THE SUPERIORITY OF THE CAR! A PROBLEM?

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ABSTRACT: *Motorisation -- and the extensive use of the private motor vehicle associated with it -- reached its pinnacle in the mid 1970s in the Federal Republic of Germany. Since then there is evidence that a certain degree of disenchantment has arisen.*

The negative effects of this phenomenon have become readily apparent to the public; pollution, energy consumption, concrete cities, progressive urban sprawl, loss of the public street area as a means of communication, accident problems, and so on.

The degree to which the conventional transport planner ignores these and other similar considerations, thereby diregarding legitimate public interests, is surprising.

This situation, which can already be seen in the Federal Republic of Germany, appears to exist in Australia in a more serious form. For this reason, it could be that the most urgent question of transport planning in the '80s is to consider the desirability of the self-perpetuating trend of increasing car usage.

Using valid research results, this paper attempts to show that when the individual is considered, a shift of values leading to a more careful use of the environment, can be achieved. It is therefore the task of the responsible transport planners to allow themselves to be open to a change in viewpoint on this issue.

TRANSPORT PLANNING, QUO VADIS?

"In a time when it seems that we are losing our sense of direction, it is valuable to review the meaning of road traffic for our society and to emphasize that the car/road traffic system gains its value only from the user who voluntarily chooses this form of transport and also supports it. This fact will have an impact on future transport planning." So ran the invitation to the German Road Congress in Munich in 1982. What is this "sense of direction" which "we seem to be losing?"

1. THE DIRECTION OF THE "CAR/ROAD TRAFFIC SYSTEM"

The direction which transport planning took in the '60s and '70s was characterised by concepts such as "the car society", "the car-oriented city" and so on. This orientation was supported by what seemed to be an ever-increasing mobility, made possible by the growing use of the car.

This approach, however, overlooked the fact that mobility is not an end in itself but merely serves as a means to access activities which take place outside the home. Thinking in terms of activities, however, leads to the early realisation that the mode used to reach these out-of-house destinations is, basically, of secondary importance. Of primary importance is the need to incorporate all of the possibilities of movement in space into an adequate total analysis of activities.

When all trips by all modes are considered, however, there is no evidence at all (or only a weak indication) of the frequently postulated increase in mobility (see, for example, the work of Kutter in this field). More specifically, this increase assumed by many transport planners only signifies a mode shift; the use of motorised vehicles noticeably increasing at the expense of non-motorised vehicles. If the total number of trips is remaining basically constant, then planning measures or policies which favour one mode will almost automatically work against the other modes.

This is most clearly apparent from the changes in patterns of land-use; changes which were closely associated with the continual expansion of the road network. For a growing number of people, more and more places could only be reasonably reached by car. As a result, an increase in car use became noticeable and, based on this, the planners of roads found reasons to develop more - and frequently very comprehensive - planning schemes.

These schemes were naturally based on forecasts which, in turn, were based on the relevant calculations from models. Because most transport planners had an engineering background, these models had been borrowed from natural science and concentrated on transport in its various levels of aggregation. The smallest unit of aggregation tended to be the vehicle rather than the individual, traffic behaving in the form of "traffic flows". Variables which dealt with occupants of these vehicles as independent objects of behaviour with a free will (probably at variance with that of the planners) only appeared in the models as unexplained residual variables.

This methodology gave rise to forecasts which simply reflected the status quo projections to a greater or lesser extent and promised an uncontrollable increase in (motorised) mobility. The forecasts tended to be mechanical and were rarely based on satisfactory post facto relationships.

They were very often supported by empirical data which were frequently based on so-called traffic counts carried out on selected screenlines (often for a total of only a few days or hours). From these counts "trips per person" were calculated.

Such counts mainly concentrated on heavily trafficked cross-sections of the town or city during weekday peak periods. In addition to the fact that these counts could not usually differentiate between an increase in trip frequency and an increase in trip distance, they also showed regular growth rates in car traffic - which once again gave impressive support to the thesis of increased "mobility".

In the planning efforts described here, non-motorised transport is either disregarded or only considered in brief. Over time, public transport data are collected, though usually with numerous prejudices. For example, if considered at all, public transport is usually recognised as being important only for the journey to work, a fact which, among other things, places increasingly uneconomic requirements on the system, thereby effecting a serious loss of image.

In this way transport planning is extensively dominated by car-orientated thinking, with those who do not have a car at their disposal forming a new group of disadvantaged in our society -- a group which does not, as a general rule, include the transport planners.

