centre due to the car and the potential for halting and reversing this decline through adequate transport and planning. Contains a series of in-depth case studies.

Solomon, Arthur P (ed) (1980) **The Prospective City: Economic, Population, Energy and Environmental Developments** London MIT Press
Part IV, 'Transforming Our Post Industrial Suburbs', contains chapters on the spatial impact of land use and environmental controls, the influence of energy on patterns of urban development, and the interaction of transportation and urban land use.

South Australia Department of Transport (1987) **Land Use Traffic Generation Guidelines** Adelaide Australia South Australia Department of Transport
Indicates traffic generation rates for a variety of land uses. Gives hourly rates, and a discussion of the factors that affect traffic generation.

Stephenson, B et al (1986) West Edmonton Mall: Transportation Planning for a Multi-use Regional Centre in **Planning for Spacial Event and Multi-use Facilities** Institute of Transport Engineers District 6/District 7 Joint Annual Meeting.

Stewart, G and E Mihalcin (1983) **The Walk to Work Trip in Downtown Toronto** **Transportation Quarterly** v37 n4 pp623-33
The city council of Toronto approved as part of its 1976 plan, a policy of promoting housing development in the central area, in order to provide homes closer to the growing office sector. It was found that more people walked to work in the 'core' than in the less dense outer areas.

Swedish National Board of Physical Planning and Building (1975) (cited from Plowden 1985 p15)
Home and Neighbourhood Guidelines for the Planning of Residential Development says that every home should be within 500 metres walking distance from a convenience store.

Tanghe, Jan Sieg Vlaeminck and Jo Berghoef (1984) **Living Cities - a Case for Re-urbanisation** UK Pergamon
The expansion of our cities must stop and we should strive for 'inner growth'. Contact between people should be encouraged and the evils associated with the dispersal of urban functions should be discouraged. European studies of inner growth are given.

Taylor, MAP and W Young (1986) **A Review of Transport Modelling Proceedures** Civil Engineering Working Paper 86/5, Clayton Australia Monash University
This paper reviews the developments in transport modelling over the past 3 decades. It finishes with an assessment of the possible directions future developments may take.

TEST (1988) **Traffic Generation of the Westminster and Chelsea Hospital** London TEST
Predictions were made of traffic generation for the proposed new Westminster and Chelsea hospital. The problems this additional traffic might cause were looked at.

- (1989) **Trouble in Store?** London TEST
This report discusses locational policy for retail developments in Britain and Germany over the last 20 years, set in the context of their North American origins. It is argued that it is foolhardy to encourage any development which encourages car travel in congested urban areas, for it destroys the quality of central areas, creates a demand for new road infrastructure and generates a host of problems which are against the community at large.

- (1990) **Development, Transport and the Environment** London TEST and Property Market Analysis (Unpublished report)
The aim of this report is to locate new developments so that, in transport terms, they contribute to environmental protection, energy conservation, accident reduction and reduced need for public or private investment in transport infrastructure. To achieve this aim, trip generation must be reduced and 'environmentally friendly' travel should be used for the journeys that remain. Examples of good practice are given.

- (1991) **Changed Travel - Better World?** London TEST
A detailed analysis of the travel patterns of two new cities, Milton Keynes and Almere in the Netherlands. Argues that different land use patterns are a major influence on travel behaviour.

Town and Country Planning (1991) **Curbing the Car** Volume 60 no 9
Transport policy is a way of pursuing egalitarian ideals; rather than accepting that alternative forms of transport will always be inferior to the car, we should find ways of restraining car use which affect everyone equally, while making those alternatives to the car more convenient more

often.

Toyota Motor Corporation (1991) **The Wheel Extended** No 77
The issue examines macro-level strategies for combatting the major urban problems of traffic congestion, concentrating on Tokyo, one of the world's most crowded cities.

Transport (1991) **Reducing Carbon Dioxide From Transport: A Costed Strategy**
The study calculates the reduction in UK transport sector CO emissions possible from a range of Green Party transport policies eg reductions in speed limits, ban on car advertising, taxing of company cars and company car parking etc. The policy of better land use planning had the most beneficial impact on CO emissions. It was stated that land use mixing can reduce journey distance, reduce the number of journeys and encourage the use of public transport.

Transportation (1986) Characterisation and Evolution of Spatial Density Patterns in Urban Areas **Transportation** v15 n3 p233
Spatial patterns of population density, car-ownership and other socio-demographic variables that affect urban travel as a function of distance from the city core, are examined using 4 case studies in 1960, 1970 and 1980. They reveal a continual overall dispersion from the city core and a 'densif ication' of the suburbs. It is suggested that this could result in increas ing congestion in the suburbs.

Transportation Research (1988) Forcasting Telecommunications – Travel Interactions **Transportation Research** v22A n3 p219

Transportation Research Board (1988) **A Look Ahead Year 2020** Washington National Research Council
Compilation of papers on the subject of futures for transport.

Transport Research Record 730 (1979) Issues in Transportation Planning for Small and Medium Sized Communities **Transport Research Record** n730

Transport Strategy Committee on Future Perth (1990) **Transporting Perth into the 21st Century** Nedlands Department of Transport
Among other questions, the paper asks how transport can contribute to a more ecologically and economically sustainable city?

Van den Berg, L and LH Klaassen (1982) Interrelationships between Car Use and Changing Space-time Patterns **The Future Use of The Car.** Round Tables 55/56/57 Paris ECMT
The relations between car-use and changing space-time patterns are analysed. Reasons for developing an urban policy aiming at control of urban development and the corresponding use of cars are examined.

Vaughan BC (1985) **Traffic Generation; Users' Guide and Review of Studies** GLC: Department of Transportation and Development
A comprehensive review of traffic generation studies carried out in Britain between 1975 and 1985. Includes sections on retail, industrial, warehousing, office, educational, hotel and restaurant, recreational, and hospital land uses. Trip rates which are oriented for Greater London are recommended.

Vickerman, RN and TA Barmby (1984) The Structure of Shopping Travel. Some Developments of the Trip Generation Model in **Journal of Transport Economics and Policy** v18 n2 pp109-21
The relationship between shopping expenditure and shopping trips is analysed. Findings are that income has little effect on trip making, but accessibility and the cost of travel are important factors.

Voorhees, AM (1972a) Alternative Land Use and Transportation Policies Paper to **International Federation for Housing and Planning Congress** Liverpool

Voorhees, AM (1972b) Land Use/Transportation Studies **Town Planning Institute Journal** Jul/Aug 1968 pp331-7

Walmsley, DJ (1972) The Influence of Spatial Opportunities on the Journey-to-consume: a Sydney Case Study **Royal Australian Planning Institute Journal**
This study looks at shopping centres to assess the impact of the type of centre on the length of the journey-to-consume. Only convenience goods were considered. Conclusions are that larger centres attract more trips, and that planned centres have longer journeys-to-consume. Movement minimisation is a poor measure of motivation for travelling to any particular centre.

Webster, FV PH Bly and NJ Pauley (eds) (1988) Urban Land Use and Transport Interaction - Policies and Models. **Report of the International Study Group on Land Use/Transport Interaction** Avebury
Describes 9 models, and applies them in 7 study areas. Criticises 4 step transport modelling, and says that integrated models give a more comprehensive view.

Webster, F and N Pauley (1990) An International Study on Land Use/Transport Modelling in **Transport Reviews 10** pps 287-308
The paper describes the first phase of a study in which land use/transport models were subjected to a rigorous set of tests covering a variety of policies.

Weidenhoeft, Ronald (1981) **Cities for People - Practical Measures for Improving Urban Environments** Wokingham Van Nostrand Reinhold
High density living in central areas is exemplified and encouraged. Vancouver has residential land within the CBD, although this alone has not prevented suburban development. The Barbican Centre is an example of mixed use development combining residential, leisure, and office land uses with good public transport links. All at appropriately high densities, to give excellent access.

White, HP (n.d) **Geographical Implications of Urban Transport Planning** University of Salford
A brief résumé of transport planning is given. Three basic deficiencies of the system are pointed out: the use of decentralisation as a solution to the problems of the CBD and decaying inner areas, the idea that full motorisation at peak hours was possible, and the separation of land use and transport planning.

Whitelegg, J (1989) The Future of Urban Transport Paper Delivered to Public **Transport Users Association Conference** Melbourne 29 November 1989
Lists some basic achievements needed in Melbourne to achieve a sustainable type of urban development, such as traffic calming, no more road construction, a full audit to determine what king of public transport is needed etc. Takes Melbourne only as an example and stresses that these changes must be seen in a global context.

Wilkes, DF (1981) **The Substitution of Telecommunication for Travel** Australia Institute of Transport Engineers

Williamson, D and D Cooper (1977) The Greater Brighton Transportation Study *Trip Generation Model* **Traffic Engineering and Control** *v18 n5 pp247-51*
Used techniques not generally used in modelling. These include: walk and cycle modes, and a non-income based car-ownership forecast.

Young, W (1990) Land Use - Transport Interaction 1969-1989 in **Australian Road Research Vol 20 No 1**

Zahani, Y (1978) Can Transport Policy Decisions Change Travel and Urban Structure? **PTRC Summer Annual Meeting**

Zahavi, Y TF Golob and MJ Beckmann (1980) Interrelating Trip Generation, Residential Location and Urban Sructure through Statistical Analyses and Urban Economic Theory **PTRC Summer Annual Meeting** July

Zuckermann, W (1991) **End of the Road** Vermont Chelsea Green Publishing Company *Outlines 33 solutions to freeing people from dependence on the car, including increased use of public transport, restructuring of city centres and suburbs, and the planning of new towns as integrated and car-independent communities.*

SUBJECT INDEX

TRIP DEGENERATION

A Literature Review

END OF REPORT

Report by TEST for the Rees Jeffereys Road Fund

TALKING ABOUT WALKING

JOHN ROBERTS

TALKING ABOUT WALKING

a literature review by

John Roberts

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1 A Bibliographic Introduction

When reviewing the literature on any topic it is often tempting to feel that people were still learning to write ten years ago: that then becomes one's time horizon. Of course this is absurd, so I will start thirteen years ago with a publication (Elkington et al 1976) that itself looked back over at least thirteen years and contained 1000 or more references to writing about the pedestrian. Arguably since that time we have not done much more than refine and sharpen the type of results that were then available, though it could be said we have become more concerned with enabling procedures, with design, and with access to pedestrian facilities.

Garbrecht (1971), URPI (1977), L'Institut de Recherche des Transports (1981) and Ramsay (1986) have produced bibliographies on pedestrians. Copley & Maher (1973) reviewed research on pedestrian movement, and R Monheim (1975) had a substantial reference list. Heraty (1986) produced one on safety aspects.

2 Urban Environmental Quality

In the United States, a preoccupation with urban quality, exemplified through pedestrian areas, had its own literature. Gruen (1965) argued for networks rather than single streets as a necessary prelude to revitalisation of down-town, and he kept this argument going (Gruen 1973); Appleyard's early 1970s writing was still being produced, having gained from experience, ten years later (Appleyard 1980,1982), while the current author had sporadic references in the 1970s which led to a relentless output (ranging from Roberts 1981 to Roberts 1989). TEST (1989) showed how pedestrian access had substantially structured traditional town centres, in a comparative study of British and German retail location policy. Returning to the mid-1970s USA, Breines & Dean (1975) and Rubenstein (1978) should be noted. Despite a wealth of European experience, it was to the US that Birmingham City Council recently turned for advice on its central precinct (Hildebrandt (1988).

3 Demand for Pedestrian Facilities

Buchanan (1963) had laid down some rules for the accommodation of walking in cities that still have relevance. In the same year, Pushkarev and Zupan explored ways of fitting pedestrians into the slots unused by motor vehicles in US cities, as a prelude to their seminal later work (1975a) on spatial requirements. Hillman & Whalley (1973) had started their long campaign for better conditions for pedestrians, and OECD (1974) produced one of their early pedestrian panegyrics, borrowing a title that had been used by Rudofsky (1969) about US streets five years previously. Also arguing for special facilities were Antoniou (1970), the London Amenity & Transport Association (1973), and the Independent Commission on Transport (1974). More recently, Goodwin (1980, 1984) has argued it is vital to include walking in travel surveys because of its interaction with other modes. Brög (1983) addresses prejudices about walking and provides a mass of data on the situation in Germany.

The early researchers probably had difficulty in following the imaginative approach of Kevin Lynch (1960) and the strong views of Oscar Newman (1972). The Urban Motorways Project Team (1973) reported on their consultants' views of pedestrian behaviour, and Hoinville (1970) attempted to evaluate community preferences, among which were the ease with which a walk to a local park could be accomplished. TEST (1975,1986) have used the technique of mental maps in an attempt to understand the concept of neighbourhood, following on from the work of Gould & White (1974).

Hitchcock said 'Walking is still the mode of transport used by most people for the majority of their trips. Yet it is perhaps not over-cruel to say that

until recently most transport policymakers' sole interest in the pedestrian has been to avoid his physical injury. It is now recognised that it is environmentally, socially and indeed commercially desirable to allow a dominant place for pedestrian movement in parts of central cities.' While this was a breakthrough in official policy statements it should be noted that special provision for male pedestrians should only be made in parts of city centres.

Conferences reflect demand, as well as reporting on research. Those on walking have greatly increased in number and scope. One of the most consistent, and dating back to the late 1970s, has been the Annual Pedestrian Conference at Boulder, Colorado. The Ninth Conference took place in 1988, and many of the names in the references below have featured in one of the sessions (the present author at the Eighth, Rolf Monheim at the Seventh, and so forth). In 1980 the Policy Studies Institute organised a conference on walking, addressed by the Secretary of State for Transport, and Hillman & Whalley (1980) among others. PTRC had a pedestrian section at its 1982 Annual Summer Meeting and has covered this subject at subsequent meetings.

A frequent speaker at conferences of this kind is John Adams, two of whose books are listed, not least because of their questioning of conventional wisdom (Adams 1981,1985). Ramsay organised pedestrian conferences at Strathclyde University in 1982 and 1988, as did Trent Polytechnic at Nottingham in 1986 and 1987. The Department of Transport organised a one-day seminar 'Safe Paths to Independence' in 1986 which considered safer walking for those with a disability. Another seminar covering Pedestrianisation in London, was organised by the London Centre for Transport Planning in 1987: Rolf Monheim's brother Heiner spoke (H Monheim 1987). In the same year, the Anglo-German Foundation held one at Wiston House in Sussex whose theme was the injection of new life in city centres. Both Monheims (1988) spoke, on traffic calming and pedestrianisation respectively.

4 Supply: in More Than One Location

By 1975 the bulk of the West German pedestrianisation programme had been achieved. It had probably started earlier than anywhere else - it used to be held that the first converted street was in Essen in either 1926 or 1929. Recent research by Hass-Klau (forthcoming) now suggests the earliest pedestrian street was in Essen in 1904.

Some pedestrianisation had been carried out in Britain since the pioneering work of Alfred Wood (1969) in Norwich in 1967. Wood's work immediately followed the 1967 Road Traffic Regulation Act, which for the first time enabled all-traffic streets to be converted to dominant use by pedestrians. It was followed by the 1971 Town & Country Planning Act. Prior to these Acts pedestrian streets had sometimes been created *de novo* - as with the Victorian shopping arcades or the shopping centres of many New Towns.

Brambilla and Longo (1976, 1977c,d,e) listed the pathetically small number of pedestrian streets in downtown areas of cities - often brought in to counter out-of-town shopping. A similar protectiveness is happening in Britain in the late-1980s - either new pedestrianisation, improving the quality of old schemes, or injecting new shopping - all in traditional urban centres. In the US, building a large shopping centre with covered pedestrian malls, in the very centre of cities, has been the preferred approach. Schaeffer (1982) thought there were at least 1000 of these new centres in the US. This may, in part, explain the small number of US converted streets ... that, and the lack of success of many when downtown shops moved out to the suburbs and beyond.

R Monheim's work on pedestrian facilities in Germany has steadily grown over time. One area he has looked at recently has been the extension of pedestri-

anisation from city and town centres to sub-centres and even to villages in Germany: this he reported in 1986. In the 1980s he has also published a general work on pedestrianisation in German town centres (R Monheim 1980) and several monographs about particular towns, including Bayreuth. While noting the output of prolific writers, Hillman & Whalley (1979) produced their emphatic 'Walking **is** Transport' and the current author his listing and analysis of pedestrian precincts in Britain (Roberts 1981). OECD (1978) had previously attempted a listing of the characteristics of pedestrian precincts in cities within its member nations. May (1988) has been more discursive, taking in several world cities, something OECD (1974), Perkin (n.d.), the Design Council (1979) and Untermann (1984) also did.

While the 1980s accelerated interest in and writing on, urban walking, Britain was left with many unattractive pedestrian streets; those shared with buses are usually the most depressing (Newcastle, Liverpool, Darlington, Portsmouth and Reading are invidiously and perhaps unfairly selected as examples). Hass-Klau (for example 1986), while reminding us of our failings, continually tries to lift British standards up to her native German ones. All is not bad, of course: there are several attractive shared streets - Slough, Harrow and Halifax are examples. And there have been improvements to ageing pedestrian streets - for example in Wolverhampton - and pedestrian streets are at last being taken seriously in London - in certain outlying Boroughs, but most noticeably in Westminster and Camden. The Greater London Council was doing excellent preparatory work on the forthcoming pedestrian revolution they were not to witness, because of demolition (see Parker and Catchpole 1983 for example).

How is this interest reflected in the literature? Let us first consider the official sector. Todd & Walker (sic)(1980) devised a sample of 5 120 people of whom 2 621 were interviewed, in a survey by the Office of Population Censuses and Surveys, commissioned by the Transport & Road Research Laboratory. This work naturally provided a lot of basic information which other researchers previously had not had the resources to do. In 1982 the Transport & Road Research Laboratory produced their collection of data, based not on the OPCS data they had commissioned, but on the 1975/6 National Travel Survey (Mitchell & Stokes 1982). Then a report was published by the National Consumer Council (1987a,b) which was unique in dealing with the kind of action people could take to improve their walking lives. The last report of this kind came from the Department of Transport (1987) which gave guidance on vehicle restriction in pedestrian zones: previously it had produced two others (DTp 1978, 1986).

It must be remembered that pedestrianisation is now a worldwide phenomenon: there are long-standing examples in Buenos Aires, Barcelona and other Spanish cities, in Venice (of course), Dubrovnik and alleyways everywhere which physically cannot be penetrated by motor vehicles. But what of today? France, a slow starter (see Lapeyre 1982), has now achieved pedestrian networks in Paris, Rouen, Lille, Lyon, and many other cities (for information on the last two see Simpson 1987, and for Lyon only, TEST 1988a).

The Netherlands have for some time had many pedestrian precincts, both street conversions and newly created ones (as in war-damaged Rotterdam): (see Economisch Instituut 1975, Gantvoort 1982 and Kraay 1986). Denmark also has an accessible, to non-Danish speakers, literature on traffic-calming (Nielsen & Rassen 1986, Gehl 1986, Russell 1986), pedestrianisation in Copenhagen (Lemberg 1973 for example) and how pedestrians use spaces allocated to them (Gehl 1980,1983). While Moscow now has a pedestrianised street, Sagona (1973) was apologetic about Italy's paucity - which is now being corrected. Pasricha (1986) has detailed the difficulties of achieving pedestrianisation in Bombay.

