HARNESSING LEISURE CYCLISTS TO PROMOTE COMMUTER CYCLING

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ABSTRACT

Cycling in South Africa is hardly a mode of transport for commuter purposes, but largely a leisure activity undertaken by specific groups, whilst these sub-cultures have garnered popularity amongst their communities, often this is where they end. In this paper the authors will explore if and how these sub-cultures can be harnessed to create further cycling use for commuter trips within South Africa. The promotion of cycling as a sustainable mode of transport within South Africa is often downplayed owing to a lack of infrastructure. However, studies within communities have shown that leisure cycling sub-cultures exist, even if no cycling infrastructure is available. Therefore, there is an innate attraction to cycling within these groups that could achieve a modal shift for other trip purposes. By understanding the drivers related to these sub-cultures it could be possible to formulate the desired conditions required to create South African cycling common use. In this paper, we have surveyed several leisure cyclists, to identify the attractive components for leisure cycling as well as the hinderances to commuting cycling use. We used the findings to develop a set of requirements that would assist in promoting more commuter-type cycling activity in the country as well as attracting more cyclists.

1. INTRODUCTION

1.1 Background

Cycling is a sustainable mode of transport and is being actively promoted worldwide. Europe and especially the Netherlands is seen as the gold standard when it comes to providing cycling infrastructure and developing a cycling culture. However, contrary to popular belief, the Netherlands has not always been the leader in this field (Morgan, 2019). In the last decades, the emerging cycling culture has spread to areas and cities that were believed to be not cycling friendly, like London and Paris.

South African cities once supported rich cycling cultures. However, similar to other cities, the rise of the automobile largely diminished this culture. Whilst other cities managed to retain some aspects of their respective cycling cultures, South Africa's social and urban policies during the apartheid regime largely killed off these remaining aspects (Morgan, 2019). Therefore, rekindling or reinventing the commuting cycling culture requires more than simply providing adequate cycling infrastructure, it requires a shift in perception.

There are thousands of studies that have proved that cycling is good for your health and for environment (greenhouse gases, air pollution, and noise). It is a cheap mode of transport, faster than walking and possibly competitive on shorter distances against highly congested car traffic. Additionally, cycling requires less space than driving a private car, it

assists in reducing road congestion, and on 1 car parking spot more than 10 bicycles could be parked. Cycling makes cities livelier, creates job opportunities, and alleviates some of the inequality that exists with access to transport. Hence, there are plenty of reasons to further promote cycling!

Currently, the South Africa commuter cycling comprises a very small percentage of daily transportation for trips to work or school (Stats SA, 2021). However, there is evidence of a leisure cycling culture in South Africa, including:

- Road cycling, mostly on weekend early mornings (when traffic volumes are low).
- Mountain biking in the veld.
- BMX cross on tracks, or playfully in residential streets.

In South Africa there is limited cycle lane facilities available, increasing traffic unsafety amongst cyclists. Sandton, Soweto and Tshwane contain a few dedicated routes; however, these are largely unused (anecdotal evidence). Even during the Eco-Mobility Festival, held in Sandton in October 2015 (Transport Month), there were some cycling facilities provided, supported with a marketing strategy, which resulted in just over 100 cyclists on a daily basis (Engelbrecht *et al.*, 2016), still less than 1% of Sandton's mobility. Durban has several dozens of kilometres of 'yellow dotted lines' along the main recreational routes for fast cyclists. Additionally, the beach front promenade is bicycle-friendly and is utilised by many slower recreational cyclists (supported with bicycle rental facilities for tourists). Cape Town has the most well developed cycle network which is made of a series of dedicated and painted cycle lanes, and includes city bike racks (Mervis, 2017).

Since South Africans do support leisure cycling activities it should be possible to harness the attractiveness of these activities and promote more commuter use of cycling. Therefore, by targeting the individuals already undertaking cycling activities, it could be the 'spark' that promotes the growth of this mode.

1.2 Objective of this Paper

This paper aims to identify and analyse leisure cyclists within South Africa to gain an appreciation of the unique components that attract them to undertake such activities. Additionally, the hinderances for them to cycle for commuter use were interrogated. From the findings it was identified what needs to be done to promote commuter cycling amongst the leisure cycling community.

In section 2, the current use of cycling in South Africa is presented, with a discussion on quality aspects required by cyclists.

The authors have set up a survey, presented in section 3, on those required quality aspects, with the results discussed in section 4. From this, section 5 gives several recommendations.

