Summer 2016

Use of Cycling Paths along the Morogoro BRT Line

Ford Sanger

*SIT Study Abroad*

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Use of Cycling Paths along the Morogoro BRT Line

Ford Sanger
Advisor: Dr. Felicity Kitchin
6 December 2016
SIT Tanzania Wildlife Conservation and Political Ecology
Fall 2016
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Acknowledgements

This project was completed with the help of numerous individuals and organizations. I would first like to thank SIT for giving me the ability to conduct this study. I would also like to thank Felicity Kitchin, Academic Director for SIT Tanzania Wildlife Conservation and Political Ecology and my project advisor, for all of her help throughout this study and the entire program. I would also like to thank the rest of the SIT staff, Oscar, Simba, Mama Juni, and more for their invaluable instruction and aid throughout my time here in Tanzania.

To UWABA and Mejah Mbuyah I am especially grateful for their aid on this project and wish them only continued success in the promotion of cycling in Dar. Thank you also to all my family and fellow SIT students for their unwavering support and encouragement.
Nuts and Bolts

If someone were to conduct a similar study in Dar es Salaam in the future I have a few recommendations. Both the Kilimanjaro Express and Dar Express buses are reliable options for transportation to and from the city. It was difficult finding an affordable and nice hostel but another student stayed at On the Way Hostel in Mikocheni and had a positive experience. Being such a large city it is important to always be conscious of your surroundings, even during the day. If someone wanted to study a topic related to bicycles I highly recommend contacting UWABA for their assistance. I would also recommend conducting thorough background research and establishing firm methods during the before and during the ISP prep period. Like any project trying to setup interviews and obtain access to physical locations involves a lot of bureaucracy. Start early to increase your chances of success and be willing to adapt on the fly. Always carry your identification: passport, visa, and SIT letter of introduction. Dar is a big city and it can be overwhelming at first coming from other parts of Tanzania to the city’s size and activity. However the culture of Dar is unique and visiting or conducting an ISP in the city would be a worthwhile experience.
Abstract

As the urban population continues to increase rapidly in Dar es Salaam it will become increasingly important to find sustainable means of urban transportation. With planned infrastructure improvements in the city to help alleviate traffic congestion, bicycles, which represent a largely underutilized form of urban transportation, have the potential to play a large role in the future of the city. Through background research, direct observations, community surveys, and interviews, both formal and informal, this study sought to understand the impact of the recent addition of bike lanes along the first phase of the Dar Bus Rapid Transit line. It was found that, while the infrastructure improvements were recognized and appreciated by those who do cycle, the addition of bike lanes along the BRT corridor has not had a significant impact on increasing the number of individuals willing to use bicycles as means of urban transportation.
Introduction

Africa is the fastest urbanizing country in the world. By 2040 over half of Africa’s population will live in a city. (ADBG 2014) This is by no means an inherently bad thing as urban centers can be important “organizing agents and engines for national development.” (Muzzini 2008) However, many sub-Saharan African cities are “growing unmonitored and without care for urban planning.” (Mkalawa 2014). Fifty-four percent of the world’s population currently lives in urban areas and by 2050 it is expected that roughly 70 percent of the world’s population will live in cities.” (Zhao 2009) With no end to growth in sight it is crucial that developing cities do so in a responsible and sustainable way. While urban migration can lead to rapid economic growth, urbanization “can also provide serious challenges to government, especially in the supply of food, jobs, housing, sanitation, transport facilities, education, health care, and services.” (ADBG 2014)

Urbanization in Dar es Salaam

Nowhere are these challenges more apparent in Sub-Saharan Africa than in Dar es Salaam. The name Dar es Salaam means “Haven of Peace” and, in many ways, the city stands in stark contrast to many of the other parts of Tanzania. While accounting for more than 70 percent of Tanzania’s national domestic revenue, the tall buildings, modern stores, vibrant nightlife, and bustling city center give the city a unique feel. (Kidata 2013) Dar also stands out for its growth. It is currently the fastest growing city in Africa with an annual growth rate of over 5.3% (ADBG 2014 & CIA World Fact book 2015 est.) Between 2002 and 2012 census data shows that the growth rate was as high as 6.5% and the city currently accounts for more than 10 percent of the Tanzania’s mainland population. (Wenban-Smith 2014 & UNFPA 2013) With a current population of 5.1 million, a UN report on the State of African Cities from 2014 predicts that Dar will be a megacity--defined as having a population over 10 million--within the next 20 years. (CIA World Factbook 2015 est. & UN 2014) Andre Bald, Program Leader for the World Bank for East Africa, described that Dar’s population growth has “far exceed predictions.” (Bald, Ramani
Once an urban area passes the 10 million mark, Bald said in reference to infrastructure development, a city is “either in good standing or bad standing and it is hard to readjust after that point.” While most of the country’s population growth is due largely to the combination of declining mortality and high birth rates, Dar’s growth can be attributed to internal migration. (Agwanda 2014) Many individuals from the country are migrating to the city in search of economic opportunities. Unfortunately the city is facing a multitude of challenges as a result of its rapid growth. According to Mr. Bald roughly 80% of residents live in “informal settlements.” The city is plagued by a high poverty rate, poor public transportation, and the inability “to provide basic infrastructure and services.” (Nkurunziza 2012b) A 2013 report issued by the United Nations classified Dar as a city with “weak prosperity factors.” (UN 2013)

