BICYCLE USE STUDY AND ANALYSIS REPORT FOR NAIROBI BUSINESS DISTRICT

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Green Africa Foundation

UN HABITAT
FOR A BETTER URBAN FUTURE

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Executive Summary

This report presents the summary findings from bicycle use study within Nairobi Business District. The study was conducted to address the objectives that formed the scope of the study that focused on assessment of bicycle use within Nairobi Central Business District. The key findings from the study and recommendations are summarised as follows.

Key findings

i. Three cyclist's corridors were investigated, and Outering road corridor recorded the highest bicycle utilization (almost double) compared other corridors surveyed, due to its orientation towards industrial area. The diurnal variation showed utilization levels along all the corridors peaked in the morning and evening; with the morning peak more spread and cascaded, while the evening peak is distinctly high and compact.

ii. The analysis of future cyclist demand revealed that potential population of 5million could revert to cycling if pro-cycling programs are adopted in Nairobi, which call for development of robust, appropriate and sustainable bicycle network design and implementation of pro-cycling programs.

iii. From the field observations, it was found that along the roads/arterials surveyed, the cyclist/NMT network is largely incoherent and inconsistent. Major interruptions, resulting from garbage/uncollected waste, parked vehicles, missing drainage grates, shallow drainage channels, roadside barriers and small scale industrial activities on most arterials were noted. A single conventional but poorly maintained cyclist parking zone was observed within the Central Business District, CBD. Recently, the bicycle parking area has also been invaded by motorcyclist and very few bicycles were found parked at the time of the survey

iv. In Nairobi, the primary barriers to cycling can be summarized as follows:

- **Conflict with motor traffic**: Most arterials in Nairobi are heavily motorized, and characterised with high traffic volumes that consume most of the effective carriageway space the cyclist are meant to share with the motorists.
- **Poor driving culture and motorists' attitude** towards cyclists making cycling ventures unsafe.
- **Conflict with other utilities**: Utility service lines for water supply, sewerage, storm drains, telephone/internet, and power cables are a disruption to walkaways that are designated as mixed use for pedestrians and cyclist.
- **Poor maintenance** of cycling lanes where provided.
- **Encroachment by business activities:** cyclists and pedestrian facilities are attractive locations for informal business activities such as fruit vendors, grocers, second hand cloth dealers and cobblers as can be seen

It is also proposed that a comprehensive approach to development of bicycle use plan and mapping of strategic objectives be included in the planning and implementation of bicycle networks. Safety and connectivity to mass transport systems are factors the study noted would upscale bicycle use uptake.

v. A review of cycling policies was undertaken and results revealed that no specific policy designed to address the needs of cyclists in particular, has been developed for Nairobi city. In general, lack of coordination in development of NMT facilities among various government agencies and Nairobi county transport department was noted. It is suggested that there is need to

have a single focal point in development of NMT facilities and that promotion of bicycle uptake in Nairobi would be supported by best practice guidelines that can be adopted in implementation of cyclist's facilities.

vi. Several stakeholders and their roles in promoting pro-cycling programs have been highlighted in this report. The report observes that closer coordination between the government and support agencies, cycling groups and associations, bicycle maintenance managers and working within business associations and private property developers would create a strong partnership for effective implementation of pro-cycling programs.

vii. The key issues inhibiting cycling among women include, gender relations, poverty, globalization, safety and security and perception and attitude towards women. Mainstream gender concerns in formulation of cycling guidelines and laws, ensuring financial independence for women, promotion of equality and equity, improving security and change in perception and attitude towards women are steps that would have a catalytic effect in stimulating cycling among women.

viii. Finally, it noted that ddevelopment of a robust cycling industry is an opportunity for employment creation. Mobilization and sale of cheap affordable bicycles would promote higher mobility rates and execution of business trips, and create income opportunities among those involved in sales and marketing. Implementation of pro-bicycle programs mandates concerned organizations to teach basic and advanced mechanics and bicycle operation skills to beneficiaries. Increased bicycle uptake would enable many spare shops; parking areas and maintenance workshops to be established which would spur job creation via a vibrant local bicycle economy, suggesting the viability and sustainability of bicycle urban mobility use plans and programs.

Recommendations

The following recommendations are suggested measures to improve cycling uptake in Nairobi.

i. There is need to energize existing promotional efforts and initiates in order to upscale the adoption of cycling as a mode of travel in Nairobi.

ii. Concerted effort need to be directed towards developing pro-cycling legislations.

iii. Pro-cycling stakeholders need to engage the road authorities the developing cycling design guidelines and manuals that are responsive to Kenyan local travel conditions

iv. Special advocacy for cycling uptake among women in light of the low a cycling uptake among the female gender. This effort should be geared towards strengthening participatory capacity of women in cycling by focusing in eliminating factors that inhibit cycling among women.

v. It is recommended that the pro-cycling agencies endeavor to provision avenues for acquisition of cheap or affordable bicycles to improve cycling uptake.

vi. There is need to strengthen the cyclist workshop maintenance managers skills, coordination and information dissemination capacity to make them a useful medium for transfer of pro-cycling information and initiatives.

vii. Investment in development of a direct, coherent and connecting pilot bicycle network plan to be used a demonstration of best practice cyclist infrastructure designs in a safe and secure environment. This can be used as a reference for development future bicycle facilities network plans.

viii. Further studies to map the origins and destinations of cyclists trips is required for preparation of a comprehensive pilot bicycle use plans and to provide guidance of the utilization levels along typical cyclist corridors in Nairobi.

ix. There is need to incorporate cycling education and cycling safety education in driving school curricular to provide a platform for teaching of cycling rules and traffic laws to cyclists.

x. There is need for greater investment in the potential employment areas in cycling industry to improve cycling uptake and to create job opportunities

xi. Finally, there is need for the involvement and development of closer ties with various stakeholders mapped in the course of this study, in order to tap in their contribution and broaden the positive aspects of pro-cycling programs. This would make bicycle use plans acceptable to most of the stakeholders and ease implementation of the bicycle use plans where and when developed.