2. QUALITY ASPECTS FOR CYCLING

2.1 Naming and Framing of Cycling

Cycling is part of Non-Motorised Transport (NMT), also dubbed as Active Mobility. These names are intriguing. Non-Motorised Transport places too much emphasis on

motorisation, where NMT seems to be less valued? Fact is that the rise of the motor vehicle largely displaced the once-popular bicycle; and in South Africa the apartheid spatial planning policies further dismantled the mode (Morgan, 2019).

For many people, 'being active' is not the main reason to cycle (although it is for leisure cyclists); rather it is motivated by the lack of funds to have a car or to afford public transport. If given the choice, many of these commuter cyclists would prefer to have 'proper transport' (motorised transport); fitness or a healthy active lifestyle is often regarded as a luxury.

In addition, there is an existing stigma around commuter cycling of being 'poor-man's transport', which discourages middle/higher-income commuters. However conversely, leisure cycling is mostly a middle/higher-income activity. For some 'hipster' groups, cycling is fashionable and introduces an alternative way of life to be proud of.

2.2 Cycling in South Africa

The National Household Travel Survey (NHTS) 2020 (Stats SA, 2021) provides some data on the use of cycling in South Africa. Almost 1 million (6%) households own 1 or more bicycles in working order, relatively more in Western Cape and Gauteng provinces.

The NHTS reveals that 0.2% of education trips were done by cycling which accounts for roughly 16,000 learners that cycled all the way to school. In addition, 1% of workers cycled all the way to work, predominately in urban areas. Their reasons were mainly by choice, work is nearby, public transport is too expensive or not available, and a few mentioned exercise as their reason for cycling to work.

Even in the most cycle-friendly city, Cape Town, only 1% (rounded) of all trips is made cycling (CoCT, 2017).

Bechstein (2010) and Irlam *et al.* (2018) have studied township cycling in Pretoria and Cape Town respectively, and found that commuting cycling is mostly done by male, lower-income people, and confirmed the reasons for cycling as mentioned in the NHTS.

2.3 Cycling Facility Guidelines

In South Africa the planning, design, implementation, and maintenance of cycling infrastructure is guided by the NMT Facility Guidelines which was released in 2014 by the National Department of Transport (NDoT). This document aims to assist service providers and government in the provision of NMT infrastructure. Additionally, this document is the guiding policy approach to NMT provision within the country. It aims to assist in the provision of suitable infrastructure to attract more users to make usage of lower carbon modes of transport (NDoT, 2014).

The NMT Facility Guidelines mentions 3 main types of cyclists with somewhat different quality considerations:

- Recreational cyclists, who value comfort of road surface, safety and security, pleasant routes, and some facilities underway.
- Commuter cyclists, where comfort of road surface, safety and security, direct quick routes, parking and changing facilities at destination are important.

- Scholars, with the highest emphasis on safety and security, low traffic or separation from traffic on busy roads, comfortable road surface, and secure parking facilities at schools.

Jennings (2015), however, indicates when cycling policy is concentrated on those groups only (and often on merely one of these groups), the general use of cycling, also for shopping, visiting facilities and meeting friends, would be ignored, while that would attribute to a full cycling culture.

Additionally, it is often shown that wide sweeping cycling policies (usually at a national level) are generally unsuccessful at increasing cyclist numbers (Hale, 2013). Also, cultural norms should be considered: there are often inherent ideas or perceptions toward cycling that are either not addressed or normalised in broad policy. Therefore, it is crucial that the finer intrinsic characterisations of potential cyclists within an area be considered (Aldred *et al.*, 2015); this would include the different considerations for female versus male cyclists (Bonham *et al.*, 2012).

2.4 Quality Aspects

Many of the literature studies have indicated issues with regard to cycling. In this paper, the authors have grouped them according to their dimensions, and partly based on Maslow's Hierarchy of Needs:

- Safety and Security: road safety and risk of traffic accidents; and personal safety/ security which includes potentially being a victim of crime, bicycle theft during the trip (bike-jacking) and while parking.
- Costs: cycling appears to be a low-cost mode of transport; however, a bicycle still costs money (and replacing a stolen bicycle again) and requires regular service/ maintenance, with chances of punctures.
- Speed and Travel Time: cycling is faster than walking (with an increased influence area) but slower than public transport or car (unless the roads are congested).
- Ease and Convenience: dedicated cycling lanes, signage, parking facilities, etc.
- Comfort: the physical effort of cycling, especially in a hilly environment and adverse weather (heat and rain).
- Appeal, Experience, Emotions: cycling is generally good for your health, and for the environment. However, the stress accompanied with the above safety and security concerns is negative.

