

# **CYCLING AS A SUPPLEMENTARY MODE TO PUBLIC TRANSPORT: A Case Study of Low Income Commuters in South Africa**

**EVA BECHSTEIN**

ITS Engineers (Pty) Ltd, P O Box 75100, Lynnwood Ridge, 0040 Pretoria  
Dresden University of Technology, 01062 Dresden, Germany  
IVAS Dresden, Alaunstraße 9, 01099 Dresden, Germany

## **ABSTRACT**

As a result of often being excluded or underestimated in past travel surveys, the importance of cycling trips needed to be investigated. The objective was to get insight into commuter travelling of low income households with the focus on cycling as a transport mode and its impact on reducing transport costs. The townships Mamelodi and Nellmapius, located at the east of the City of Tshwane, were chosen as the case study area. The data collection consisted of a qualitative and a quantitative approach. The key component was the quantitative questionnaire with 180 single interviews of cyclists and public transport users. The factors affecting bicycle use are predominantly transport costs and subjective factors. Cyclists save on average about 20% to 45% of their monthly household income if they go by bicycle instead of using public transport. The comparison of the cyclists' trip characteristics, transport costs and user profile to the public transport users showed trends of a thus far unknown field in transport research. Additionally, 50% of the cyclists indicated a strong affinity towards cycling, appreciating both low-cost and the exercise factors the most which in consequence showed that they are not captive users. Based on their attitudes, captive cyclists were determined to be those who would stop cycling if they could afford public transport. This was 35% of cyclists. For these users cycling is the only option due to a lack of funds. On the other hand, 38% of public transport users were receptive to (future) bicycle usage. The potential of the bicycle as an alternative mode to public transport is high and even its intermodal integration would not only positively affect money expenditures but also save time. To take advantage of this, it is the task of the municipality to empower the existing cyclists with specific programmes. Further, it is essential to provide access to bicycles to potential cyclists. Future policies should be tailored to the local situation to finally activate and speed up awareness building processes.

## **1 INTRODUCTION**

As a result of often being excluded or underestimated in past travel surveys, the importance of commuter cycling trips in South Africa needed to be investigated. In general, it seems that cycling as a sport or recreation is done by the middle to upper income South Africans, and commuter cycling is done by low income South Africans. In numbers, the low mode share of cycling seldom accounts for more than 1% of modal splits (Behrens, 2006). Commuter cycling only accounts for 5% of all bicycle use (de Waal, 2000). The public perception is that those who cycle to work are poor, because they cannot afford motorised transport (due to newspaper research and anecdotal evidence). In other words, commuter cyclists are perceived to be captive users.

Cycling in South Africa can be categorised into three markets, namely sports, recreational and commuter. However, as indicated in the title of this study, commuter cycling was selected to be the subject of investigation. This was done because commuter cycling is assumed to impact positively on these cyclists' standard of living. The objective of this study was to get insight into commuter travelling of low income households with the focus on cycling as a transport mode and its impact on reducing and/or saving transport costs. Specifically, goals were

- to determine key characteristics of commuter travelling of low income households by comparing the mode bicycle on the one hand, with the modes train and taxi on the other hand;
- to assess peoples' attitudinal background towards commuter cycling in particular by investigating commuter needs and deterrents of cycling;
- to reveal reasons of going to work by bicycle;
- to determine the condition under which cycling is a supplementary mode of transport with the aim to expose the potential of commuter cycling in South Africa; and
- to establish measures and requirements to maintain current bicycle users with further recommendations for future promotion to encourage more commuter cycling.

The status quo of cycling was assessed through a structural and a user analysis. The townships Mamelodi and Nellmapius, situated east of the City of Tshwane Metropolitan Municipality (CTMM, province Gauteng) were chosen to be the case study area.

## **1 SURVEY METHOD**

The pre-study consisted of mainly four parts. The dataset of the NHTS 2003 was used to provide a first broad understanding of the field of cycling and commuting. Secondly, traffic counts were conducted to understand the numbers related to local bicycle usage in the CTMM. Thirdly, a qualitative approach including household and commuter interviews provided first hand feedback. Lastly, contact with the Tshwane Bicycle Association (TBA) helped to give access to the cycling community itself.