While most publications on German pedestrianisation are in the German language

Hall & Hass-Klau's (1985) work covers, in English, some aspects of interest to pedestrian researchers on seven German cities. Other commentaries in English can be found in Bowers (1986), H Monheim (1986), Brambilla & Longo (1977b), TEST (1988a), and Hajdn (1988). And Türke (1983) discusses the German state-of-the-art in area -wide traffic restraint, the Federal programme. Kossak (1988) shows how Hamburg's central city was revived through imaginative pedestrian facilities. Among publications in German, a number have to be singled out: Apel (1984) powerfully puts the car in its place; the Bundesminister für Raumordnung, Bauwesen und Städtebau (1980,1986) with lavishly-illustrated booklets on pedestrians and traffic-calming, and the Bundesforschungsanstalt für Landeskunde und Raumordnung (1983) on traffic-calming are notable. Machtemes (1977) and Machtemes et al (1979) provided voluminous reviews.

In the United States the National Cooperative Highway Research Program (1981) has investigated the benefits of separating pedestrians and vehicles. Important to the researcher on pedestrian facilities is a series of US studies under the generic title 'Auto-restricted zones'. They were undertaken in the mid-1970s in Boston, Burlington, Memphis, Providence and Tucson. To give an example, the Boston report (Urban Mass Transportation Administration 1982) covers the 'Downtown Crossing' ARZ and investigates a range of impacts following the elimination of all auto traffic from twelve blocks and six streets in Boston's CBD; one impact was on pedestrians. A Canadian initiative through the Journal 'Contact' (Pressman 1981 with Foreword by Garbrecht 1981) produced many North American articles but also some on The Netherlands, Switzerland, France and other countries.

5 Supply: Single Schemes

One or two monographs on particular places should be mentioned. Lukey (1987) believes Milton Keynes provides a paradise for pedestrians and Finney (1987) extensively reviews the history of pedestrianisation in Leeds. Prestwood-Smith (1987) has tried to do the same for London, and Campbell & Rabinovitch (1987) have made specific recommendations for the partial pedestrianisation of Trafalgar Square, London. Collins (1986) describes the lengthy history of pedestrianisation in Norwich, while Lemberg (1973) has interpreted the subtleties of Copenhagen.

6 Access

In the second half of the 1970s TEST started what was to become something of a preoccupation with access issues. A three-year study of a south London High Street's gradual pedestrianisation (TEST 1980) was complemented by another study in southwest London (TEST 1979): both were concerned with how bus users were to reach pedestrianised streets when many bus routes had been diverted away from them. In 1981 a report was prepared for London Transport summarising knowledge on this topic and it was updated later (1987a). Further access issues were explored (TEST 1987b,1988b). Bendixson (1983) noted the extent of walking done to and from cars which often led to walking between them as well. Levinson (1986) looked at streets for people and transit, while in 1989 TEST discussed walking to the shops in traditional town centres. Roberts (1986a,1987a) examined how people reached pedestrian areas in two papers.

7 Safety

Throughout the period we are considering, safety (a euphemism for 'danger') has interested many researchers. Mackay's work on accidents has continued to this day; it was preceded by, among others, the research of Jacobs & Wilson (1967) and Biehl et al (1970). The Department of the Environment (1973) followed closely. Gamble (1987) asked outright how many of us would die in road accidents.

There are various key works on children at risk (Finlayson 1972, Howarth et al 1974, Grayson 1975 for example). Goodwin & Hutchinson (1976) and Ward (1987) investigated pedestrian accident rates, while Dawson & Parker (1985) considered pedestrian safety in subways and shopping centres at night. Grayson (1987) looked at the risk to pedestrians while crossing roads, while Ganguli (1974) and Goldschmidt (1976) considered pedestrian delay and risk. Havlick (1986) wanted a Bill of Rights for pedestrians!

Bosselman (1986) complained of conflict on the streets and of little attention paid to residential streets; Beth and Pharoah (1988) tried to remedy this deficiency. The Department of the Environment East & West Midland Regional Offices (1987) surprised us with their description of several residential traffic-calming schemes in their areas. Risk to the disabled is greater than to others, so it is good to see the Department of Transport have a disability unit: Frye (1987) has discussed problems of those with a disability in pedestrian areas, echoed in a conference paper by Roberts (1986c).

8 The Technology of Walking

Much technical work was evident in the early 1970s. Fruin (1971) conceived the 'level of service' approach to quantifying the number of people walking within any given area; this was used (and slightly modified) by Pushkarev & Zupan (1975a,b) in New York, again elaborated by Seneviratne & Morrall (1985), and used by TEST (1985) in the City of London. Appleyard and Lintell (1970) had published their frequently-copied analyses of walkers' movements in streets with different traffic volumes and mixes. Transport & Road Research Laboratory became interested in pedestrians' road crossing behaviour (Sabey 1973 - an early publication of many by her - and Hitchcock 1975), as did Imperial College London (Crompton et al 1975) and Birmingham University (Mackay 1972). Dalby at TRRL pursued pedestrian interests (1973, and with Williamson, 1975). And in 1975 the World Bank monitored Singapore's traffic restraint policies; TEST used time-lapse photography to observe pedestrian numbers and distribution and crossing delay, on streets before and after the policies were introduced (McGlynn & Roberts 1977, Watson & Holland 1978).

Research on the specifics of pedestrian behaviour and precincts has continued, and is rather superficially covered here. Colwill (1973) produced the not particularly startling observation that cars and air pollution were related. Navin & Wheeler's (1969) footway usage study has recently been complemented by Wright's (1988) observations of pedestrian movement through all the obstructions in their path. Trevelyan (1974) analysed movement. Gilbert (1986) has become an authority on mathematical modelling of pedestrian behaviour, and Mellor (1976) examined methods of counting and estimating numbers of people on streets, a topic to which Turvey et al (1987) have returned. Hopkinson et al (1987a,b) have investigated in depth what constitutes a pedestrian environment and Bentham & Haynes (1985) have shown a direct relationship between reduced vehicular traffic and increased pedestrian flows.

Psychological and environmental perception to an extent parallelled the establishment of Urban Design courses in Britain and corresponding interest in the US. In the 1970s, two key figures were Appleyard (1973) at Berkeley, and Lee at Surrey, Universities. A good example of the latter's work may be found in Lee et al (1975). Rees & Clyde examined the psychological effects of pedestrian streets in Liverpool. Llewelyn-Davies et al's (1971) research on urban motorways, led by the current author, included some consideration of the topic of community severance, caused by the cutting of pathway routes.

9 Designing for Pedestrians

Russell (1986) has advocated having a core time for pedestrian areas when no

traffic should be allowed into a precinct (excepting emergency vehicles), and Adie (1986) plus Adie & Parker (1987) have said for a precinct to succeed its design should be simplified, but done well. Boeminghaus (1978) produced a design guide on the detailing of pedestrian areas, while Krehl (1985) edited a 250-page lavishly illustrated handbook of 'public design' - much of which concerns pedestrian areas.

The Federal German Government publications on the design of traffic-calmed areas have already been mentioned above, as has the much less attractive English version (perhaps because there is so little to advertise).

The Second Conference on Pedestrianisation at Trent Polytechnic had a number of papers on paving, reflecting that it was partly sponsored by pavior manufacturers (see Lilley, Bull and Hammett, all 1987).

10 Evaluation of Pedestrian Facilities

From the mid-1970s evaluative studies of pedestrianised streets became popular - Myatt's (1975) study of London's Carnaby Street, Van Cort & Matthys' (1978) study of Ithaca, New York, Edminster & Koffman's (1979) evaluation of three transit malls, and Stewart et al's (1979) user response study are examples. Guise (1987) appraised pedestrian areas, Dueker et al (1982) undertook an impact study of the Portland (Oregon) transit mall while Beaton & Murray (1984) did the same for the Denver transit mall. Spenceley (1986) evaluated precincts in Essex and Kent. Students in Britain also used pedestrian activity for theses, and had probably long been doing this in Germany (Ramsay 1977, Parker 1977, Cashmore 1981). Cashmore concentrated on evaluation.

11 Concluding Remarks

Some recognition of consistent supporters of TEST's should be given: The Rees Jeffreys Road Fund, London Transport, London Regional Transport, the World Bank, the Greater London Council and the Campaign to Improve Public Transport. There is much other activity: the Pedestrians Association publish a journal and sponsor an annual lecture. The National Consumer Council's work on the pedestrian has not stopped, as they are members, along with Adams, Hillman, Roberts and others of the well-respected pressure group 'Feet First', administered by Transport 2000. And, of course, Transport & Road Research Laboratory has carried out quite a lot of research on aspects of pedestrian behaviour. Other agencies appear in the references.

A recent TEST publication followed three years' work on the economic benefits of giving priority to pedestrians, cyclists, surface public transport, and essential servicing vehicles ... in traditional urban centres. Doing this radically improved the centres' environment, which then led to economic gains for shopkeepers, landowners, employers and employees (TEST 1985, 1986, 1988 refer). Among current work, we are investigating any street's ability to accommodate certain mixes of means of transport, and five case studies of bus and pedestrian streets had been undertaken when this chapter was drafted: for an interim report see Roberts et al (1988). Acknowledgements should be made to earlier work on this theme by Claxton (1972) and Dalby (1976).

Finally, I must apologise to the myriad authors whose work has not been cited. This review had to be selective of a large literature. Rather than attempt to cover all of it, thereby replicating the bibliographies cited in Section 1, it seemed of more use to suggest some of the works which have proved most useful to me. Bibliographies on their own are as useful as the descriptiveness of each individual title, once you have ordered the topics that interest you. Annotated bibliographies are a step forward. Full abstracts are more useful still. Researching pedestrian issues concentrates the mind best of all.

ANNOTATED REFERENCES

Abbreviations:

DoE	Department of the Environment (London)
DTp	Department of Transport (London)
ECMT	European Conference of Ministers of Transport (Paris)
GLC	Greater London Council
GPO	Government Publishing Office (Washington)
HMSO	Her Majesty's Stationery Office (London)
LCTP	London Centre for Transport Planning
LRT	London Regional Transport
LT	London Transport
OECD	Organisation for Economic Cooperation and Development (Paris)
PSI	Policy Studies Institute (London)
PTRC	Planning & Transport Research & Computation (London)
RRL	Road Research Laboratory (Crowthorne)
TRRL	Transport & Road Research Laboratory (Crowthorne)

Adams, John (1981) **Transport Planning: vision and practice** London Routledge
Critique of current trends and methods in transport planning, and their disruptive effect on existing lifestyles and blight cast upon traditional cities, with the motorized world 'as a hostage to the oil-producing countries.'
- (1985) **Risk & Freedom: the record of road safety regulation** Transport Publishing
While accidents reduce as passenger-km by vehicles increase, Adams says this is nothing to be proud of. What it effectively means is that people are inhibited from crossing roads and moving about freely: accidents therefore reduce in relation to these constraints. Also discusses 'risk compensation' or the transference of risk from a vehicle driver, through wearing a safety belt, to non-belt users in the vehicle pedestrians and cyclists.

Adie, D (1986) Urban Design in Pedestrianization Schemes **PTRC Autumn Course** London
Adie claims that many pedestrianisation schemes fail because they are overdesigned and often badly designed. Paving is not strong enough to take the occasional emergency vehicle and cracks up, for example.
Adie, D and J Parker (1987) Paving the Way: Some Examples of Pedestrianisation as Practised in London **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 Jan.
Review of past and present achievements, problems encountered, and detailed design.

Antoniou, J (1970) Planning for the Pedestrian - Access Networks **Official Architecture and Planning** 33,6 pp510-526
In planning for pedestrians it is essential to define a series of origins and destinations, with emphasis on accessibility and linkages, rather than a finite route network

Apel, D (1984) **Umverteilung des städtischen Personenverkehrs, Teil 3 Stadtverkehrsplanung** Berlin DIfU
Apel's graphs of modal splits in various European cities have been widely reproduced. A non-auto centred view of transport planning.

Appleyard, D (1973) Notes on Urban Perception and Knowledge in Downs & Stea (eds) **Image and Environment** Chicago Aldine Publishing Co
Suggests that environmental perception proceeds on three levels: the operational, the responsive and the inferential. Operationally, people select various aspects of the city environment to carry out tasks: details of traffic circles, islands and intersections are often greatly exaggerated in subjective maps. They respond rather passively to elements that are imposed upon them - billboards, signs, etc - but 'imageability' must take into account sound smell and touch as well as sight. Inferentially, significant places or buildings are identified through reference to a previous experience.
- (1980) **Livable Streets** Berkeley University of California Press
- (1982) Streets are Public Property, but who is the Public? in Moudon and Laconte (eds) **Streets as Public Property** Seattle College of Architecture and Urban Planning
Appleyard, D and M Lintell (1970) **Environmental Quality of City Streets** Working Paper 142 Berkeley Institute of Urban and Regional Development
Considers 3 similar streets in San Francisco with different traffic levels. Much reproduced diagrams showing pedestrian movement patterns in relation to the number of vehicles. The one with 16 000 vehicles/day is considered unsafe by residents, who keep to the sidewalks and rarely cross. That with 8 000 occupies a middle position

and is crossed more. That with 2 000 is considered safe, and pedestrian movement is more random.

Beaton, Joseph P and Eric P Murray (1984) Spreading the Benefits of a Pedestrian/Transit Mall in **Proceedings of Fifth Annual Pedestrian Conference** Boulder Colorado
A detailed review of the Denver Transit Mall, in which 16th Street has a free shuttle bus service along its one-mile length. The authors are critical of the original designers' claims for the future prosperity of this shopping street, quoting Gruen's (1965) view that revitalising just one downtown street is not enough - a network is required.

Bendixson, Terence (1983) Making Cities Fit to Walk in: A British Point of View **Fourth Annual Pedestrian Conference** September 20-21 Boulder Colorado
The President of the Pedestrians' Association makes various cogent points, one being a modest criticism of pedestrianisation: 'as cars become more numerous and widely used so more and more walking involves getting to and from them and thus takes place in proximity to them.'
- (1984) The Marketing of Pedestrian Areas: A Fresh Look at Old Pedestrian Streets **PTRC Seminar** London 20 March
Pedestrian streets need periodic reviews and renewal. In the US they have gone through several changes. Attempts to attract middle-class suburbanites by knocking down housing to provide parking lots are not as helpful as catering for Blacks, Hispanics, single-parents, elderly people and other inner city residents.

Bentham, CG and RM Haynes (1985) The Effects of Vehicular Traffic Restriction on Pedestrian Numbers **Traffic Engineering & Control** 26,4 p 210
Various sites were compared on a Wednesday and Saturday in Norwich. Changes in pedestrian numbers from Wednesday to Saturday were much greater in the street with Saturday vehicle restrictions than in other Norwich streets with the same traffic regimes throughout the week - partial closure to vehicular traffic therefore attracts substantially increased numbers of pedestrians to a street.

Beth, Liz and Tim Pharoah (1988) **Adapting Residential Roads for Safety and Amenity** South Bank Polytechnic Department of Town Planning
'Most authorities seemed unaware of practice in other European countries, where reconstruction of residential streets to achieve environmental and safety improvements has been standard practice for ten years or more.' The paper therefore calls for a major expansion of street adaptation activity, based on experience of other European countries.

Biehl, BM, SJ Older and DJ Griep (1970) **Pedestrian Safety** Paris OECD
Summarises past research on pedestrian behaviour by age, sex, social factors, drinking driving experience, accidents, etc. Extensive bibliography.

Boeminghaus, Dieter (1978) **Fußgängerzonen** Stuttgart Karl Krämer Verlag
Fully illustrated examples of the detail of pedestrianisation, drawn from various European countries in German, English and French. A useful handbook for designers.

Bosselmann, Peter (1986) Redesigning American Residential Streets **Built Environment** 12,1/2 pp98-106
The author suggests that residential streets have for a long time been regarded as just another part of the automobile network, despite pioneering work by Appleyard (from the early 1970s) and a few others. Three types of street need investigating: the pre-automobile, streetcar, and automobile ones, and sketches suggest how conflict could be reduced.

Bowers, Philip H (1986) Environmental Traffic Restraint: German Approaches to Traffic Management by Design **Built Environment** 12,1/2 pp60-73
Shows the various methods used in Germany to achieve 'traffic calming', with technical details and some costs.

Brambilla, Roberto (1973) **More Streets for People** New York Italian Art & Landscape Foundation

Brambilla, Roberto & Gianni Longo (1976) **An Appraisal: Traffic-free Zoning** (This and the following four publications (1977a to d) by these authors were carried out at the Institute for Environmental Action at Columbia University and published by the Government Printing Office, Washington) This is Volume 5, published first.
- (1977a) **A Handbook for Pedestrian Action**
Reviews pedestrian schemes world-wide and actions needed to make a scheme work.
- (1977b) **The Rediscovery of the Pedestrian: 12 European Cities**
- (1977c) **Banning the Car Downtown: Selected American Cities**
- (1977d) **American Urban Malls: A Compendium**
Listing about 70 US towns and cities with downtown malls. Not all have been successful particularly those which attempted to revitalise downtown after most trade had gone to out-of-town malls.
- (1977e) **For Pedestrians Only: planning, design and management of traffic-free zones** New York Whitney Library of Design
This appears to be a hardback version of the 5 'Footnotes' that are listed above. Comprehensive detail on US, Canadian and some European malls.

Breines, Simon and William J Dean (1975) **The Pedestrian Revolution: Streets without Cars** New York Vintage Books

Brög, Werner (1983) Does Anybody Still Walk Nowadays? Data and Facts from the FR of Germany **Fourth Annual Pedestrian Conference** September 20-21 Boulder Colorado
Addresses eight misconceptions or prejudices about walking through presentation of a large amount of German data.
- (1985) Changes in Transport User's Motivation for Modal Choice: Passenger Transport-the Situation of the Federal Republic of Germany Paris **ECMT Round Table No 68**

Buchanan, Colin (1963) **Traffic in Towns** London Ministry of Transport & Civil Aviation
A twentieth-century classic, misinterpreted by the road lobby to mean massive road-building should be undertaken.

Bull, JW AK Mirasa and H Al-Khal (1987) The Design of Precast Concrete Paving Flags ir Pedestrian Areas which are Subjected to Vehicular Over-run **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January

Bundeforschungsanstalt für Landeskunde und Raumordnung **Flächenhafte Verkehrsberuhigung** Heft 8/9 Bonn

Bundesminister für Raumordnung, Bauwesen und Städtebau (1980) **Wohnstraßen der Zukunft**
- (1986) **Stadtverkehr im Wandel** Bonn
Both these publications are lavishly illustrated with photographs and plans; they depict achievements for pedestrians, more particularly of traffic calming.

Campbell, Brian and Jonas Rabinovitch (1987) Opportunities for Pedestrianisation in Central London: Report of a New Study carried out by Ove Arup for the LCTP **LCTP Seminar Pedestrianisation in London** London 30 March
Description of the study of Trafalgar Square, concluding that its northern and western sides could be closed to traffic, which could be accommodated on the other two sides.

Cashmore, JF (1981) **Toward an Evaluation Method for Pedestrianisation Schemes** Diploma dissertation, Leeds Polytechnic
Tackles a largely uncharted area: components of pedestrianisation, interest groups involved and a review of such evaluative methods as were available.
- (1982) Pedestrian Flow Patterns **World Developments in Pedestrian Planning** Strathclyde University 1 July
Examples from Manchester of pedestrian flow under different conditions.

Claxton, Eric (1972) **Reappraisal of Urban Mobility** London British Cycling Bureau
Considers spatial demands of different transport modes by area occupied within movement space, and their relationship to vehicle occupancy (a full bus holds perhaps five times as many people as full cars occupying the same space) and speed.

Collins, M (1986) A Pedestrian Street over two Decades - London Street, Norwich 1966-86 **PTRC Autumn Course** September
A comprehensive review of London Street, complementing Wood's (1969) description.

Colwill, DM (1973) **Atmospheric Pollution from Vehicle Emissions: Measurements in Reading 1971** TRRL LR 541
An early acknowledgement that motor traffic materially contributes to air pollution.