Transportation

Despite its importance, transportation has proven to be an especially difficult challenge for the city. Transportation is a critical component for the “growth of megacities in developing countries” as it provides for the “social and economic well-being of their inhabitants.” (Zhao 2009) Currently, though, the growth of Dar has simply “far outpaced the capacity to provide basic infrastructure” and transportation services. (Nkurunziza 2012b) Most of the city’s residents travel “short distances but with much difficulty leading to low levels of mobility.” (Mkalawa 2014) The poor public transport services include inefficiency, poor quality of service, and a lack of safety for commuters. (Nkurunziza 2012b) With no end to Dar’s growth in sight, many are concerned with the city’s ability to reconcile “urban growth and its transport implications.” (Nkurunziza 2012b) The high level of poverty and number of residents living in informal settlements is an indicator that most cannot afford cars. Roughly “75 percent of trips are made by public transit and walking.” (Nkurunziza 2012b) Mr. Bald said that, on average, traffic only moves 15km - 20km per hour. Cars, however, are becoming a more significant factor. The city has the fastest annual growth rate, 20%, of vehicle ownership of any city in Tanzania. Finding alternative, sustainable modes of urban mobility is critical to
providing individuals with widespread access to goods and services, job markets, and social activities, while limiting adverse consequences on social, economic, and environmental services and systems. (UN 2016)

In response to the city’s tremendous transportation challenges, Dar adopted a Bus Rapid Transit (BRT) system in 2003 as one of its long-term mass transit solutions. Known locally as Dar Rapid Transit, or DART, the project’s official mission is to “provide a quality, accessible and affordable mass transport system for the residents of Dar” with the aims of reducing poverty, improving the standard of living, and fostering sustained economic growth. (DART) The Public Relations Manager for DART, William Gatambi, explained that phase one is currently complete. The first phase, which covers 20.9 kilometers, runs primarily along Morogoro road straight into the central business district (CBD), terminating at the Kigomboni ferry terminal in downtown Dar. (See Appendix II.I) He also explained that the remainder of the project will be implemented in six phases with over 130 kilometers of BRT lanes planned which they city aims to have completed by 2035. (See Appendix II.II) One of the components of the installation of the BRT is the construction of designated pedestrian and bicycle lanes, the first of their kind in the city, along the corridor.

One of the four main objectives of the DART project is to promote the use of Non-Motorized Transport (NMT). A report issued by the African Development Bank Group, one of the main funders of the project, stated that “bicycle lanes shall be provided in both directions whenever possible.” (ADBG 2015) There is no data on how many kilometers of bike lanes exist as part of the 20.9 kilometer first phase though it is apparent that bike lanes are not available along the entire corridor and end right after crossing into the CBD without continuing through downtown to the Kigomboni ferry terminal. These lanes, where present, represent the first designated bicycle lanes in the city.

_Cycling_

Bicycling is getting more attention worldwide “due to its environmental and health benefits and its potential to integrate with public transportation.”
Bicycles have the ability to be used as a means of transportation, exercise, and recreation generating “benefits to the bicyclist as well as to the community as a whole.” (Xing 2010) Despite these benefits, it is common in low- and middle-income countries to have “mixed traffic where pedestrians, vehicles, and bicycles share the same road space, with few or no dedicated infrastructural facilities” for NMT. (WHO 2013). Given Dar’s growth and planned infrastructure improvements, bicycles could be an important means of transportation for the city in the future. Though being “unrecognized” and viewed as an “unattractive” and “inferior” alternative means of transportation, a 2011 study in Dar found that bicycles can “provide better access to activities and facilities” that are considered “vital” like hospitals, education, employment, as well as “basic commercial and social activities.” (Nkurunziza 2012a & 2012c) It is estimated that only 5% of trips in the city are made by bicycle. (Nkurunziza 2012a) Despite its low modal share of transportation, cycling has a multitude of benefits and represents a sustainable and affordable mode of transportation for residents. (Nkurunziza 2012c) Dar es Salaam is at a pivotal point in deciding whether to make increased bicycle use a priority for the city going forward.

This study, which was designed to examine the use of bicycle lanes in Dar, was conducted in part through a partnership with Umma Wa Wapenda Baiskeli (UWABA). UWABA is bicycle advocacy group in Dar es Salaam which was founded in 2005 and attained NGO status in 2007. The group operates on the 5 E’s: Engineering, Enforcement, Education, Environment, and Encouragement. Engineering refers to the promotion of bike infrastructure, such as bike lanes and bike racks. Enforcement refers to enforcement of the law, such as ensuring that bike lanes are exclusively used by cyclists. Education is intended to target individuals both on the benefits of cycling and cycling safety as well as drivers on how to safely coexist with bikers in an urban environment. Environment refers to bicycles as a green mode of transportation. Finally, encouragement is meant to challenge the thinking of those who feel as though biking, for whatever reason, is not a viable option for them. UWABA has assisted other academics in professional research and is currently working with numerous government agencies and institutions in Dar to
promote cycling. It also works as an umbrella organization for other cycling groups and organizations in Dar, most notably Dar Active Cyclists (DAC), a recreational group of cyclists, and FASTA, a grassroots bike messenger service in the city.