The key survey instrument was interviewer-administered and took the form of a structured questionnaire broken into three parts. These parts covered trip characteristics of the last weekday travelling (adapted from the SrV-questionnaire: Dresden University of Technology, 2008), mobility and demographic details and attitudes towards cycling. A travel day consists of one or more trips defined as one-way movement from an origin to a destination, to fulfil a purpose or undertake an activity. "Education", "work", "visiting friends/family", "shopping", "back to home" and "others" covered the list of trip purposes, whereby going to work was the main reason mentioned among all respondents. The number of interviewed cyclists was 98 and 80 public transport users. Due to restricted resources it was not possible to interview more commuters. The interviewed cyclists were chosen randomly by stopping them on the road and at their work places. The interviewed public transport users were recruited at a central located Metrorail train station.

## FINDINGS OF THE SURVEY

The completed questionnaire provided data to assess the status quo of cycling in Mamelodi and Nellmapius. Moreover, a cycling corridor was characterised by studying its spatial, socio-economic and socio-cultural dimensions to understand why some commuters cycle and others do not.

### Cyclists' profile

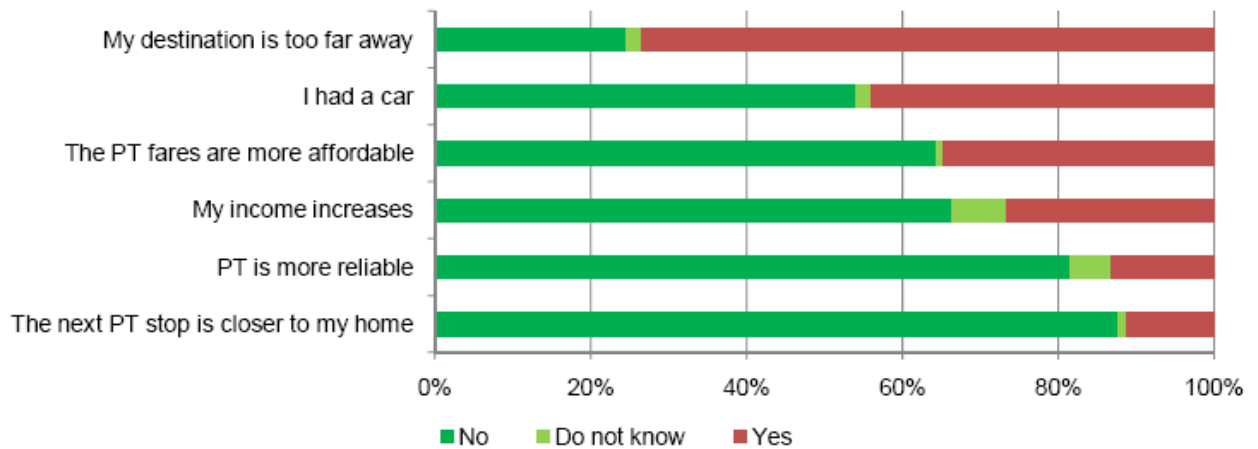
*Demographic and socio-economic characteristics* The cyclists appeared to be a population segment with a similar demographic and socio-economic background. All cyclists were male and African. The mean age was 34,2 years, with 12% between 18-24 years, 41% between 25-34 years and 44% between 35-49 years. Only 3% were older than 50 years. They had a low level of education and were mainly economically active as labourers and domestic workers. Their monthly household income revealed that 41% belong to the low income segment (less than R2 000) and 50% to the middle income class (R2 000 to R6 999). The other 9% of cyclists refused to disclose their household income. No cyclists' household had an income of more than R7 000 per month. The overall social status and standard of living can be estimated to be low.