Chapter 1 Table of Contents

Chapter 2 Introduction

1.1General

Transport in Nairobi today is mostly motorised, with those in the high income brackets operating personal cars, while the middle class are mostly public transport dependent. A small percentage use commuter trains. Walking and cycling (Non-Motorized Transport, NMT) is mainly the preferred mode for those in the low income bracket executing trips below 5 km. Low income earners form the bulk of the population of Nairobi City. Figure 1.1 and 1.2 below illustrates the mode share and distribution of NMT modes by distance as presented by Climate.xl field survey in 2009 for United Nations Environmental Program, UNEP.

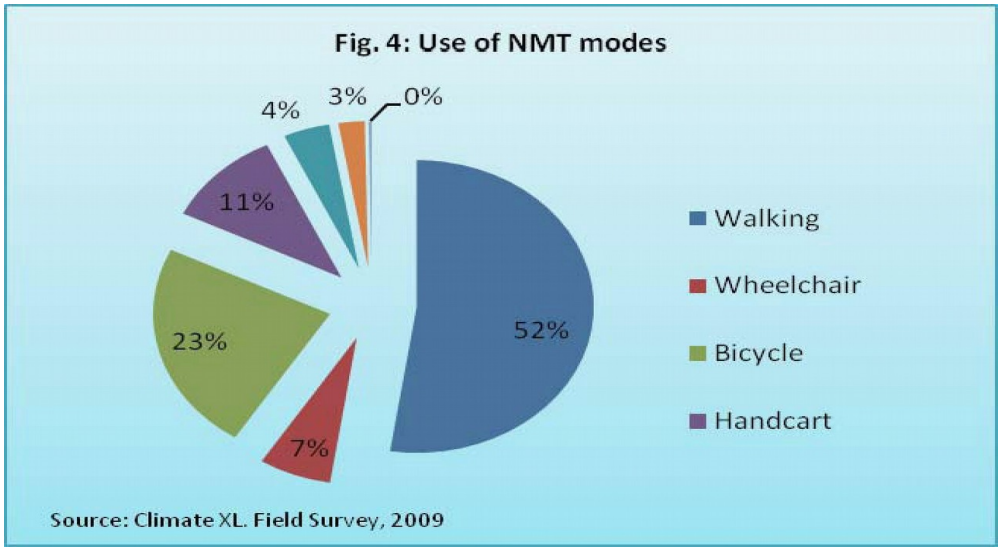


Figure 1.1: NMT Mode share in per cent.

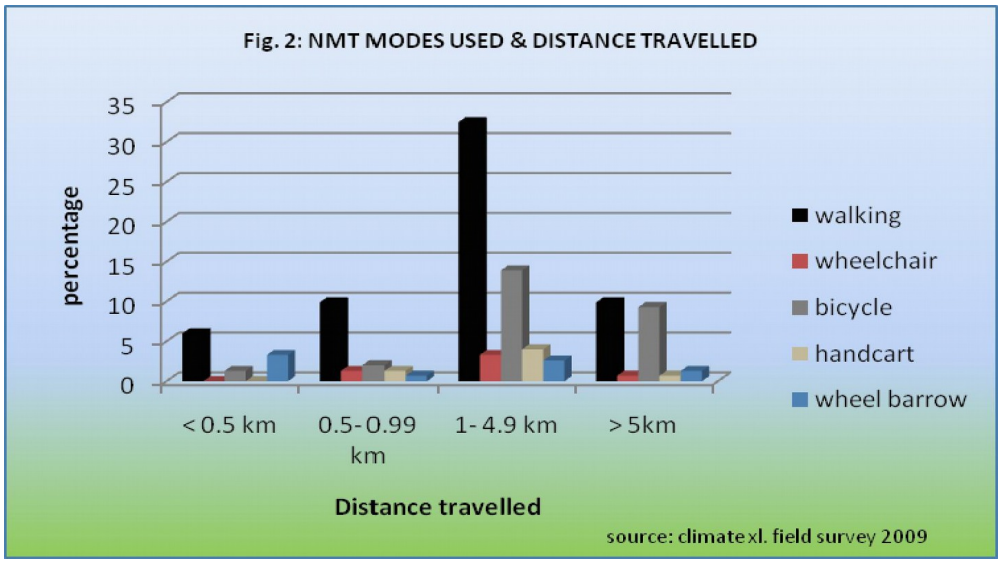


Figure 1.2: NMT Mode share in per cent by trip distance.

Figures 1.1 and 1.2 above show cycling is the second in rank to walking among the NMT modes.

Despite the significance of cycling as a potential alternative mode of travel for the bulk of the population in Nairobi, the general design of the major road links/arterials in Nairobi discourages to the usability of bicycle as alternative mode of travel.