This thinking could be another reason for the development of numerous prejudices against other modes of transport leading to considerable controversy over the years. Among other things, it has been claimed that the availability of the car would lead to an even higher level of mobility, despite the evidence which had shown (Wermuth, 1978) that this mobility could be traced to socio-demographic characteristics of these people rather than car availability.

2. SELECTED EMPIRICAL FINDINGS ON MODE CHOICE IN THE FEDERAL REPUBLIC OF GERMANY

In view of the situation which has been described briefly and in a rather simplified form, it is of particular significance that the German Federal Ministry of Iransport commissioned a household survey (KONTIV) (Sozialforschung Brög, 1977) in which, not trips, but activities were recorded. (The survey ran for a whole year.)

The results for 1976 showed:

that the number of car trips (37%) was less than the number of non-motorised trips which totalled 40% (of which 10% were bicycle and 30% walk trips);

- that an above-average car usage occured mainly for males between 20 and 55 years of age, while all other socio-demographic groups used public or non-motorised transport in varying degrees;

- that every tenth car trip was no greater than 1 km, every third trip no greater than 3 km, and every second trip no greater than 5 km. About 30% of all car trips were around the average trip distance for a bicycle (2.5 km);

- that each car was driven an average of one hour a day, meaning that it stood or was parked for 23 hours of the day;

- that the average distance of a trip by public transport was about 15% greater than the average car trip (15.3 km to 13.3 km);

- that in large cities with good public transport connections the percentage of car trips dropped to less than one third of all trips and public transport trips correspondingly climbed to almost one quarter;

- that the bicycle mode (non-motorised) cannot be called exclusively a "fine weather" and/or a "recreational" mode;

- that bicycle use was lowest among 20-40 year olds (i.e. exactly those persons who would be best suited to it both physically and psychologically) and climbed again with increasing age;

- that the share of bicycle trips varied so greatly between different communities that it could not be explained only on the grounds of infrastructure or topography. Rather, the variations were closely related to the current "community climate".

These findings surprised some transport planners, made others insecure, and encouraged still others. They may not have been so widely quoted had it not been for the obvious change taking place on the streets; it could readily be seen that mode usage was changing. But an incorrect analysis of these findings was still a danger, especially if old prejudices remained. But are we seeing a passing fashion or a lasting behavioural change? Is it only a "recreation/fine weather" trend or are there actual mode substitutions occurring? Is the potential for mode shift already exhausted or is further change possible? The list of questions is as long as the range of view points held by transport planners. The resulting uncertainty is, however, an enormous problem, largely because it increases the difficulty of developing effective planning measures to guide and influence current travel demand - regardless of which way the influence is intended.

For this reason the behaviour changes which have been observed will be described in more detail using results (Brög and Erl, 1982).

3. CURRENT BEHAVIOURAL CHANGES IN MODE CHOICE

3.1 Data Base

The point of departure for this discussion is the data available (on a national basis) from the above mentioned KONIIV (1976) together with data from numerous regional surveys of comparable methodological design carried out at the beginning of the '80s - giving a type of time-series. The regions selected for this paper are shown in Table 1.

TABLE 1 LOCATIONS CHOSEN FOR THE TIME SERIES COMPARISON

Location	Characteristics	Net Sample Size (unweighted values) 1975/76	1980/81
DETMOLD	medium size city (67.000 inhabitants) in Nordrhein-Westfalen	1,419 trips (1975)	4,235 trips (1981)
ROSENHEIM	medium size city (52.000 inhabitants) in Bavaria	2,674 trips (1975)	5,608 trips (1981)
LANDSHUT	medium size city (55.000 inhabitants) in Bavaria	1,860 trips (1976)	2,693 trips (1981)
OFFENBURG	medium size city (50.000 inhabitants) in Baden-Württemberg	1,824 trips (1971)	3,032 trips (1981)
HANNOVER (region)	peripheral area of large city (542.000 inhabitants) in Niedersachsen	4,709 trips (1975/76)	12,517 trips (1980)
HANNOVER (city)	large city (535.000 inhabitants) in Niedersachsen	5,207 trips (1975/76)	13,854 trips (1981)
The results of a large survey in a German metropolitan area are also depicted. Since the total results cannot yet be published, a more specific characterisation is not given.			

The results are based on an independent random sample from the whole region. At the very least, the sample sizes allow useful trend forecasting. When differences in methodologies (weighting) were apparent, they were rectified using the relevant data correction methods.