3. SURVEY ON CYCLING ASPECTS

We have approached several cyclists that cycle for leisure (race or tour on the road, mountain bike in the veld, cross bike on circuits) with a survey to identify what is withholding them from commuting with their bicycle to work, school, shopping, etc. The survey was circulated to several cycling clubs, communities and individuals in Johannesburg/Pretoria, Durban and Cape Town/Stellenbosch, with the option to forward it to other cyclists.

The assumption was that the target audience already have a positive attitude towards cycling, and it would probably take less effort and facilities to persuade them to also cycle to work, school or shops. Additionally, these cyclists would have an accurate perception of what is required, and what is missing for commuter cycling on a daily basis.

The next assumption was that once cyclists are on the road for daily cycling, it could persuade others to also cycle: once you have the initial numbers, then further numbers will come. This is further signified by the contrary: due to the low numbers of cyclists on the roads, there is a lack of encouragement for others to join, largely owing to the aspect of 'safety in numbers' (Jacobsen, 2015; Christie *et al.*, 2015).

Growing numbers would then furthermore emphasise the provision of measures. The more confident users are shown to cycle regardless of the quality of infrastructure. However, the more novice the rider, the better quality the infrastructure has to be (Fishman, 2016).

4. RESULTS

The survey received 89 responses by regular leisure cyclists to understand what is required to get these individuals to become commuter cyclists and promote this mode to a wider group. In this section, the results of the survey are presented. Various questions allowed respondents to select more than 1 response, which resulted in percentages adding up to more than 100%. There was space to add additional considerations and comments.

Given the low number of responses and the fact that the results are not fully representative, the values were rounded to 5%.

4.1 Respondents' Profile

Although the survey was anonymous, it opened with a series of questions profiling the respondents (with an option not to answer):

- 80% is male, 20% female.
- 5% is younger than 25, 25% is between 25 and 45, 50% between 45 and 65, and 20% older than 65. Considering these age groups, the respondents would mainly commute to work and shops, not so much to schools; the results of the survey can therefore not be used for any cycling to school policies.
- 60% of respondents were White, 35% Indian, and 5% Black or Coloured. The authors had approached several cycling communities in townships; however, responses were limited, partly owing to technological issues and other hinderances such as mobile data availability.
- 5% considered themselves as having a fairly low income, 60% moderate, and 25% stated they had a high income (without the questionnaire stating any income brackets); 10% preferred not to say. This confirms that leisure cycling is mostly an activity for middle/higher-income people.
- The majority of respondents live in Durban (45%), Gauteng (35%), and Cape Town area (5%). The remainder 15% live in other big cities, smaller towns or rural areas. The authors had approached several cycling communities in Cape Town, however, few responses were received.

The next set of questions interrogated respondents' cycling habits:

- 15% cycle almost daily, 55% several times per week, 25% several times per month, and 5% less often. We excluded a few (5) respondents that indicated that they did not cycle at all.

- Of the respondents' cycling activities: 80% do so on the road, 55% in the veld, 5% cross on circuits; some also cycle indoors on a home trainer.
- Already some 15% indicated that they regularly use their bicycle to work or shops. All of them are older than 45, many of them reside in the Cape Town area, and most cycle almost daily.
- The normal commute to work of the cycling respondents was 80% by car, 5% walking, and 15% was already cycling; only one respondent used public transport.
- Their commuting distances were: 35% had to travel 0-10km, 25% 10-20km, 20% 20-30km, and 20% more than 30km.

It can be concluded that the respondents are not a fully representative reflection of the cycling community, as scholars, township cyclists, and Cape Town residents were under-represented. Nevertheless, the survey provides subjective information about leisure cyclists in South Africa, and can be used qualitatively to indicate required cycling facilities and issues that require attention to enhance cycling for commuting purposes. Additionally, some objective facts about cycling were also verified.

4.2 Main Issues

The first set of questions aimed to identify the main issues that are withholding cyclists from commuting with this mode to work, school or shops. The respondents agreed or strongly agreed on the following issues:

- 70% is concerned of safety and security issues.
- 60% had no facilities at the destination.
- 30% mentioned aspects on travel time and routing.
- 20% found the distance too long.
- 20% indicated adverse weather and too much effort.
- 10% of cyclists mentioned they did not have a suitable bicycle to cycle to work, school or shops. This aspect would definitely be more prevalent for non-cyclists.