When fully operated in a forgiving environment, bicycle can attain speed of up to 45km/hr., making residential and economic activity zones which are public and car dependent trips, reachable within 20 minutes. The maximum achievable bicycle speed in unconstrained cycling environment is also far above the operating speed experienced along the arterials at peak hours that vary between 10-30km/hr., and close to the average posted speed limit of 50 km per hour. Further, cycling is non-pollutant, energy saving and has a myriad of health benefits, except under adverse weather. This calls for a concerted effort towards encouraging cycling as an alternative travel mode in Nairobi today.

1.2Project background

NMT in Nairobi includes walking, cycling for personal transport and goods transport, and the use of wheelchairs, hand-carts and push-carts. According to a comprehensive urban transport study in Nairobi by JICA [2006, ibid], which showed that out of 4.82 million trips per day made in Nairobi in 2004, 2.32 million trips/day were made by either walking or cycling. This finding indicates that NMT represents 48.2 % of all daily trips in Nairobi. Out of the 22.7million daily NMT trips in Nairobi, 47.1% are made by walking while cycling contributes 55 thousand trips or 1.1% of all NMT trips. Dominance NMT as a mode of transport in Nairobi is also supported by a case study along Jogoo Road by the SSATP programme of the World Bank which established that 64% of all the trips originating from Eastland's using Jogoo Road corridor and terminating in industrial area and CBD are executed by walking and 0.8% are executed by bicycles.

The low uptake of cycling, which is a faster and easier mode of travel is attributed to absence of cycling supporting facilities, association of cycling with poverty, rurality of cycling tradition and perception of cycling as an unsafe and uncomfortable mode of urban travel (JICA, 2008; Olvera et al., 2008; Nkurunziza et al., 2010).

Two NMT traffic flow patterns are observable in Nairobi; a radial flow between residential areas and areas surrounding the CBD where a wide range of formal and informal jobs are found in the commercial, industrial and the informal or Jua Kali sectors and; and two, circumferential flow across different settlement and employment zones. The two NMT flows arise from a connectivity demand between low income residential areas and the industrial areas, which are the informal employment centres and medium-to-high income residential areas for domestic or home service jobs.

Owing to the benefits of cycling and the prevailing latent cycling demand in Nairobi, Green Africa Foundation in conjunction with UN Habitat has commissioned a bicycle use study within Nairobi Central Business District (CBD) to highlight key issues that inhabit cycling and to bring forward, strategies that can be adopted to promote cycling in Nairobi. A Consultant has been contracted to provide Consultancy Services for Bicycle Use Study within Nairobi Central Business District.

1.3Objective and scope of the study

The Terms of Reference provided by the Client forms the scope of the study in this project. In brief, the Consultant is required to;

i. Analyze bicycle Transport dynamics within uptake, embrace and use in most people living/working in Nairobi to illuminate patterns of access and use of Non-Motorized Transport, county data on the use and access of Non-Motorized Transport with particular focus on Nairobi CBD and make recommendations.
ii. Establish cycling infrastructure e.g. bicycle parking, cycle lanes, cycling friendly facilities in working places and identify limitations in planning for Non-Motorized Transport.
iii. Analyze factors affecting planning for Non-Motorized Transport use and access in urban areas, available opportunities and propose ways of developing inclusive and broad adoption of best practices in Non-Motorized Transport in Nairobi.
iv. Provide analysis on NMT policies and legislations e.g. traffic rules on cycling and use of cycling lanes, tax regimes on bicycle importation ,bicycle licenses, training schools etc.
v. Map stakeholders responsible for urban roads and their efforts on NMT development.
vi. Provide gender disaggregated data and people with special needs using NMT.
vii. Analyze employment opportunities in NMT and initiatives to increase use of NMT in Nairobi e.g. through competitions and campaigns.

1.4Description of Project Area

The transportation system in Nairobi is a reflection of the relationship between the urban structure and the overall social-economic character of the city. Travel in Nairobi is guided by an inflexible zoning regime as described by distinct industrial, commercial and residential belts. In the recent past, there has been growth trend towards mixed land-use patterns. In summary, the basic character of the city consists of the following:

- Residential areas surrounding the various land-uses, with particularly high population concentrations in the Eastern, western and northern sides of the central Business District. These areas include the informal settlements of Kibera, Kawangware, Kangemi, Dandora and Kayole. The immediate regions bordering these settlements have undergone rapid changes over the last decade and areas that were formerly low-to-medium density residential areas have over the years, witnessed rapid land use and density changes thereby generating more non-motorised traffic.
- The commercial Central Business District (CBD), defined by Uhuru Highway, Haile-Selassie Avenue Kirinyaga Road, and spreading northwards to Westlands. Commercial developments in the form of

offices and supermarkets/shopping malls along the road have led to increase of pedestrian and motorised transport to and from this zone.

- An Industrial segment in the Eastern and North-Eastern parts of the city and is located on the Eastern parts of Mombasa road, the Eastern fringe of the CBD (Gikomba area) and the Northern part of Outer Ring Road, stretching to North East part of Thika Road. These areas host heavy and light industries including the “Jua Kali” (small scale industrial sheds). These industrial activities rely mainly on NMT modes for support in terms of labour and material supply and partial distribution finished goods.

The densification of the hitherto intermediate buffer zones and growth of informal settlement within such areas and conversion of properties fronting city roads for commercial purpose and growth of activities especially related to the building and construction industry have also generated additional non-motorised traffic along major arterials linked the CBD.

