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## **Potential for Increasing Public Transport, Cycling and Walking Trips**

This paper outlines the potential level of behaviour change that can be achieved through the behavioural approach without the need for system improvements, pricing and land use policies. The in-depth research technique employed has been developed by Werner Brög over many years and its application in the Cities of South Perth and Subiaco and Town of Victoria Park is an important ingredient in the debate about achieving the Metropolitan Transport Strategy targets.

The research shows that in the three local authority areas where the research was undertaken that in theory the Metropolitan Transport Strategy targets are achievable even without improvements to the transport system. The question therefore is not whether the targets can be achieved but which travel demand management techniques are the most effective in achieving the targets.

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## ***Introduction***

The need to change the mode share for travel in the Perth Metropolitan Region is clearly enunciated as a set of targets in the region's Metropolitan Transport Strategy. The traditional mobility management approach to achieve mode change has been through the provision of transport services and infrastructure, including pricing, and the longer term land use policies. The application of a behavioural approach, especially in a car dominated city like Perth, has not, until recently, been in the transport planner's tool box.

This paper outlines the potential level of behaviour change that can be achieved through the behavioural approach without the need for system improvements, pricing and land use policies. The in-depth research technique employed has been developed by Werner Brög over many years and its application in the Cities of South Perth and Subiaco and Town of Victoria Park was a further step in the implementation of various TravelSmart® behaviour change programs.

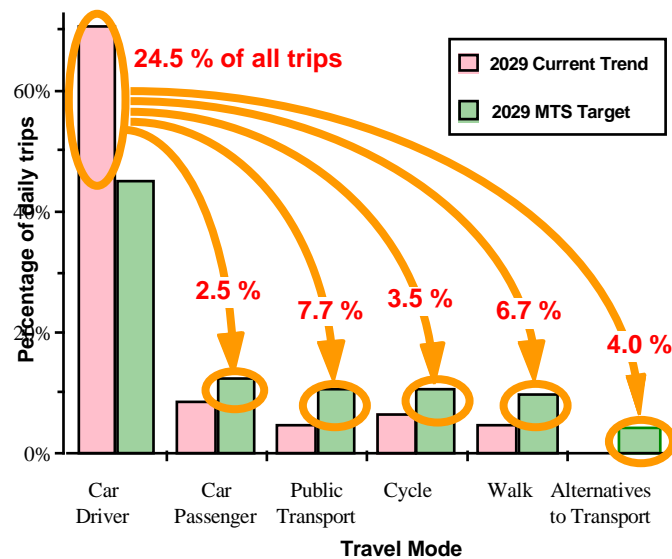
## ***Transport Policy Setting***

The Metropolitan Transport Strategy (MTS) provides the overall policy setting for the need to achieve a better balance in the use of the motor car. The reasons for this better balance are common for most developed cities through out the world. The MTS provides a vision for a liveable city, of which transport is a contributor, and is supported by a set of principles and targets (Department of Transport *et al*, 1995).



The relevant MTS targets for the behavioural approach are:

1. The car occupancy target is to increase car occupancy from 1.21 in 1991 to 1.25 by the year 2029 (the trend is to an occupancy rate of 1.13 by 2029).
2. The trip length target for personal trips is to reduce the average trip length from 8.4 km in 1991 to 7.2 km in 2029 (the trend is to 10.7 km in 2029).



3. The mode share targets are shown in Figure 1, which clearly illustrates the aim of redistributing car driver only trips across the alternative modes.

**Figure 1: Metropolitan Transport Strategy Mode Share Targets**

The primary target for the behavioural approach is the mode share target. This paper identifies whether it is possible to achieve this target.

### ***In-depth Research Rationale***

We all perceive the world around us in a subjective fashion. This leads to incomplete and distorted views of the world, but regardless of how wrong these subjective worlds may be, these views determine our behaviour.

