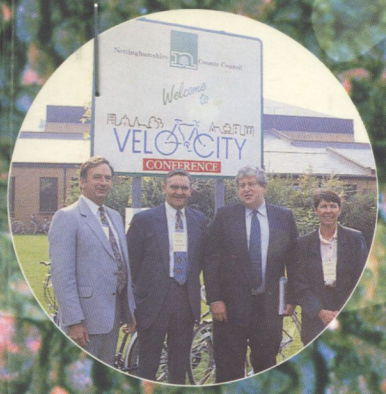

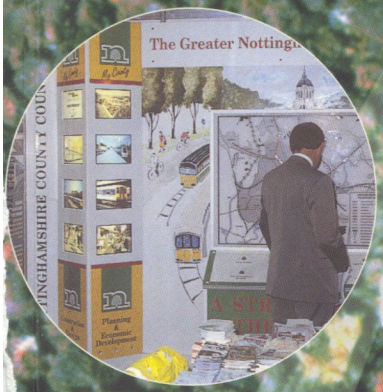

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TENSIONS BETWEEN BICYCLES AND PUBLIC TRANSPORT

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INTRODUCTION

There is a strong case for reducing the amount of motorised traffic in cities[1] in order to meet social and economic objectives as well as to achieve environmental improvements (see Pharoah 1992, 1992a).

Although there are hardly any cities where the trend of traffic growth has been breached, many city authorities have policies which emphasise traffic restraint. Since bicycles and public transport are both more "environment-friendly" than the car, it is often assumed that both are equally deserving of encouragement. In practice, however, bicycles and public transport may compete more with each other than they do with the car. In this case, the justification for increasing cycling activity must be justified in terms other than the desire to reduce motorised traffic.

This paper examines the extent to which bicycles and public transport are complementary to, or in competition with each other, in the total urban transport mix. Both theoretical aspects and empirical data are discussed. Suggestions are made as to how strategies can be made more specific with regard to bicycles and public transport, in order to reduce the mode share of cars.

RELATIONSHIPS BETWEEN DIFFERENT MODES

First we can establish some useful shorthand vocabulary. The "car" refers to individual motorised transport (excluding two-wheel vehicles). "Public transport" refers to bus, tram, light rail, heavy rail and other collective transport modes. We can refer to cycling and walking as the "soft modes". "Public transport" and "soft modes" together are the "city-friendly" modes.

The different modes together comprise the total transport "offer", and ideally each mode would fulfil the functions to which it is best suited, and the use of environmentally harmful modes would be

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[1] For the purpose of this paper, "cities" includes "towns".

minimised. This would require the "city friendly" modes to compete successfully with the car, without impeding each other.

The great majority of person trips are of short or medium distance. For example in Britain, 34% of all trips are under one mile (1.6 kilometres) and 89% of trips are under 10 miles (16 km) in length. Most of the short trips are made entirely on foot (84% of trips under one mile in Britain are made on foot), and motorised modes are not serious competitors. For journeys of 5-10 miles and over, heavy rail systems can compete where they are available, but otherwise the car dominates the market.

The battleground of competition is thus mainly in the trip range one mile to ten miles (1.6 - 16 kilometres). National modal split figures reveal the dominance of the car, but some individual cities have demonstrated that other modes can play a large if not dominant role in providing for these medium-distance trips.

CONFLICT OR HARMONY?

The assumption is often made (by environmentalists at least) that the car is in conflict with the "city-friendly" modes, and that the different "city-friendly" modes are automatically to be favoured because they do less harm to the environment. On closer examination, however, this is seen to be an over-simplification.

There is in fact considerable potential for conflict between the "city-friendly" modes, and moreover the extent of their use may not be a true indication of the "greenness" of the total city transport activity. This requires measures that relate to total travel (such as vehicle miles driven, or energy consumption). There is also potential conflict between the "city-friendly" modes in terms of their operational requirements. These aspects are considered in turn.

Mode share:
Buses, light rail, bicycles, and to a lesser extent walking, are all well suited to medium distance travel. It is also the case that the car is best suited to medium length trips (for longer distances the railway has greater competitive advantage).

The bicycle competes with local public transport for short trips, and medium distance urban trips, especially in the range one to five miles (1.6 - 8 kilometres). High levels of bicycle use, unless they result from less car use, can thus directly reduce the market share for public transport. This can undermine the viability of public transport provision if the "critical mass" of the service falls below a certain threshold level (ie. when there are not enough passengers to justify a service quality that is capable of attracting or retaining passengers).