Unfortunately there is a severe lack of literature or data on the history of bicycling in Dar to draw on. Only in the last half decade has literature emerged on the potential for cycling to become a key means of urban transportation. The studies have mainly focused on the attitudes of individuals toward cycling and analyzing motivators and barriers to bicycle use. Both UWABA members and individuals interviewed during the course of this study expressed that prior to a couple decades ago, bike use was a more prominent means of transportation in Dar. In the last couple decades though, with an increase in alternative forms of transportation and particularly the rise of the automobile culture, cycling came to be seen as an inferior form of transportation. It was believed that only those who could not afford cars or other means of transportation, like daladalas or motorcycles, rode bicycles.

However, due to the city’s rapid growth, increased exposure to outside culture, traffic problems, and environmental awareness, cultural attitudes toward biking are starting to shift again. The inclusion of designated bicycle lanes as part of phase one of DART represents the first time that such lanes have existed in the city. Having just been completed in May 2016, no study has yet to examine the impact of the newly designated bike lanes or attitudes surrounding their use in the city.

One of the chief aims of this study was to examine the number of individuals using the designated bike lane as compared to bicycle usage on roads with no bike lanes. Other aims of this study were to assess cyclists’ perceptions of the bike lane and to determine factors that impact bike lane usage. This study fills an important gap in regards to the effects of the designated bike lane in the city.
Methods

Quantitative Data Collection

For a three-week period between 11/7/2016 and 11/24/2016, quantitative data regarding bicycle usage in Dar was collected through an observational raw count and through an orally administered survey. During this time period two locations were examined. Both are intersections along two of the four major trunk roads that connect residential and peri-urban areas to the CBD. The first location, the intersection of Morogoro road and United Nations road, referred to locally as fire, was chosen because the intersection is the crossing point for Morogoro into the CBD (See Appendix III.I). The designated bicycle lane along Morogoro also ends after this intersection and most cyclists continue into the CBD on the road. A second location, the intersection of Bagamoyo/Ali Hassan road and United Nations road, at the south end of Selander Bridge, was chosen for comparison because it is also a major trunk road in the city but without designated bike lanes. (See Appendix III.II) The intersection is the point at which Bagamoyo road enters the CBD. The road is also the site of phase four of the BRT project, which will be a 19km BRT corridor along the road. These two locations were chosen after personal observations of cycling traffic, a literature review of previous bike studies in the city (Nkurunziza 2012a & 2012b), and consultation with UWABA.

Raw Count of Bicycle Commuters

To address the first aim of the study, which was to assess bike usage, a rudimentary raw count of the cyclist that passed through the selected intersections was conducted. By selecting two comparable zones, one where the BRT bicycle lanes have been installed and one without bike lanes, a comparative analysis could be made. Both intersections are heavily populated with high trip generation and commuting cyclists. (Nkurunziza 2012c) Morogoro Road and Bagamoyo, Road, along with Nyerere and Kilwa Roads, are the four trunk roads that connect the surrounding areas to the CBD.

Three days were spent at each location between 6:30am and 9:00am. This time frame was carefully chosen through consultation with UWABA as it was
determined to be the main window for morning commuters traveling into the CBD. It was decided that morning would be a more effective time to count cyclists, as there is a smaller, more concentrated time frame for commuters who are cycling. The number of cyclists passing through the intersection was recorded in 15-minute intervals. Only cyclists traveling from outside the CBD into the CBD were counted. Three wheel bicycles used for the transportation of goods were not counted nor were children under the age of 18. At the Morogoro intersection, cyclists on the road not using the designated bike lane were not counted. Tick marks representing each cyclist were made on a piece of paper and later a total count was conducted. The three-day average from each location was then computed for comparison.

**Survey of Bicycle Commuters**

To assess cyclists’ perceptions of the bike lane, data was collected through face-to-face, personal interviews using a survey questionnaire. A businessman who works regularly at both intersections checking registration on motorbikes and bajajs administered the survey orally. The survey questions were formulated based on research, previous surveys administered to measure bicycle preferences in Dar (Nkurunziza 2012a, 2012b, & 2012c), observations from the three days of raw counting at each location, and with input from UWABA. (See Appendix I.I & I.II) They were originally written in English and then translated into Swahili by a professional translation agency in DAR, Alliance Française. The survey was administered orally to help ease the translation process, reduce the time required for completion, minimize response errors, and combat literacy issues.

The translator was able to encourage people to stop and take the survey and answer their questions. He facilitated every survey and thus the administration of the survey was consistent across respondents. The author of this study was present for every survey administered and to clarify any questions to the survey facilitator.

The first part of the survey collected information about how long the individual had been riding a bicycle in Dar es Salaam and, on average, how many days per week he/she rode. The second part asked about the effect of, or potential effect of (depending on location), the presence of bike lanes on individual ridership.
The third part asked the individual for what purpose he/she was using the bicycle on the given day. The fourth part collected information on factors that influenced the respondent’s ridership. The final part collected basic demographic information like sex, age, and nationality.