The remaining respondents indicated that those aspects would not withhold them from commuter cycling: they disagreed or were neutral to the statement. This does not mean they are fully happy with the safety aspects or provided facilities, but it would not necessarily stop them from commuting by bicycle.

The main aspects are discussed in more detail in the sub-sections below.

4.3 Safety and Security

As mentioned above, 70% of respondents are concerned about safety and security issues. However, all respondents did address one or more safety issues:

- 85% indicated that traffic safety is a concern; including too much traffic and driver behaviour (some mentioned taxi drivers specifically).
- 45% indicated risk of crime during the trip as a concern, including bike-jacking and robbery.
- 35% were concerned about bicycle theft due to insecure parking facilities at destinations.

Fact-check:
The National Household Travel Survey (StatsSA, 2021) indicates that a very small portion of people use bicycles (<1%). The traffic safety statistics (WHO, 2018) indicate a low number of cycling casualties in South African traffic (3%). Despite the very low numbers (seemingly too small for statistically significant conclusions), it seems that cyclists have a bigger chance of getting involved in a traffic accident with more severe outcomes, compared to motorists or even pedestrians.

Theft of bicycles is surveyed in the Victim of Crime Survey (StatsSA, 2017), where approximately 21,000 households have experienced bicycle theft, equal in metro and non-metro areas. Considering the number of households that actually own a bicycle (1 million according to the NHTS 2020), the chance of occurrence is approximately 2%. Theft of cars was higher in absolute numbers, but given the much higher number of cars, this is relatively less occurring.

Therefore, as illustrated above, there is indeed a higher safety and security risk when undertaking cycling activities, compared to car usage.

4.4 Facilities at the Destination

60% of the respondents stated that the lack of facilities at destinations withholds them from cycling to work, school or shops. Within this group of aspects, respondents further mentioned:

- 45% indicated the lack of shower and changing facilities at the destination.
- 30% indicated the lack of safe parking facilities at the destination. This would possibly be available at some workplaces, but not at public places like shopping centres.
- 30% highlighted that there is no decent signage on their routes.
- 15% expressed the lack of service and maintenance facilities for their bicycle as a withholding factor.
- 15% of respondents did not mention any issue on such facilities, possibly indicating that these aspects were not a serious problem for them.

Fact-check:
The lack of facilities at destinations was also identified by Randall (2015), who surveyed potential cyclists to an office park in Cape Town. Prior to the survey, none of the 55 workers cycled to work. When shower and changing facilities were made available, 5 started cycling to work and using the facilities several times a month. For the others, safety on the road and/or distance to work was keeping them from cycling.

4.5 Travel Time

Respondents mentioned the following issues related to travel time:

- 30% of the respondents indicated that their commute trip would be too long to cycle. The survey results revealed that half (50%) of these respondents had to commute more than 30km, another quarter (25%) more than 20km, which in commuting cycling terms is considered long.
- 15% mentioned that cycling is generally too slow for commuting.
- 40% found their cycling route too indirect.
- 15% were hindered by too many traffic lights.

Many respondents mentioned these above aspects in conjunction. 25% of respondents did not mention any issue related to travel time, possibly indicating that these aspects were not a serious problem for them.

4.6 Comfort and Effort

The main aspects that were mentioned:

- 20% indicated that lighting along the routes was an issue owing to the darkness early morning and late afternoon.
- 35% identified adverse weather (heat, rain) as a hinderance.
- 20% indicated that hills and steep inclines were not conducive to commuting (2/3 of these respondents live in Durban, 1/3 in Gauteng).
- 35% highlighted that potholes created a safety risk / comfort issue.
- 20% of respondents did not mention such comfort issues, thus indicating that these were not a hinderance for them.

Fact-check:
Generally, there is sufficient daylight between 6 AM and 6 PM, however in Cape Town these times are almost 1 hour later. In summer the days are longer with an additional hour in both the morning and evening, in winter days are generally 2 hours shorter; thus, many commuter trips, would have the challenge of darkness, especially in winter.

The rainy season in Cape Town is in winter, whereas in Gauteng and Durban it rains more often in spring and summer with many afternoon thunderstorms. Additionally, Durban is very humid in summer. However, the weather conditions during the morning trip to work or school would be less challenging as the adverse weather conditions would mainly affect the afternoon trips. But, since the afternoon trip is mostly returning to home, it may not be viewed as such a hinderance as one can freshen up in the comfort of their home. Cape Town is generally fairly flat, Gauteng has long rolling hills, while Durban has steeper roads.