A situational research technique was developed to analyse and understand individual behaviour patterns (Brög, 1982). Every individual is given a specific amount of personal freedom by his environment within which he can act; this is his objective situation. The personal freedom of the individual is affected by

- the transport infrastructure and services they can access;
- the constraints and options of the individual and his household which can be socio-demographically deduced (e.g. age, stage in life cycle); and
- their social values, norms and options which are pertinent to travel behaviour.



Each individual experiences these objective situations differently; thus creating individually different subjective situations. The subjective situations differ from objective situations due to perceptions being incomplete or distorted consciously or unconsciously. The extent of deviation depends upon the individual person and their specific experiences.

Individual decisions are made in these subjective situations. Thus individual decisions made in subjective situations are responsible for determining behaviour.

To understand travel behaviour, it is necessary to reconstitute the chain linking objective situation – personal perception – subjective situation – individual decision – behaviour. It is possible by using different methods to influence every link in this chain.

Therefore behavioural change measures should not just be based on ‘hard policies’ like system improvements, but also on ‘soft policies’ like communication, motivation and – last but not least - information.

The situational approach is not limited to individual behavioural situations, such as factors influencing an individual’s free choice. The approach also recognises the fact that individual (behavioural) decisions are made in accordance with a personal, subjective logic that is frequently at odds with the researcher’s, planner’s or politician’s ‘rationality’. This does not imply that the individual does not act rationally; only that their logic is also subjective. The regularities of subjective logic are naturally manifold and have not yet been exhaustively studied. (Brög and Erl, 1981)

For example, one of the assumptions used in economic theory is that the mobility market is a perfect market place in which buyers are fully informed. To rely on this assumption in ‘selling’ the alternative modes to buyers is a fallacy and leads to a missed market share – an aspect car manufacturers do not leave to chance.

Travel behaviour decisions are influenced to large extent by individual perceptions of mobility, especially individuals knowing they have a choice in the way they travel. These perceptions are in turn influenced by the land use patterns; household structures and interdependencies in which people live; availability of alternative modes; previous experiences; habits, values and attitudes.

### ***Data Base and Study Area***

The implementation of the in-depth research methodology requires an intensive dialogue with each household (up to one hour) with each member having previously completed a travel diary (Brög and Erl, 1980).

The sample used for this was 406 persons, evenly distributed through each of the local authority areas of South Perth, Subiaco, Victoria Park (together called “Perth” in the



following figures). The interviews were carried out in October and November 1998 with a response rate of 67.5%.

### ***Criteria used to Define Potential***

Every person in “Perth” makes around thousand trips per year. Every time someone makes a trip a mode can be chosen and most people choose and use all kinds of different modes. Therefore to categorise each person as simply a car driver, public transport user or cyclist is fallacious. This is an opportunity for behaviour change measures – because everybody has a trip each day where environment-friendly modes like public transport, walking or cycling are feasible alternatives. These trips are the potentials for behaviour change (Brög and Erl, 1996b).

In many cases only subjective reasons hinder the use of these alternative modes, which can be based on lack of information. Often people have not even used the alternative modes for years and have no information about their current state and standard. Therefore usage, combined with information which is adapted to the individual needs, can be the key to gain a new user.

On the other hand there are also always trips without an alternative mode. First of all there can be constraints against alternative modes like the use of cars for business reasons or transport of heavy luggage. Another reason, especially for public transport, can be an inadequate connection.

Finally there are trips that can be defined as free of choice, where people are informed and chose not to use an alternative mode to the car.