The bicycle can, however, complement longer distance public transport as a feeder / distributor mode. The competitive position may thus be related to city size, because longer trips and railways to serve them are found only in larger cities.

We are concerned in this paper particularly with the relationship between bicycles and public transport, but walking is also an important consideration. For example, in Germany between 1976 and 1982, the mode share of bicycles increased from 8.6% to 10.2%, but at the expense of a decline in walking. Over the same period the share of the "soft modes" (walking and cycling together) declined from 43.2% to 40.0% (Verkehr in Zahlen, 1986).

We can see, therefore, that increased modal share for bicycles may have effects on total urban transport that are not wholly desirable.

Total Travel

The mode share of the "city friendly" modes must also be considered alongside total travel. Expansion of the mode share of bicycles and public transport may appear less of an achievement if the total travel by car has not diminished. Transport as a whole is a cost to the individual and to the community, and the aim of transport planning should be to reduce the quantity of travel for a given quantity of activities. Rising traffic levels are generally undesirable, and can be masked by examination of mode share alone. Most interview surveys with cyclists address the individual rather than the household, but while the individual may have given up the car in favour of the bicycle, another household member may have taken over that car for other purposes, and there may be no reduction or even an increase in car miles driven by that household.

Road space:

Bicycles and public transport are in competition for roadspace, and this can lead to conflict in infrastructure design, depending on the layout of roads and development. London and Zurich, for example, have narrow roads and dense development (in inner and central parts), so cycle lanes cannot easily be provided without reducing space for pedestrians and buses, and are sometimes impossible on tram routes. London has some bus lanes only 3 metres wide with bicycles included; this is not a comfortable arrangement. In contrast, South Birmingham has many distributor roads built to very generous dimensions where excellent cycle provision can be made (Wenban-Smith, Huddart and Pharoah, 1992).

Road time:

The bicycle is operationally in competition with buses where roadspace is shared, because their average speed is similar in dense urban networks: buses and cyclists tend to arrive at each bus stop at the same time. Also at junctions, cyclists compete with public transport for signal time if a separate phase is included.

Resources

Finally there may be competition for financial and planning resources in the provision of bicycle and public transport infrastructure, though often the budget for road expansion overshadows both.

WILL PEOPLE SWITCH FROM CAR TO CYCLE?

New cycle trips fall into three basic categories, the first when people take up cycling, the second when cyclists make cycle trips to a new activity (eg. a new school or a new job); and the third when people switch from another mode of travel. The first and second categories may avoid the generation of more car trips, the third category is potentially useful in reducing car trips. Two surveys in London have investigated this latter potential (GLC, 1981, 1982).

The first survey, undertaken in Fulham Road, West London, showed a 109% increase in bicycle use over a five year period (1976 - 1981). Interviews with cyclists were carried out in 1981. Nearly three quarters of those interviewed had previously made the journey by another mode. Of these, 12% had been car drivers or passengers, 5% had used a motorcycle, and 13% had previous walked. Most, however, came from public transport, 50% from train and 20% from bus. The positive aspects of cycling (cheap, healthy, quicker, pleasant) were given as reasons for the switch much more frequently than negative aspects of public transport.

The second survey carried out in Camden (inner North London), produced similar findings, with 70% of cyclists interviewed having previously made the trip by another mode, 87% of these having come from public transport. Again, only 10% had come from the car.

A third London survey of 1,000 in Hyde Park cyclists explored the question of what other mode cyclists would use if they could not cycle (GLC, 1985). The results emphasised that "cycling is viewed mainly as an alternative to public transport. Only 6% of cyclists... would use another form of private transport".

A further indication of British motorists' unwillingness to switch to cycle is included in a recent survey by the AA (1993). The survey found that 69% of motorists had not cycled in the previous two years, and these were described as "non-cyclists". Of these motorists, 72% said that they were "not at all likely" to take up cycling again, and a further 9% said that they were "not likely". Only 11% said that they were "quite likely" to cycle again.

Such reluctance to cycle may be a reflection of the generally poor conditions for cycling on British roads, and the low levels of cycle use. The potential for mode shift in places with more favourable conditions (physically and socially) may be much greater. It may be noted, for example, that in the Bremen (Germany) experiment in which six families gave up their cars for four weeks, the bicycle was the preferred alternative mode in most cases (Kramer-Badoni, 1991 reported in Pharoah 1992).

EXPERIENCE OF MODE SWITCH IN DELFT

The development of the cycle network in Delft (Netherlands) is well known, and does not need detailed explanation here. We shall look only at the mode change results that have occurred in the city

during the demonstration project period 1982-85 (results from Dutch Ministry of Transport, 1987).