1.5Survey Locations

This study focuses on bicycle use survey within Nairobi Central Business District. Three bicycle transit corridors were identified for the bicycle use study and one survey points placed along each corridor.

The corridors are;

i. Waiyaki way; being a link between Kangemi, an informal settlement and the CBD
ii. Thika Road, being a newly constructed super highway, with cyclist facilities, to evaluate usage of such facilities
iii. Outering road, being a typical intermediate link between main city industrial centres to settlements to the Northeast of the CBD.

Figure 1.2 shows the study area and survey locations.

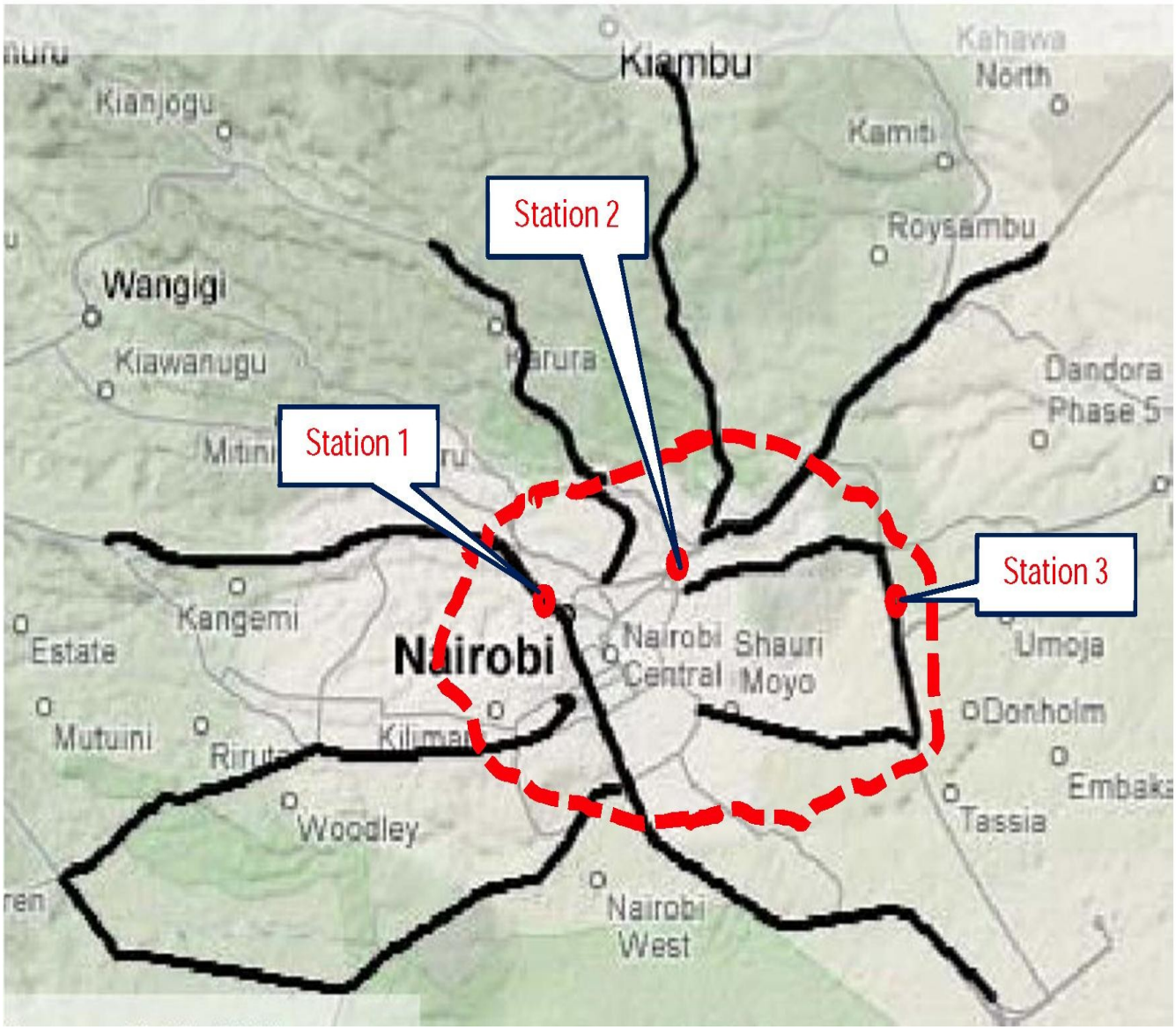


Figure 1.2: Survey Locations

Chapter 3 : Traffic Analysis

1.1Introduction

This section describes the bicycle traffic data collection and analysis for the bicycle use study project. Analysis and results are explained in detail in the foregoing sections.

1.2Bicycle Transport uptake in Nairobi

Existing Bicycle Traffic

Existing traffic was determined by conducting bicycle traffic along the three bicycle transit corridors. The counts were basically two way link midblock counts for picking up traffic moving in both directions along the road.

Survey Procedure

Manual traffic counts were conducted over a period of 3 consecutive days at the three survey locations. The counts were carried out between 6.00am to 18.00pm (12 hours) for three consecutive days over 12 hour period. Results of the counts were analysed to generate Daily Average Traffic (ADT) flow data presented within this report.

Table 2.1 shows the traffic census stations where data was collected. The table provides additional descriptions of the various components of the traffic data collected for this study.