In order to portray a clear picture of the changes which occurred, an index of change was developed, based on the observed value for 1975/76 and divided by the corresponding value for 1980/81.

$$\text{Index of Change} = \frac{\text{Value for 1975/76}}{\text{Comparable Value for 1980/81}} \times 100$$

If the calculated index was greater than 100, the 1975/76 value was greater than the 1980/81 figure - the selected variable thereby having a declining tendency; if it was less than 100, the selected variable had an increasing tendency.

3.2 Mobility

When all trips are considered, it can be shown, even from the selected municipalities for which general indices were available, that there is only a very weak trend toward increasing mobility. Increases in average trip rates occur primarily through the increasing number of complex trip chains used to combine activities (see Table 2).

TABLE 2 MOBILITY

Mobility Figures	Indices*) of change					
	Detmold	Rosen-heim	Lands-hut	Offen-burg	Hannover region	Hannover**) city
Out-of-house share	100	100	100	100	100	99
Trips per mobile person	98	98	98	97	100	98
Trips per person	98	99	98	98	100	97

*) see Section 3.1

**) These figures are not available for the other survey in a German metropolitan area

At the same time, however, there is a slight decrease in the distance travelled per day (and thereby in total traffic capacity). Because this decrease is not adequately balanced by a corresponding decrease in trip duration, the average daily traffic speeds are tending to drop. These developments are, however, closely tied to changes in mode use.

3.3 Mode Choice

As can be seen from Table 3, there is a noticeable difference in the mode split between the regions studied. Bicycles in particular

show very strong variations even though topography is an important factor in only one case. Notwithstanding, the bicycle mode share is indicative of the degree of the behavioural changes for which statistics will be presented later. In addition, it must be observed that in the case of

TABLE 3 MODAL CHOICE 1981 (in percent)

Transportation mainly used:	Detmold	Rosenheim	Landshut	Offenburg	Hannover region	Hannover city	large German city region	large German city
on foot	27	26	28	26	23	33	27	32
bicycle	14	23	26	20	22	14	7	3
motor-bike	2	2	2	5	1	1	1	1
car as driver	38	33	25	35	32	25	39	33
car as passenger	12	8	10	9	6	6	13	11
public transportation	7	8	9	5	16	21	13	20
TOTAL	100	100	100	100	100	100	100	100
MODAL-SPLIT								
non-motorised modes	41	49	54	46	45	47	34	35
motorised individual modes	52	43	47	49	39	32	53	45
public transportation	7	8	9	5	16	21	13	20
TOTAL	100	100	100	100	100	100	100	100

non-motorised traffic (bicycle and walk) there are certain balancing factors between the two modes which lead to a smoothing out of results when mode split is considered at the regional level. This effect also means that the actual behavioural changes (which will be discussed in a further analysis of mode split) are somewhat moderated. Despite this, there are several parallel trends apparent (Table 4): (1) motorised,

TABLE 4 MODAL SPLIT

(Extended) Modal Split:	Indices*) of Change							
	Detmold	Rosenheim	Landshut	Offenburg	Hannover region	Hannover city	large German city region	large German city
non-motorised modes	68	117	91	107	100	86	101	100
motorised individual modes	117	83	112	91	106	135	100	108
public transportation	171	87	108	131	85	80	97	85

*) see Section 3.1

individual modes of transport are decreasing (with three exceptions); (2) public transport usage is increasing in urban areas (especially where there are service improvements); (3) use of public transport is decreasing in smaller communities which do not have easy access to urban agglomerations. Trends in non-motorised transport are not uniform.

This non-uniformity vanishes, however, when all priority modes are considered (see Table 5). It can then be seen that bicycle use throughout the whole area is increasing (even if in varying degrees), though in several cases it is at the expense of pedestrian traffic.

TABLE 5

MODE CHOICE

Transportation mainly used:	Indices*) of Change							
	Detmold	Rosen-heim	Lands-hut	Offen-burg	Hannover region	Hannover city	Large German city region	Large German city
on foot	82	180	135	134	117	94	102	103
bicycle	41	50	45	73	81	68	99	63
motor-bike	30	26	39	19	100	120	72	44
car as driver	133	85	125	103	103	136	104	116
car as passenger	75	93	95	82	119	132	93	91
public transportation	171	87	108	131	85	80	97	85

*) see Section 3.1

This in fact means that the satisfaction which has greeted the increase in bicycles must be seen relatively. Only in a very few cases can it be assumed that significant movements have occurred away from motorised, individual modes to the bicycle. There are some instances where walk trips are being substituted by bicycles. Although this change in behaviour helps to make people more familiar with bicycle as a mode, it is not exactly what planners intended.