Two days were spent at each location conducting surveys. At Fire a total of 50 complete surveys were collected. A total of 37 surveys were collected at Selander Bridge. Surveys took roughly two minutes each to complete and participation was completely voluntary. Those under 18 were not allowed to take the survey. A brief introduction was given before any questions were asked. The introduction only indicated that the study was about commuting; bicycle use was not explicitly mentioned to help avoid bias.

The survey questions administered at the two sites were identical with the exception of the question regarding bike lanes. The cyclists surveyed at Fire were asked about the effect of the addition of a designated bike lane on their ridership. Those surveyed at Selander Bridge were asked about the potential impact of a designated bike lane on their ridership.

**Qualitative Data Collection**

In addition to the quantitative data collected, qualitative data was obtained through formal and informal interviews as well as community forums. The community forum included the heads of UWABA, DAC, and FASTA. Formal interviews were held with Yonas Eliesikia Mchomvu, the Senior Transport Specialist for the World Bank in Tanzania, and William Gatambi, the Public Relations Manager for DART. Informal interviews were held with Andre Bald of the World Bank, Titson Rasik, owner of DIYA Enterprises Limited, a bike shop in the CBD, and Mussa Natty, who is currently the Senior Advisor of the Dar es Salaam Regional Commission and former director of the Dar es Salaam City Council. A conference at which Andre Bald and Theresia Mmbando, the Regional Administrative Secretary for Dar es Salaam, spoke was also attended. A public presentation by Innocent Maholi, the Mapping Supervisor for the Tanzania Humaitarian OpenStreetMap Team, provided access to various bike and traffic maps used for research in this project. Multiple discussions
and informal interviews where held with Mejah Mbuyah, the head of UWABA, during his organization’s partnership with this study. Detailed notes and quotes from all interviews and discussions were hand written, with the date and time recorded, for later use in this paper. Topics of discussion in these forums and interviews included urbanization, transportation, and bicycle usage.
Results

Quantitative data

Raw Count

The number of bikers observed in 15-minute periods ranged from 3 to 36 (See Table 1). 6:45 am through 8:00 am saw the highest concentration of bikers. Fire saw a higher total number of bikers per interval on each of three days of observation and, except for the 7:45 – 8:00 am interval, saw a higher three-day average for each time interval (See Graph 1).

Three-Day Average of Bicyclists

(X axis: time interval, Y axis: number of cyclists)

Graph 1
Three-Day Raw Counts and Three-Day Average of Cyclists

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Day 2</td>
<td>Day 3</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>6:30am - -</td>
<td>6:45am</td>
<td>22</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>6:45am - -</td>
<td>7:00am</td>
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<td>30</td>
<td>25</td>
</tr>
<tr>
<td>7:00am - -</td>
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<td>36</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>7:15am - -</td>
<td>7:30 am</td>
<td>25</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>7:30 am - -</td>
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<td>25</td>
<td>15</td>
</tr>
<tr>
<td>7:45am - -</td>
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<td>16</td>
<td>18</td>
</tr>
<tr>
<td>8:00am - -</td>
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<td>14</td>
<td>18</td>
</tr>
<tr>
<td>8:15am - -</td>
<td>8:30 am</td>
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<td>10</td>
<td>11</td>
</tr>
<tr>
<td>8:30 am - -</td>
<td>8:45am</td>
<td>9</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>8:45am - -</td>
<td>9:00am</td>
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<td>3</td>
<td>11</td>
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<table>
<thead>
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<th>Day 3</th>
<th>Average</th>
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<td>Day 1</td>
<td>Day 2</td>
<td>Day 3</td>
<td>Average</td>
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<td>10</td>
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<td>9:00am</td>
<td>3</td>
<td>9</td>
<td>13</td>
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</table>

Table 1
Survey

Two categories of data from the surveys administered to bicycle users were examined (See Appendix II.I – II.II). First, basic information was collected which included respondents’ age, sex, nationality, purpose of bicycle use, length of use, and average number of days per week of bicycle use (See Table 2). All those surveyed at both locations were Tanzanian males and the overwhelming majority reported riding at least six days per week. Over 70 percent of respondents reported being between the ages of 18 and 40. No one surveyed was over the age of 65. Individuals almost exclusively reported using their bikes to go to work. No one reported riding for exercise or recreation. Two thirds to three quarters of respondents expressed that they had been riding for over one year.
Summary of Basic Information

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<thead>
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<th>Gender</th>
<th>Fire</th>
<th>Selander Bridge</th>
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<td>Female</td>
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<th>Fire</th>
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<td>50 - 65</td>
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<tr>
<td>Exercise</td>
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<td>Other</td>
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<th>Fire</th>
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<td>Less than 1 year</td>
<td>32</td>
<td>24.3</td>
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<table>
<thead>
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<th>Average number of days per week of bike utilization</th>
<th>Fire</th>
<th>Selander Bridge</th>
</tr>
</thead>
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<td>7</td>
<td>43.1</td>
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<td>4.5</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2

The second component of the survey addressed perceptions of using the bike lane or sidewalk, depending on location, and barriers that prevented increased utilization of cycling. At Fire, 86 percent of cyclists using the designated bike lane viewed the lane as being in good condition. Yet 88 percent still had safety concerns stemming primarily from motorcycles and bajajs who also used the designated bike lane (See Table 3). 58 percent said that the addition of the BRT bike lane had no effect on the amount they rode while 42 percent said that the bike lane had increased their ridership. After safety, a lack of bike facilities at their destination or
workplace was the most common deterrent that individuals cited as a factor preventing an increase in their ridership.