Copley, G and MJ Maher (1973) Pedestrian Movements: a Review **SRC Transportation Planning Project** ITS Leeds University
Extensive review of research on pedestrian movements considered environmentally, in terms of flow/concentration relationships, and in terms of pedestrian travel demand

Crompton, DH DL Warriner and J Goldschmidt (1975) **Accidents to Pedestrians and Environmental Evaluation** London Imperial College (unpublished)
An attempt to introduce comparative pedestrian risk to the environmental evaluation of alternative urban transport plans

Dalby, E (1973) **Pedestrians and Shopping Centre Layout: a review of the current situation** LR577 TRRL
Describes techniques adopted to that time by local authorities to improve shopping amenity while preserving satisfactory levels of goods servicing, bus access, car parking and through traffic.
- (1976) **Space-Sharing by Pedestrians and Vehicles** LR743 TRRL
Research in Cornmarket Street Oxford into the coexistence of buses and people on foot; discusses types of paving and whether this should be continuous or with footways raised above the carriageway. Also shows chevron-like formations of people giving way to passing buses.

Dalby, E and AE Williamson (1975) **Pedestrian and Traffic Management Techniques in Delft: report of a visit made in December** SR257 TRRL

Daor, E and PB Goodwin (1976) **Variations in the Importance of Walking as a Mode of Transport** RM487 GLC
Using GLTS and NTS data, the authors explain the significance of walking to make good its absence from many transportation studies.

Dawson, Gillian and John Parker (1985) **Planning and Crime Prevention** a paper for NACRO
The authors take several areas of interest to planners - housing, subways, open space, public transport and car parks, shopping centres and street lighting. Of interest to this review, they call for direct, short and spacious, well-lit and maintained and well-used subways. Regarding shopping centres, 'busy pedestrian areas by day can, if badly lit at night, provide potentially dangerous areas for solitary pedestrians.'

Department of the Environment (1973) **Pedestrian Safety** HMSO
Provides criteria for establishment of pedestrian crossings, signing, applicable law, appropriate street furniture and lighting and a variety of safety guidelines. Details footway obstructions and roadworks and problems for the disabled, traffic management, and what is termed 'segregation' - precincts.

Department of the Environment E & W Midland Regional Offices (1987) **Improving the Residential Environment** Works related to European Year of the Environment
Shows a number of examples of 'traffic-calmed' residential areas.

Department of Transport (1978) **Notes on the Preparation of Pedestrianisation Schemes** Local Transport Note 2/78
- (1986) **Shared Use by Cyclists and Pedestrians** Local Transport Note 2/86
- (1987) **Getting the Right Balance** HMSO
Shows the shift in values that have taken place since DoE (1973). Greater recognition of the need for pedestrian facilities, though a little ponderous as the booklet is structured around the law.

Design Council (1979) **Streets Ahead** London
One of the best presented of several design-oriented books that have been produced.

Dueker, Kenneth J Pete Pendleton and Peter Luder (1982) **The Portland Transit Mall Impact Study Final Report** Portland State University Center for Urban Studies
150-page study of a wide range of variables and their values within a bus and pedestrian mall.

Economisch Instituut voor het Midden- en Kleinbedrijf (1975) **Voetgangersdomeinen in Nederland** 's-Gravenhage Sociaal-economische publikaties
A Dutch viewpoint which covers problems of pedestrians, how 'domains' for them have arisen and how they have been developed, with a review of experience gained.

Edminster, Richard and David Koffman (1979) **Streets for Pedestrians and Transit: An Evaluation of three Transit Malls in the United States** Washington US Department of Transportation
The malls are in Philadelphia, Minneapolis and Portland Oregon. Topics analysed are: maintenance and construction costs; transit service improvements; level of service for pedestrians; environmental impacts; pedestrian and bicyclist safety; traffic diversion; parking; goods delivery; enforcement and economic aspects.

Elkington, John Roger McGlynn and John Roberts (1976) **The Pedestrian: Planning & Research** London TEST (Transport & Environment Studies)
Volume 2 of TEST's report to the DoE (TEST 1976) with some elaboration. Over 1 000 annotated references following eight review chapters of (some of) the pedestrian literature up to 1975.

Finlayson, Helen (1972) Children's Road Behaviour and Personality **British Journal of Educational Psychology** 42,3 pp225-232

Finney, John E (1987) Pedestrianisation in Leeds **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January
Reviews Leeds' notable contribution to pedestrianisation over a period starting in the early 1960s, to completion of the first schemes in the early 1970s, and additions of enclosed shopping centres since that time.

Fruin, JJ (1971) Designing for Pedestrians - a Level of Service Concept **Highway Research Record 355** Washington Highway Research Board
Part of Fruin's prolific output on the measurement of pedestrian activity. Established techniques for measuring 'level of service' or the amount of space provided to individuals pedestrians under different density conditions.

Frye, Ann (1987) Pedestrian Areas - Helping or Hindering Disabled People? **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January
Frye, from the DTp's Disability Unit, makes cogent points to ease the movement of people with disabilities within pedestrian areas.

Gamble, S (1987) **How Many of Us Will Die in Road Accidents?** London DTp

Ganguli, BK (1974) **Pedestrian Delay Studies** RM439 GLC

Gantvoort, J Th (1982) Pedestrian Planning in the Netherlands **La Voix du Piéton XVIII** Autumn 1982
Describes the history of woonerven, winkelerven and the concept of redesign of whole urban areas. Residents' responses to woonerven are positive, to the extent they will accept restraints on parking, but this is seen to relate mainly to the improved appearance of the area. The winkelerf (shopping 'yard') is a much newer concept, intend to fit between the shopping mall, which requires large numbers of pedestrians to keep itself lively, and all-traffic shopping streets. Redesign was tried in Eindhoven and Rijswijk, separating traffic corridors from residential areas.

Garbrecht, Dieter (1971) **Pedestrian Movement: A Bibliography** Council of Planning Librarians Exchange Bibliography 225
One of the earliest bibliographies on the subject
- (1976) Pedestrian Factors and Considerations in the Design or Rebuilding of Town Centres and Suburbs **International Conference on Pedestrian Safety** Haifa Israel 22.12
7 propositions are addressed: groups disadvantaged on spatial mobility; environment should be adapted to human beings; regulating walking as we do car use is a mistake; continuous network required; walking should reduce car use; evaluation research necessary and, the main one: walking must be considered as important as other travel modes
- *(1981) 7-page Foreword to special double issue of* ***Contact Vol 13 2/3: International Experiences in Creating Livable Cities***
Advocates large precincts in CBDs and should include all streets with shops; these

precincts should extend to surrounding neighbourhoods to improve pedestrian access to the centre; delivery by car was acceptable to Garbrecht; space sharing to include public transit should be promoted.

- (1982) Promoting Walking as a Prerequisite for Livable Streets **Conference 'Streets as Public Property'** Seattle University of Washington May 21-22

Suggests an action programme: Take pedestrian transport seriously; adapt legal and built environment to the pedestrian; create networks; place walking in the framework of transportation and urban development policy.

Gehl, Jan (1980) The Residential Street Environment **Built Environment** 6,1 pp51-61

- (1983) From Downfall to Renaissance of the Life in Public Spaces - A Brief Overview of the Changes in Attitudes and Development Trends Concerning Traffic Planning and the Use of Public Spaces in Denmark 1953-1983 **Fourth Annual Pedestrian Conference** September 20-21 Boulder Colorado

Gehl's longest title of this selection says most of what is needed, though it should be mentioned that his main research area is the way people locate themselves spatially in pedestrian areas.

- (1986) 'Soft Edges' in Residential Streets **Scandinavian Housing & Planning Research** 3:89-102

Reviews examples in Australia, Canada aand Scandinavia where the street comes alive through unfenced 'yards' and what is effectively a branch of traffic calming.

Gilbert, D (1986) Environmental Effects of Pedestrianisation Schemes in **PTRC Autumn Course** London

A mathematical description of pedestrian activity and of trips made.

Goldschmidt, J (1976) Pedestrian Delay: its Measurement and Response to Changes in Traffic Patterns **UTSG Conference** Aston University January

'Frustration and annoyance at having to wait at the kerb ... lead some people to accept shorter gaps (in traffic) than would be safe.'

Goodwin, Phil (1980) Problems and Possibilities for Travel Surveys, Modelling and Appra isals of Transport Systems **PSI Conference on Walking** 4 June

Walking data must be collected in travel surveys as there is a significant interaction between walk and vehicle trips. A model suggests that in London if bus fares are increased, 40% of the lost bus trips transfer to walk; if all public transport fares increased 3x as many trips transfer to walk as to car; if petrol prices increase, a similar number transfer to walk and to rail.

- (1984) Walking: the Paradox of Public Opinion **The Second Foley Memorial Lecture** London 12 November The Pedestrians' Association

Goodwin, PB and TP Hutchinson (1976) **The Risk of Walking** University College London Traffic Studies Group, unpublished

NTS data show people spend about 19 minutes a day walking, on average. Accident rate probably about 400 per 100m miles walked. Confirms Smeed's daylight hour proposition that the number of pedestrian accidents is roughly proportional to the product of vehicle and pedestrian flows.

Gould, Peter and Rodney White (1974) **Mental Maps** Harmondsworth Penguin

Explores people's perception of areas, of objects within them and of routes through them, usually of the neighbourhoods in which people live and/or work.

Grayson, GB (1975) **Observations of Pedestrian Behaviour at Four Sites** TRRL LR670

An extensive review of child pedestrian accidents

- (1987) Pedestrian Risk in Crossing Roads: West London Revisited **Traffic Engineering + Control** January pp25-30

Gruen, Victor (1965) **The Heart of our Cities** London Thames & Hudson

- (1973) **Centers for the Urban Environment** New York Van Nostrand

Guise, Richard (1987) Appraising Pedestrian Areas: An Agenda for Responsive Design **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January

Discusses factors in the design and planning of town centre pedestrianised areas; an urban design approach is needed in the preliminary design stage and implementation.

Hajdn, JG (1988) Pedestrian Malls in West Germany: perceptions of their role and stages in their development **Jnl American Planning Association** 54,3 pp325-335
Traces evolution of pedestrian malls to show how the concept changed from ad hoc origins after 1945 to becomne major environmental and social features of German city centres. Considers effects of lobbies on creation and characteristics of malls.

Hall, Peter and Carmen Hass-Klau (1985) **Can Rail Save the City?** Aldershot Gower
Comparative studies of British and German cities' attempts, by pedestrianisation as well as rail, to underpin traditional town centres. Much data, uncertain conclusions.

Hammett, Michael (1987) Clay Brick's Contribution to Creative Landscape Design **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January

Hass-Klau, Carmen (1986) Environmental Traffic Management in Britain - Does it Exist? **Built Environment** 12 1/2 pp 7-19
One of several papers edited by Hass-Klau for this special double issue. She is nontoo complimentary about British achievements in this field, coming from a country whose standards and wealth of achievement are much higher (Germany).
- (1987) Pedestrianisation on the Continent **LCTP Seminar Pedestrianisation in London** London 30 March
Pedestrianisation should be part of a wider concept of environmental traffic manage ment ('everything that is against the car'); public participation is important; more research is needed; pedestrianisation as an historic process.
- (forthcoming) Thesis: **The Pedestrian and City Traffic**

Havlick, Spenser W (1986) A Tentative Bill of Rights for Pedestrians **Seventh Annual Pedestrian Conference** September 18-20 Boulder Colorado
This is much needed, though a disappointment for it relates only to US conditions, which are unique and not at all representative of what happens elsewhere in the world. The 'rights' in fact mostly suggest a sycophantic relationship with the automobile, precisely the opposite of what we in the 'old world' are fighting against.

Heraty, Margaret (1986) **Review of Pedestrian Safety Research** Contractor Report 20 TRRL
Literature review with a substantial reference list specifically about safety aspects.

Hilderbrandt, Don (1988) **Pedestrian Movement and Open Space Framework** prepared for City of Birmingham Development Department LDR/HLN Consultancy
A comprehensive investigation of pedestrian needs in the city centre of Birmingham, where, despite a reasonably-sized pedestrian precinct in the shopping district, walk ers elsewhere are constantly subjugated by and in conflict with the motor car.

Hillman, Mayer and Anne Whalley (1973) **Personal Mobility and Transport Policy** PEP 542
The first of several reports that established their important position in research on the pedestrian, even though this report ranges more widely. It was one of the earliest to make clear that though a household owns a car, individuals within it may only infrequently have access to it.
- (1979) **Walking is Transport** London Policy Studies Institute
A thorough review of the transport mode of walking, with details of personal trips by purpose, frequency, length, etc.
- (1980) The Role of Walking in Personal Patterns of Travel **Proceedings of a Conference on Walking** PSI London 4 June
An update of previous papers on the subject, with implications for public policy.

Hitchcock, AJM (1975) **Planning of Transport Operations** LR671 Crowthorne TRRL
Contains short sections on pedestrians and cyclists, pedestrian precincts and vehicles in pedestrian areas; his suggestions show a general dissatisfaction with facilities for pedestrians at that time.

Hoinville, G (1970) **Evaluating Community Preferences** London SCPR

Hopkinson, PG AD May and IG Turvey (1987a) **Pedestrian Amenity and Street Survey Design** Working Paper 243 Leeds Institute for Transport Studies
Pedestrian amenity questionnaire in the location listed in May et al (1987)
- (1987b) **The Influence of Town Centre Conditions on Pedestrian Trip Behaviour: Results from a Household Survey in Two Locations** Working Paper 246 Leeds ITS

Survey undertaken in Hazel Grove, Greater Manchester and Lanark. A wide range of environmental responses was solicited.

Howarth, CI DA Routledge and R Repetto-Wright (1974) An Anaiysis of Road Accidents Involving Child Pedestrians **Ergonomics** 17,3 pp319-330
Complements Grayson (1975)

Independent Commission on Transport (1974) **Changing Directions** London Hodder Paperbacks
Makes a claim for pedestrian networks and for pedestrians to be at ground level

Institut de Recherche des Transports (1981) **Les Déplacements Piétonniers: Analyse Bibliographique** Note d'Information No 20

Jackson, Leonard (1980) Retail Planning **PSI Conference on Walking** 4 June
Food buying static over 20 years and unlikely to change in the future. Large multiple tending to take over and oust small shops. A solution is to maintain shopping centres for local community for looking as well as buying, in precincts. 'Qualitatively better than shopping in impersonal, large and money-conscious hypermarkets.'

Jacobs, GD and DG Wilson (1967) **A Study of Pedestrian Risk in Crossing Busy Roads in Four Towns** RRL Report LR 106

Kossak, Egbert (1988) The City is Dead - Long Live the City in Hass-Klau (ed) **New Life for City Centres** London AG-F
Shows how Hamburg's city centre has been revitalised through the introduction of a pedestrian square in front of the town hall and a number of arcades, which connect different parts of the central city together and make a true network of its pedestrian areas.

Kraay, Joop H (1986) Woonerven and Other Experiments in the Netherlands **Built Environment** 12,1/2 pp20-29
Describes streets converted to what we now call 'traffic calming', derived from the German 'Verkehrsberuhigung': complements Bowers (1986).

Krehl, Heinz (1985) **Public Design: Jahrbuch zur Gestaltung öffentlicher Räume** Gütersloh Bertelsmann Fachzeitschriften GmbH
A wealth of colour photographs depicting good design of the elements of pedestrian areas in various parts of West Germany

Lane, Bob (1980) Implications for Other Aspects of Transport Planning **PSI Conference on Walking** 4 June
The importance of walking, and appropriate provision for it, have to be seen within the greater context of strategic transport planning. Giving greater priority could mean some transfer from (and therefore lower viability) of buses, and slowing down of other traffic, particularly emergency vehicles.

Lapeyre, Roger (1982) L'homme-piéton en France in **La Voix du Piéton XVIII** Autumn 1982
Identifies various possibilities for the pedestrian: ped. streets, 'historic streets', commercial and market streets, pedestrian and bus streets, woonerven, networks, footbridges and subways, green residential areas. Walking is most widely-used form of transport with most trips shorter than 2 km. In Paris 65% of short-distance trips are made on foot. In Paris, 50% of those killed on roads are pedestrians.

Lee, TR, SK Tagg and DJ Abbott (1975) Social Severance by Urban Roads and Motorways **PATRAC Symposium on Environmental Evaluation** September 25

Lemberg, Kai (1973) **Pedestrian Streets and other Motor Vehicle Traffic Restraints in Central Copenhagen** City of Copenhagen General Planning Department
Comprehensive description of Copenhagen's 2330m of pedestrian streets

Levinson, Herbert S (1986) Streets for People and Transit **Transportation Quarterly** 40,4 pp503-520

Lilley, AA (1987) The Application of Precast Concrete to Pedestrianisation Schemes **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January

Llewelyn-Davies Weeks Forestier-Walker & Bor (1971) **Urban Motorway Case Studies: Vol 7 Technical** a report to the DoE
Case studies were held in Port Talbot, Liverpool and Glasgow; this volume contains information about specific studies undertaken to complement them.

London Amenity & Transport Association (1973) **Pedestrians in London: the need for a policy**
An early attempt to improve on London's lamentable provision for pedestrians.

Lövemark, Olof (1982) Air Poisoned by Vehicle Exhausts **World Developments in Pedestrian Planning** University of Strathclyde 1-2 July
A study in Örebro in Sweden showed WHO standards for carbonic oxides and nitrous oxide to be exceeded when vehicle flows rose above 1 000 vehicles/hour. 'UN should declare the present generation of cars to be a major threat to urban society.'

Lukey, ME (1987) Milton Keynes - A Paradise for Pedestrians **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January
While the title may be a little hard to accept, the author shows that Milton Keynes is certainly an advance on most other cities in terms of facilities for pedestrians.

Lynch, Kevin (1960) **The Image of the City** Cambridge MIT Press
A seminal work, which greatly preceded work on mental maps, showing how people relate to their physical environment - routes, buildings, signs, vegetation etc.

McGlynn, RF and John Roberts (1977) The Impact of Traffic Policies in Singapore: The Impact of Traffic Policies on Pedestrians **Traffic Engin. & Control** 18,6 June pp298-302
This reported part of TEST's work in Singapore for the World Bank, using pedestrian behaviour and problems as part of the evaluation of the Area License Scheme; measured pedestrian density and crossing problems before and after introduction of the Scheme.

Machtemes, A (1977) **Raum für Fußgänger** Dortmund Institut für Landes- und Stadtentwicklungsforschung des Landes Nordrhein-Westfalen. 2 Volumes
An unillustrated forerunner of the work below.

Machtemes, A et al (1979) **Raum für Fußgänger** Dortmund, publisher as above, 3 vols:
1 *Raum für Fußgänger Wege durch die Stadt*
Many photographs and sketches of all types of pedestrian ways through a town
2 *Raum für Fußgänger Wohgnbereiche*
Residential facilities for pedestrians
3 *Raum für Fußgänger Strasse und Stadtgestalt*
Precincts and ways, paving and street furniture details.

Mackay, GM (1972) **Injury to Pedestrians** Road Accident Research Unit Report 42 University of Birmingham
Part of Mackay's prolific output, 'this report reviews briefly what is known about the biomechanics of pedestrian collisions' concentrating on vehicle shape and resilience. Comparative data on US, UK and Poland are provided.

May, AD (1988) Transport and the Environment in Major Cities **PTRC Annual Summer Meeting** University of Bath 12-16 September
Compares British attitudes to traffic-caused environmental problems in the UK with the assessments of 'Traffic in Towns' and with current practice in continental European cities. Attitude of pedestrians suggests the need for more research.

Meighörner, Gerhard (1983) Munich - a Pedestrian Precinct. Description, Questionnaire and Summary of Experiences up to 1983 **Fourth Annual Pedestrian Conference** Sept 20-21 Boulder Colorado

Mellor, Harry (1976) **Counting and Estimating the Number of People on Streets in Towns** MSc thesis, Cranfield Institute of Technology

Mitchell, CGB and RGF Stokes (1982) **Walking as a Mode of Transport** LR 1064 TRRL
The authors cover ground of previous authors, using the 1975/6 NTS data and some of Todd & Walker (1980).