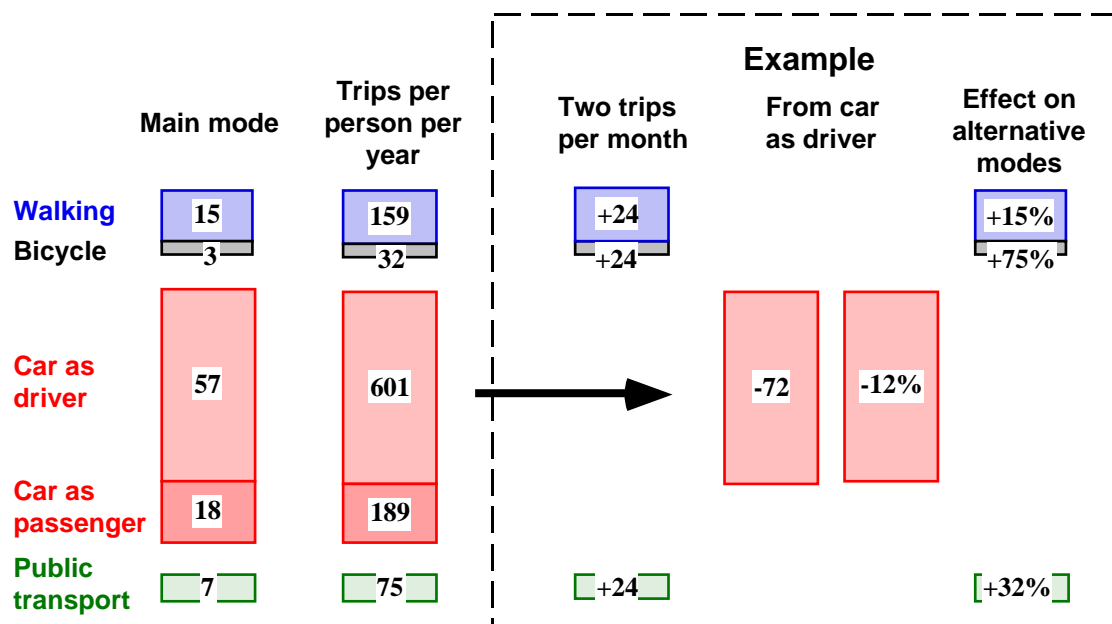
The following criteria were conservatively applied to determine if an alternative mode is suitable:

1. People do not have a constraint, such as needing to carry a large parcel, feeling unsafe travelling at night, work business, etc.
2. A public transport option that is less than double the time or twenty minutes longer than using the car, which ever is the least.
3. A trip that is less than two kilometres that can be made by walking.
4. A trip less than six kilometres that can be made by bicycle.



## Small Changes Large Effects

To increase the share of trips with environment-friendly modes, moderate changes can achieve impressive improvements. This is shown in Figure 2.



**Figure 2: Changes are possible**

In 15% of all trips walking is the main mode, in 3% the bicycle and in 6% public transport. In absolute numbers an average “Perth” citizen covers 159 trips per year by walking, 32 by cycling and 65 with public transport. In contrast 76% of all trips are covered with motorised private transport, 58% with the car as driver and 18% as passenger which equals 803 trips a year by car.

To increase, for example, the share of walking by 15%, a change in the mode choice for 24 trips per person per year would be necessary. That means two trips per month - there and back. If we want to increase the number of cycling and public transport trips by 24 trips per person per year, people would have to change modes three times a month to and from an activity. These changes of behaviour are moderate and do not require major changes to lifestyle or levels of mobility.

Mobility is a closed market. Therefore a potential gain for environment-friendly modes requires replacement of car trips with the alternative modes. To replace 24 trips per year for each alternative mode requires 72 car trips to be replaced, equal to 12% of all car as driver trips. The effects of this change would not just be a 15% increase of the walking-share, but also a 75% increase in cycling trips and a 37% increase in public transport trips.



## Current Motorised Private Mode Trips

Motorised private modes – cars and motorbikes (as drivers and passenger) – are used on average for 803 trips per year. Table 1 shows the breakdown of car trip numbers by journey purpose and trip distance.