4. THE TRANSPORT INFRASTRUCTURE AND THE RESIDENTIAL NEIGHBOURHOOD

At this point it should once more be emphasised that the transport infrastructure does not only serve safety needs, but also represents an important element in our living space. This becomes clearer if the individual as a behavioural unit is seen, not only as a participant in transport, but also as a user of this living space, i.e. in this case, as a resident in neighbourhoods which are accessible to transport.

In this context, it can be established that, already since the beginning of the '70s, and even more since the mid '80s, there has been an increasing desire among residents to improve the shape and quality of the local environment. The most important elements of these desired changes are (Brög, 1982c):

- less disturbance from traffic noise and emissions;
- more green space and recreational areas within residential areas;
- increased freedom of movement in safer streets;
- closer attention to disadvantaged groups (children, the aged, the mobility-disadvantaged);
- suitable attention to non-motorised modes;
- rediscovery of the street as a communication space and recreational area, and so on.

While the desire for these improvements is now becoming an ever higher priority in the choice of residential location, satisfaction with the degree of fulfillment of the desires is relatively low. By contrast, in 1976 the degree of satisfaction with the neighbourhood transport environment was quite high (see Table 6) (Sozialforschung Brög, 1976).

TABLE 6 EVALUATION OF CHARACTERISTICS PERTAINING TO NEIGHBORHOOD IN PLANNING REGIONS WITH AN URBAN STRUCTURE KONTIV 1976

Characteristic	Importance*)	Contentment**)	(Degree to which fulfilled)
Basis	2455	2455	
Neighborhood, area surrounding residence	1.73	2.34	(-)
Characteristic of residence (costs, size, furnishings)	2.10	2.49	(-)
Protection against pollution and noise caused by traffic	2.32	3.20	(--)
Shopping possibilities in the area	2.33	2.40	(0)
Accessibility by public transportation	3.16	2.63	(+)
Accessibility by private motor vehicle	3.24	1.83	(++)

*) The Scale reaches from 1.00 = most important to 6.00 = least important

**) The Scale reaches from 1.00 = very content to 6.00 = very discontent

With this background it must be assumed that, parallel to the trends discussed here, there are additional trends to be considered for those persons using motorised, individual modes.

5. THE POTENTIAL FOR THE SUBSTITUTION OF MOTORISED, INDIVIDUAL MODES

The results discussed so far lead to the conclusion that current trends, the existing mood of environmental awareness, as well as other conditions which affect behaviour, all argue in favour of non-motorised and/or public transport. It is, therefore, important to consider whether, and under what conditions, the users of individual modes would be prepared to actually change to these alternative modes (Brög and Erl, 1983).

As has been discussed at length elsewhere (Brög, 1982b), this question is relatively difficult to deal with from the point of view of research methodology. Nevertheless, the now frequently applied situational approach (Brög and Erl, 1981a), used together with the new empirical survey techniques (Brög and Erl, 1980), can be expected to give relatively reliable results. The potential for a mode switch to bicycle has already been analysed in this way (Socialdata, 1980b) and presented to the research community (Brög, 1982a). In this report, various factors (dimensions) influencing mode choice were identified. These factors could, in turn, be dealt with using specific planning measures (see Table 7). A calculation of the mode shift away from car confirmed that a goal-oriented bicycle promotion campaign could effect a recognisable decrease in individual traffic. In particular, it was apparent that subjective measures (together with an integrated system of planning measures) were very important and were capable of achieving a further reduction (about 10%) in car trips, even without measures restricting car traffic.

Obviously this estimate can vary according to the specific spatial influence. This also applies to the substitution of car trips with public transport. However, since the various results referred to all exhibit similar trends, it is possible to use them as the basis for forecasting general trends.

Already in the mid '70s in the Federal Republic of Germany about two thirds of all car trips could not be made with public transport because of objective restrictions or severe constraints (Brög and Schwerdtfeger, 1977). In every fourth case the existing alternatives were not chosen for subjective reasons (e.g. too little information, poor subjective perceptions). Only every tenth car trip could have been made equally well with public transport from both an objective and a subjective point of view. This order of magnitude has since been confirmed variously (Wermuth, 1979; Socialdata,1980a). It can therefore be assumed that a mode shift would best be effected if it were possible to actually question each individual car driver and/or to encourage at least the experimental use of alternate modes (Brög, Förg, Mötsch, 1983) (something not usually achieved in "classical" advertising methods). If this were achieved it could be expected that at least half of this potential (i.e. at least 5% of car drivers) would shift mode on a long-term basis (Brög and Erl, 1981b).