Table 2.1: Traffic census stations and traffic survey types

Location	*Junction Name*	*Survey Type*	*Duration*
1	*Along Waiyaki way next to Westgate building*	*Traffic Volumes*	*3 Days 12 hour bicycle traffic counts*
		observation surveys	*3 days -12hours Days Road Side observation surveys*
2	*Along Thika Super Highway near Mathare Mental Hospital Crossing bridge*	*Traffic Volumes*	*3 Days 12 hour bicycle traffic counts*
		observation surveys	*3 days -12hours Days Road Side observation surveys*
3	*Along Outering Road, between Kangundo Road Junction and Mtindwa*	*Traffic Volumes*	*3 Days 12 hour bicycle traffic counts*
		observation surveys	*3 days -12hours Days Road Side observation surveys*

Traffic Count Analysis

Indicative ADT from the counts were derived by averaging the 3-day daily traffic data. The 12-hour counts were converted to a full day bicycle traffic flows using a 1.1 as the partial conversion factor to account for bicycle traffic that passed outside the survey hours. Normally, the count is grossed up using a 24-hour traffic count and taking the ratio of traffic in the same counting period and direction to the full 24-hour count.

Finally, two-way traffic flows were arrived at by summing the ADT for each direction. Analysed bicycle ADT has been presented including directional distribution along all the three bicycle transit corridors.

1.3Bicycle Traffic Analysis

Base Year Bicycle Traffic Model

Two-way ADT and peak bicycle flows for the three corridors are shown in Figure 2.1. The baseline average 3-day average bicycle traffic is presented in Figures 2.2, 2.3 and 2.4 below.