Although the main aim of the network plan was to make cycling more attractive to those who rely on the bicycle, it was hoped that car traffic would also be reduced.

Although there was an increase in cycling activity, this involved limited change of mode. Most of the increase in cycling was due to cyclists making more cycle trips per day. The mode share of cycling in Delft increased from 40 to 43%. Over the same period the share of walking and car remained stable at 26%, but the public transport share declined from 6% to 4%.

This result appears to suggest that new cycle trips are won at the expense of public transport. On the positive side, however, the stability of car traffic in Delft may well have resulted from the enhanced cycle provisions, and is in contrast to the continued increase in car traffic elsewhere in the Netherlands. Moreover, the share of cycle trips has been increased in a city where there is considerable potential for mode shift away from cycle: the study found that 56% of cycle trips could potentially transfer to other modes, including 27% to car.

MODAL SPLIT AND CITY SIZE

Transport mode split is related to the population size of the city, although this is probably best regarded as a proxy for transport infrastructure and journey length variables. In general the larger the city, the larger will be the mode share of public transport, and of rail in particular, and the smaller will be the share of car, and the "soft modes" walking and cycling. Modal split comparisons are therefore more meaningful between cities of similar population size.

Below we discuss modal split results collated from research by Apel at the Deutches Institut fur Urbanistik (1992). The data for the different cities are consistent and relate to all weekday journeys by residents of the cities concerned in 1989. [2] The data here are for modal split only, not total travel.

MODE SPLIT IN MEDIUM-SIZE CITIES

Mode split has been collated for ten cities with 100,000 - 300,000 population as shown in Figure 1. In order to say that cycle use reduces the proportion of journeys undertaken by car, we would expect those cities with higher than average cycle use to have lower than average car use. Four of the cities have above average cycle use, and two of these (Delft and Groningen) indeed have below average car use, while the other two (Erlangen and Freiburg) have average car use. Basel, the other city in the group with below-

[2] Exceptions are: Delft and Cities of NorthRhine-Westfalia 1985, Berlin (W) 1986, Groningen and Kassel 1988.

average car use has modest cycle use (in 1989) but the highest public transport share.

These figures indicate that it is possible to hold down car use by building up either the cycle share, or the public transport share. However, in either case, the mode share has to be far in excess of the average to make an impact on car use. The cycle share in Delft and Groningen, for example, is two and a half times the average of the group, whilst the public transport share in Basel is twice the average to bring about a similar result for car use. Moreover, it appears to be difficult to achieve above-average use of both cycle and public transport. Delft and Groningen both have a public transport share only about one third of the average.

Comparing the "soft modes" (walking and cycling) together, the conclusions are similar to those for cycling alone. However, taking walking by itself, most of the cities have a walking share close to the average. The exceptions are Erlangen and Groningen, both of which have a walk share 30% below the average. In Erlangen this is counter-balanced by a higher cycling share. In Groningen the cycle share makes up not only for the low walk share, but also the low car and public transport share. Indeed, Groningen is believed to have the largest cycle share of any European city.

MODE SPLIT IN LARGER CITIES

We can apply the same analysis to ten larger cities, with populations in excess of 500,000 as shown in Figure 2.

Four of the ten have a cycle share of all weekday trips in excess of the average for the group, namely Amsterdam, Hannover, Munich and Nuremburg. Of these, only Amsterdam has below-average car use, and all of them have less public transport use than the average for the group.

Of the four cities with above average public transport use (Berlin, Bologna, Stockholm and Zurich), three have achieved below average car use; Zurich has car use 25% less than the group average. However, all of these "public transport cities" have a cycle share that is well below the average.

In these bigger cities, therefore, it is true to say that where the cycle share is larger than the average, this has been achieved mostly at the expense of public transport rather than the car. Conversely, while good public transport can moderate car use, this has not been accompanied by high levels of cycle use.

Walking accounts for a roughly similar percentage of trips in all the cities in this group. Only Bologna has a noticeably higher walk share, and this can mostly be explained by the city having the smallest cycling share of the group (3% of all trips).

CONCLUSIONS

This paper has considered the extent to which the development of the "city-friendly" modes (walking, cycling and public transport) is likely to bring about a reduction in car use. Some conceptual analysis has been offered, together with some data on mode share and mode switch, from which some general conclusions can be made.