	Up to 1.0 km	1.1 to 3.0 km	3.1 to 5.0 km	5.1 to 10.0 km	Over 10 km	<b>Total</b>	Proportion
Work	8	34	35	54	67	<b>198</b>	25%
Education	4	10	12	5	8	<b>40</b>	5%
Shopping and services	35	72	97	43	19	<b>206</b>	26%
Leisure	21	47	42	68	84	<b>230</b>	29%
Other	12	27	26	31	24	<b>119</b>	16%
<b>Total</b>	<b>80</b>	<b>100</b>	<b>151</b>	<b>190</b>	<b>182</b>	<b>793</b>	
Proportion	10%	24%	19%	24%	23%		

**Table 1: Trips with Motorised Private Modes (per year)**

Of those eight hundred trips with motorised private modes 10% (80 trips) are less than one kilometre (average 0.8 km) in length and almost a quarter are between one and three kilometres (average of 2.3 km). Trips of these distances – around one third of all motorised private mode trips - are potential walking trips, provided that there are no constraints (e.g. heavy parcels or trip chaining).

Around one fifth of all trips (19%) are between three and five kilometres and a further quarter (24%) are between five and ten kilometres, distances which have the potential to be made by bicycle and public transport. Less than one quarter of all motorised private mode trips (23%) are further than ten kilometres.

The most frequent journey purposes with more than a quarter of all trips are leisure and shopping (including “service” trips to the post office, doctor, etc.), followed by work trips.

Even a superficial glance at the individual fields of the matrix shows that there are clearly many car trips for which it is difficult to imagine that it is absolutely necessary to use the motor car.

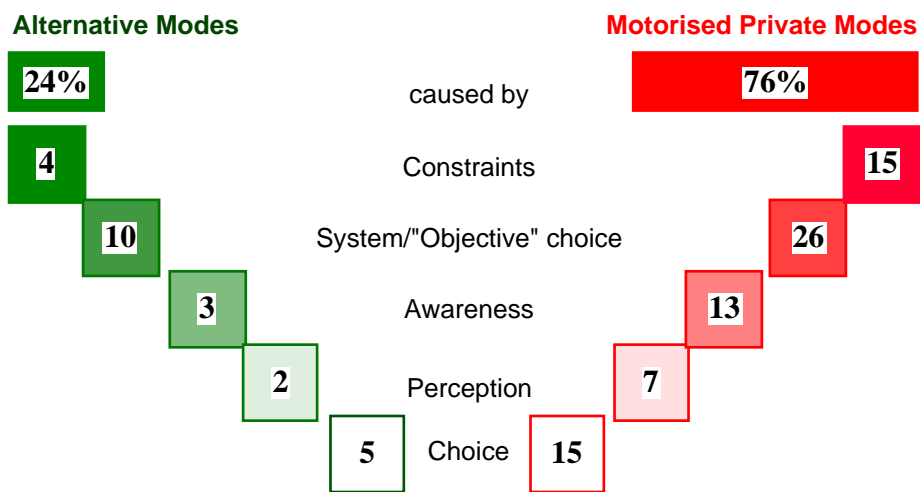


To determine the possibility for replacing car trips, it is necessary to test each individual trip to see if there was an objective reason for using the car (e.g. business use of the car, car trip within a longer transport chain, transport problems, etc.) and whether an alternative mode would in fact have been available. The interactive approach of the indepth technique coupled with each individual's travel diary provides an avenue clearly differentiate between people's subjective and objective situations, unlike traditional market research that relies solely on determining people's subjective situation.



## Objective and Subjective Situations

In the study area the alternative modes account for 24% of all trips and motorised private transport for 76%. Of the motorised private mode trips, 15 % involve material constraints, while there is no suitable motorised private mode alternative for 26% (see Figure 3). The reasons for not the alternative modes for 13% are a negative awareness and a negative community attitude about using these modes, and for 7% a negative judgement in terms of time, comfort and cost. There remains 15% of motorised private mode trips for which the use of an alternative mode was known and the individual had a positive view of the alternative, but it was not chosen.



**Figure 3: Potentials**

In the in-depth survey detailed information about the potential was collected. The main constraint reason was luggage; against public transport at 95 trips, against cycling in 74 times and walking 70 times. In contrast, a transport chain was just mentioned in four times for public transport and cycling and five times for walking.

As for “objective” reasons, there was no public transport connection available for 118 trips out of the 1,000 personal trips and for 404 trips the connection time was not reasonable.