Of all cyclists interviewed, 7% had at least one household-owned car, but only 57% of these had access to use a car. However, it was not been investigated whether these cars are in working condition. Important to mention is that 75% of those cyclists who had access to a car were not willing to exercise mode change - meaning they will keep on cycling. All cyclists had access to at least one bicycle, 20% had access to two or more bicycles. The average household bicycle ownership per household was determined to be 1,23. The average of available bicycles per respondent was assessed to be 1,12.

*Socio-cultural characteristics* Attitudes, expressed as social values and thoughts do not necessarily guide travel behaviour, but it is believed to be one key to understand decisions of travelling. To say it simple, attitude is a positive or negative evaluation of an object (Gardner, 1999). A tendency of the transport users' attitude towards their future travelling, including bicycle usage, was examined. Consequently users were classified into segments. In summary, 35% of cyclists would exercise mode change if they had the opportunity (therefore defined as being captive). Based on their attitudes, captive cyclists were determined to be those who would stop cycling if they could afford public transport. For these users cycling is the only option due to a lack of funds. 50% of the cyclists indicated a strong affinity towards cycling, appreciating both low-cost and the exercise factors the most which in consequence showed that they are not captive users. Therefore, the hypothesis that all cyclists are captive users is proved as false.

In summary, the survey assessed mainly two types of cyclists, the practical cyclist and the captive cyclist. Practical cyclists choose to cycle because they find it an effective and efficient way to get around, considering transport costs and personal preference (choice traveller). For the majority of the existing cyclists it is not only a cheap mode of transport, it is in particular seen as an good exercise, moreover, in some cases, colloquially speaking, it is seen as a "cool" means of travelling. They feel comfortable racing the traffic and also appreciate the psychological well-being they received after they had cycled. For the captive cyclist on the other hand, cycling is the only option due to a lack of funds. The overlap between these two groups is indicated by a tentative portion of cyclists. From figure 1 it is seen that most cyclists are not captive users, but understand how cycling can have a direct positive impact on their standard of living. The bicycle would still be a preferred option, even if the socio-economic situation improves (e.g., access to a car, higher income etc.). On the other hand, long distance travelling is the main reason to

consider stop cycling. It is believed that promotion of cycling can create an awareness of this and cause some current public transport users to exercise mode change and start cycling.



**Figure 1: „I would stop cycling if“**

*Trip characteristics* Most commuter cyclists also have other trips during the day, e.g., shopping and social visits and not all of these are necessarily by bicycle. Travel behaviour including all day trips was as follows. The mean person trip generation rate (person trips/weekday) for the cyclists was 2,34. Only 18% of the cyclists had more than two trips per day, whereby two-thirds used their bicycle again for these trips. Among those, their trip motivation was shopping (67%) and/or social reasons (33%). For cyclists, the household income has no influence of the number of generated trips per day. In general, the respondents' location in a remote area and their generally limited transport budget resulted in a low generation of trips.

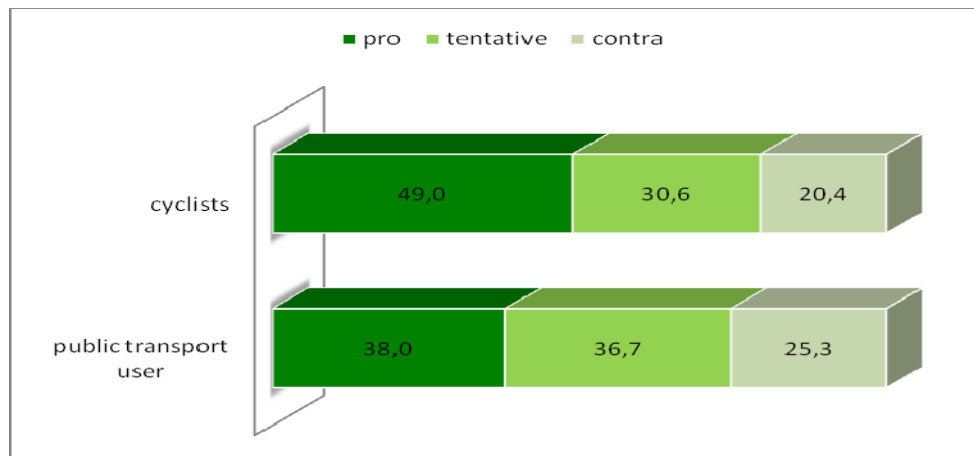
The percentage of cyclists who took more than one hour to get to their work places was assessed to be 19%. The origin-destination analysis showed that the cyclists work more towards the southeast of the CTMM. These tangential trips connect the periphery and the inner suburbs which have less public transport options. For all cyclists, the top three destination areas were: Silver Lakes (43%), Fairy Glen (11%) and Garsfontein (9%), which are all residential areas.