Monheim, Heiner (1986) Area-wide Traffic Restraint: A Concept for Better Urban Transpor **Built Environment** 12,1/2 pp74-82
While the concept concerns all forms of road transport, pedestrians invariably benefit from such projects. The article shows various types of scheme, including bus/tram and pedestrian space-sharing.
- (1987) Pedestrianisation: its role in urban planning **Pedestrianisation in London Seminar** LCTP 30 March
The Monheims have offered a substantially new insight into walking. While Rolf has considered behavioural and comparative aspects, Heiner sets pedestrianisation in context. He considers walking as part of the modal split according to size of town and according to different parts of the town and concludes that the higher the density the more important walking becomes. He also examines different streets in the hierarchy and the time occupance of them by different modes, tolerance by pedestrians of a range of vehicle speeds, and tolerance of the environmental capacity of streets according to number of vehicles in them.
- (1988) Traffic Calming in North-Rhine Westphalia in Carmen Hass-Klau (ed) **New Life for City Centres** London Anglo-German Foundation
This review of one of Germany's State's achievements follows Heiner Monheim's move from the Federal Government in Bonn to the Land Government in Düsseldorf.
Monheim, Rolf (1975) **Fußgängerbereiche** Köln Deutsche Städtetag
An extensively quoted work. It lists a large number of German cities and examines in considerable detail their provision for pedestrians, in particular their precincts, and proposals for their future extension (much of which has now happened).
- (1980) **Fußgängerbereiche und Fußgängerverkehr in Stadtzentren in der Bundesrepublik Deutschland** Bonn Ferd. Dümmlers Verlag
Despite its date, this work resumes research on the period up to 1976, and therefore complements ***Fußgängerbereiche****. There is a detailed analysis: interestingly, in today's trend-following conjunction of shopping and leisure facilities, a study in Mülheim showed that the main reason for increased numbers of pedestrians after its centre's pedestrianisation was an increase in leisure activities. The study came up with another important finding: provided the destination is interesting, people will happily walk 500m from a tram or bus stop, rather than the 2-300m previously assumed.*
- (1986) Pedestrianization in German Towns: A Process of Continual Development **Built Environment** Vol 12 1/2 pp30-43
This article has particular interest in showing how pedestrianisation of city centres is almost complete, so it is moving outwards to subcentres of towns and to smaller towns and villages, particularly in Bavaria.
- (1988) Pedestrian Zones in West Germany - the Dynamic Development of an Effective Instrument to Enliven the City Centre in Carmen Hass-Klau (ed) **New Life for City Centres** London Anglo-German Foundation
A general introduction is followed by examples of pedestrianisation in Munich, Cologne Frankfurt, Nuremburg, Göttingen, Bayreuth and Marktredwitz (in population order from 1.2m to 19 000).
Monheim-Dandorfer, Rita and Heiner Monheim (1982) Verkehrsberuhigung **Geographie Heute** Heft 12 August pp I-VIII

Myatt, PR (1975) **Carnaby Street Study** RM 466 Greater London Council
One of London's early conversions to pedestrian use has gone through various changes. Its early paving was not very successful and has since been altered. However, Myatt provides data on inception, conversion and use of the street.

National Consumer Council (1987a) **What's Wrong with Walking?** London HMSO
- (1987b) **Pedestrians** London The Council
These two works result from an initiative by the Council who rightly considered the position of walkers to be of considerable consumerist interest. TEST participated in the study. The two reports have different foci: the first shows the problems faced by pedestrians and some ways in which they have been tackled; the second is an action guide for local groups showing what they can do when dissatisfied with local conditions for walking.

National Cooperative Highway Research Program (1981) **A Manual to Determine Benefits of Separating Pedestrians and Vehicles** Washington Transportation Research Board
This report sets out some evaluation variables and provides a method for their application. It attempts to put $ values on certain benefits that may be achieved through pedestrianisation.

Navin, FPD and RJ Wheeler (1969) Pedestrian Flow Characteristics **Traffic Engineering** Washington Institute of Traffic Engineers
Colour time-lapse photography was used to determine usage of sidewalks

Newman, Oscar (1972) **Defensible Space: Crime Prevention Through Urban Design** New York Macmillan

Nielsen, Ole Helboe and Jørgen Rassen (1986) Environmental Traffic Management in Odense Denmark **Built Environment** 12,1/2 pp83-97
Reassuring evidence that traffic calming is becoming Europe-wide, though in many cases Denmark's policies are the toughest in Europe. Detailed article with much data.

OECD (1973) **Techniques of Improving Urban Conditions by Restraint of Road Traffic**
A collation of 23 papers from worldwide cities, some of which are directly referred to within these references. An influential document of its time, with much baseline data which remains useful.
- (1974) **Streets for People** Paris
A collection of photographs of pleasant examples of pedestrianisation from OECD member countries.
- (1978) **Results of Questionnaire Survey on Pedestrian Zones**
This survey was undertaken in over 100 of OECD's member nation cities. It presents a fascinating collection of before and after data, of a comprehensiveness that has not since been repeated, to the present author's knowledge.

Orski, KG (1973) Vehicle free Zones in City Centres (in OECD 1973)

Parker, John (1977) **Locating Offices near Rail Termini in Central London** PhD Thesis Polytechnic of Central London
Parker's thesis examined the routes and modes of transport used by people to offices, and the effect of locating them adjacent to mainline stations.
Parker, John and Tim Catchpole (1983) **A Pedestrian Network for Central London** GLC
This work was completed shortly before abolition of the Greater London Council and shows the kind of networks that are needed, though are less likely to happen if they interfere with the movement of motor vehicles.

Pasricha, PS (1986) Pedestrian Planning, Politics and the Role of Traffic Manager in a Developing Country: A Case Study of Bombay **Seventh Annual Pedestrian Conference** September 18-20 Boulder Colorado
Complex task to cater for pedestrians in a developing society; they are illiterate or semi-literate and have to travel on foot or at best by mass transport. Vehicular traffic is chaotic and of many types. These factors result in fatal road accidents of 17.5/10 000 motor vehicles against 3.2 in the US. Nevertheless some streets **have** *been pedestrianised.*

Perkin, George (n.d.) **Streets for Pedestrians** Europa Nostra

Potter, Stephen (1978) **The Role of Segregation Planning and the Pedestrian/Vehicle Conflict in Britain's New Towns** The Open University New Towns Study Unit
Also deals with segregated bicycle planning from Radburn to Milton Keynes.

Pressman, Norman EP (ed)(1981) International Experiences in Creating Livable Cities **Contact** 13, 2/3

Prestwood-Smith, Paul (1987) Pedestrianisation: the Way Forward for London **LCTP Seminar Pedestrianisation in London** London 30 March
Reviews progress in London: quite slow in the past, but now gathering speed, with schemes by Westminster and Camden for central London, and isolated schemes elsewhere.

Pushkarev, B and JM Zupan (1971) Pedestrian Travel Demand **Highway Research Record 355** US Highway Research Board
Of particular interest in this aerial survey of New York City's sidewalks and adjacent land use were the reasons for walking (eating 87%, shopping 72%, business calls and pleasure trips 50-55%) and the mean distance walked (524m - see the abstract for Rolf Monheim [1980]).

- (1975a) **Urban Space for Pedestrians** Regional Plan Association Cambridge MIT Press
The second of these two works is another seminal one, and has influenced many planners of pedestrian schemes. It is a detailed run-down on spatial needs, updating Fruin's (1971) work and the way they are not met in New York City, for example.
- (1975b) Capacity of Walkways **Transportation Research Record** No 538

Ramsay, A (1977) **Scope and Criteria for Pedestrianisation** MA Thesis Manchester University Department of Town Planning
- (1986) **Planning for Pedestrians** Topicguide Stamford Capital Planning Information
This second edition provides much information on the literature, on journals, and on other sources of information. 658 references are reviewed.
- (1987) The Consumer Approach to the Planning of Facilities for Pedestrians **Second Conference on Pedestrians** Trent Polytechnic 19-21 January
Describes the National Consumer Council's approach to pedestrians as consumers.

Rees, FJ and CA Clyde (1977) **Comparison of Phsyical and Psychological Effects of a Major Pedestrian Scheme** Working Paper 97 Leeds Institute for Transport Studies
Discusses Church Street and Lord Street Liverpool against a control street in Warrington. Detailed environmental survey of pedestrianised streets, and interviewing, 1974.

Roberts, John (1981) **Pedestrian Precincts in Britain** London TEST
While now out of date, this work is probably still unique in attempting to list, with much detail, Britain's precincts in 1981. Information was gathered from about 75% of Counties, some District Councils, and Scottish Regions. Over 1300 examples of facilities for pedestrians (single streets, networks and enclosed centres) were identified. The tabulation is accompanied by nine text chapters.
- (1982) Urban Walking Provision: Three Nations Compared **PTRC Summer Annual Meeting** Warwick University
Compares pedestrian provision in UK, USA and West Germany.
- (1984) Commercial Responses to Pedestrianisation **PTRC Seminar Issues in Pedestrian Schemes** London 20 March
- (1986a) Sunny Side of the Street **Seminar Zukunft des Verkehrswesens** Kassel 21.2
- (1986b) Green Cities=Green Backs? **Second International Conference 'Making Cities Livable'** Venice 11-16 June
Explores TEST's evolving hypothesis that traffic restraint in city centres enhanced their economic performance.
- (1986c) Whose Footway is it, Anyway? Department of Transport Seminar **Safe Paths to Independence** 29 October
Contribution to a Seminar on pedestrian facilities and the disabled, focussed specifically on the state of footways and the problems they presented.
- (1987a) Getting There - Access to Pedestrianised Streets by Public Transport **Second Conference on Pedestrianisation** Trent Polytechnic 19 January
- (1987b) Transport Planning in Continental Cities - Lessons for Britain Town & Country Planning Association Conference **The Car, Planning and the Environment** London 13 May
- (1987c) Sensible Transport Anglo-German Foundation Conference **City Centres: Planning, Transport & Conservation in British & German Cities** Wiston House Steyning Sussex 2 June
- (1987d) Genius Loci - How is it Retained or Revived? **Eighth Annual Pedestrian Conference** Boulder Colorado
- (1989) Car Precincts **Green Modes Symposium** Institute of British Geographers Conference, Coventry January
As pedestrian precincts have been developed, it is now time to create ones for cars, so people can enjoy them after they have been removed from public roads.

Roberts, John Alan Jessop and Nicholas James (1988) Space-sharing **PTRC Summer Annual Meeting** University of Bath September
A progress report on a TEST study of bus and pedestrian streets in seven English and Scottish towns and cities. The data achieved are used in the construction of a predictive model for use in locations where the precise mix (or lack of it) of transport modes has to be decided.

Rubenstein, Harvey M (1978) **Central City Malls** New York John Wiley
Seems like an extension to Brambilla & Longo's (op cit) work, though there are more illustrative examples. Design features and many case studies.

Rudofsky, Bernard (1969) **Streets for People - a Primer for Americans** New York Doubleday
'American city dwellers live by the law of the asphalt jungle. A growing police force, assisted by the military, is measuring its strength with an increasingly unruly population. This equilibrium of forces is tested daily, indeed hourly, in the street, the nation's shooting gallery.' He goes on to argue that a street is a street by courtesy of the buildings that line it; they can undermine any pedestrian facility by simply not being designed with the pedestrian in mind.

Russell, AW (1986) Transportation Engineering Aspects: A Traffic Engineer's View **PTRC Autumn Course** London
There should a core time during which no vehicles at all are permitted to enter a pedestrianised area (presumably excepting emergency vehicles): 'there are always difficulties when concessions are given to one or other road user.'

Russell, John RE (1986) **Traffic Integration: Environmental Traffic Management in Denmark** Edinburgh College of Art
Shows how Denmark is restricting traffic speeds in residential areas, complementing severe vehicle import taxes to mean a lesser problem than in other European countries.

Sabey, BE (1973) Accidents in Urban Areas **Report of the Conference on Traffic Engineering and Road Safety** 2-5 October Brighton
- (1980) **Road Safety and Value for Money** TRRL SR 581

Sagona, PL (1973) Historical Centres and Pedestrian Areas (in OECD 1973)
Ducks the issue as far as Italian cities are concerned: notes that Rome had plans at that time, but repeatedly refers to the difficulties of implementation.

Schaeffer, KH (1982) Pedestrian Facilities in the United States **World Developments in Pedestrian Planning** University of Strathclyde 1-2 July
The author notes two 'facility responses': the first was to get people in their cars as close as possible to what they wanted to reach (it included drive-in churches and home kitchens located next to the carport so there would be the minimum distance to carry the groceries), and thus eliminated or minimised walking; the second, producing producing pedestrian-oriented developments has been a later, and less destructive, phenomenon. It may have happened because the first was an economic failure - the inefficiency of car hops serving food to diners sitting in their cars, or the fact that pedestrians, who can browse, spend more than people sitting in cars. The trend then moved from private malls to public malls (pedestrianisation).

Seneviratne, PN and JF Morrall (1985) Level of Service on Pedestrian Facilities in **Transportation Quarterly** 39,1 pp109-125
Extends the work of Fruin and Pushkarev & Zupan (op cit). Authors argue that while the significance of walking is well-recognised, the reason why pedestrians have received far less attention than vehicular traffic is the complexity of their travel patterns. An alternative planning technique is proposed.

Simpson, Barry J (1987) **Planning and Public Transport in Great Britain, France and West France and West Germany** London Longman
This work makes some mention of pedestrian facilities, usually where they link with transport interchanges.

Spenceley, Graham (1986) Pedestrian Schemes in Shopping Streets: Analysis of Selected Schemes in **PTRC Autumn Course** September
Four precincts in Essex and Kent are evaluated in terms of accident saving, pedestrian mobility, accessibility, design, comprehension, enforcement, maintenance, environment and alternative traffic routes.

Stewart, JR B Goodey and AS Travis (1979) **User Response to Pedestrianised Shopping Streets** Birmingham University Centre for Urban & Regional Studies
This study immediately followed TEST's 1976 one, and had case studies in Birmingham, Bristol, Bolton and Hereford. A wealth of data are presented.

TEST (1974) **Pedestrian Movement in Brockley**
The first of TEST's studies of pedestrians, it attempted to correlate pedestrian activity patterns with local land use around a minor shopping street.

- (1976) **Improving the Pedestrian's Environment** 4-volume report to the DoE
Apart from a large literature review (Elkington et al 1976) this report evolved from complex case studies in three areas - two in London and one in Birmingham. Pedestrians were interviewed on street and in their homes, and were asked to follow their chosen routes from a particular origin to a particular destination, recording certain impressions on the way. Three of the volumes have not been published, but can be consulted at the DoE or TEST by appointment.
- (1979) **Bus Routeing and Pedestrianisation in Kingston** Unpublished Study for LT
- (1980) **Sutton High Street - a Study of Pedestrianisation** LT
Results of a three-year study of the gradual pedestrianisation of this south London street - first mooted twenty years before, and still incomplete when the study ended. Shopkeeper and pedestrian interviews, and a supplementary study of accident migration from the street to surrounding junctions.
- (1981) **Buses and Pedestrian Areas** LT
Examined ten pedestrian streets, with a particular concern for access - nearness of the street to bus stops and car parks - and evolved a set of preferred routeings for buses
- (1985) **The Accessible City** a report for the Campaign to Improve London's Transport
- (1986) **Changing to Green** a report do. do.
The first of this pair examined the City of London, the second Holborn and Bloomsbury, to see whether large-scale traffic removal was possible. It was concluded that it was.
- (1987a) **Buses in Shopping Areas** LRT
This was effectively an update of the 1981 study above.
- (1987b) **The Future of Buses in Croydon Town Centre** a report for LRT.
Considers pedestrian and bus space-sharing in North End, the most prosperous shopping street outside London's West End, and explores possibilities of a fun 'road train' to connect with buses otherwise diverted from the street.
- (1988) **Quality Streets: how traditional urban centres benefit from traffic-calming**
11 European cities examined on the hypothesis that a good physical environment is a good economic environment. Evidence presented is supportive of the hypothesis, though there are of course other factors at work than the removal of extraneous traffic.
- (1989) **Trouble in Store? Retail location policy in Britain and Germany**
The rôle of walking in structuring the city centre, and its catchment area, is discussed. The point is made 47% of all visitors to London's traditional shopping centres (except the West End) came on foot in the 1980s.

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Design guide, citing examples from North America and Europe.

Urban Mass Transportation Administration (1982) **Downtown Crossing: Auto Restricted Zone in Boston** Washington
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Four consultants (including one team led by the author of this literature review) undertook some innovatory work on severance caused by new urban motorways.

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Little more than a leaflet, this document shows how a pedestrian mall has revitalised downtown in this small university town.

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About 24% of all urban injury accidents involve pedestrians, clustering where high vehicle and pedestrian flows coincide. The paper discusses ways of reducing the hazard

Watson, Peter L and Edward P Holland (1978) **Relieving Traffic Congestion: The Singapore Area License Scheme** World Bank Staff Working Paper 281 Washington The World Bank
Detailed description of all of the Bank's work in Singapore. TEST's three studies for the Bank are described, including the before and after pedestrian behaviour studies.

Wiedenhoeft, Ronald (1975) Planning for Pedestrians **The Planner** June pp 228-231
The author selects a number of examples in Britain, Germany, the Netherlands and Sweden, and discusses their component parts and why they have succeeded.

Wood, Alfred (1969) **Norwich - the Creation of a Foot Street** Norwich Corporation
Wood is the 'father' of pedestrianisation in Britain, at least in terms of the conversion of all-traffic streets to ones dominantly for pedestrians, enabled by the 1967 Road Traffic Regulation Act.
- (1987) Foot Streets **Second Conference on Pedestrianisation** Trent Polytechnic 19-21 January
Wide-ranging discussion of the need for foot streets, their ability to regain some of the lost qualities of city centres, need to curb the car, etc.

Wright, CC (1988) Geometric Delay to Pedestrians **Transportation Research** Part A: General 19a,3 pp219-226
Pedestrians in urban areas are deflected from their natural paths by guardrails, pedestrian crossings, roundabouts and, most of all, the roads themselves. Article reviews the main sources of geometric delay and estimates its magnitude.


THE BIG CHOKE
ERITH
LWT

THE BIG CHOKE

Short and longer-term approaches to London's transport problems

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ABSTRACT

Transport in London is grossly overloaded because of car-based policies which ensure the continuance of chaos. It is evident that Government ideology is a poor substitute for rationality. Current advances in transport planning are curiously missing from some technical studies; the environment has become a matter of rhetoric, and democracy could join other endangered species. Is London unique? Only in obstinacy: Paris has remarkably successful public transport policies, and many other European cities have solutions from which we could learn.

The multitude of recent studies and commentaries on London's transport crisis, by a broad spectrum ranging from the most formal professional institutions and the Government's own advisers through Green campaigners to left-wing councils, draw very similar conclusions. Most say that in no way can use of the car solve London's transport problems; that company cars as perks have no place in an egalitarian society; that public transport needs considerable (though not necessarily massive) capital and revenue funding, and should remain largely under public sector control. Finally, transport provision and operation need to be integrated, not disintegrated as is Government policy.

It is fascinating that the statutory advisory body for planning in London, LPAC, using the Government's own predictive method, found that a scenario following 'current trends' performed worse than any other that had been developed. This is apposite just when the campaign against indiscriminate car use is gathering strength, for the car is a human health hazard akin to smoking, against which there has been a remarkably successful campaign.