84 percent of cyclists surveyed at Selander Bridge viewed the sidewalk condition as bad and 94 percent had safety concerns. 77.1 percent of the bikers said that the addition of a bike lane would have no impact on the amount they ride. 17.1 percent said that a designated bike lane would increase the amount they ride while 5.7 percent said a bike lane would decrease their ridership. Again, after safety, a lack of bike facilities was the most frequent barrier respondents cited as a barrier to increasing their ridership.

**Barriers That Prevent More Bicycle Utilization (Percent)**

<table>
<thead>
<tr>
<th></th>
<th>Fire</th>
<th>Selander Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance of bike lane/sidewalk from origin or destination point</td>
<td>8</td>
<td>10.8</td>
</tr>
<tr>
<td>Lack of knowledge about bicycles</td>
<td>6</td>
<td>8.1</td>
</tr>
<tr>
<td>Fear of safety from cars, motorcycles, and bajajs</td>
<td>88</td>
<td>91.8</td>
</tr>
<tr>
<td>Bad bicycle lane/sidewalk condition</td>
<td>14</td>
<td>81.5</td>
</tr>
<tr>
<td>Lack of bike infrastructure/facilities at workplace</td>
<td>54</td>
<td>78.3</td>
</tr>
<tr>
<td>Weather</td>
<td>18</td>
<td>35.1</td>
</tr>
</tbody>
</table>

*Table 3*

**Qualitative data**

Based on thematic analysis of the qualitative data collected from interviews and community forums, five major factors influencing bicycle use in Dar es Salaam emerged.

**Cost of bike**

Interestingly, cost was not observed to be a significant deterrent to bike use. In the meeting with UWABA, DAC, and FASTA, all representatives made it clear that it was “not because of money” that individuals did not bike. Rasik also explained that most people could afford bikes. Interestingly most of his business, he said, came from individuals who lived far outside the city in locations that are more
spread out and where fewer transportation modes, like dalalas, the BRT, and Bajajs are available.

Culture

There are various cultural barriers to bike use in the city. This is indicated by the lack of female riders in the city. In 10 days of raw counts and surveys, only 16 female bikers were observed. Manyanya said that DAC actually has a good number of female riders in the group, particularly on their weekly Saturday rides, citing that riding on good roads, outside the city, and with a large group, increases safety and attracts more women. There also exists a lingering perception of the bicycle as an inferior form or transportation used only by those who cannot afford a car or other means of transportation. Mbuyah said that in the last half decade this perception has been diminishing and he believes that in three or four more years the stigma will be gone. The proportion of those surveyed that indicated ridership of less than one year may be evidence of this cultural shift. In addition, many view a car as a symbol of wealth, an “attitudinal variable” important to consider, especially considering Dar’s high rate of increase in vehicle ownership. (Baker 2009) Mchomvu added that “most people behind the wheel view pedestrians and cyclists as congestion.”

Politics

Both Senior Transport Specialist Mchomvu and Senior Regional Commissioner Natty discussed the need for increased political pressure on the government as an important means of increasing bicycle usage. Mchomvu said there needed to be a “political champion” that comes from the community to advocate for cycling. He added that currently that there are “too many players” in the political realm to get things done to improve cycling conditions and that there is currently a “fragmentation of responsibility.” Currently, Mchomvu explained, “no one is responsible for anything.” Therefore it has been hard to get proposals passed like the creation of a road safety agency or the inclusion of curriculum on cycling in licensing exams. Natty indicated that “political pressure” would help politicians and city officials consider a “wider perspective” when considering legislation and
infrastructure projects. Mchomvu also stated that consideration for cyclists and the inclusion of cycling infrastructure has not been included in the country’s various master plans, transportation policies, and development projects.

_Bike Facilities and Infrastructure_

One major infrastructure issue is the lack of bike racks in the city. Mbuyah said that many cyclists often have to ask where they can put their bikes when they enter businesses or buildings and some places actually prohibit riders from bringing bicycles inside. He pointed out that there is a big opportunity for municipalities to make money off advertisement on city bike racks and that it is a relatively inexpensive infrastructure improvement that could have significant effects. It was observed that bike racks are absent from BRT stations and that bikes are also prohibited on BRT buses.

Furthermore, many people do not have access at work to adequate shower or changing facilities if they do wish to bike. Given the hot climate of the city, and the multitude of survey respondents who cited weather as a factor affecting their cycle usage, such facilities seem to be a critical component impacting attitudes toward cycling. Natty said the lack of facilities after biking to work was a significant deterrent that many individuals had voiced to him.

Other than along the current BRT route, no designated bike lanes exist in Dar. Mchomvu said that city needs to “support complementary infrastructure projects” when paving and fixing roads to make them more friendly to forms of NMT. Currently too many roads are “being built without consideration for cyclists.” He also suggested that, while the BRT corridor is a good start, it would be better to look 1km or more off the main roads to improve access to the main corridors.