Lack of or insufficient information on travel time was the reason in 464 trips for not using public transport, followed by no information on fares 416 times and no information concerning the route 366 times. Comfort in general was mentioned for not using the public transport alternative for 220 trips, however detailed complaints were hardly mentioned. A main comfort reason against cycling is the requirement to wear a helmet (126 trips).



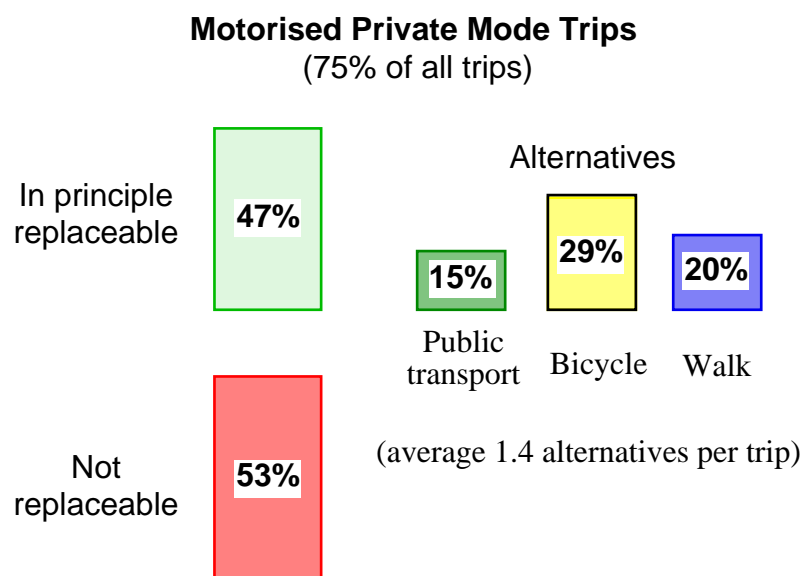
Conversely, for the trips undertaken by the alternative modes, freedom of choice to use a motorised private mode exists at any time for 5% of all trips (or for one fifth of all trips with alternative modes). In 4% of all trips there are constraints against a motorised private mode use. Trips by alternative modes without an objective choice are the largest group with 10% of all trips (a car was not available for 426 trips, for 118 trips a driving licence was missing). Awareness is the reason in 3% of all trips and perception in 2%.

For 20% of all trips made with motorised private modes because of ‘subjective’ reasons – awareness and perception. Even with system improvement, this would be still an additional task.

### **Potential for Change**

The in-depth research identified that up to 47% of motorised private mode trips are in ‘principle’ replaceable (no constraints, alternative available). This is without system improvements, such as more public transport services, cycling infrastructure, etc. On average people have 1.4 alternative modes available to replace the car trips – a fifth by walking, 29% by cycling and 15% by public transport (see Figure 5).

Therefore in theory it is possible to use travel behaviour programs alone to achieve nearly a fifty per cent reduction in car trips. In practice it is not an issue of potential but effectiveness of behaviour change measures. Information and communication have already been proved to be effective measures to increase the share of environment-friendly modes.

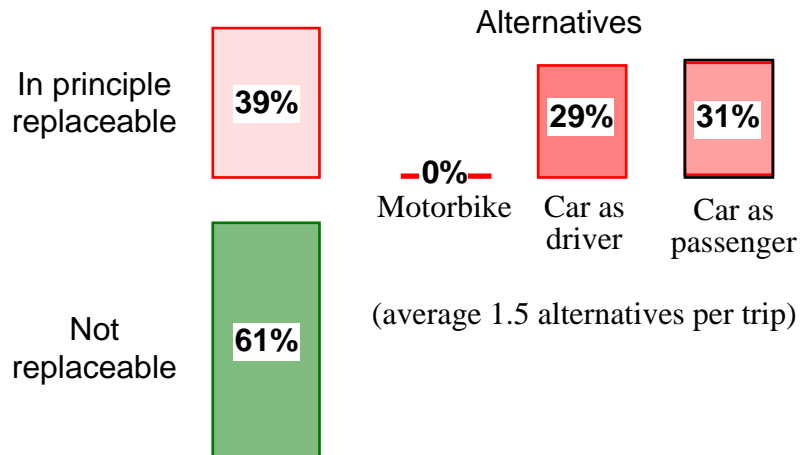


**Figure 5: Potential for Environment Friendly Modes**

Conversely it is also possible that existing use of the alternative modes shift to the motorised private modes. Nearly forty percent of trips by alternative modes could be undertaken by car, either as driver or car passenger, provided that a car is available and no constraints exist.