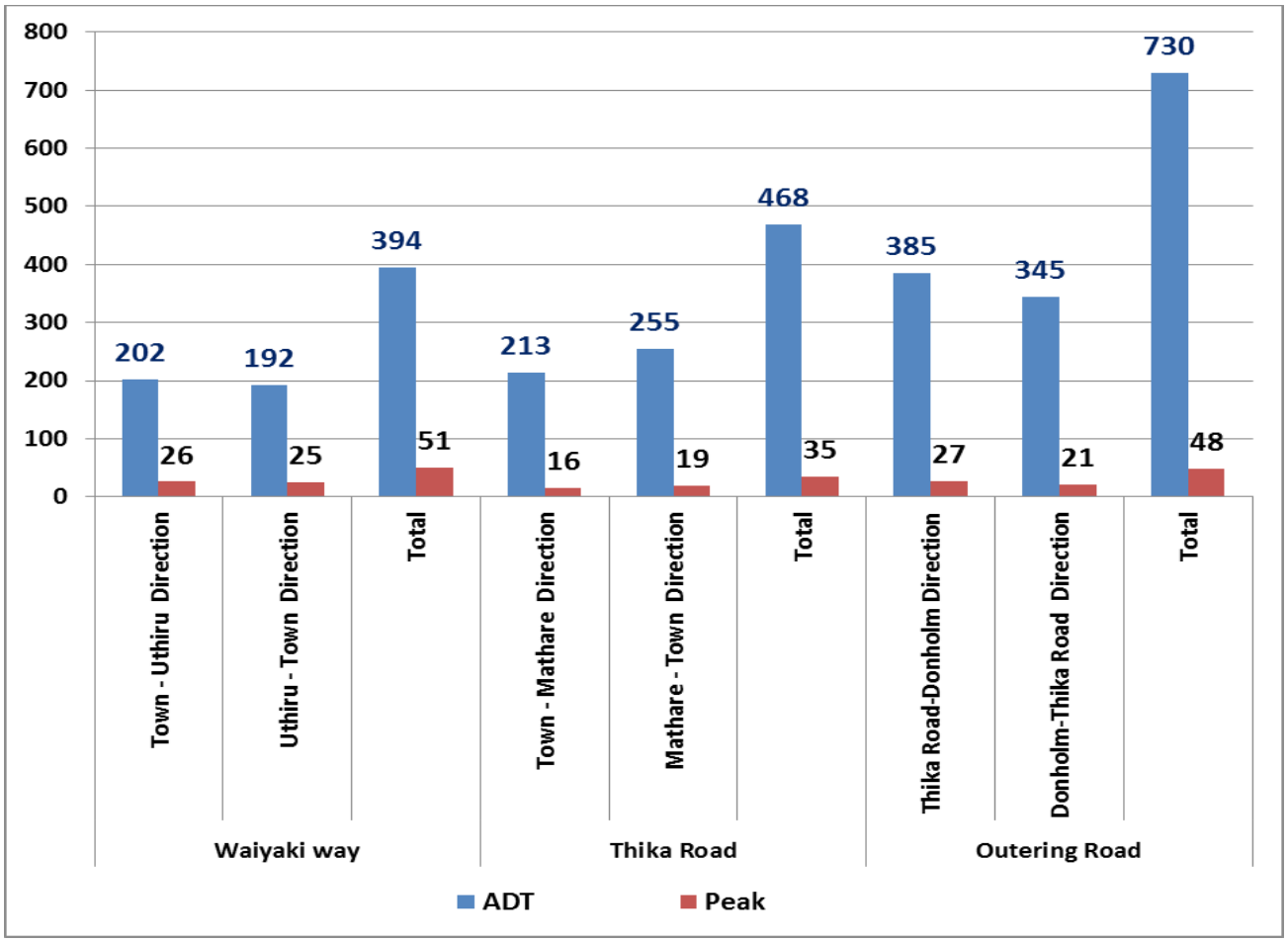
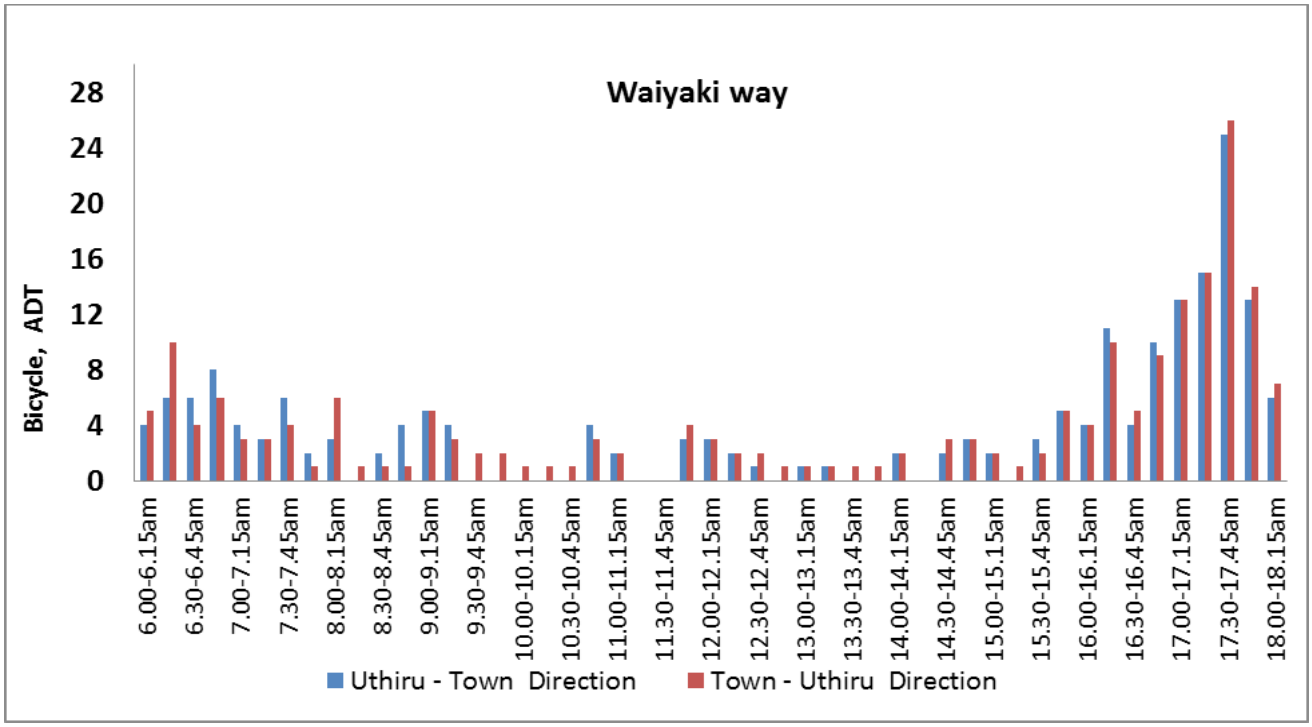
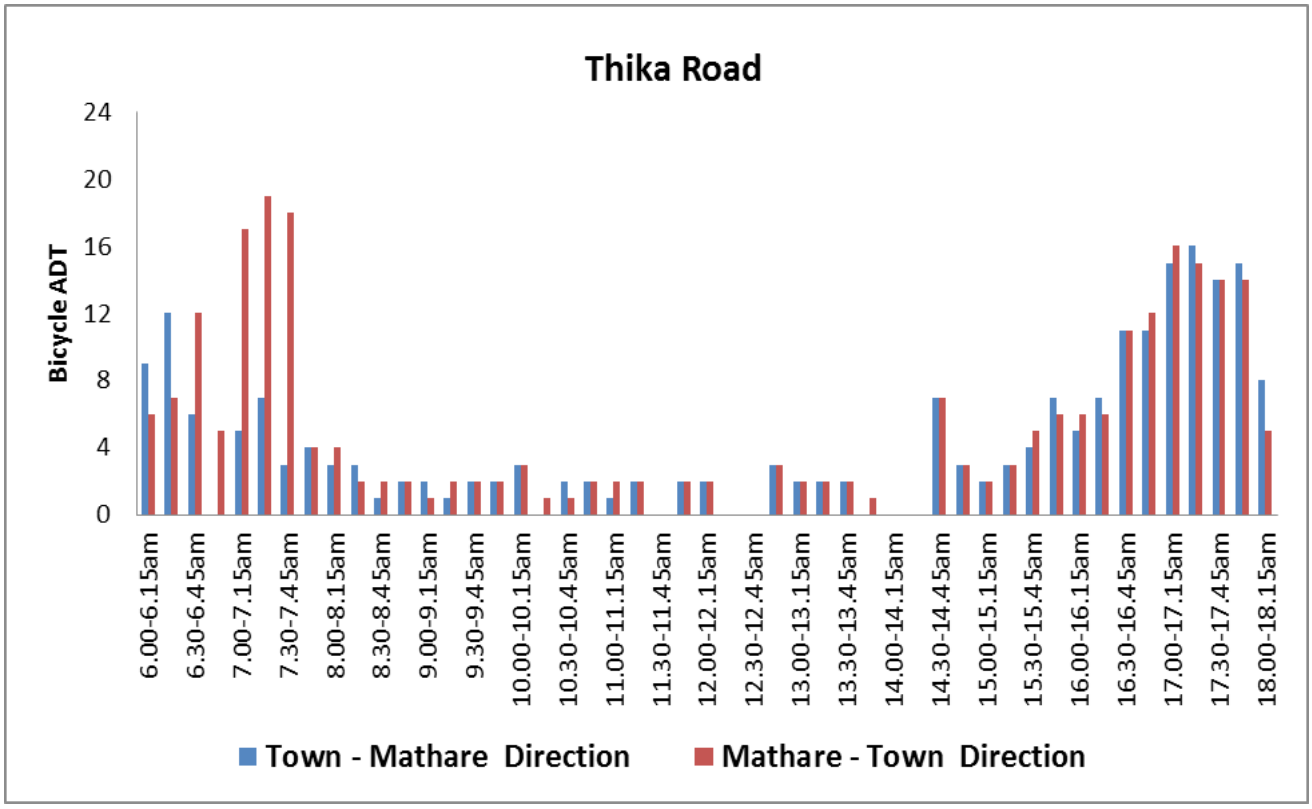