All Londoners and its visitors suffer from the present mess. The consensus policies, outlined above, need a strategic transport and planning body to make them effective. This body should be elected by Londoners: if proof were needed, all the London Boroughs form part of the larger consensus. Without this body and these policies, London will continue to deteriorate until its description by some as a 'third world city' becomes reality.

a report by TEST for London Weekend Television and the London Programme

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1 THE MYTHOLOGY OF TRANSPORT

Everyone knows how to solve London's transport problems. *'Build more roads!' 'Provide more parking!' 'Add more carriages on to tube trains' 'More space for taxis' 'Privatise' 'Nationalise'.* So why this booklet? Because there **are** solutions, and they are usually not those above. Experts differ too: some stick their necks out, others 'sometimes tend to be chameleon-like in the policies they recommend, taking on a changing colouring from their clients' (Goodwin 1988). Is conventional wisdom wise or merely conventional? What **are** the myths that sustain beliefs and distort reality?

1 Using my car does not affect anybody else

Many people want to own and use a car, not least because public transport has deteriorated. If asked 'Do you want a car?' nearly everyone says 'yes!' If confronted with its costs: worsened public transport, accidents, air and noise pollution ... many would say 'no'.

2 Everybody has a car these days

In Great Britain in 1986, 63% of **households** had regular use of one or more cars. In London in 1985 it was 58%. In Outer London it was 64%, in Inner London 42%. There were 3.87 and 1.47 persons per household in Outer & Inner London respectively, so clearly there were many people in car-owning households who did not always have use of it (GLC 1986, DTp 1988a).

3 Railways? You mean what commuters use?

Motorways are the poor man's railway. Their objective is to move as many people and as much freight as small vehicles permit. They are thus like tracks with stretched-out trains, and correspondingly far less efficient and much slower. Realising this, there is a major revival of interest in rail: the Community of European Railways recommend a network of high-speed rail through Europe; part of that is the London-Chunnel high-speed link. BR is electrifying several routes, and the London Rail Study (DTp 1989) recommends £3bn for new lines.

4 New roads relieve congestion and should be built to satisfy demand

Many studies show this is wrong for London: the M25, Westway, A4/M4 have all created a vast amount of new traffic. And, new roads usually **create** congestion, on themselves and other existing roads. Buchanan in 1963 brought these together by saying if 9 000 residents, 50 000 staff and 115 000 shoppers in Tottenham Court Road used cars, **six 10-lane motorways** would be needed.

5 Walking's not very important

The Department of Transport categorise walk journeys by distance travelled. But **journeys made** is the vital statistic - distance travelled needs curbing, see below. **47% of all journeys** to London's traditional shopping shopping centres (except the West End) were on foot in 1981. Studies by TEST in various parts of London showed people walking to the shops spending nearly as much as bus users; car users rarely spent more than 30% of the total in a street (DTp 1988b, Hurdle 1986, TEST 1987).

6 Transport is about mobility

We travel to reach other people or the facilities we need; being continually on the move is rarely of value. The shorter the journey the better, both for travellers and to reduce the damage listed in Myth 8 below. Travel is about *accessibility.*

7 *New roads stimulate the economy*	Road lobby rhetoric, with no basis in fact. Transport costs are only 5-10% of total production costs, and more than half of this is in terminal, not route, costs. New roads enable producers to centralise their facilities; transport costs then **increase** as a proportion of costs of goods to the consumer (Whitelegg 1985 Vanke 1986, 1988; Friends of the Earth 1989).
8 *Car ownership reflects freedom of the individual*	Freedom to do what? This 'freedom' also creates costs for others like congestion, death and maiming, bereavement, lost worktime, air and noise pollution, environmental destruction of cities, severance.
9 *Public transport is downmarket*	Not true for taxis; middle class commuters use BR extensively; a wide social class range uses Underground. True, to-day, for bus. But big opportunities exist for making bus the preferred mode. Many people can only use cars because of free private off-street parking.
10 *London cannot learn from other European cities*	The arguments against are size, density and cultural differences. Paris is the same size and has a great deal to tell us, as the London Programme on 10 March 89 shows. **All** cities, irrespective of size and culture, can help others understand principles. Size doesn't so much change the problem as enlarge it.
11 *Public transport can be left to market forces*	Not true if an efficiently working city is one's objective. Selective privatisation could be a solution and would require a central public sector organisation regulating routeing, frequency and pricing as in Lyons, France - or London's 24 bus route for example. Scale of the problem is shown by transport used in a.m. peak to Central London: BR 40%, Tube 36%, Bus+coach 8%, bike 2%. Car is only 14% but see the congestion it causes!
12 *Cars are vital to continued success of traditional town centres*	Research by TEST in 10 major German cities showed **no relationship** between car parking provision and shopping turnover per square metre. In fact, it seems that too much car parking can adversely affect retail turnover - probably because urban space can be used more profitably than for car parking (TEST 1988).
13 *Car owners pay more tax than they get back in roads etc*	The principle of 'hypothecation' or allocating taxes to the area they were collected from was abandoned decades ago. The total cost of cars to society (to include control, health care, environmental impact etc) exceeds taxes retrieved (Roberts 1983). Have things changed?
14 *Diesel-engined vehicles are clean*	Diesel engines are lead-free. But they may produce 4x more SO_2 per litre than petrol engines; diesel engined vehicles produce more nitrogen oxides than petrol ones (Holman 1987). A diesel vehicle produces 10x more smoke than a petrol one (Whitelegg 1988), largely hydrocarbons which are carcinogenic.
15 *Transport & urban planning are unrelated*	Low density housing, concentration of facilities like shopping, leisure, education, health and leisure centres, all create new demand for travel and for roads, as such development is unsuited to rail provision. TEST advocate 'trip degeneration' - reducing the number

and length of journeys through higher average residential densities integrated with jobs and services used on a daily basis.

The next Section tries to set out what the problem is: clearly we cannot discuss everyone's individual problems, like difficulties of getting to work from Harrow to Ilford, taking the kids to a Wembley rock concert, seeing Auntie Glad who's just moved to Hemel Hempstead, or recovering some lost baggage at Terminal 4. Nevertheless, we hope what is being said here bears upon individual's problems - there are sure to be others out there experiencing something similar!

Section 3 is about official policy and studies; it traces the history of transport organisation in London during the 20th century, concentrating on the last 20 years. Section 4 examines the wide range of media comment, consultant work, and local government views on how to deal with the transport problems of London.

Section 5 looks at how cities in other countries cope with problems often identical with ours. At the end of this Section we try to summarise what has been found in Sections 3 to 5 that can help us in London. We think you will be surprised to see how many views of the problem, and how many solutions, are common to a large number of commentators.

Now we understand the problem and some potential solutions, we can set up some objectives, and then see how we can match these with what has been proposed. Section 6 provides the objectives, Sections 7 and 8 suggest how they can be met. Section 7 is concerned with what we can do **now** - practical solutions that can be implemented quickly with relatively modest investment. It suggests that one of the most important things to do is to start thinking about the more distant future - about the changes that may take place in society, about whether London will decline or grow, about how quality of life can be helped and not hindered by the transport systems we choose to have. Section 8 keeps these thoughts going, though its conclusions are necessarily much more tentative.

2 STREET-WISE PROBLEMS

Political rhetoric paints an optimistic picture of transport issues in London. Its transport system is 'being modernised', 'generally improving', 'about to get an awful lot better, and could be an awful lot worse'. There are also many proposals to invest large sums in road and rail, echoing what is now being spent on the Government's existing road programme. The London Boroughs try to protect their local environment and road system from the effects of traffic through management schemes, and some streets are being pedestrianised. Why then do the people who use London's transport system think there are so many problems?

For the traveller, the reassuring statements from Government, LRT and BR do not relate to the true state of London's transport system. Many are too afraid of assault to use public transport. Many BR and tube services are appallingly overcrowded, as is much of the road network. For cyclists and pedestrians, who are not cocooned in vehicles, the pollution and danger of travelling on most of London's streets cause acute concern. For people with difficulties (with small children, or with minor walking problems, as well as the officially disabled), public transport is distinctly unfriendly. Fewer employees are there to help. Buses are delayed by road congestion and by drivers acting as sales staff.

However, it is not just travellers who experience problems with London's transport. Ill-conceived transport policies in a densely packed city like London impact **everyone.** Noise, fumes, and the disruption to communities caused before, during and after construction of major new infrastructure literally change

1. What price freedom?

2. Room inside?

3. Park now pay later

4. Pedestrians left up in the air

5. Not even standing room

6. Down down deeper and down…?

6

people's lives for the worse. Most of these problems are now associated with the use of private motor vehicles, lorries (specially heavy ones) and the new roads to accommodate them. On flight paths serving Heathrow, aircraft noise and air pollution are severe problems. Public transport can also cause environmental problems, but currently in London these are completely eclipsed by those caused by private transport. All forms of congestion affect **everyone**.

Less obviously, transport influences the location of shops, workplaces and homes with car based developments undermining traditional shopping centres and other local facilities, detracting from the quality of life of those who do not, or cannot, use a car. For this reason transport problems are all pervasive; there is an absolute requirement for those who plan, regulate and provide transport to be responsive to the needs of London as a whole, not just as separate groups of people using different modes of transport or suffering different sorts of environmental damage. This section considers some problems in more detail, while Section 3 looks at the organisational problems contributing to *The Big Choke*.

Land Use

The disposition of housing, jobs, schools, shopping and support services should *determine* transport provision - not the other way round. In other words, we should decide how we want to live first, and what we want to have within easy reach, before deciding on transport hardware - roads, rail, footways and cycleways, and so on. Hundreds of years ago most journeys were made on foot, a few on horses, and even fewer in carriages. While other forms of transport - canals, railways, motorways - have appeared since then, it is quite remarkable how many journeys are still made on foot (47% of all shopping journeys in all London's shopping centres except the West End in 1981). This phenomenon clearly shows that people like to have facilities within easy reach of their homes. Why not?

Separating people from facilities has given rise to ever-increasing car use, and to a lot of needless journeys that used to be perfectly feasible by what are becoming known as the 'Green modes': normally on foot, often by bike and, for somewhat longer journeys, by public transport. Low density residential developments are part of the problem: the other part is the concentration of facilities often far from where people live and, indeed, inaccessible to those without access to a car. Out-of-town shopping and leisure centres, ever larger and more spaced-out health and education campuses are cases in point. Even in-town shops are getting larger and fewer, causing problems for local residents trying to reach them, and confronted with a new surge of cars on their local roads. In summary: *new land use patterns favour the car, but the street network doesn't.*

Plus ça change...

As the French say, 'the more things change, the more they stay as they are'. Behind real change, aspects of public transport are scarcely changing at all. For example, despite major changes in where and how people live and relate to facilities, many London bus routes and their numbers are the same as the tram routes they replaced, 40 years ago. The few express routes and local services have not made much impression on the historic pattern, and bus lanes are widely abused. Despite residual areas still unserved by Tube, there has only been one entirely new line in the last 50 years, and some extensions. In fact, if buses had their own right-of-way, or if trams still ran on the streets, protestations about the Underground would be unnecessary. The Thames Link and Docklands Light Rail are welcomed, but the former is using tracks that could have been linked long ago, and the latter is inadequate for loads it is expected to take from Docklands.

Using the Routes and Branches

Where people come from and where they go to clearly is a vital matter. *Journeys*

from outside Greater London are often congested and overcrowded, but rail journeys have the attraction, for some, of becoming cheaper per km as greater distances are travelled: shorter distance travellers within London are therefore disadvantaged. Road travel from outside London and air travel are also adding to congested services within London.

Longer journeys within London are beset with problems: congested roads nearly everywhere, with the situation worsening in outer London, because people choose to use cars (often because rail is equally bad). Parts of the Underground are at capacity. Buses are often useless as they are caught up in car congestion, and bus lanes are not adequately enforced.

London is really bad for the *pedestrian* - there are still many signals without a pedestrian phase, footways are narrow or used as an adjunct of the carriageway for car parking, traffic signs and signals, meters; there is little pedestrianisation. And, many motorists are increasingly ignoring zebra crossings, crossing signalised junctions on the red, and not giving way to pedestrians (as required by the Highway Code) when turning at a road junction. For *cyclists* it is worse. There are few cycleways, few preferential crossing points, and constant conflict with unthinking - or positively aggressive - vehicle users. These walkers and bikers require little space, are quiet and pollution-free, and could save the National Health Service, and transport budgets, a great deal of money.

The Private Car

Unpalatable though it may be to accept, *most transport problems in London are caused by the car.* A relatively small number of trips made by cars (certainly in Inner and Central London) create disruption out of all proportion to their number. Investment in roads has been at the expense of investment in public transport, the **only way** a large city can accommodate mechanised passenger transport without destroying itself.

Car use is actively **encouraged** instead of being kept to essential use at peak times: company cars are blessed with discriminatory tax relief while there is no such relief for public transport commuters (TEST 1984, Bibby 1988). These authors showed the inequity and other dubious characteristics of company-assisted motoring. Bibby, building from the base of the TEST work, estimated there were some 3.4 million company cars (about **one fifth** of the total stock) causing the Exchequer a total tax loss of about £2.4 billion pounds; this amount is £500 million **more** than the entire subsidy of rail and road public transport in Britain (DTp 1987).

A graphic illustration of positive discrimination toward the car was given in the GLC's last Transport Policies & Programme (GLC 1985). In 1985, of those car drivers travelling to Central London, 36% of commuters and 42% of all travellers were using company cars. 81% of work journeys by car and 78% of all car trips were made by drivers receiving some form of assistance. And 52% of those commuting had a parking space provided from among 58 000 Central London private off-street spaces (GLC 1985). Further support for the car is not difficult to find; it is a net cost to society, rather than a net benefit, because of the damage that unrestricted car use causes to people and the environment.

The Department of Transport permits no change by others to 'its' trunk roads (in fact owned by local and national taxpayers), and little change to designated roads - the old GLC Metropolitan Roads largely, whose future should be a matter for London Boroughs, not central government. A final irony is that key personnel in British Rail and London Regional Transport get either chauffered cars or company cars, demoralising other staff and protecting senior staff from experiencing their own system's deficiencies.

There is nothing wrong with cars in themselves; there are many things wrong with their indiscriminate use. The Automobile Association (1989) recognise this: in a statement to the House of Commons Select Committee on 'Roads for the Future,' though much of it is about some assumed natural law which says you must satisfy demand - as the number and use of cars grow, so more roads should be built to accommodate the growth.

While it is reasonable for a motoring lobby to try and satisfy the demands of its seven million members, there is quite insufficient acknowledgement of the insuperable problems this creates. There are some parallels with natural ecosystems that exist to the extent there are resources to support them. In the case of the car, the resources are finite, and the scarcest of all in high-density countries is **space**. To argue that demand for car use must fully be satisfied is simply irresponsible. It is also quite unrealistic: in exchange for the manifold benefits of cities (range of choice in goods, jobs, friends, education, leisure activities...) certain constraints have to be accepted. One of these is a limitation on car use and storage. If there were no constraints, then one could demand free beer piped into one's living room, raise sheep or grow wheat in the street outside one's home, go to work by elephant, play music at 120 decibels through the night ...

London Regional Transport

How many people are required to run the public transport services has become a contentious issue in recent years. Fewer people are now employed as conductors, guards and station staff. But costs saved by operators are never set against costs imposed elsewhere. Introduction of one-person operated buses on a wide scale has increased road congestion because of delays caused through driver-ticketing. According to LSPU (1986), OPO has led to increased social security payments which have to be borne by the Exchequer, who receives less tax revenue. Another sector of central government sees savings because it is providing less in revenue payments: taking these changes together, LSPU maintained OPO has caused a net **increase** in public expenditure.

From 1983 to 1987-88 LRT bus passenger journeys increased by 18%; LRT Underground passenger journeys by 42%, and Underground passenger-miles by 44% (Hansard 1989). These huge increases, stemming from the GLC's introduction of lower fares and the Travelcard, have resulted in extra revenue, but this has been used to reduce financial support from the public sector, not to increase quantity and quality of services. The Government has made it clear that new infrastructure will be largely paid for by the passengers through their fares - a complete contrast to the way motorists get their roadspace (and companies the vehicles, fuel, maintenance and parking space) paid for by the taxpayer. Furthermore, fares are rising ahead of inflation.

British Rail

Its image has marginally improved through painting of stations and new station placards, and some new rolling stock. Safety does not figure very highly, it seems - the Observer (Routledge 1989) suggests staff who cut corners get a bonus, thus helping BR to be the first railway in the world to appear profitable. These actions are more likely to concern privatisation than appeasement of the cattle-truck commuter. As the railway to score another first (to have its debts amortised by taxpayers' money) BR will doubtless prove attractive to buyers of its shares. Hansard (1989) shows a 20% increase in those arriving at and departing from central London stations. Ironically the Government has paralleled this windfall with a reduction of subsidy from nearly £300m in 1985/6 to £86m in 1992/3. Instead of welcoming the new money and ploughing it back into improved conditions for travellers, money is **withdrawn** (BR 1988).

The method of evaluating new transport investment, and the availability of public money, differ between road and rail, and rail suffers. Public money is available for road building, but when BR wanted to electrify the East Coast Main Line to Edinburgh, it was authorised to do so *provided the money came from its own resources.* The inevitable consequence was higher fares, pushing rail beyond the ability of many to use at certain times, and of many to use at all. Sources of funding for the London rail improvements are still being debated, but the Treasury's first response to the £3 bn cost of implementing recommendations of the Central London Rail Study led the Transport Secretary to say it had largely to be found by rail travellers, for he could see no reason why taxpayers outside the South-east Region should pay for London schemes. He had at that stage forgotten that taxpayers nationwide had paid for the M25, and that London taxpayers (generally without demur) help investment in deprived areas of Britain.

The recent document on upgrading European Railways came from a group chaired by the British Rail chairman. Its findings (Community of European Railways 1989) endorse high speed trains and new track on which they can run. The report argues that European rail traffic would quadruple in 30 years, given infrastructure of the kind proposed. Clearly some of this quadrupling will arrive in London. Will public transport, hotels and space at attractions, be comparably available?

Danger on the Road (often euphemistically called 'Safety')

Paul Channon made a welcome statement to the House of Commons on 7 February 89 regarding stiffer penalties for irresponsible drivers. He also said that while Britain had the lowest road accident figures in Europe they were still too high. This too is welcome, but it disregards the fact that accident figures are **comparatively** low (but **absolutely** high) because parents curtail children's freedom to walk or cycle to school, and because many people of all ages are sufficiently scared of their fellow men and women driving vehicles they are wary of crossing roads. In short, cars and other road vehicles curb fundamental principles of freedom of access to places needed to enhance one's quality of life. Friends of the Earth (1989) go further: '...the fact that fewer accidents occur is primarily because roads are becoming **less** safe.' Adams (eg 1985) pursues this theme relentlessly, joining others who wish to see statistics properly interpreted.

A little later in February, according to the Daily Telegraph (27.2.89), Mr Channon said he would resist EEC measures to reduce permissible blood alcohol levels in British drivers. Might there be some inconsistency with his previous statement? Another matter requiring attention is the absurdly low penalty for manslaughter, sometimes homicide, by road drivers.

Defining Green: (i) To Respect the Environment (ii) To be Uninformed

Because this report considers the main problem of road traffic to be one of **health**, environmental issues (and their misunderstanding, even misuse) have to figure substantially in it. Air pollution is widely recognised to be a major problem of to-day. An OECD meeting in Berlin in 1989 decided it should stop worrying about transfrontier pollution and concentrate on its source: the city. And the major issue in the city was emissions from motor vehicles.