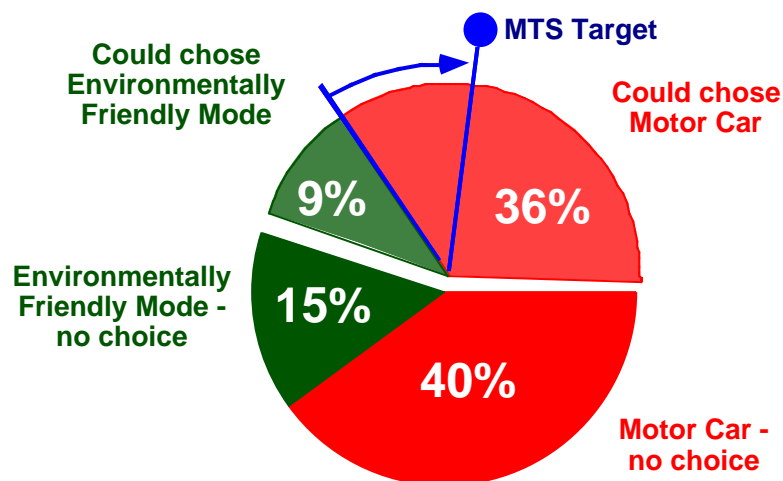
### Alternative Mode Trips (25% of all trips)



**Figure 6: Potential for Private Motorised Modes**

Thirty nine percent of trips by alternative modes are in principle replaceable by motorised private modes. On average there are 1.5 alternatives. Around 30% of the alternative mode trips could be undertaken in the car, either as driver or as passenger.

When we combine these two analyses together we find that 40% of all current trips by car and 15% by alternative modes are not replaceable (see Figure 7). The choice market for car and environment-friendly modes is 45% of all trips, of which the car has achieved a market share of nearly 80%. The MTS target is to increase the share for the alternative modes to about half of these trips by the year 2029. The market share for Germany by comparison is fifty per cent - which approximately equates to the MTS target.



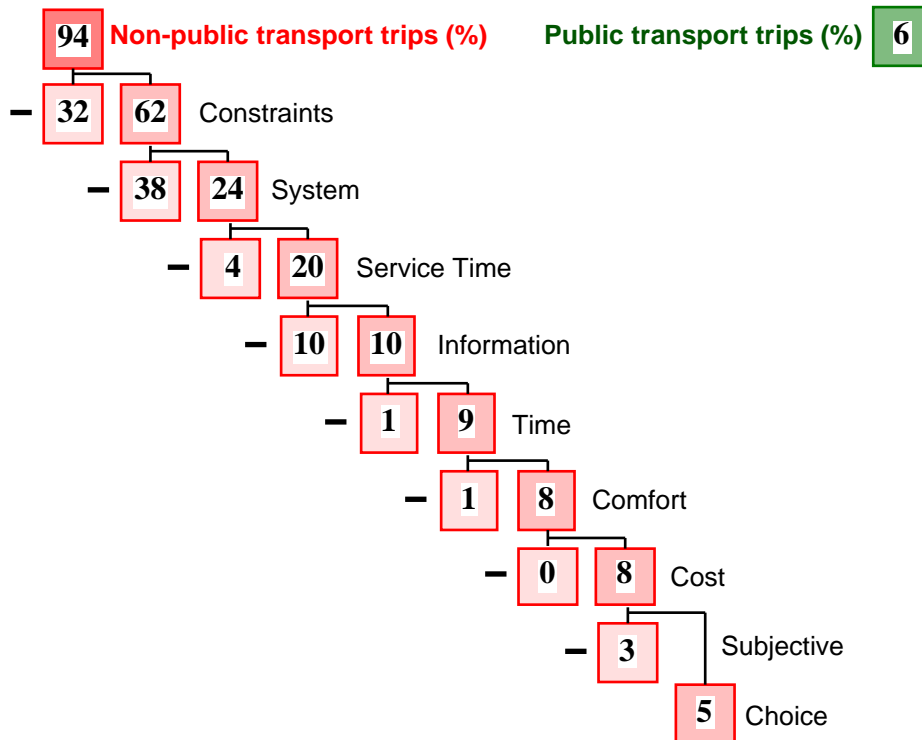
**Figure 7: Potentials for Change of Modes**