Figure 2.1: Bicycle ADT

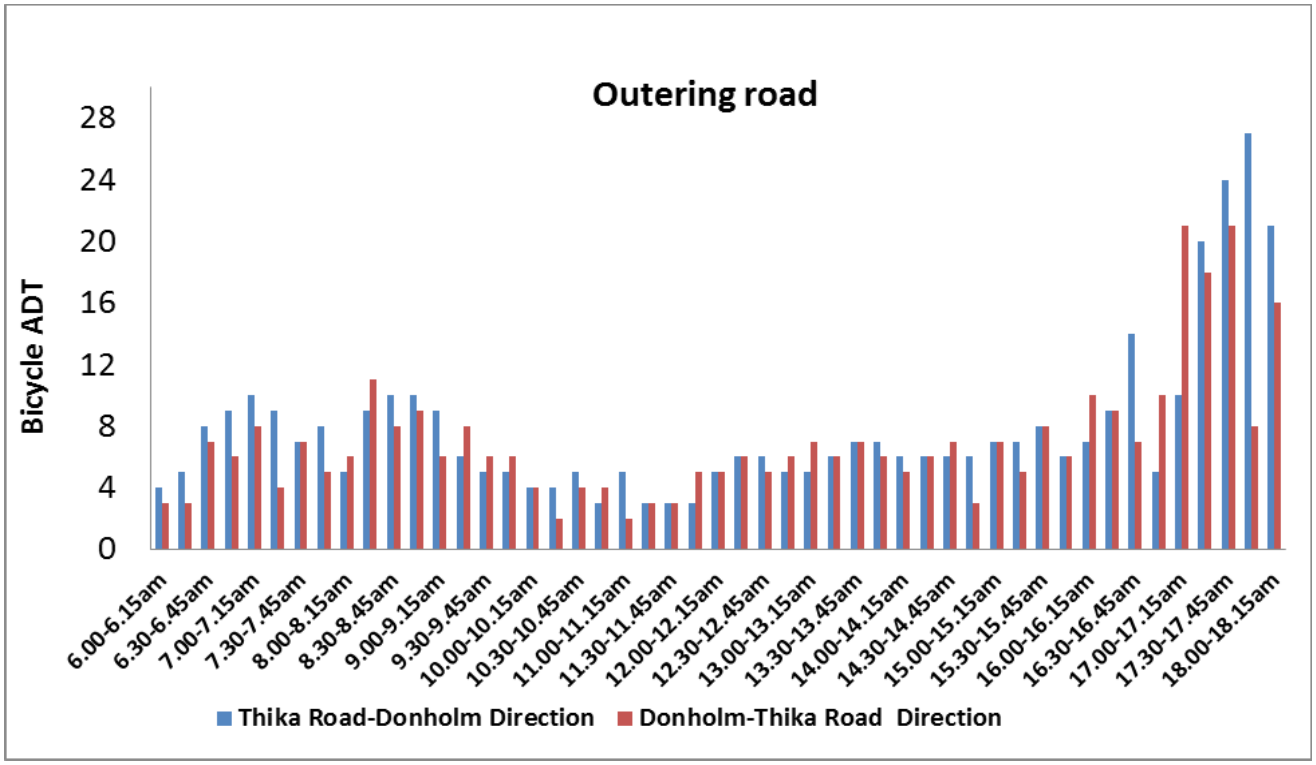
Outering road corridor has higher bicycle utilization (almost double) than other corridors surveyed, due to its orientation towards industrial area. Cyclist trips along this corridor are attracted to informal jobs that are readily found within industrial area.



Figures 2.2: Diurnal cyclist volume variation for Waiyaki way



Figures 2.3: Diurnal cyclist volume variation for Thika road



Figures 2.4: Diurnal cyclist volume variation for Outering road

Bicycle traffic flow (road utilization) is highest along Outering road corridor throughout the day. The diurnal variation shows utilization levels along all the corridors peaks in morning and evening. Both graphs show a trend where the morning peak is spread and cascaded, while the evening peak is distinctly high and compact.