Let's start with a beneficial change: there has been a 14% reduction in lead levels from road transport, 1976-1985. This is a significant achievement: lead falls on fruit and vegetables, growing and on sale, so reductions are imperative (Weir [1988] sent fruit from his north London garden to the Food Commission laboratory. It contained **0.5 mg/kg** of lead; the maximum safe level for children is **0.2 mg/kg**). However, the media's concentration on lead disguises wider, and very serious, environmental effects of vehicle emissions. Recent petrol advertis is distinctly equivocal: unleaded petrols are shown against 'green' symbols such as leaves and forests. The two are in fact unrelated: lead, while it does some

damage to vegetation, is not a constituent of the acid rain which decimates forests. 'Some companies apply "green gloss" to their brand image whilst selling products ... which may pollute the world about us' (Murrell 1988).

Road vehicles contribute a higher proportion of nitrogen oxides to atmospheric pollution, and therefore acid rain, than industry and all other sources. In London road vehicles recently contributed 75% of all emitted nitrogen oxides, and concentrations at roadsides frequently exceed European Community standards, and the much stricter World Health Organisation standards (Blake 1989). But it is not popularly acknowledged that road vehicles have anything to do with acid rain. A welcome change was John Ardill's (1989) review of the road transport specifics of air pollution.

If acid rain is capable of severe damage to **half** of Switzerland's trees and to a high proportion of Germany's and Sweden's - what is it doing to human health? When nitrogen and sulphur oxides fall into water, they leach out heavy metals otherwise quiescent in soils, and aluminium has reached drinking water. Acid rain also falls on growing foodstuffs. And, the situation is worsening - a 23% increase in nitrogen oxides was emitted from road transport 1976 to 1985, and 21% more of each of carbon monoxide and hydrocarbons. No less than 86% of carbon monoxide derives from road transport.

The greenhouse effect and holes in the ozone layer are world problems. The latter may be diminished through progressive banning of CFC aerosols. The former is attributable to continually increasing production of carbon dioxide, caused by burning fossil fuels - coal, petrol, oil for central heating, etc. Ironically, catalytic converters on cars, one of whose functions is to mitigate carbon monoxide, convert it into carbon dioxide (ongoing survey by Warren Springs Laboratory). Destruction of the world's tropical rain forests deprives the world of a 'sink' which can absorb some of the excess carbon dioxide production.

The greenhouse effect, and disturbance of the ozone layer, contribute greatly to the earth's warming. Warming helps create the right conditions for inversion, the Los Angeles virus which is spreading to Athens, Phoenix and other warm cities with an inordinate number of cars. Inversion is a requirement of smog, whose frequency is increasing. Smog is no friend of bronchitics, those with heart problems, those who wish actually to see the world they live in. If you think this is exaggeration, consider the effects of a mild winter on London and inversion on 18-19 January 1989 when, according to London Scientific Services, all four of its monitoring stations recorded twice the World Health Organisation limits for carbon monoxide, followed by twice the limits for nitrogen oxides. The Department of the Environment disputed this on evidence from one site. The 5 Utah National Parks in the US are at least 650 km from Los Angeles but visibility has reduced greatly in recent years due to far-distant automobile exhausts.

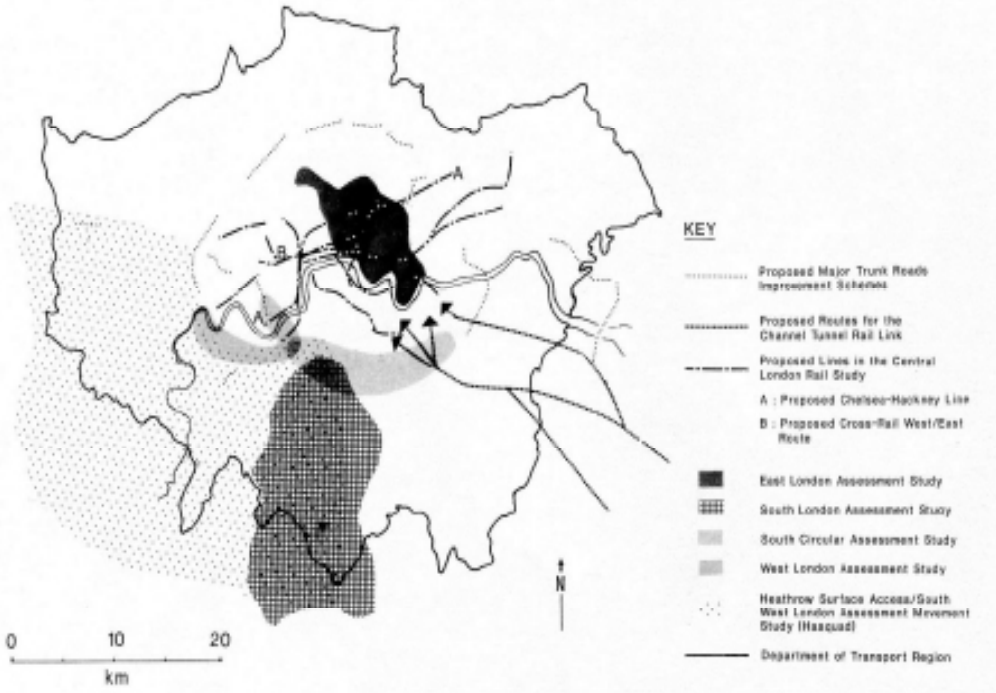
So, motor vehicles should be stamped with a Government Health Warning, for research has shown, in many countries and without any shadow of doubt, that they cause, or substantially contribute to: death and injury in accidents, acid rain, carcinogens from hydrocarbons, lead, carbon dioxide and earth warming, smog and bronchitis, stress-related diseases, obesity through lack of exercise...

What are **you**, gentle reader, doing about all of this? Or is it only caused by other people?

A few words must be said about the 'natural' environment. Despite massive protest, a road is to be driven through the historic Oxleas Wood in south London. Another potential new road, favoured in several options of the East London Assessment Study, is the path converted from the Finsbury Park to E Finchley railway. It passes through vegetation which has colonised the corridor: again there is a powerful protest group in total conflict with the DTp and its consultants.

Fig 1 Proposed Transport Improvements for London

Source : Department of Transport (1989)



3 RUNNING ON THE WRONG LINES

Perhaps this section should start with a reminder of what change should be about. It is taken from a conference paper by the economist J Diandas (1988):

> 'When one talks about (nationalisation) or privatisation one is talking about a change in status. One can argue that private enterprise is better or worse than government enterprise either as a principle or for a particular case. But to justify a change one ought to be quite sure that the status after change will be better than the present state, and that the degree of betterness is substantial enough to offset the cost of upheaval arising from the act of change.'

Transport Planning and the Greater London Council

We saw in the last section that problems need to be tackled as a whole, not individually. But today London's transport system is run and planned by an ever changing multitude of agencies each with unrelated responsibilities.

In 1964, following a Royal Commission into London Government, the Greater London Council (GLC) was formed; among its functions was transport planning. After a major land use and transport survey, a long term plan - the Greater London Development Plan (GLDP) - was prepared. The Plan set out a general strategy for transport, to be implemented by the GLC through a three year programme, updated every year, called the Transport Policies and Programme (TPP). The GLDP lists four main 'elements' for London's transport strategy. In summary they are:

* to maintain and improve public transport so that it carries as many passengers as can use it as safely, reliably, comfortably and quickly as possible;
* to manage and selectively improve the road system so that a hierarchy of primary, secondary and local roads can be formed and to improve existing main roads to relieve conflicts between traffic and pedestrians;
* to restrain car use, particularly in busy areas at the busiest times;
* to relate the planning of land use and transport in a consistent and effective manner.

But the GLC ran into several problems. First, the Government did not hand over control of trunk roads in outer London, and it retained control over some quite detailed matters. Second, the GLC itself got involved in local issues. Third, while it controlled London Transport's finances, the GLC found difficulty influencing the way it was run. And fourth, it had no control over British Rail's London network, though it could make grants.

But progress was made, particularly in the late 70s and early 80s: this resulted from important agreements about London's transport problems. The GLC alternated between Left and Right administrations, but there was some kind of consensus on major transport policies, much as there is in continental European cities. On public transport a zonal fare system gradually evolved. The road building experience showed that traffic grew to fill the space available and that greater road capacity was of no help. The lack of consideration for pedestrians and cyclists was slowly remedied. Other issues such as provision for people with disabilities and safety and security for public transport users led to measures such as Dial-a Ride and the Taxicard, which still enjoy all party support.

Abolition of the GLC in 1986 changed all that. Instead of a single plan for the whole of London, boroughs will now prepare Unitary Development Plans (UDPs). Although UDPs will pay some attention to London-wide issues, the Government set up a joint body of all London boroughs, the London Planning Advisory Committee (LPAC), to develop strategic planning guidance. Their advice is discussed below.
Responsibility for local roads fell to the boroughs, but the Department of Transport (DTp) gained tacit control over London's strategic roads. It did so in three new ways: by establishing a 'strategic network' which cannot be altered without their permission; by issuing 'traffic management guidance' to the London boroughs to direct their actions on all roads other than trunk roads, and by extending the trunk road network to include former GLC roads such as the South Circular. At the same time the DTp commissioned consultants to study traffic problems in the corridors where the newly trunked roads would be. The initial stage was road-oriented, but after considerable opposition from local authorities, the public, and professional institutions, the terms of reference were changed to include consideration of other transport 'solutions' to identified problems. They are now known as the London Assessment (or Corridor) Studies.

Control of London Transport passed to the DTp, and it was renamed London Regional Transport (LRT), subdivided into London Underground Limited (LUL) and London Buses Limited (LBL), and pressed ahead with plans for their privatisation, starting with the bus system which already has leased routes, and may soon be deregulated. The DTp has furthered its involvement in London by taking a direct part in Docklands transport (with a recently set-up East London Rail Study) and early this year producing its 'Statement on Transport in London.' Figure 1 shows

study areas and current strategic transport proposals for London.

The LPAC Studies

LPAC's advice to the Environment Secretary, which was agreed by all the London Boroughs, included a chapter on transport. The advice builds on the GLDP, but absorbs the new understanding of transport in London achieved in the late 1970s and the 1980s. The transport strategy has seven elements representing refinement and expansion of the GLDP's original four. A commitment to comprehensive traffic management is added, with the clear statement that there should be 'no capacity increases on the Inner and Central London road network, and some limited capacity reduction arising from environmental traffic management, bus priority and "traffic calming" schemes'. Public transport is divided into rail and bus (a regrettable invitation to disintegrate the system), with a strong emphasis on modernisation and expansion for rail, on better local accessibility and more road priority for buses. Traffic restraint is supported even more strongly by LPAC than the GLC, as is the importance of co-ordinating transport development with other planning activities like housing, employment and shopping. Pedestrians and cyclists are also given some priority. Finally, the 'selective improvement' applied to all London roads by the GLDP is limited to 'the orbital road network in Outer London'.

The LPAC Advice on transport (LPAC 1988) involved borough officers and LPAC's transport consultants, the MVA Consultancy and Colin Buchanan & Partners. Working parties and steering committees were made up of representatives from the DTp, BR, LRT, LPAC, the boroughs and the consultants. Public consultation and meetings were held on the first draft. Overall it represents the most comprehensive and widely supported transport policy statement produced since the GLC was abolished. LPAC's background studies show exactly why they support public transport and traffic restraint, and reject road capacity increases, at least in inner and central London. They reviewed effects of four basic 'scenarios' for the future of London's transport:

* **Scenario 1** is based on existing plans
* **Scenario 2** adds major new rail investment and excludes the WEIR proposal
* **Scenario 3** consists of Scenario 1 road schemes with the addition of major new orbital roads in outer London, and some orbital road improvements in inner London.
* **Scenario 4** is based on the idea of road pricing to control congestion. Enforcement measures are also improved.

Scenarios 2-4 had two variations, with road pricing added to 2 and 3, and 4 extending road charges to inner London. The development and testing of options was carried out with the co-operation of the boroughs and the operators, and representatives of the DTp first co-operated, and then acted as observers.

To assess the costs and benefits of each scenario, LPAC's consultants made a major step forward in methodology, by using a computer programme which looks at all types of transport at once. It is called the London Area Model (LAM) and was evolved by the Government's own Transport & Road Research Laboratory (TRRL) to overcome some of the failings of existing methods. In particular, the effects of public transport improvements like Travelcards could be included. LPAC's consultants' view is that, compared to other models, LAM's treatment of the choice of transport and destination is 'more coherent', it deals with more modes, and in its simulation of the feedback effects of road congestion 'LAM comes into its own'. The importance of the LPAC exercise is that it is the most co-ordinated effort to test different policies for the future of London's transport since the GLC was abolished.

The results of the LPAC testing provide an important insight into how London's

transport problems can be tackled. First, **the 'current trend' scenario, followed by the Government,** despite optimistic assumptions about the impact of deregulation, **performs worse than any other.** 'Current trend' plus orbital road building performs better in some respects than 1, high rail investment is better still. **Road pricing outperforms all other options, and improves the performance of any other option to which it is added. It produces time savings for motorists and bus passengers, as well as real cash income, and reduces accidents. Only rail investment can match its environmental benefits.**

The implications are that the **current policies will not solve the growing problems on London's transport system.** *Even in Outer London road building is less cost-effective than rail investment.* Managing demand through pricing offers greatest scope for improvement.

LPAC's work should be seen as a major step forward, but it would be wrong to conclude that the road pricing option should be implemented as the only policy for transport. LPAC themselves are careful to avoid this approach. Instead, a combination of measures is put forward, with vigorous traffic restraint in central and inner London instead of road building, major capital investment in rail, and selective road building in outer London. In addition, the needs of individual travellers such as people who are unable, afraid, or cannot afford, to use the transport system are recognised. These requirements have often been ignored in the past, as planning was dominated by the immense daily task of getting people to and from work. **The policies contained in LPAC's Strategic Advice, were agreed unanimously by all London boroughs.**

There remain two areas of concern which LPAC's work does not adequately cover. The first is freight, where all scenarios have the same policies, and more consideration will be necessary. The second is the lack of a more revenue intensive, bus based scenario for public transport. LPAC's consultants recognised such an alternative strategy, but had insufficient resources to make it a scenario in its own right. Work has continued since the first LPAC Reports, and a technical audit of LAM, organised by the DTp, found the results to be generally robust. A further report on road charging is about to be published, and it is understood that this recommends a system of electronic road pricing as achieving the best results.

The London Assessment Studies

These studies, referred to above, contrast with the LPAC approach. Though they were expanded to include public transport options, the problems identified relate to road traffic and not transport as a whole; the late addition of a few public transport 'solutions' to the road building plans has failed to create a proper balance. And there is no Londonwide context. Options have already been partly assessed, while the consultants were still waiting for a 'policy backcloth' from the DTp. The brief has been interpreted differently by the consultants, with some ruling out consideration of road pricing. Effects of major schemes outside the study areas are largely excluded.

Worse still, the studies seem set on using methods of assessment which were rejected by LPAC's consultants as old-fashioned and inadequate. Matters like the effect of congestion on trip making, and the reverse effect where new roads generate extra traffic, are put to one side. Road networks are to be modelled in detail, but there is to be little public transport modelling, and the method for estimating transfers between road and public transport is crude and ineffective. There is little recognition of the increased understanding of London's transport problems which has evolved in recent years.

It is hardly surprising that the Assessment Studies have met with a great deal of criticism. Local authorities have continued to talk to the consultants so as

not to lose touch with their work, but - irrespective of political complexion - they have felt it necessary to distance themselves from the consultants' work. Not only is that work dated and limited, but the consultants are not prepared to respond to the boroughs' detailed and often constructive criticism. Blight is widespread in the areas where road schemes are being considered, and major opposition has already been expressed. There has been severe criticism from the Association of London Borough Engineers and Surveyors and the Institution of Civil Engineers, neither of whom are known for bias against road building.

There has, however, been one area of progress between DTp and London boroughs. Following extensive discussions, an agreed set of objectives has been produced for all the Assessment Studies: an important step for London's transport. They are compatible with objectives formulated by the boroughs and others (including LPAC) and will significantly aid measurement of progress.

SACTRA and its Objectives

It is important to underline the use of objectives in transport planning. The Standing Advisory Committee on Trunk Road Assessment (SACTRA) in its report on Urban Road Appraisal provides the most recent view. SACTRA sets out an orderly procedure which applies to road proposals, but which is also more generally applicable. First, general objectives (desirable ends) should be set: 'These can be distinguished from policies for achieving those ends. In our view objectives need to be set out as desirable aims without preconceptions about how they might be fulfilled' (Part 5.1). The next step is to find out where objectives are not being achieved: 'The problem identification stage of road and transport appraisal is an important initial step. It indicates the need for professional assessments of problems related to the objectives which are reflected nationally and in local development plans' (Part 6.2).

It is at this point that different 'solutions' can be formulated: 'Having defined objectives and problems with urban main roads, traffic and public transport, the next step is to find remedies for those problems. We regard options as alternative ways in which some or all of the identified problems may be alleviated; they are unlikely to be entirely eliminated' (Part 7.1).

Objectives give a direction to transport policy which economic assessment cannot. They ensure that transport is contributing to what the GLDP refers to as 'quality of life' objectives as well as meeting financial targets. The agreed set of Assessment Study objectives is emphasised in the latest 'Statement on Transport in London' by the Secretary of State. It remains to be seen how they will be reflected in the next stage of the studies, and in Government transport policy generally.

The Statement on Transport in London

This document is designed to 'complement and support' Strategic Guidance, as yet unpublished, and to set the context for public authorities, operators, and others with transport responsibilities. It begins by outlining basic information about transport in London, and then lists current Government action, including its financial and quality of service targets for LUL and BR, its trunk road programme, and various other areas such as traffic light control, parking and automated route guidance for car drivers. Chapter 6 of the document moves from factual information to discuss the policy framework.

This chapter shows the great difficulties faced by the Government in coming to terms with London's transport problems. It starts by attacking two opposing views of the future of transport. One is that more road space must be provided 'whatever the cost', the other that new rail links, subsidies to public transport users and 'possibly' road pricing are optimal. The Government rejects both

'extremes' but fails to propose any clear rationale of its own. It starts by treating transport like any other item for sale, saying that the 'primary objective' is: 'to utilise and expand the resources employed in transport in the most efficient way, so that resources are allocated to the services people most want and are willing to pay for. Increased efficiency is achieved by fair competition between transport modes and by people choosing which modes to use to travel or move their goods on the basis of prices which ... reflect as far as is reasonably practicable the costs which they impose by their choice.' (Para 6.2) It is unlikely this is the objective of all travellers in London.

However, the Government is willing to admit, in para 6.4, that market forces are constrained when it comes to transport. Among these constraints are safety, environmental impact, and the effect of transport on land use development. The requirement for compulsory purchase of land, and the fact that major infrastructure (such as a road or rail line) could not be built in duplicate by competing companies also limits normal market forces. Finally, public expenditure limits affect both road and rail, and the Government admits that the fact that road users do not normally pay directly is a further constraint on the transport market. The statement goes on to say that these effects are particularly important in London, that the effects of central London road building 'would be unacceptable' but that public transport in that area is subject to a reduced competitive effect. Despite this, 'comprehensive Government planning of the road system and public transport services' is rejected on the grounds that it would 'override consumer preferences' and lead to 'distorting inefficiency'. So, 'Subsidies will have specific objectives, such as relieving road congestion'.

The position the Government finds itself in is this:

* First, it is perfectly clear that there is no free market in transport in London (or indeed elsewhere), nor is there a semblance of fair competition between modes.
* Second, it is also obvious (and has been well documented by Government sources among others) that the effects of transport provision on users and non-users alike are very large indeed, specially in urban areas. Grudgingly, the Statement begins to accept this.
* Third, judged by the free market approach, it is the road system which is having an easy ride (as it has for many decades).

These factors mean that the Government cannot impose its free market philosophy on London's transport as a whole. On the other hand, it has a massive road programme in London (perhaps as high as £3.5 bn), public transport investment is needed, and the functioning of London, specially the City, as a major business centre and as a high density capital city is absolutely reliant on public transport.