This research shows that there is a large potential for change, both in favour of motorised private modes and the alternative modes. The MTS targets lie within the potential range, slightly off centre in favour of the alternative modes. The challenge is therefore not one of potential but one of effective measures.



## Potential for Public Transport

In Perth just six percent of all trips are covered with public transport. Due to the mobility market being closed, future public transport trips lie within the remaining 94% of trips. A detailed analysis was performed to quantify the actual potential for additional public transport trips. The analysis is based on an average week-day.



**Figure 8: Potential for Public Transport**

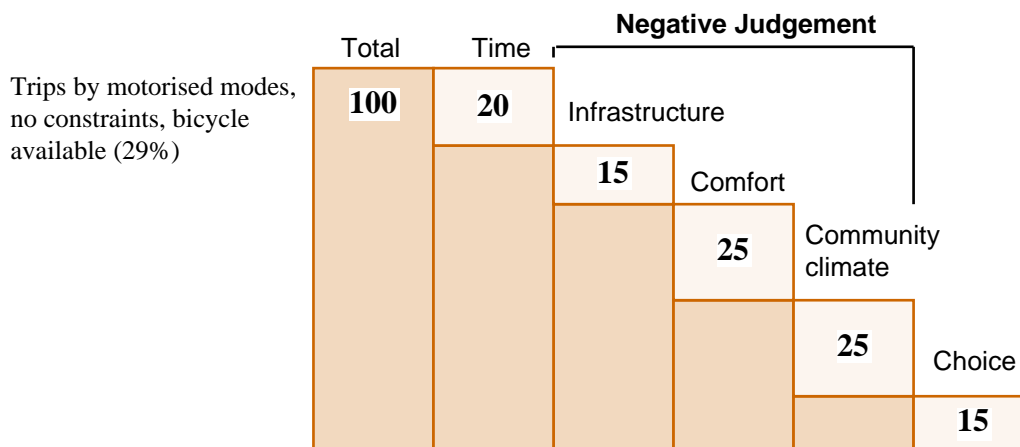
Constraints (e.g. carrying large parcels or the use of cars for business reasons) are the reason for 32% of all trips not being potential public transport trips. For 38% of all remaining trips no adequate public transport alternative exists. For a further 4% the service time is not competitive with the other modes. All these reasons are objective reasons which can not be effectively solved without system improvements, if at all.

Therefore there are 20% remaining trips where just subjective reasons prevent the use of public transport. This potential for usage is more than three times higher than the current use of public transport. Half of this lost potential is due to lack of information – which means that one of ten trips could be undertaken by public transport if people were informed. In only two percent of cases time and comfort are the reasons for not using public transport. Costs are often considered too high, but this was not mentioned in the discussions with people. For three percent of all trips, other subjective reasons hinder the use. Therefore every twentieth trip (5%) is a free of choice decision not to use public transport.



## Potential for Cycling

The in-depth survey identified that 29% of all motorised private mode trips are in principle replaceable by bicycle (car trips with no constraints, bicycle available – see Figure 9). When interviewed further respondents identified a number of reasons why they did not cycle.