1. More cycles less cars?

It is possible in medium-size cities to contain the growth of car traffic by developing a much larger than average proportion of trips by cycle. The Dutch cities of Delft and Groningen are pre-eminent examples. However, the cycle share in most cities elsewhere in Europe is very much smaller than in the Netherlands, and it would probably require massive effort to emulate the Dutch experience. It appears to be less easy to reduce car traffic through cycling development in larger cities. The (British) surveys presented, although limited in scope, reinforce the propositions that (a) most motorists are unlikely to switch to bicycle, and that (b) most new cycle trips replace public transport rather than car trips.

2. Cycles and public transport together?

From the evidence presented here, it appears to be difficult to enlarge the mode share of both cycling and public transport. None of the twenty cities in the mode split analysis has an above average share of trips for both of these modes.

3. Defining a specific role for cycling.

In the light of this observed relationship between cycling and public transport, city transport strategists should avoid general promotion of both these modes and instead decide a clear set of priorities. In general the smaller cities can give priority to cycling, while the larger cities (with rail systems and the need for longer journeys) can give priority to public transport. This approach has been taken, for example, in York and Oxford which as smaller cities give priority to cycles ahead of public transport, and by Zurich which as a larger city has given top priority to its public transport (tram and bus) system. However, in the larger cities there is more scope for integrating cycling as a feeder mode for longer distance public transport.

It is suggested that the role of cycling in city strategies should be specified with reference not only to its relationship to other modes, but also in terms of different categories of cyclist. People using bicycles for local access to shops, schools and stations ("access cyclists") have different requirements from people cycling longer distances to work or for sport ("distance cyclists"). For example, the former can be accommodated on cycleways shared with pedestrians, whereas the latter require separate cycleways, and are better able to mix with motor traffic.

4. Conflict between cycle and buses.

The main problem appears to be the conflict between buses and cycles for local travel (say, one to five miles), which is apparent

in terms of competition for the same travel market, as well as conflict in the use of shared roadspace. These difficulties could be overcome if the mode share of both was maintained by a corresponding reduction in car use (not achieved in the cities studied in this paper), and if substantial improvements were made to bus and cycle infrastructure.

5. Carrots and sticks.

The experience from the cities reviewed would suggest that if the objective is a reduction in car traffic, then the offering of "carrots" alone (in the form of cycle improvements) is unlikely to be effective, and "sticks" will be required to restrain car use directly.

6. The role of walking.

The mode-share battle between cycles and public transport does not appear greatly to affect the proportion of trips made entirely on foot. However, the interaction between cycles and walking for very short trips should be further investigated.

7. Further justification for cycle development.

The relative ineffectiveness of cycle promotion in reducing car use does not, of course, diminish the other objectives of such a policy, such as better health, independence for people below driving age, and a choice of cheap transport.

END

The author would be glad to receive comments or suggestions on any of the issues raised in this paper. Please write to:

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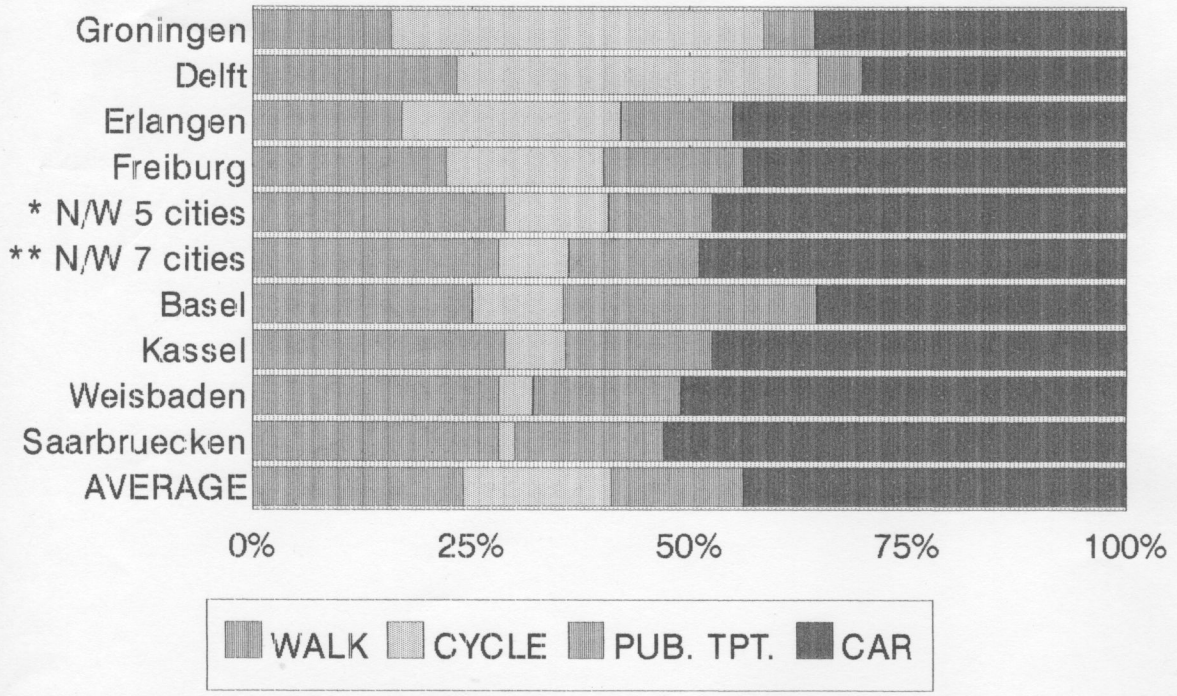
FIG 1. MODE SPLIT IN MEDIUM CITIES