4.7 Experience

10% of the respondents mentioned that cycling is considered ‘poor-man’s transport’ and therefore they are not cycling to work, school or shops. Several other respondents stated additional considerations:

- It doesn’t fit in their working culture or is not accepted with business visits etc.
- They use the car as they had to drop-off/pick-up kids at school, which is inconvenient doing so by bicycle.
- Carrying their work laptop or groceries is inconvenient and a potential safety risk on a bicycle.

4.8 Required Changes

Similar to the first question – what is withholding people to cycle for commuting activities – at the end of the survey the question was asked: what would need to change in order for them to cycle to work, school or shops. The following was indicated:

- 90% mentioned safe and convenient cycling lanes.
- 50% indicated secure parking facilities.

- 35% would like to see tax incentives or subsidies.
- 15% would like to use an electric bicycle (1/3 of them mentioned this in conjunction that it was too hilly to cycle). Interestingly, the majority of potential electric bicycle users are male and are from the younger population. One could consider that experienced cyclists would not be averse to some physical effort, but electric bicycles could definitely assist others cycling.

Fewer than 5% mentioned that nothing will change their minds: they will not cycle to work, school or shops. Apparently, the vast majority of leisure cyclists would consider cycling for other purposes (and 15% already do so) – which is an encouraging outcome – if only the safety and facility issues were addressed.

4.9 Motivation to Cycle

If all facilities were good, the main motivation for cycling would be:

- Healthy exercise: 90%.
- Good for environment: 75%.
- Cheap mode of transport: 45%.
- Fast mode of transport: 20%.

Many respondents mentioned 2 or more aspects. Some specifically added that they felt good while cycling, feeling relaxed, more productive during the day, and similar benefits.

5. CONCLUSIONS AND RECOMMENDATIONS

From the findings it is evident that there is a wide range of measures that are required to be implemented to get people cycling for commuter purposes.

5.1 Safety and Security

The results from the survey indicated that there is general discomfort with current road conditions. Safety and security were ranked as the most pressing issues. Roads can be made safer by carefully planning a comprehensive cycling network (not just a few corridors), including short-cuts. For higher trafficked roads, it is suggested that cycling lanes and other dedicated infrastructure be provided. Other cycling routes should preferably avoid busy roads, and the less busy roads (mainly in residential areas) should have some form of speed-reducing measure. Ideally 30 km/h-zones be provided, as this speed reduces the number of accidents (as it allows motorists enough time to avoid collision) and reduces the extent of injuries. Additionally, these streets should be lively to deter unwanted behavior (such as robbery) in quiet and secluded areas. Additionally, fixing potholes, signage and lighting will support the attractiveness and useability of cycling routes.

5.2 Facilities at Destination

The lack of bicycle parking and shower facilities at workplaces and destinations was identified as the second priority issue. The provision of such facilities is largely a task for employers and building developers, with possible support by national legislation and/or local municipal planning regulations (Randall, 2015). Additionally, the availability of subsidies may assist further in the provision of such facilities.

As additional support, more service stations for bicycle maintenance and secured parking facilities should be provided in residential areas and/or near destination clusters. This could be a private initiative, with start-up subsidies recommended to support local entrepreneurs.

5.3 Cycling to School

The survey had a vast under-representation of young people and subsequent school cycling trips; thus, no conclusions could be drawn here. In this regard, it is worthwhile to mention that Qhubeka and other organizations have set up programs that provide bicycles to learners in order to reduce their travel time to school. It could be assumed that once these children are accustomed to cycling, they would be more accepting of undertaking cycling as their mode of choice to work or shops, when they get older.

However, whilst these programs are an essential part of cycling promotion, they see limited success. As indicated above, the NHTS reveals that roughly 16,000 learners cycled all the way to school, while the Qhubeka program has already distributed over 100,000 bicycles (Qhubeka, 2020) – possibly the NHTS numbers are understated? This could also suggest that either there are inherent safety risks for the children, routes are not accessible by bicycle, or that maintenance of the bicycles is troublesome. Either way, it highlights the need for a holistic approach.

On the other hand, a survey undertaken in a small town in northern Namibia indicated that cycling is accepted by learners and students (40% owns a bicycle, 10% cycles to school and 80% would be interested to cycle), but not by workers (2% cycles, with merely another 7% willingness), due to the perception that cycling is for low socio-economic status individuals (Mokgano, 2021).