So, given these circumstances, the Government implements market forces in a piecemeal, opportunistic manner, for example deregulating buses and canvassing private money for road and rail infrastructure. It knows that subsidies are required, but again adopts an approach which lacks coherence, setting objectives as it goes, rather than trying to start out with clear objectives as its own committee of experts (SACTRA) recommended.

The Statement next discusses various plans and possibilities for the future, but these lack a consistent, unifying vision of how London's problems are to be solved. In this vital respect, the Statement is a great disappointment, giving no clear lead to those attempting to find realistic solutions. It is most surprising that the work of LPAC, although reporting to a separate Government Department, is so little mentioned. Could it be that the answers given by DTp's own model to LPAC were not to DTp's liking?

The Private - Public - Private Cycle

Having seen how London's transport planning has lost any semblance of rationality, we should note the way arguments about transport have become bogged down in a doctrinal conflict about the balance between public and private control. As a result, London's transport system has undergone many organisational changes through the years, but real changes in transport provision have been few. It is not surprising that a Borough Chief Planning Officer recently called London's system 'neanderthal' and that others compare it with a 'third world city'.

56 years ago buses and tubes were owned by private companies, then publicised (the opposite of privatised) as London Passenger Transport Board in 1933. That name then changed to London Transport when the Greater London Council took it over in 1964, with yet another change to London Regional Transport (which it is not, because BR is excluded, and the 'Region' extends far beyond London) when the Department of Transport took it over in 1984. If it is soon privatised, full circle will have been achieved. Publicisation could recur soon after that if, as seems likely, privatisation does not work for users.

These historical cycles are graphically illustrated by this diagram (Figure 2) from Sri Lanka, weighing private against public enterprise; it suggests a perpetual cycle devolving from some countries' inability to depoliticise fundamental transport issues (Diandas 1988).

The view that changing ownership distracts those trying to make real progress is also supported from sources closer to home. The prime minister's economic adviser some years ago, when discussing nationalization of road freight by Labour and privatization by Conservatives, said: 'We denationalized the trucking industry ... the reason was that many people thought that in private hands they would be more efficient ... I tried to examine the objective evidence. The strange thing was the original opponents of nationalizing (said) the nationalized trucking industry had been better than the privately owned industry ... this was the dispassionate evidence. I don't think one can judge whether a nationalized industry is efficient or inefficient just like that ... one has to look at the facts, look at them with a cool head.' (Walters 1961)

Integration or Disintegration?

Whatever political aims are achieved by changes in organisation terms, London's transport is one vast system which **must** be considered as a whole. It is **one** system because each means of transport interacts with all the others. The decision to use a car drastically affects everybody. The decision where to put a new station can have a major impact on where people decide to live and work... But it is wrong to categorise travellers so strictly. If you decide to go shopping by car you have to walk to where it is parked, drive, find somewhere to park, walk again to specific shops, all of which is reversed when you return home: you are therefore half pedestrian half motorist. Other journeys are more complex: walk to BR train, then bus or underground, then another walk is very typical, and it may have a 'kiss-and-ride' car addition at the home end. All are made easier by having direct, safe and reliable **interchange** between types of transport. London is poor on interchange (and it could become worse, without market intervention, after bus deregulation), so many journeys become more difficult, and people transfer to cars. Good interchanges may be found in Bradford, Stockholm, Oslo, all large German cities, Lyons, Lille, Vienna... But Newcastle's good Metro : Bus interchanges disappeared after deregulation.

4 WHAT DO OTHERS SAY?

So London's transport planning is in a mess. While the GLC may not have been wholly successful, it was trying to draw the essential elements of transport planning together. Now control is fragmented, rail investment is not related to road building and neither is related to land use planning, the key to traffic generation. The Department of Transport appears to accept this unintegrated approach, but what do others think? This section highlights cogent conclusions of groups who range from respected professional bodies to commentators with different views. Despite their diversity, their arguments are remarkably similar. At the end of Section 5 their recommendations are compared.

The Institution of Civil Engineers (ICE)

This conservative professional body was highly critical of the first stage of the London Assessment Studies (ICE 1987). Instead of concentrating on road corridors the studies should have examined London's transport as a whole. But they had not looked at public transport, the possibility of trying to restrict traffic, enforce tight parking control, nor options such as park and ride. By concentrating on road transport the studies had completely neglected the needs ICE argued that solutions should be based on traffic restraint, public transport, banning company cars, better involving the public, and, crucially, better integrating landuse and transport planning.

The Association of London Borough Engineers and Surveyors (ALBES)

Another professional body not known for radical opinions was equally critical of the Assessment Studies (ALBES n.d.) The fact that transport in London was not being examined as a whole was seen as a major failing. The road options examined were too coarse, ignoring their own generative effects and the possibility of policies to make public transport more attractive. ALBES recommended that the Studies evaluate private and public transport options on equal terms and that more attention should be paid to the need for parking controls to restrain traffic. They called for coordinated transport planning for London.

The Association of London Authorities (ALA)

The ALA (1989), representing London's inner boroughs, spells out a set of principles some of which apparently have little relevance for the Department of Transport. Any transport system for London should be democratically controlled, should improve access, the environment, safety and security, **overall** efficiency, equality and equity and should maximise transport's contribution to the economy. In practical terms this would mean more frequent bus services with well enforced priorities, greater capacity and integration for BR and the Underground, extensive traffic calming, parking control and better facilities for pedestrians and cyclists. Again, the integration of landuse and transport planning is seen as vital.

The London Borough of Haringey

Haringey's 'Blueprint for Transport' (1988) echoes many criticisms described above. A good transport system should give everyone good access, it should be efficient, environmentally sensitive and should provide good value for money. Key to such a system would be improved public transport. More frequent bus services would run along well enforced bus routes with priority at junctions. New signalling and additional lines would increase BR and Ungerground capacity, while light rail could be used on already busy surface routes. At the same time traffic restraint would encourage freight to use rail, water and smaller vehicles, and road space would be reallocated to buses, pedestrians and cyclists.

Company cars and subsidised parking spaces would be ended.

The London Strategic Planning Unit (LSPU)

LSPU (1986) regarded most of London's transport problems as symptoms of a lack of integration between landuse and transport planning. It pointed to the transfer of London Transport from GLC control to the Department of Transport and the subsequent abolition of the GLC. The fragmented nature of the DTp's current studies of London's transport typified the system's failings. LSPU outlined eight essential principles for a good transport system (see Section 6). In its advice for London Boroughs, it suggested they should lobby for a better way of managing the capital's transport, and that individually they should recognise the relationship between landuse and transport.

The London and South East Regional Planning Conference (SERPLAN)

As an interesting counter to the Government's belief that transport users should bear the costs of new investment, SERPLAN (1988) argued that in the South East expenditure on transport is above the national average, and continues to rise. But shifting costs onto the consumer ignores the importance of London for the national economy. SERPLAN argued that despite a number of high profile projects, overall investment has failed to match the growth in travel demand. It suggested that good accessibility for all, safety, environmental quality and the optimum use of different transport modes should form the basis of transport planning. Within London, SERPLAN favoured a mixture of policies including new investment substantially to improve public transport, limited road building to divert traffic from town centres and allow orbital movement, well enforced parking control, traffic management to assist public transport, and environmental improvements to favour pedestrians and cyclists.

TEST

Two studies by TEST examined transport and environmental problems in Central London (1985,1986). Problems created by road congestion were out of all proportion to the number of people who travelled to work by car. The first problem was the high proportion of traffic which merely passed through parts of Central London adding to congestion, accidents etc. Second, the studies showed that many car users were subsidised by the State. Most of that car use was inessential, and could easily transfer to public transport. TEST proposed measures like traffic calming, pedestrianisation and better public transport which would limit traffic, improve the environment and thus enhance the local economy. In another study, TEST investigated the effects of the company car subsidy more deeply (1984). It concluded that company cars were inegalitarian and were a major cause of road congestion. The report proposed a series of measures designed to remove the subsidy for company cars.

Other people have focussed on particular aspects of the transport problem:

Mogridge (1985) argued that in areas such as London there is so much suppressed demand for car use, any additional roadspace will fill up with newly generated traffic, and the equilibrium which previously existed will recur. While road-building has little effect on road congestion, it affects public transport because patronage falls. Turning conventional arguments on their head, Mogridge argued that the best way of relieving traffic congestion is by increasing the speed of public transport - by creating continuous high capacity bus lanes and taking away roadspace from private vehicles.

Donald and Pickup's study (1988) of the effects of bus deregulation in Merseyside provides useful lessons for London. Contrary to Government claims, in Merseyside the result has been a deterioration in the level of service for con-

sumers. Worst hit are already deprived low-income families who have to contend with higher fares, frequent timetable and route changes, lack of information and unreliability.

Goodwin and Jones (1989) examined the concept of road pricing. When compared with other measures designed to restrain traffic, road pricing seemed the most effective way of limiting road congestion. Provided that charges vary according to location and time, road pricing can be a very effective way of controlling traffic levels and absorbing rising car ownership. It is most successful when combined with other restraint measures and better public transport. However, the authors do admit that the most difficult aspect of road pricing is getting public approval. Not only are there concerns about equity and fairness, but the possibility of an invasion of privacy is an understandable worry.

This is just a sample of the wide range of professional bodies, associations and academics who have directly or indirectly criticised the direction of current transport 'planning'. Also there has been intense media interest in London's transport problems, no doubt increased by tragic, but symptomatic disasters at Kings Cross and Clapham. Articles have appeared in The Times, The Independent and The Observer, and current affairs programmes like Nature, Panorama Newsnight, Equinox and Radio 4's Today programme have also contributed to the debate. The result is that transport is now a key political issue in London.

5 WHAT DO OTHERS DO?

A problem with much of British transport planning is its insularity. There is a pronounced reluctance to look beyond our shores to see how other countries have dealt with problems we face today. In fact, Britain has lagged far behind its neighbours in adopting new and imaginative ways of tackling urban problems. This section provides a selection of the lessons our transport planning should embrace. A fuller analysis of the measures adopted by different cities is included at the end.

The United States

The US obsession with the motor car is an object lesson in how not to plan! By exclusively catering for the car, many downtowns lost any vestige of attraction for shoppers and therefore retailers. A Los Angeles planning report typifies the approach: 'The pedestrian remains the single largest obstacle to free traffic movement' (Gruen 1964). Retailers responded to the deteriorating environment and the traffic congestion by abandoning city centres for locations on freeway intersections on the edge of town. Office employment followed, creating mini-downtowns round urban areas, but weakening or killing the original centre.

* In Milwaukee, Wisconsin, new roads serving the city centre led to a decrease in the number of trips made there as the environment was destroyed and economic activities chose to relocate (Gruen 1964).
* Downtown sales as a proportion of metropolitan sales in a sample of 59 Metroplitan Areas plummetted from 34.6% in 1948 to only 7.9% in 1972 (Lord 1988)
* Despite their freeway locations, 'suburban downtowns' are now creating their own congestion, only this time it extends right across the road network, penetrating residential areas and extending into the open countryside (Orski 1987).

Even where the car is so enshrined in national culture some surprises exist. In New York (assumed Manhattan morning peak journeys) 72% of people travel by rail

and only 12% by car (compared with London where the proportions are 84% public transport of all kinds and 14% car) (Armstrong-Wright 1986, DTp nd).

Copenhagen

Copenhagen has long recognised the problems created by high traffic volumes. At a metropolitan level it has integrated landuse and transport planning by developing a number of 'fingers' of development extending into the countryside along radial high speed rail links. The effect is to ensure that equal access is provided to excellent public transport. In the city centre traffic calming has halted the decline in trade caused by the deteriorating environment and has promoted new activities such as the annual carnival (TEST 1998) - the reference for the snapshots on this page and the next).

Vienna

Echoing Copenhagen's landuse plan, Vienna's new policy links the city centre with the Vienna Woods and surrounding Green Belt by green wedges between linear strips of housing and employment facilities. The linear strips are based on high intensity public transport corridors.

Freiburg

This city of 175 000 near Basel has adopted a low-cost approach to traffic restraint. It has established a large pedestrian network in the city centre, traffic calmed areas of considerable size in surrounding residential areas and introduced an 'Environmental Travel Card'. This was the first city in Germany to encourage travel by public transport in order to safeguard the environment. For adults, the policy has effected an 18% switch from car, motorcycle and bicycle. Another policy of low car parking provision in the city centre has resulted in only 14% of people shopping by car; 58% walk or cycle there.

Lyons

Operation of public transport in Lyons provides an interesting alternative to the kinds of deregulation and privatisation that look set for London. Although the metro operator is a private company, it comes under the control of the city council who maintain ownership of infrastructure and trains, and determine the routes, timetables and fare structures. This recognises the fact that public transport must be planned and integrated if it is to be successful.

Hanover

In the 1960s Hanover was faced with the kind of choice facing us today. Predictions of future traffic levels suggested that a major roadbuilding programme was necessary, yet it was realised that by doing this the town's environment would be shattered. So instead of blindly accepting the forecasts, the city followed an alternative course based on pedestrianisation, excellent public transport (much of which is light rail) and traffic calming. Hanover succeeded in changing the course of events. Whereas nationally the use of public transport fell by 4% between 1970 and 1986, in Hanover it grew by 22%. There was also a dramatic growth of cycling.

Stuttgart

As the headquarters city of both Porsche and Mercedes, it is not surprising that Stuttgart has been slower than some other German cities in its attempts to restrain the car. Yet even here there have been substantial improvements in public transport complemented by traffic calming in inner city residential areas and city centre pedestrianisation. This traffic restraint has benefitted

the city centre which has to compete with five prosperous town centres, and many out-of-town developments, in the hinterland.

Italy

Here again is a country where manufacture of the car is closely linked to national identity. Yet the threat that high volumes of traffic pose to historic town centres means that many places have already adopted, or are adopting traffic restraint. In the 1970s' the communist council of Bologna introduced a complex street hierarchy to limit vehicle access in order to preserve the city's heritage and to boost the 'common good'. Squares that were parking lots are now revealed in their Renaissance splendour, and the city has begun to achieve its slogan - 'a city for living'.

In 1988, Florence introduced a traffic ban in its historic centre. The aim was to protect its Renaissance treasures and improve public health. The results have included much improved public transport, falls in pollution and noise levels and a major shift from the car to walking or cycling. Other Italian cities adopting traffic restraint include Siena, Brescia and Lucca.

Groningen

This Dutch town adopted restraint based on the traffic cell concept. Although the initial effects of its introduction were mixed, within a few years retail trade stabilised and improved. Immediate benefits were achieved in terms of town centre road congestion, accident levels and air and noise pollution.

Gothenburg

Another city where traffic cells were introduced to discourage through traffic and improve the environment, only here it has been complemented by public transport improvements. The aims were to improve the environment, bolster city centre trade, to increase the city centre population and to cut accidents. The aims were achieved by the drop in traffic and the shift to public transport.

Other places try to discourage *car ownership (Goodwin and Jones 1989):*

* in Bermuda ownership is limited to one small car per household.
* in Japan residents of large urban centres have to prove they can park their car off-street before they are allowed to buy one.
* in Hong Kong a trebling of the annual licence fee and a doubling of registration tax in 1982 led to a 25% drop in car ownership during the next two years, though in practice this led to reduced traffic levels in the least congested areas rather than in the city centre!
* high import taxes on cars in Denmark have contributed to a fall in car ownership and use since 1979 (TEST 1988).

...and road pricing is an increasingly popular option (Goodwin and Jones 1989):

* experience in Singapore highlights the very effective control over traffic volume and patterns that can be achieved
* in Stockholm plans for some form of road pricing are being revived after 20 years of indecision
* in Bergen and an area licensing scheme has been introduced as a means of raising revenue. Oslo is considering a similar scheme

ANALYSIS - Who says what? Who does what?

Table 3 summarises the main methods that these agencies would use to solve London's transport problem. Key differences between the Department of Transport and other commentators include:

* the need for a London wide transport planning strategy
* the need to build roads
* the need to make public transport price attractive.

Table 3: Who says what?

	DTp 1	DTp 2	LPAC	SER-PLAN	LSPU	ICE	ALBES	HARIN-GEY	ALA
Link landuse and transpt plang	NO		YES		YES	YES			YES
Strategic auth	NO		YES		YES		YES		YES
Cut public trans subsidy	YES	YES							
Low fares option	NO	NO					YES	YES	YES
New BR/LRT lines	YES	YES	YES	YES				YES	YES
Impr Public Trans	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bus lanes + priority								YES	YES
Bus frequencies up								YES	YES
Deregulation									NO
BR/LUL capacity up		YES	YES					YES	YES
Integrate tickets									YES
Better links to airports			YES	YES					
Better links with Channel Tunnel			YES	YES					YES
Build new roads	YES		LTD*	LTD*					NO
New Parking	YES								
Control parking	YES		YES	YES			YES	YES	YES
Restrain traffic			YES			YES		YES	YES
Road Pricing			YES						
Cut Company Cars						YES		YES	
Lorry Ban			YES					YES	YES
Freight transfer road to rail/water			YES					YES	
Impr facilities for pedestrians + cyc				YES				YES	YES
Improve environment			YES						
Expand regional airports								YES	YES

* Agency argues for limited use of this method

DTp 1 = Department of Transport 'Transport in London'
DTp 2 = Department of Transport 'Central London Rail Study
LPAC = London Planning Advisory Committee
SERPLAN = London and South East Regional Planning Conference
LSPU = London Strategic Planning Unit
ICE = Institute of Civil Engineers
ALBES = Association of London Borough Engineers and Surveyors
HARINGEY = London Borough of Haringey
ALA = Association of London Authorities

On the first point, the Government's position could not be clearer. By abolishing the GLC, and taking control of LRT, it has ended strategic transport planning in the capital. Arguing that an overall transport plan is unwieldy, the

Department of Transport instead undertakes and recommends solutions to individual problems, what other agencies describe as symptoms of a larger problem. The net result is an transport system which is planned and developed in an unrelated and piecemeal fashion.

Despite some hints that the Department of Transport is beginning to accept the argument that new roads fill with newly generated traffic, roadbuilding still prominantly features among Government policies. Other bodies generally only support road construction on a small scale or where it aids orbital movement. Otherwise they realise new roads in London are self defeating, creating environmental destruction and additional pressure elsewhere on the network.

Key to the Government's proposals for public transport is that bus rail and tube services should become more and more self financing, while users of public transport should themselves pay for its improvement. This argument, which ignores the fact that (to follow Mogridge's argument above) road users too will benefit from public transport improvements as motorists transfer to the better services, is inconsistently applied. Why do motorists using the M25 not pay for that 'improved' facility, and why is road-pricing seen in such a poor light? The argument also disregards the fact that transport costs in the South East are already a significantly higher proportion of personal income than nationally, and that London plays a significant rôle in the national economy. Other agencies argue that fares subsidies, when combined with other measures, are an important means of restraining traffic. They also help ensure equity.

Table 4 (over page) draws on material collected during TEST's research into European examples of traffic restraint. The table summarises the range of measures that have been implemented, or were planned. An essential element of the approach is **flexibility,** with different combinations of measures being applied in different locations. Thus while a city the size of Vienna has metro, light rail and bus networks, in Groningen, a relatively small market town in the Netherlands, bus services are considered enough to handle the increase in patronage brought about by traffic restraint.

In all cases however **public transport has undergone significant improvement,** both to cope with new demands and also actively to encourage its use. Bus lanes frequently allow public transport to move quicker and more directly than the rest of the traffic which has to contend with elaborate one-way systems. Public transport is invariably allowed to cross traffic cell boundaries. In many cases fare levels are set to encourage a switch from private to public transport.

Some cities, such as Bologna, rely on a series of **traffic cells** which deter through-traffic, while others, such as Hanover, reduce the capacity of existing streets by implementing traffic-calming measures such as street narrowing, speed humps and semi-pedestrianisation.