The use of a bicycle twice a day (e.g. to work and home) results in per capita savings of up to R500 per month compared to using public transport (mean value by taking all respondents). In other words, about 99% of the cyclists would pay more than 10% of their monthly household income on public transport, in particular taxi. In most cases, it would be even much more than “only” 10%. In fact, 20% to 45% have been the average percentages found. In two cases there would not have been the financial ability to pay the public transport fares at all.

Potential of cycling

The bicycle is not on the list of available transport modes for the vast majority of low income households. Their modal choice is therefore limited due to the fact that cycling is not a considered mode of transport. Nevertheless, the survey revealed a positive attitude towards cycling not only among the cyclists: 38% of public transport users were receptive to (future) bicycle usage and so represent potential of bicycle usage. Public transport users will consider commuter cycling when there is no other choice of transport (68%) or if

they have access to a bicycle (61%). Figure 2 gives an overview of the cyclists' and public transport users' attitude towards cycling. The high proportions of the "pro-cycling"-position within both user groups indicate the potential of bicycle usage.



**Figure 2: general attitude towards cycling**

*Low income commuter travel needs* Travel needs of commuters cover the same needs of every traveller. In short, they strive for a safe, short (regarding distance and time) and cheap/affordable trip to work. Further needs include a reliable, flexible, and comfortable kind of transport. These needs are believed to be satisfied by cycling in many instances. Especially for poorer households the need of affordability becomes more important and cycling becomes an attractive option. However, ultimately cyclists should not be captive users, or if they are, they should still be positive about the benefits of it.

*Deterrents of cycling* The main deterrent of cycling was road safety. Almost every cyclist (81%) has at least seen an accident involving a bicycle, and 33% have already been involved in one accident. They are physically vulnerable users, as well as legally.

## 2 DISCUSSION

Factors of high relevance that affect commuter cycling in the CTMM were assessed to be of monetary, socio-economic and socio-cultural nature. The bicycle, used as a commuter transport mode presents one niche of cycling in the South African transport system. The revealed bicycle usage of low income commuters (labourer) in Mamelodi/Nellmapius leads to two ways of how the bicycle can serve as a supplementary mode to public transport. Additionally, a third situation/condition for the bicycle as a supplementary mode is believed to succeed while serving as a feeder mode.

### Cycling as a supplementary mode to public transport

*The bicycle as an alternative* The interviewed cyclists travelled to places which were mainly served only by taxis (which present the most expensive option of public transport), and to lesser extent by bus. Practice showed that the bicycle competes with public transport over distances up to 25 km (per direction). For trips no longer than 15 km the bicycle is even a more realistic option. There is a higher benefit of cycling on travel routes where the alternative travel mode(s) are most expensive (usually taxis). The advantages of cycling with its direct, individual and private routing from door to door and its low expenditure are good arguments to consider the bicycle instead of public transport.

*The bicycle on routes without a public transport service* In some cases, no public transport option served the destination of the cyclists. This was in particular the case when the destination was only a residential area, located outside of the main road network. The bicycle is also a preferred mode when the distance between the public transport stop and the final destination is too long.