There are numerous indications, therefore, which, despite continually increasing motorisation, suggest that the use of the car may stagnate or actually decline in the future. This decline will presumably fail to eventuate only if the use of the car continues to be promoted through car-oriented planning measures.

TABLE 7

POTENTIAL FOR CHANGE

Change of the Bicycle Share for all Trips due to Policy/Planning Measures

		OBJECTIVE CHOICE	CONSTRAINTS		PERCEPTION OF THE ROUTE	PERCEPTION OF TRIP/TRIP TIME	SUBJECTIVE WILLINGNESS
		Making Bicycles available at all times	Improvement of Weather Protection on Bicycles	Improvement of the possibility to carry luggage	Removal of traffic problems on the route	Improvement of the perception of bicycle trips on the route	Creation of subjective willingness to ride a bicycle
Making Bicycles Available at all Times	Potential for Bike:	16.9 - 18.9%					
	Reduction of:						
	• Walk	- 1.1%					
	• Indiv. Modes	1.1%					
	• PT	0.4%					
Improvement of Weather Protection on Bicycles	Potential for Bike:		16.9 - 22.0%				
	Reduction of:						
	• Walk		- 1.3%				
	• Indiv. Modes		- 3.8%				
	• PT		- 0.5%				
Improvement of the Possibility to carry luggage	Potential for Bike:			16.9 - 19.9%			
	Reduction of:						
	• Walk			- 0.4%			
	• Indiv. Modes			- 2.8%			
	• PT			- 0.3%			
Removal of Traffic Problems on the Route	Potential for Bike:				16.9 - 19.2%		16.9 - 27.1%**)
	Reduction of:						
	• Walk				- 1.0%		
	• Indiv. Modes				- 1.5%		
	• PT				- 0.4%		
Improvement of the Perception of Bicycle Trips on the Route	Potential for Bike:				16.9 - 21.9%	16.9 - 19.6%	
	Reduction of:						
	• Walk				- 1.7%	- 1.0%	- 4.3%
	• Indiv. Modes				- 3.4%	- 2.1%	- 5.7%
	• PT				- 0.4%	- 0.2%	- 0.8%
Creation of the Subjective Willingness to Ride a Bicycle	Potential for Bike:	16.9 - 23.1%	16.9 - 25.0%	16.9 - 24.4%	16.9 - 22.3%	16.9 - 24.8%	16.9 - 19.6%
	Reduction of:						
	• Walk	- 3.5%	- 3.2%	- 2.4%	- 3.1%	- 3.3%	- 2.0%
	• Indiv. Modes	- 2.6%	- 4.6%	- 5.3%	- 2.3%	- 4.5%	- 0.9%
	• PT	- 0.6%	- 0.7%	- 0.4%	- 0.5%	- 0.4%	- 0.3%

Sample Size: 1593

**) A Combination of the three measures

Corresponding to this decline is a strengthening trend towards public and non-motorised transport - a trend which could undoubtedly be strengthened still further if suitable planning measures supported it (Brög, 1982e). It would, however, need a basic rethinking of planning since it would require that all planning schemes included:

(i) methods to increase the information received by those people with the potential to shift mode, and,

(ii) methods of correcting the negative subjective perceptions.

By differentiating between individual spatial structures, a completely different perspective of transport events would be gained. In cases where it is possible to stabilise the established trend toward a more considered use of the car, and to put together a suitable package of integrated planning measures, it will also be possible to achieve a substantial decline in car trips (per person) without having this decline balanced by an increasing volume of traffic.

6. CONCLUDING COMMENTS

Returning to the quotation cited at the beginning of this paper, the empirical findings presented here have clearly shown that some of today's "users" who have "voluntarily chosen the car/road traffic system as their form of mobility" may well ascribe a "value" other than the transport planning philosophy underlying this quotation. Certainly in order to support the quotation it would be essential that the "user" could, in fact "voluntarily choose" his "form of mobility". When it is realised, however, that according to a rule of thumb two out of three car drivers (see Section 5) would be restricted to a limited set of activities without a car, the thesis "voluntarily chosen form of mobility" must be questioned.

Similarly, it is currently evident that, even if this "form of mobility" would have been "voluntarily chosen" by the individual in all cases and not a generated demand, negative side effects of this use have developed for many users.

These negative effects are documented through increasingly articulated expressions of annoyance and as observable behaviour changes; changes in areas where some transport planners still tend to act against the interests of the most affected groups.

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