**Figure 9: Potential for Cycling**

In 20% of those potential bicycle trips the amount of time was the reason for non-use and in 15% the lack of bicycle infrastructure was mentioned. Comfort was decisive in 25% of the trips and in similarly 25% community climate (i.e. a negative view of citizens in a community about cycling) was the reason.

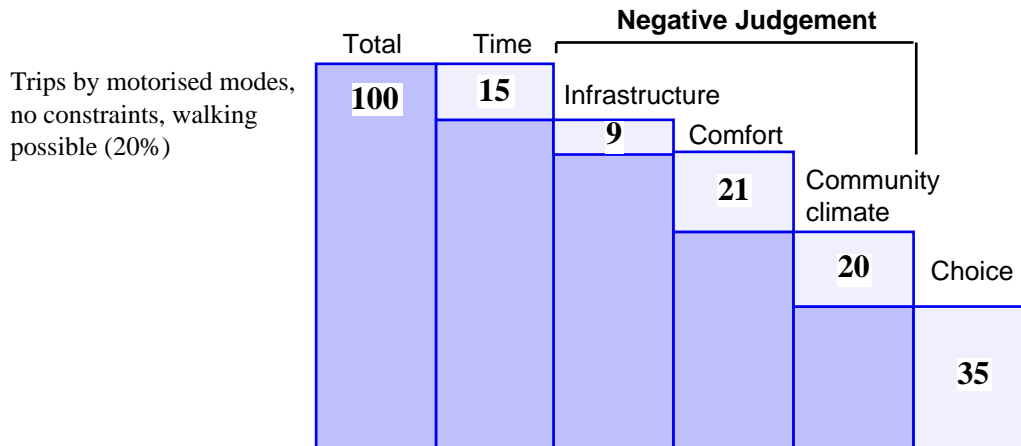
Long-known findings are confirmed with bicycle infrastructure have only a relatively small potential to increase cycle use. A substantial increase in cycle use is possible however there is a need to change general opinion (community climate) towards the bicycle being seen as an everyday transport mode.

Fifteen percent of potential bicycle trips are free of choice travel decisions. For these trips people sometimes just do not have the bicycle as an alternative to the car in their minds. Therefore just an increase in the awareness for this alternative is required.



## Potential for Walking

A comparable consideration for motorised private mode trips substitutable by walking gives similar results. Every fifth car trip is in principal replaceable by trips on foot. Further inquiries revealed the reasons why the motorised private mode is chosen even though there are no constraints and walking is an alternative.



**Figure 10: Potential for Trips by Walking**

Out of all possible walk trips 15% are undertaken with the car because of time reasons. Like cycling, “community climate” is a stronger factor affecting the decision to decide to walk (20%) than infrastructure (9%). Comfort was mentioned for 21% of the relevant trips. Again measures in the system (‘hard policies’) only have lasting success if they are accompanied by suitable measures for people’s travel decision making (‘soft policies’). Like cycling, “community climate” is a stronger factor affecting the decision to decide to walk (20%) than infrastructure (9%). Comfort was mentioned for 21% of the relevant trips. Again, measures in the system (“hard policies”) only have lasting success if they are accompanied by suitable measures for people’s travel decision making (‘soft policies’).

Thirty five percent of the possible walk trips are therefore free of choice. The free of choice potential for walking is clearly stronger than that for cycling and public transport.

## Conclusion

The intensive in-depth research undertaken for these three local communities shows that the issue for behaviour change is not one of potential but rather one of devising effective measures. Nevertheless there is often a great deal of scepticism about the potential for behaviour change. This is likely to be due to previous survey techniques only being able to identify those in the ‘choice’ category. The in-depth research has identified that the theoretical potential for the alternative modes is 60% and car trips is 85%. The research also showed, that almost half of all car trips are in principal replaceable by the alternative modes – 20% by walking, 29% by bicycle and 15% by public transport – an average of 1.4 alternatives available. To achieve the MTS targets, 42.5% of the in principle replaceable trips need to be



made by the alternative modes and 57.5% by the private motorised modes. The in-depth research shows that this can be achieved without any system improvements.

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