UWABA members said that large projects like cycle lanes are important but that other measures can be taken to promote bicycle ridership which are relatively easy and inexpensive. For example, repairing minor holes in roads, removing parked cars from sidewalks, installing NMT crossings at intersections, and creating curbs that do not require dismount and remount are small changes that together could have a significant impact.
Safety

While 86 percent of survey respondents in this study were enthusiastic and positive about the addition and condition of the designated bike lane, 88 percent still cited safety concerns. This is in large part due to the fact that motorcycles and Bajaj also use the designated bike lanes to avoid heavy congestion on the road. While this may not deter current cyclists, it could prevent more individuals from using the BRT bike lanes and discourage cycling in general. The lack of enforcement of the bike lane as a designated space for bikes also appears to drastically undermine efforts to increase the number of those willing to utilize bicycles as means of transportation in the city. In an interview with Mussa Natty, the Senior Advisor of the Dar es Salaam Regional Commission, he said motorcycles are “not allowed to use the lanes” but there needs to be an effort to “reinforce the laws that exist.” In 10 days of collecting data at Fire and Selander Bridge police confrontation of motorcycles and bajajs was never observed. Natty also said that many people call the motorcycles “bullets,” illustrating the extent to which citizens consider them a threat to their personal safety. He believes that if you “provide a true cycle lane people will use it.” He said people are tired of traffic congestion and related transportation issues and want to bike but constantly ask “are we safe?” During this study multiple car and motorcycle accidents were witnessed on the road next to the bike lane as well as on the bike lane itself. In a meeting with Mejah Mbuyah, the head of UWABA, Peter Elmes, the head of FASTA, Matthias Manyana, the head of DAC, and Mukiza Richard, an active community member of both DAC and UWABA, they explained how biking is simply “too dangerous, too intimidating,” to most individuals and that “you have to be crazy” to bike in the city. Previous studies on cycling in Dar also suggest that safety is a major concern for cyclists. According to a 2013 World Health Organization Report, after malaria and HIV, road traffic accidents are the leading cause of death in Africa, 43 percent of which are pedestrian and cyclist fatalities.

In addition to motorcycles and Bajaj using the bike lanes, roadside stands of consumer goods and food products are often set up in the bike lanes, rendering them impassible. Mchomvu stated that municipalities need to invest in permanent
markets for these individuals. He expressed that they “would like to move but do not know where.”
Analysis and Discussion

This study examined the perceived impact of the designated BRT bike lanes installed as part of phase one of the BRT corridor running along Morogoro Road on bicycle ridership rates. A comparable trunk lane without designated bike lanes but with bike lanes planned in the future was used for comparison. The findings suggest that, while those who use it noticeably appreciated the designated BRT bike lane, it had a negligible impact on increasing the number of individuals using bicycles as a means of urban transportation. During the survey period, a multitude of respondents at both locations were very animated when asked about the condition of the bike lane or sidewalk. Many riding along the BRT path were enthusiastic in their responses when asked about the condition of the bike lane, clearly showing their appreciation for the quality of the bike lane. Likewise many individuals surveyed at Selander Bridge were frustrated and unhappy when asked about the condition of the sidewalk. It was observed that at this location many cyclists biked on the road instead of the sidewalk likely due to its poor condition. In contrast, not a single biker was observed cycling on the road at Fire.

Forty-two percent of cyclists at Fire reported that the bike lane had increased their ridership. This does not necessarily mean that the bike lane was a factor influencing them to begin riding. An increase in ridership could also reflect a greater number of days per week ridden, more trips per day, or choosing to cycle along Morogoro road as opposed to another road. Given that only 32 percent of respondents had been cycling less than one year it is factors other than the creation of the bike lane likely increased ridership. The dissipating cultural stigma, increasing traffic congestion, and increasing knowledge about the benefits of cycling could all be contributing factors as well.

Despite Fire and Selander Bridge both being major trunk roads, vehicle and pedestrian traffic is noticeably heavier along Morogoro road. Given the presence of the designated bike lane and higher traffic on Morogoro road one would also expect bike traffic to be proportionately higher. However, raw count data does not support this conclusion. The higher number of cyclists passing through Fire compared with
Selander Bridge represents a negligible difference. It appears that most who used the designated bike lane cycled regularly prior to its construction and that the installation of the bike lane had an insignificant impact on motivating residents to use cycling for transportation. The high percentage of riders who reported riding for longer than one year, before the completion of the bike lane, as well as interviews with UWABA members also support this conclusion. The high prevalence of those riding at least six days a week also indicates a strong motivation by those who do ride indicating that they would likely ride regardless of the sidewalk or bike lane condition. The results indicate that the creation of the bike lane is not responsible for those who reported riding less than one year, as proportions were similar at both locations. In addition, despite the fact that over 90 percent of survey respondents found the Selander Bridge sidewalk in bad condition, the location still saw a high number of riders, suggesting that the condition of the road is not the sole factor influencing bike use, thus in part explaining the relatively similar number of riders observed at each location.

The findings of this study are consistent with others conducted in the last decade (Nkurunziza 2008, 2012a, 2012b, & 2012c) that cite safety, the provision of cycling facilities, infrastructure, and psychological and social factors as impacting bicycle ridership in Dar es Salaam.