Changing this culture can potentially assist in the motivation to get the wider public to shift modes, hence further study of this area is recommended.

5.4 Electric Bicycles

The introduction of electric bicycles could further persuade non-cyclists (and even a few seasoned cyclists) to reduce their effort especially uphill or on somewhat longer distances. However, this requires charging facilities at home and/or at destinations. The provision of such charging facilities could require some form of subsidy or tax incentive, supported by national or municipal departments.

5.5 Final Conclusion

The recommendations put forward align to the conditions required by commuter cyclists in the NMT Facility Guidelines. Therefore, if practitioners and municipalities adequately follow these guidelines, the prevailing cycle routes and networks should encourage cycling. Additionally, an awareness campaign should be developed and included to alter driver behaviour to be more cognizant and patient with cyclists. Furthermore, stronger enforcement of traffic rules would be required, which would be a task for national and municipal departments. As an example, the City of Cape Town has a holistic Cycling Strategy, requiring budgets and further implementation (CoCT, 2017).

Once safety and security issues are addressed and facilities are made available, many leisure cyclists would consider cycling to work, school or shops. This would reduce car traffic on the road, which would alleviate congestion, and provide additional health and environmental benefits.

Once leisure cyclists are cycling for commuting purposes, others might follow. As leisure cyclists are mostly middle/higher-income individuals, it would also counter the sentiment that cycling is merely 'poor-man's transport', further encouraging lower and middle-income commuters to cycle. This would further enhance the social and economic position of these commuters.

6. REFERENCES

Aldred, R, Woodcock, J & Goodman A, 2015. *Does more cycling mean more diversity in cycling?* Transport Reviews, 36(1):28-44.

Bechstein, E, 2010. *Cycling as a supplementary mode to public transport.* 29th Southern African Transport Conference, pp.33-41, Pretoria.

Bonham, J & Wilson, A, 2012. *Bicycling and the Life Course: The Start-Stop-Start Experiences of Women Cycling*. International Journal of Sustainable Transportation 6(4):195-213.

Christie, N, & Pike, I, 2015. *Is it safe in numbers?*. Injury Prevention 21(2015), pp 276-277.

City of Cape Town (CoCT), 2017. *Cycling Strategy.* Cape Town.

Engelbrecht, M, Peers, V & Mokitimi, M, 2016. *What did we learn from the Eco-Mobility Festival?* 35th Southern African Transport Conference, pp 624-639, Pretoria.

Hale, C, 2013. *Beyond cycle paths: A bottom-up approach to promoting cycling culture*. Master Thesis Series in Environmental Studies and Sustainability Science 2013:08.

Irlam, JH & Zuidgeest, M, 2018. *Barriers to cycling mobility in a low-income community in Cape Town: A Best-Worst Scaling approach*. Case Studies on Transport Policy 6 (2018), pp 815-823.

Jacobsen, PL, 2015. *Safety in numbers: More walkers and bicyclists, safer walking and bicycling*. Injury Prevention, 21(2015):271-275.

Jennings, G, 2015. *A bicycling renaissance in South Africa? Policies, programmes & trends in Cape Town*. 34th Southern African Transport Conference, pp 486-498, Pretoria.

Mervis, L, 2017. *Cape Town Commuter Routes & Bike Map*. Bicycle South. Available at: https://bicyclesouth.co.za/2017/01/cape-town-commuter-bike-map/. Accessed 3 Jan 2022.

Mokgano, R, 2021. *An investigation into the state of non-motorized transport infrastructure in Ongwediva*. UNAM Research Project, Namibia.

Morgan, N, 2019. *How apartheid killed Johannesburg's cycling culture*. The Guardian. Available at: https://www.theguardian.com/cities/2019/jun/26/how-apartheid-killed-johannesburgs-cycling-culture. Accessed 4 January 2022.

National Department of Transport (NDoT), 2014. *NMT Facility Guidelines*. Pretoria.

Qhubeka, 2020. *Annual Report 2019.*

Randall, G, 2015. *End-of-trip facilities for cyclists and realignment of current South African bicycle regulations.* 34thSouthern African Transport Conference, pp 519-530, Pretoria.

Statistics South Africa, 2017. *Victims of Crime Survey 2016/17*. Pretoria.

Statistics South Africa (StatsSA), 2021. *National Household Travel Survey (NHTS) 2020*. Statistical release P0320, Pretoria.

World Health Organisation (WHO), 2018. *Global status report on road safety 2018*. Geneva.