*The bicycle and its intermodal integration* Only one (small) part of the distance is covered by bicycle whereby the potential is believed to be as a feeder mode. At this stage, almost none of the passengers used the bicycle as a feeder to the Metrorail trains. The bicycle as a feeder can be a competitive option versus going by taxi to get to the train station or to replace walking to the train station, assuming the train as being the main mode of the commuter trip. A distance of 5 km from the Metrorail train stations is considered to be feasible. European experience shows that there needs to be a certain ratio between the travel time for the feeder trip and the public transport trip. This appears to be psychological: the feeder trip should be experienced as a minor part of the total trip from door to door. For instance, people will not cycle 15 minutes for a public transport trip of only 5 minutes (I-CE, 2007). At this stage a bicycle/train mobility model is still a long way off and the first two options above are believed more feasible.

### **3 CONCLUSION**

This work presents a baseline approach of research in commuter cycling. Besides the gained insights into the cyclists' socio-economic and socio-cultural background, it provides a methodology to conduct similar future surveys. The paper is one key component en-route to a holistic understanding of cycling trips and cycling behaviour in South Africa. By assessing the potential of cycling it is now the task of the official stakeholders to take action in this field of transport. The conclusion of this work is shown below in three parts as new findings on bicycle usage, some assumptions (which are in need of further investigation) and recommendations.

#### Results

- A lack of cycling infrastructure does not hinder the current cyclists, but also does not encourage more people to start cycling.
- There are mainly three reasons to go by bicycle: saving money, no other available transport option, doing exercise. The weight of these issues differs individually.
- Not all cyclists are captive users.
- The vast majority of cyclists are domestic workers, e.g. gardeners (73%).
- Cyclists save a reasonable amount of money per month (on average R500). Their expenditure on transport is very low, only running costs such as bicycle maintenance have to be covered.
- Bicycle trips replace taxi trips. For instance, for gardeners going by taxi would mean spending (on average) 26% of their personal monthly income on transport.
- Having more income available improves the cyclists' household standard of living.
- All of the cyclists' destinations were not reachable by train which presents the cheapest public transport mode.
- The bicycle can be an alternative mode to public transport. This presents one way of integration into the local transport network.
- A share of 41% of all respondents cycled distances of more than 15 km one way.
- Those cyclists who are positive about cycling also cycle for social and sport reasons.

### Assumptions

- Three basic conditions have to be changed to attract more cyclists: A cycling network (or at least one appropriate main route); easier access to bicycles and educational work with the community (issue: road safety).
- Bicycle usage will become more important if not only the low income population cycles on a daily basis (to work).
- The bicycle can support local businesses due to its advantages when it comes to internal traffic. (neighbourhood)
- For a direct comparison it would be of relevance to approach current taxi commuters on the same routes. These users present another group of potential cyclists. They are confronted everyday with the current cyclists and see, that going by bicycle is viable.

### Recommendations

Based on the results of the survey there is a need of establishing measures to truly making the bicycle a recognised part within the local transport system. Cycling needs to be fully incorporated into transport planning and management practices and accommodated appropriately in infrastructure improvement programmes. Generally, knowledge needs to be shared to broaden people's perspective about commuter cycling. Initiating an awareness campaign is the first step to educate the public with the aim to change long-standing habits and encourage more commuter cyclists.

In order to integrate commuter cycling into the transport network, the CTMM needs to serve as the patron and key stakeholder in this process. With road safety as the main deterrent for bicycle use, there is commitment needed from the municipality to offer a safe cycling environment. This is to keep current commuter cyclists and to encourage more commuters to exercise mode change. There is a need to make the advantages of cycling known to the municipalities' officials. For instance, referring to the bicycle as a "zero-emission-vehicle", where it helps to improve the long term sustainable development. The fact that a part of the population uses bicycles should be justification enough for the CTMM to consider the cyclists' needs. Offering affordable transport options, thus enabling them to participate more fully in social life and access education facilities and work places should be more reason to do so. In particular, it is recommended:

#### *To provide easier access to a bicycle*

- *Integrating the bicycle into subsidies policy*  
The South African government aims to meet the needs of the low income segment by introducing subsidies policies, e.g. urban reconstruction and development programmes. In this regard, there is a chance to enshrine bicycle access as well to promote a consistent urban development policy of housing and transportation. The government since 1994 has initiated and implemented several housing delivery programmes and subsidy mechanisms to provide houses to the disadvantaged South Africans (Department of Human Settlements, 2000). One important housing delivery model is integrated into the Reconstruction and Development Programme (RDP), a policy framework for integrated and coherent socio-economic progress. One of the six basic principles of the RDP is meeting basic needs and building the infrastructure in which transport is addressed as well (Republic of South Africa, 1994). Including one bicycle for each subsidised house is expected to strengthen the service of this delivery model. Besides gained mobility, this measure is also believed to strengthen the development of comprehensive sustainable human

settlements. Additionally, it helps to ensure the condition, recommended by the White Paper on National Transport Policy, that public transport is affordable, with commuters spending less than about 10% of disposable income on transport (Department of Transport, 1996). This proposal should be tested in a pilot project, preferably conducted in Mamelodi/Nellmapius, where a housing delivery process is still on going. Based on the success of the pilot project this could be further implemented.

The most important initiative on cycling that has been implemented so far, the Shova Kalula National Bicycle Programme (also called Pedal Easy) should be integrated in this process as well, as its objective is to promote cycling as a low cost mobility solution for low income households. The focus of the Shova Kalula programme is on the construction of dedicated bicycle pathways, safety education for cyclists as well as promotion and rollout of bicycles.

- *Employers' allowance in form of a bicycle*  
Focus should be on employers located within cycling distance from low income areas. The aim is that they encourage their staff to use a bicycle to get to work by providing a bicycle (new or used one) or by helping with an advance credit. Employers could further show their commitment to cycling by providing showers, changing facilities, secure cycle sheds, incentives to travel to work by bicycle and loan schemes for bicycle purchase.
- *Second hand bicycle market*  
A more informal attempt would be asking high income households to donate (not anymore used) bicycles to deliver them to low income, disadvantaged households which are willing to cycle. It is believed to exploit a so far unconsidered potential. Moreover it is also part of a public sensitisation while making the "other side" aware of the issue of commuter cycling.

*Providing a Safe Bicycle Trip* Promoting future bicycle use requires an improvement of physical planning for cycling. In short: road conditions have to be made suitable for cycling.

- *Implementation of Infrastructure*  
The revealed main route currently used by the cyclists should be upgraded to decrease their vulnerability. For the short term this implies an extension of paved shoulder lanes to give cyclists more space. In the long run a cycle network and parking facilities need to be considered by conducting further traffic counts and surveys.
- *Education*  
The fact that the cyclists are physically, as well as legally, vulnerable users indicated the need of a motorists' education with stricter driver proficiency tests, as current levels of driver skill and courtesy are considered to be low. Such issues should be addressed at an early age. This includes a uniform use by observing certain rules, such as always going on the left hand side of the road, to decrease insecurity among the cyclists. For instance, schools can serve as places for such initiatives (addressing pupils as well as their parents/family). Campaigns to encourage driver understanding of bikes and vice versa should be take place within the local community.
- *Law Enforcement*  
Traffic rules should be enforced and the main cycling corridors should be monitored by routine traffic police to prevent motorists to drive in the proposed cycling lanes.



*Empowerment of existing cyclists* The willingness of personal involvement from the cyclists showed that only some guidance from the official stakeholders is necessary to get the structures to work. Using the already existing human resources and giving the cyclists a right to say, will additionally help to support the community. All in all, it is aimed to provide a platform to discuss the cyclists' views and knowledge to finally consider these by a future integrated planning and implementation process. Therefore, workshops present a feasible option to gather all interested cyclists together. Here cyclists should be informed of their legal rights as cyclists. It is important to get municipal officials, urban planners and community representatives on board. Nevertheless, the emphasis is based on participation rather than on a top-down approach.

Generally, infrastructure and soft policies must be equally part of one strategy. The actions of encouraging bicycle usage should first focus on the low income segments. In future, promotion efforts should also consider the middle and high income classes, i.e. sport and recreational market. In sum, an integrated approach to encourage cycle use is required. This entails combining national level, municipality and local community level strategies. Additionally, future development planning needs an improved design of settlement guidelines.

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