**Biases and Limitations**

This study had several limitations. Only one individual was responsible for the raw counts everyday at each location. As both were busy intersections it is possible some bicycles were missed or doubled counted. Cyclists who ended their commute at locations outside the CBD were not counted or surveyed. Given the limited time frame available for this study, only three days of raw counts and two survey days could be devoted to each location. Not all four major trunk roads could be analyzed and only a small sample size could be taken from each location. Though the principal investigator was present for every survey administered, the language barrier and use of an unofficial translator could have affected the survey results. Though not intentional, and stemming largely from cultural factors, no women were
surveyed. Brief incidents of rain, lasting from 10 to 30 minutes occurred on some morning of raw counts and surveys, which could have affected the number of cyclists observed. Despite the limitations of this study, the data adds to the very limited research on bicycle use in Dar and sheds light on the impact and perceptions of the designated bike lane as well as the factors that influence its use.
Recommendations for Future Studies

The aim of this paper was to analyze the impact on the designated BRT bike lane on ridership in Dar es Salaam. The data collected, both quantitative and qualitative, and analysis presented should be viewed as a preliminary examination of the effects of the current bike lane installed as part of DART phase one and the potential impact of the planned bike lanes of DART phases two through six. It is not the intent of this study to suggest specific policy recommendations for increasing the number of individuals who choose to utilize bicycling as a means of urban transportation in Dar. The findings of this study may be used to inform future studies on bicycle use in Dar es Salaam and to explore strategies to increase ridership. Further studies specifically targeted at determining factors that prevent an increase in ridership and analyzing the potential effects of policy implementations meant to increase bicycle utilization are recommended. There is still a “great need for clear empirical evidence on the kind of initiatives that could create a conducive environment for cycling” in the city. (Nkurunziza 2012a) It is the hope of this investigator that more studies are conducted as it is critical “to build an adequate empirical base to inform urban policies” before any specific actions are taken. (Muzzini 2008) It would be interesting to conduct more in depth studies on the designated bike lane usage as well as analyze other bike lanes as they are built as a part of future BRT corridor projects as no such studies surrounding the BRT bike lanes exist. It would also be interesting to revisit the Morogoro bike lane in the future and analyze what change, if any, has occurred in its usage as cultural and policy shifts are always occurring. Aside from its impact on ridership rates, it would be worthwhile to investigate whether the bike lane has improved the safety of cyclists.
Conclusion

The results of this study suggest that the designated bike lane installed along segments of Morogoro road has not had a significant impact on increasing ridership rates along the corridor. While this study found that individuals recognized the quality of the path and enjoyed the lane itself, the bike lane has not appeared to attract new riders to the path nor increased the frequency with which individuals cycle. Data, observations, and interviews from this study indicate that other factors like concern for personal safety and lack of widespread bike infrastructure in the CBD and surrounding areas prevent more individuals from utilizing the designated bike lane. Mmbando expressed that, as Africa’s fastest urbanizing area, Dar has the potential to be a model to other cities in the continent that are growing at a slower pace. There must be an emphasis on developing properly, she said. It is clear that the experience of using bicycles must be positive for people to continue cycling and especially for attracting potential switchers. (Nkurunziza 2012c) This is especially important for Dar given the city’s current state of infrastructure and its projected growth rate. There is a large potential for bicycles to decrease congestion and household financial pressure while increasing mobility, livelihood, quality of life, and access to services. (Nkurunziza 2012c) The findings of this study suggest that many individuals in the city would find biking to be a more viable means of urban transportation if the proper infrastructure was in place and critical barriers, like safety concerns, were removed. The decisions that the city makes now in regards to bicycle infrastructure, laws, and attitudes will “lock in travel and mobility behavior” for many years to come. (Koinage 2016)
References


Appendix

Appendix I

Survey to those using the BRT bike lane

Je, ni kwa muda sasa umekuwa ukuendesha baiskeli jijini Dar es Salaam?

_______ Miaka ________ Miezi

Kwa wastani, ni siku ngapi za juma umaendesha baiskeli? ________ Siku

Je, kujengwa kwa barabara za waendeshia baiskeli pembeni ya barabara za BRT/DART, kunaathiri vipi undeshaji wako wa baiskeli?

_______ Hazijaathiri kivango changu cha kuendesha baiskeli
_______ Zimepunguza kivango changu cha kuendesha baiskeli
_______ Zimeongeza kivango changu cha kuendesha baiskeli

Je, shughuli ipi inaelezea vizuri matumizi yako ya baiskeli kwa leo?

___ Shule ___ Kazi ___ Burudani ___ Mazoezi

Nyingine (Tafadhali Kuandika) ______________________________

Je, kipi ni kikwazo kikubwa kwa wewe kuendesha baiskeli zaidi?