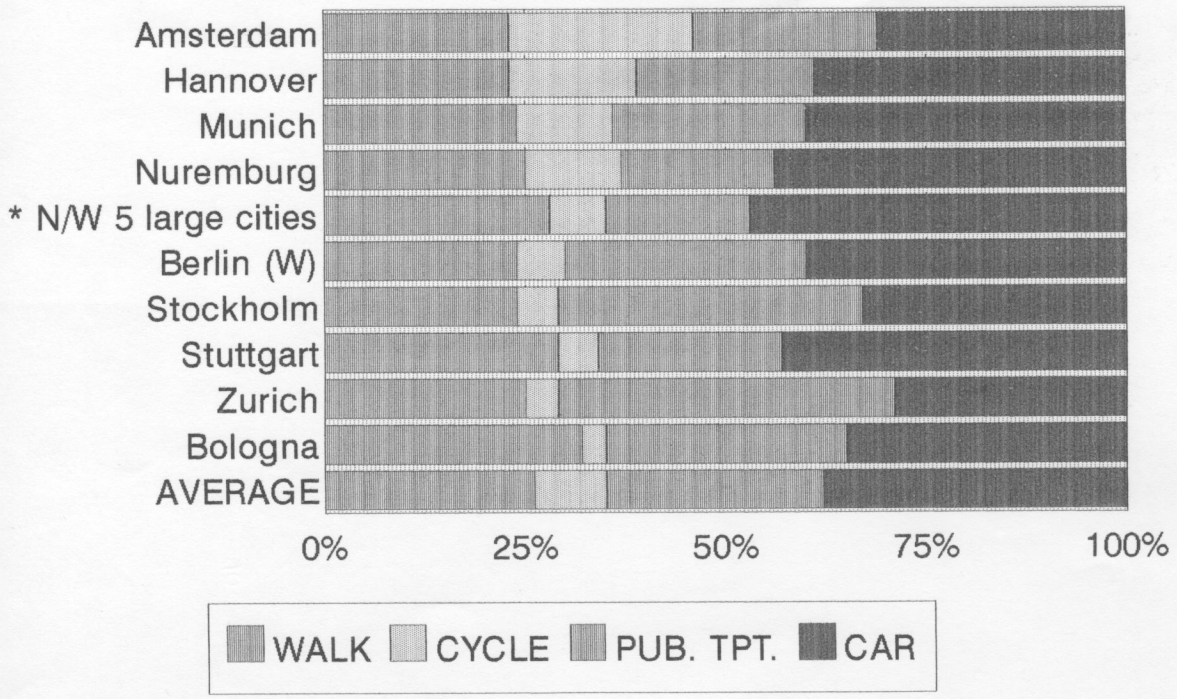
Weekday trips by residents, 1989



Sources: Apel, 1992, and Delft, 1987.

Fig 2. MODE SPLIT IN LARGER CITIES

Weekday trips by residents, 1989



Source: Apel, 1992.

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Notes:

Fig 1. * Solitary cities in NorthRhine-Westfalia: average for Muenster, bielefeld, Paderborn, Siegen. (1985)

** Heartland cities in NorthRhine-Westfalia: average for Krefeld, Moenchengladbach, Wuppertal, Aachen, Bonn, Bochum, Hagen. (1985)

Fig 2. * Average for 5 large cities in NorthRhine-Westfalia: Cologne, Dusseldorf, Essen, Dortmund, Duisburg (1985)