Most of the cities in the Table try to **discourage car use** at a number of different levels. Bologna for instance has been improving its bus services in residential areas so people are less likely even to start their journeys by car. Park and ride facilities are a popular measure, allowing people from outside the city to travel to its edge and transfer to rail or bus. Strict traffic calming in the city centre, together with limited parking nearby can cater for those drivers not already deterred.

An important element of all the schemes is the **improvement of the environment for pedestrians and cyclists.** Where pedestrianisation and traffic calming are extensive, pedestrians invariably benefit - not only do they have more space, but the air is cleaner and the noise levels lower. Cycling is also encouraged, either by having designated cycle routes, or by allowing the use of streets where normal traffic is not permitted.

City	TRAFFIC RESTRAINT MEASURES												AREA COVERED		
	Ped Streets	Traffic Cells	Parking Control	Traffic Calming	Tram/ LRT	Bus	Trolley	Metro	Local Rail[1]	Right of Way	Park & Ride	Bike Routes	CBD only	CBD + Inn Cit	All Urb Area
Vienna	YES	YES	YES	YES	YES	YES		YES	EXT	YES	YES	YES		YES	
Copenhagen	YES	YES	YES	YES		YES			YES			YES	YES[2]		
Lyons	YES		YES			YES	PLAN	EXT	YES		YES	PLAN			YES
Freiburg	YES		YES	YES	YES	YES			YES	YES		YES			YES
Hanover	YES		YES	YES	YES	YES			YES	YES	YES	YES		YES	
Stuttgart	YES			YES	YES	YES			YES		YES	YES			YES
Bologna	YES	YES	YES			YES	PLAN	PLAN	EXT	YES	YES	YES			YES
Groningen	YES	YES	YES	YES		YES						YES	YES[2]		
Gothenburg	YES	YES	YES		YES	YES			YES	YES	YES	YES			YES

Notes: 1 includes S-Bahn services
2 both Copenhagen and Groningen have traffic calming in some residential areas
EXT - being extended
PLAN - planned
Source : TEST 1988

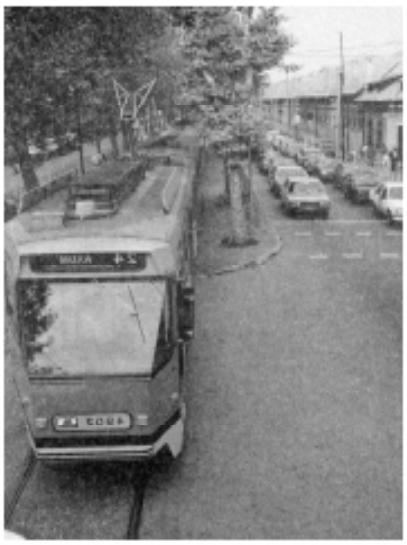
6 SENSIBLE OBJECTIVES

We need non-partisan goals and objectives. If we adopt the road lobby's, many will suffer. Similarly, if we adopt those of the Pedestrians' Association, or the Freight Transport Association, many will suffer. We need to ensure that everyone gets a fair deal, lives longer, has a better quality of life. These essentials are to do with people rather than the obsessively used term 'market'.

We considered many sets of objectives, and selected those developed by a team of people who had moved from the GLC at abolition to the London Strategic Planning Unit. Their findings, with a few amendments, are reproduced below. There are many points where they parallel the objectives of the London Assessment Studies, themselves agreed by all the London Boroughs, though democracy, equity and equality appear to be missing (see MTRU 1989). Eight areas are important:

* Accessibility - to promote a transport system for people to gain access to employment, to goods and sevices and to each other. Should be measured in person trips (accessibility) rather than passenger-kilometers (mobility).
* Democracy - to ensure a democratically elected London body is responsible for decision making on transport and urban planning in London.
* Efficiency - to make the most effective use of available resources to meet the transport needs of London's population, visitors, industry and commerce, and to take account of transport externalities.
* Employment - to support socially useful employment and promote economic development in London.
* Environment - to protect and enhance the quality of the environment.
* Equality - to ensure freedom of access to London's transport system for all.
* Equity - to ensure that benefits from the design and operation of the transport system are available to all, and to redress imbalances.
* Safety - to minimise the risks and fear of personal injury, assault and harassment while using transport in London. To reduce the number, risk and severity of road traffic and other transport accidents.

7. A sign of the times in Munich … total interchange



8. Milanese

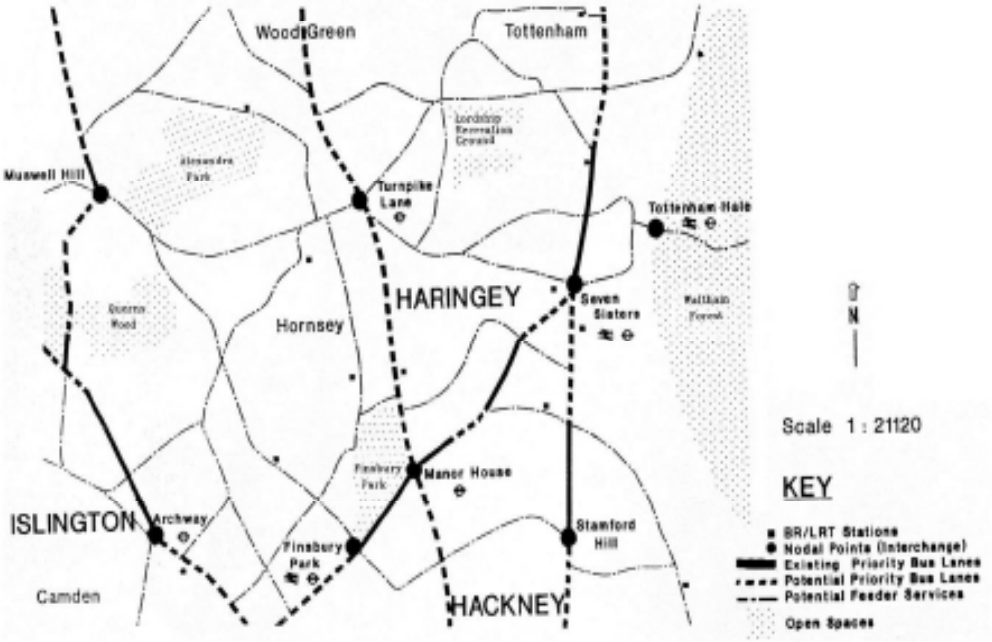
9. A calm street in Dusseldorf

10. The next Richmond train (Richmond California, that is!)

11. Not a bad pedestrian environment!

27

Fig 5 A New Structure for London's Surface Transport
Case Study : North London



7 SHORT-TERM TRANSPORT PROPOSALS

Short-term is **now** ... and the next couple of years. What can we do **now**? What does not cost a great deal of money? If it does not require new legislation, so much the better. This Section is divided as follows: first it looks at measures which concern **understanding** and **organisation**, which need initiating now, though it would take a few years to get them accepted and working to everyone's benefit. Then there are various measures which have a rapid and perceivable pay-off to users of transport in London.

The **first** short-term measure concerns the establishment of a high level impartial Commission with three major tasks:

a. *To consider the optimal way of achieving a body elected by Londoners with responsibility for transport, and related urban, planning in London.*
b. *Starting from the premise that there has to be a restriction on car access to large and small urban centres, to investigate all aspects of road pricing and supplementary licensing for London. The Commission will wish to satisfy itself on who controls the pricing system and for what objectives, and how individual privacy will be safeguarded.*
c. *To consider allocations of movement space within London which satisfy access requirements of all who live in and visit the capital, provided the objectives in Section 6 are satisfied. (As an example of suboptimal distribution of movement space, according to the number of people moved, there exist wide spatial disparities between cars, pedestrians and cyclists).*

The **second** measure has been quietly, progressively, but far too slowly, addressed by the Chancellor over the last few years. It concerns company-assisted motoring: the government has said it will finally remove all tax relief in March 1990, but some are sceptical about this. Most often the perk takes the form of the company car, provided to an employee whether s/he wants one or not, or already has one. For two-thirds of all those with a company car it is quite unnecessary for the performance of the job. Those with company cars (or using their own) may also benefit from free petrol, servicing, payment of fines and provision of a parking space at the workplace. We recommend:

All company cars which are not essential to a person's job, should immediately be taxed at the full rate, or sold and retrospectively taxed, as should all additional perquisites. Payment of fines etc by a company for an employee should be made illegal.

The **third** measure concerns high mileage allowances to those using their own cars on official business. They should be considerably reduced so as not to encourage car use in situations where an alternative is available.

The **fourth** measure concerns buses. Figure 5 shows part of north-east London whose road network has been adapted to provide an example of our policy recommendation. Existing bus lanes are made continuous, with bus-actuated signals. On these trunk routes buses would stop infrequently, and travel faster than now (up to 50 km/h) between transport interchanges. At the interchanges (for example, Muswell Hill, Archway, Finsbury Park and Stamford Hill within the map area) there would often be BR or London Underground; there would always be minibuses (or larger ones) which both served the local area and 'fed' the trunk routes. All ticketing would take place off-bus and all tickets would be interchangeable (see below). New buses should be introduced reasonably quickly - image is important. Some aspects of this recommendation would need to extend into the medium-term. Finally, these bus measures would have to be associated with parallel measures that reduced other traffic - company car reduction and parking restraint, for example. This is because continuous bus lanes would reduce junction capacity (with traffic flows as they are today), sometimes causing unacceptable delays to vehicles other than buses.

The **fifth** measure concerns car parking and the reallocation of movement space in congested areas. On street car parking needs to be restricted to current authorised spaces, or cut back. We support all the London Boroughs' calls for on street parking control to be devolved to them individually. Illegal parking should be dealt with not by clamps which induce lengthy occupation of valuable road space but by 'jumbo' fines on tickets, payable within 7 days or an automatic endorsement (plus the fine) at a Magistrate's Court. As the policy takes effect, the carriageway should be narrowed or reallocated to other modes (bus, cyclist, pedestrian). Public off-street parking should be reduced, as should private off-street parking when legislation is available to do this. Naturally these measures must be accompanied by radically improved public transport - the third measure above, as a start. Private off-street parking would lose much of its present glamour through the company car curbs and other restraint measures.

The **sixth** measure concerns pedestrians and bicyclists, and is related to the first and fifth measures above. High density pedestrian activity must lead to pedestrian priority measures compatible with bus access; where the density is lower to traffic-calming; where it is very low, to footway-type pedestrian networks. Suppressed demand for cycling should be satisfied, safely. Routes through parks and back streets, special junctions, split footways which have been extended into the carriageway - part walking, part cycling - are effective in German and Swedish cities.

The **seventh** measure is about control, particularly of public transport pricing.

First, we must say that deregulation in London is premature and ill-conceived. A contribution by the private sector **could** be made on the Lyons principle where the public sector maintains ownership of the bus fleet. On pricing for services we recommend:

* all ticketing takes places off vehicles and is time-stamped when boarding the vehicle***
* all tickets allow one or more journeys to be made with changes between bus and rail as needed to complete the journey; a single-journey ticket would have a time limit of perhaps one hour***
* pricing which encourages off-peak travel should be continued and even enhanced; conversely, peak-time travel should be more expensive
* off-peak tickets should be attractive to families and other groups
* instead of potentially dangerous barriers, experiments should take place on the 'open-station' approach, as with many continental systems. Periodic checks would be made on and off trains, with heavy on-the-spot fines for the ticketless. Staff displaced from barrier controls should be relocated to security functions to protect the traveller from assault***

*** = difficult or impossible under deregulation

The **eighth** measure derives from the seventh, and concerns the collection and utilisation of publicly-achieved money. First, fares should be carefully considered in relation to their function of transferring people to public transport from cars in congested situations and then giving them a satisfactory service; if necessary there should be revenue subsidy, but fare increases should never rise above the level of inflation. Fares are related by transport users to expected quality of service, not to preparation for privatisation. Nor should they be expected more than modestly to finance major transport upgrading and other large investments. There **are** ways of funding major investments that are scarcely felt: in Germany, a small tax on motor fuels raises enormous sums for public transport, as does the small employment tax in Paris.

The **ninth** measure is about traffic calming. This should progressively be applied to all residential roads. It would slow all vehicles by speed humps, and accommodate residential parking, playspaces and vegetation.

The **tenth** measure concerns the integration of land use and transport planning. For example, development control should be able to stop superstores and other large non-retail facilities from locating where their traffic generation would be adverse.

Some Details and Costs

If **company-assisted motoring** tax relief were removed, and these perks properly taxed, then a figure upwards of £1.0 bn would become available. This figure recognises that the Chancellor is progressively increasing tax on company-assisted motoring and that the extent of car fleet reduction which would take place is not known with any precision. TEST's view of tax gained is that it should be invested in public transport improvement and not into relieving income tax.

Hounsell (1988) has provided some costs of a London-wide **bus-actuated signal** system. This concept originated in the Greater London Council; they authorised an experiment in Hounslow in the early 1980s, and followed that with support for its introduction in the Selkent Area - basically south-east London. 150 buses and 56 signalled-junctions were adapted. Adapting all of London to the system - 5 000 buses fitted with transponders, and 330 signalled junctions would cost £3 million, which would pay for itself through bus time savings in one year (using COBA or Cost-benefit analysis). Marking out bus lanes and providing roadside signs costs £45 000/km; £90 000/km if coloured surfacing is used (LRT 1989). 8

8 LONGER-TERM TRANSPORT PROPOSALS

The future is notoriously difficult to predict: most people who have tried this have been unsuccessful because what appeared to be robust predictions have collapsed through one or more events that had not been conceived - a war, famine, earth resources shortages, manipulation of international financial markets or excessive speculation, breaking protective layers around the earth through conspicuous consumption, political impacts on fertility rates, and so on. The other problem is that while a **technological** future can reasonably be predicted, **societal** changes rarely are in step with such a future: one slides over the other like plates in the earth's crust, and the relation of one to the other is at best ill-defined, at worst catastrophic.

The most important aspect of the future is the present. One reason why it is difficult to predict transport futures for London is that little experiment has taken place - there is therefore little to learn from. The ideas floated in Section 7 above allow rapid action: it can be built up where successful, and rejected where not, without excessive use of public funds.

So, the **first** longer-term measure is likely to have evolved from the first measure in Section 7: Road pricing should be introduced to control lorry routeing and to safeguard bus lanes. Bus lanes would be priced so high that they would rapidly become self-enforcing.

Whether road pricing should be extended to all vehicles will again have evolved from the measure in Section 7. There are many factors involved. For example, if residential roads have been traffic-calmed by this time, rat-running through them would not be worthwhile. Furthermore, if inner area parking has been cut back, many erstwhile car journeys into congested areas will no longer be made. These factors influence the extent of road pricing that may be necessary.

The **second** longer-term measure is to extend the bus 'revolution' suggested in Section 7. New buses should be introduced, and it may prove desirable to locate a pair of lanes in the centre of a carriageway rather than at the side - as with streetcars which may well be operating there by this time. This accommodates those who **must** occasionally stop at the kerb - emergency vehicles and some delivery vehicles. Pedestrians joining or leaving buses and streetcars would of course have to have absolute priority when wishing to reach the footways.

The **third** measure concerns large-scale investment proposals. If the bus quality of service has been greatly improved, it effect shifts from BR and Underground short to medium-distance journeys, to bus. The degree of success would suggest the extent of new rail investment required. TEST's considered view is that this could have been overestimated. The London Rail Study, and the Commission of European Railways' Study show seductive proposals for new rail systems (see Figure 1. Not all of these may be necessary, but priorities might be given to:

* Tunnelled connexions to Kings Cross/St Pancras of the Channel Tunnel high speed lines from the point where they enter developed parts of Greater London
* the Chelsea-Hackney Line, because it brings into the tube system two ill- or non-served areas, and because it could give relief to the Victoria Line between Victoria and Kings Cross
* Fast links to Heathrow and Stansted Airports. The Heathrow links could beneficially split so part was routed Paddington-Kings Cross-City, and part Victoria-Waterloo-London Bridge-Docklands; alternatively, an extension of the Olympia and York Waterloo-Canary Wharf-Greenwich rail link could link it to Victoria and the Heathrow line
* Docklands Light Rail underlined as just that. Its rôle should be to feed trunk tube lines rather than pretend to be a high-capacity heavy rail system.

Its extension to Lewisham, Greenwich and Thamesmead would seem sensible

The **fourth** measure concerns light rail and streetcars. Light rail is already proposed for the Croydon area. Parts could be implemented experimentally (East Croydon BR via North End to West Croydon BR, all on-street, as an example) while other parts of London were being studied. This would in fact be more like a streetcar system as light rail normally has a segregated right-of-way.

The **fifth** measure has not received any attention for several years: an orbital rail system parallelling the Circle Line, perhaps roughly on the alignment of the North and South Circular Roads. The existing South London Line could form part of it, perhaps being linked with the North London Link.

The **sixth** measure relates to essential road building. Certain bottlenecks need easing to allow for high speed bus lanes, and to make the part allocated to other vehicles work efficiently, within the constraints of Section 6 above. There may even be cases where a modest amount of new road building is necessary. This again would have to be within Section 6 constraints, and would be justified on environmental grounds mainly. As with the West London Environmental Route (WEIR) the justification collapses entirely unless measures specifically exclude a substantial amount of traffic from the surrounding area. Road tunnelling under London is not part of our scenario. Its damaging potential is major: encouraging car use; diminishing public transport use just at a time of great success; and creating new congestion at entry and exit. Investment on this scale would lessen private investment in socially needed projects elsewhere and, **any** road scheme is acutely vulnerable to availability and affordability of vehicle fuels.

The **seventh** concept concerns the adoption of innovative 'high-tech' modes of transport. 'Solutions' which allow the existing road network to accept higher volumes of private vehicles (Autoguide, Scoot etc) will simply lead to congestion elsewhere on the network and a greater risk of total seizure. We prefer a more fundamental examination of the possibilities which modern technology offers provided it is compatible with the environmental objectives of Section 6.

In the new visionary period which is opened out above, an **eighth** measure should be developed. It concerns future lifestyles and work patterns in relation to transport: learning from, and perhaps adding to, the Rees Jeffreys Road Fund's major new initiative **The Future of Transport and Society.** The new strategic transport and planning agency for London clearly should participate in this important debate.

Some Details and Costs

The Central London Rail Study (DTp 1989) reviews costs and benefits of some of the new routes we conditionally support. We like their combination of the Chelsea-Hackney line and an East-West Cross Route: the two together give a benefit:cost ratio of 1.1 - ie the benefits just exceed the costs. We would have preferred their Cross to have incorporated Canary Wharf as it links Docklands more persuasively than does its Light Rail. Table 6 below shows some of the Rail Study's costs (£ million).

Project	Capital construction cost	Total equivalent annual cost	Total annual benefit	Benefit: cost ratio
Chelsea-Hackney	1 000	150	130	0.9:1
East-West Crossrail	870	85	140	1.6:1
Both combined	1 870	235	270	1.1:1

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This couldn't happen in London .....*could it?*

The Big Choke

Transport in London is grossly overloaded because of car-based policies which ensure the continuance of chaos. It is evident that Government ideology is a poor substitute for rationality. Current advances in transport planning are curiously missing from some technical studies; the environment has become a matter of rhetoric, and democracy could join other endangered species.

All Londoners and its visitors suffer from the current crisis. The consensus policies, outlined in this report, need a strategic transport and planning body to make them effective. This body should be elected by Londoners: if proof were needed, **all** the London Boroughs form part of the larger consensus. Without this body and these policies, London will continue to deteriorate until its description by some as a 'third world city' becomes reality.

This report analyses the problems and their causes. Drawing on the lessons learnt elsewhere in the world, TEST suggest both short- and long-term measures designed to get London out of its current mess.

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Rear Cover