_______ Umbali kutoka inapoanzia na / au zinapoishia barabara za waendeshia baiskeli
_______ Ukosefu wa ulewa kuhusu baiskeli
_______ Uoga wa kugongwa na magari, pikipiki na majanga mengine
_______ Barabara mbaya / barabara za watembea kwa miguu zinazua kutumia barabara za waendeshia baiskeli
_______ Ukosefu wa miundo mbinu ya waendeshia baiskeli jijini au sehemu yangu ya kazi
_______ Hali ya Hewa

Tafadhali zungushia iliyo sahihi – Jinsia: Mwanamke au Mwanaume

Tafadhali zungushia iliyo sahihi – Umri:

18 – 30 50 – 65 65+
30 – 40
40 – 50
50 – 65

Utaifa? Tanzanian au __________________________
(English Version)

How long have you been riding a bicycle in Dar es Salaam?

_______ Year(s) ________ Month(s)

On average how many days per week do you ride a bicycle? ________ Day(s)

What affect, if any, has the installation of the BRT/DART bike lanes had on your ridership?

______ No impact on the amount I ride
______ Decreased the amount I ride a bicycle
______ Increased the amount I ride a bicycle

Which activity best describes the use of your bicycle today?

______ School ______ Work ______ Recreation ______ Exercise

Other (Please Write) ________________________________

What is the biggest barrier factor that prevents you from using a bicycle?

______ Distance of start and/or destination from bike lanes
______ Lack of knowledge about bikes
______ Fear of safety from cars, motorcycles and other hazards
______ Bad roads/sidewalks to access the bike lanes
______ Lack of bike facilities in the city or at my work
______ Weather

Please circle the appropriate option – Gender: Male or Female

Please circle the appropriate option – Age:

18 – 30 30 – 40 40 – 50 50 – 65 65+

Nationality: Tanzanian or ________________________________
Survey to bikers at Selander Bridge

Je, ni kwa muda sasa umekuwa ukiendesha baiskeli jijini Dar es Salaam?

_______ Miaka _______ Miezi

Kwa wastani, ni siku ngapi za juma unaendesha baiskeli? ________ Siku

Je, kuwepo kwa barabara maalum za waendesha baiskeli kunaweza kuwa na athari yoyote, kama ipo, kwa wewe kuendesha baiskeli?

_______ Barabara za waendesha baiskeli hazina athari kwenye kiwango changu cha kuendesha baiskeli

_______ Barabara za waendesha baiskeli zinaweza kupunguza kiwango changu cha kuendesha baiskeli

_______ Barabara za waendesha baiskeli zinaweza kuongeza kiwango changu cha kuendesha baiskeli

Je, shughuli ipi inaelezea vizuri matumizi yako ya baiskeli kwa leo?

___ Shule ___ Kazi ___ Burudani ___ Mazoezi

Nyingine (Tafadhali Kuandika) ______________________________________

Je, kipi ni kikwazo kikubwa kwa wewe wewe kuendesha baiskeli zaidi?

_______ Umbali kutoka inapoanzia na / au zinapoishia barabara za waendesha baiskeli

_______ Ukosefu wa ulewa kuhusu baiskeli

_______ Uoga wa kugongwa na magari, pikipiki na majanga mengine

_______ Barabara mbaya / barabara za watembea kwa miguu zinazua kutumia barabara za waendesha baiskeli

_______ Ukosefu wa miundo mbinu ya waendesha baiskeli jijini au sehemu yangu ya kazi

_______ Hali ya Hewa

Tafadhali zungushia iliyosahihi – Jinsia:  Mwanamke au  Mwanaume

Tafadhali zungushia iliyosahihi – Umri:

18 – 30  30 – 40  40 – 50  50 – 65  65+

Utaifa?  Tanzanian  au  ____________________
How long have you been riding a bicycle in Dar es Salaam?

[ ] Year(s) [ ] Month(s)

On average how many days per week do you ride a bicycle? [ ] Day(s)

What affect, if any, would the installation of designated bike lanes have on your likelihood to ride a bike?

[ ] The bike lanes would have no impact on the amount I ride
[ ] The bike lanes would decrease the amount I ride a bicycle
[ ] The bike lanes would increase the amount I ride a bicycle

Which activity best describes the use of your bicycle today?

[ ] School [ ] Work [ ] Recreation [ ] Exercise

Other (Please Write) ________________________________

What is the biggest barrier factor that prevents you from using a bicycle?

[ ] Distance of start and/or destination from bike lanes
[ ] Lack of knowledge about bikes
[ ] Fear of safety from cars, motorcycles and other hazards
[ ] Bad roads/sidewalks to access the bike lanes
[ ] Lack of bike facilities in the city or at my work
[ ] Weather

Please circle the appropriate option – Gender: Male or Female

Please circle the appropriate option – Age:

18 – 30 30 – 40 40 – 50 50 – 65 65+ 65+

Nationality: Tanzanian or ________________________
Appendix II.I

DART SYSTEM MAP (PHASE I)

- Terminal (5)
- Station with overtaking lane (23)
- Station without overtaking lane (4)
- Feeder Station (3)
- Feeder Route (32)
- Feeder Route Terminal
- Connector Station (1)
Appendix II.II

Implementation Phases

Key DART corridors phases
- Phase 1 - 20.9 km
- Phase 2 - 19.3 km
- Phase 3 - 23.6 km
- Phase 4 - 16.1 km
- Phase 5 - 22.8 km
- Phase 6 - 27.6 km

- 130.3 km of DART corridors
- 18 terminals
- 228 stations