This scenario is explained by the fact that in the morning, cyclists leave at the different times to report to work from 7.00 to 9.00 am, resulting in staggered arrivals. In the evening, informal employees leave work at around 5.00pm when many businesses close, resulting in near uniform arrivals. The sustained cyclist trips along Outering road are attributed to other trip purposes.

Observation surveys

Observation surveys were made alongside the bicycle traffic counts at all survey stations. In addition to recording the bicycles passing, the following details were recorded:

- Gender of rider
- Load type transported
- Ride direction
- Riding location
- Riding surface type,
- Commodity carried
- Traffic flow conditions at the time of passing

The data was cleaned and statistical analysis conducted using SPSS. From the field observations, 3,958 bicycles were sampled which is the entire sample size as can be seen in table 2.2.

Table 2.2: Sample size

Survey Station	Frequency	Per cent
Outering Road	1916	48.4%
Thika Road	1112	28.1%
Waiyaki Way	930	23.5%
Total	3958	100.0%

The data sample size is deemed statistically significant given the present level of bicycle traffic flow along the survey corridors. Table 2.3 shows the gender distribution recorded from field surveys.

Table 2.3: Gender distribution

Rider Gender	Frequency	Per cent
Male Adult (MA)	3845	97.1%
Male Youth (MY)	78	2.0%
Female Adult (FA)	29	0.7%
Not Recorded	6	0.2%
Total	3958	100.0%

The proportion of cycling females along the surveyed corridor is only 0.7%. Men (Male adults and male youths) constitute over 99% of cyclists operating on the survey corridor. This shows very low cycling uptake for personal commute by women in Nairobi. Male population in Nairobi is more likely to cycle than females on the corridor surveyed, and by extension, in Nairobi. Figure 2.5 shows commodity recorded during the three days cyclist commute.

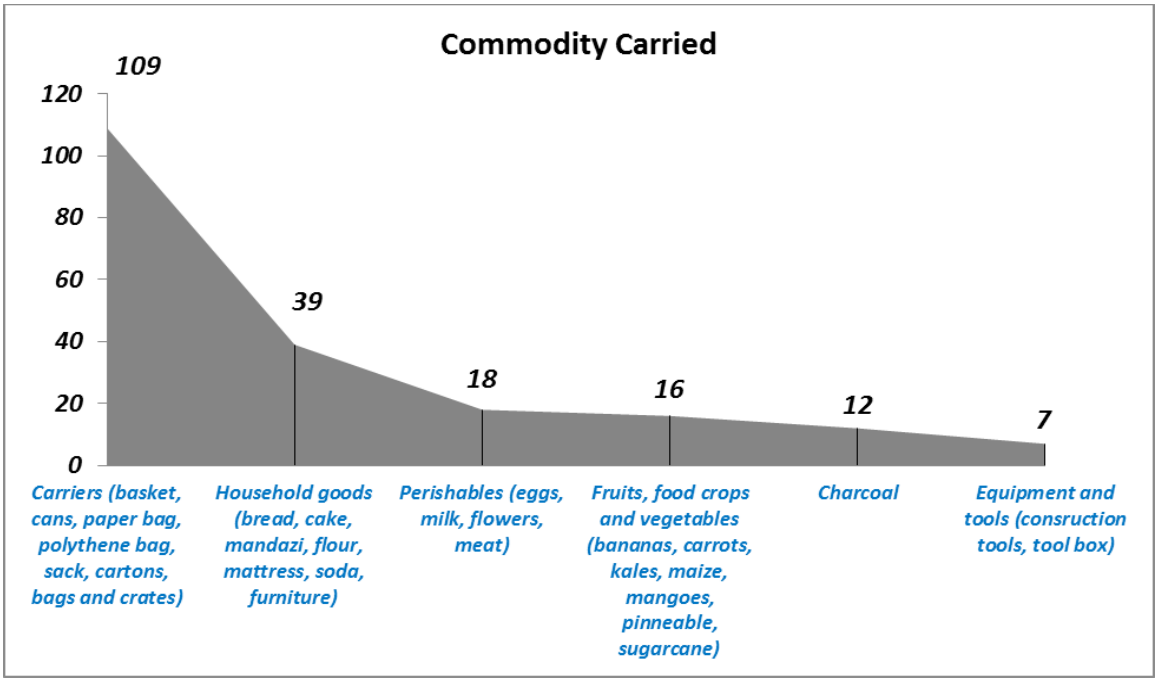


Figure 2.5: Commodity recorded among cyclists.

Carrier items dominate among the items cyclists transport. Household goods are next in rank followed closely by perishables and fruits, food crops and vegetables almost in equal proportions. Cyclists transporting pillion passengers are 1.7% (see table 2.4). This observation shows bicycle is used delivery of goods besides personal commute to work.

Table 2.4 shows the share of cyclists with pillion passengers.

Table 2.4: proportion of cyclists carrying pillion passengers

Pillion Passenger	Frequency	Per cent
None	3890	98.3%
Yes	68	1.7%
Total	3958	100%

Sharing of cyclists trips in unpopular, with only 1.7% of the cyclists having pillion passengers aboard their bicycles.

Riding Locations

Cyclist riding locations relative to the road were recorded during filed observation survey. It is expected that, where cyclist's facilities are provided, cyclists would fully use such facilities for their commute trips. Figure 2.6 show the distribution of driving locations relative to the roadway along the three cyclist's corridors. Figure 2.7: show the distribution of driving locations by gender.

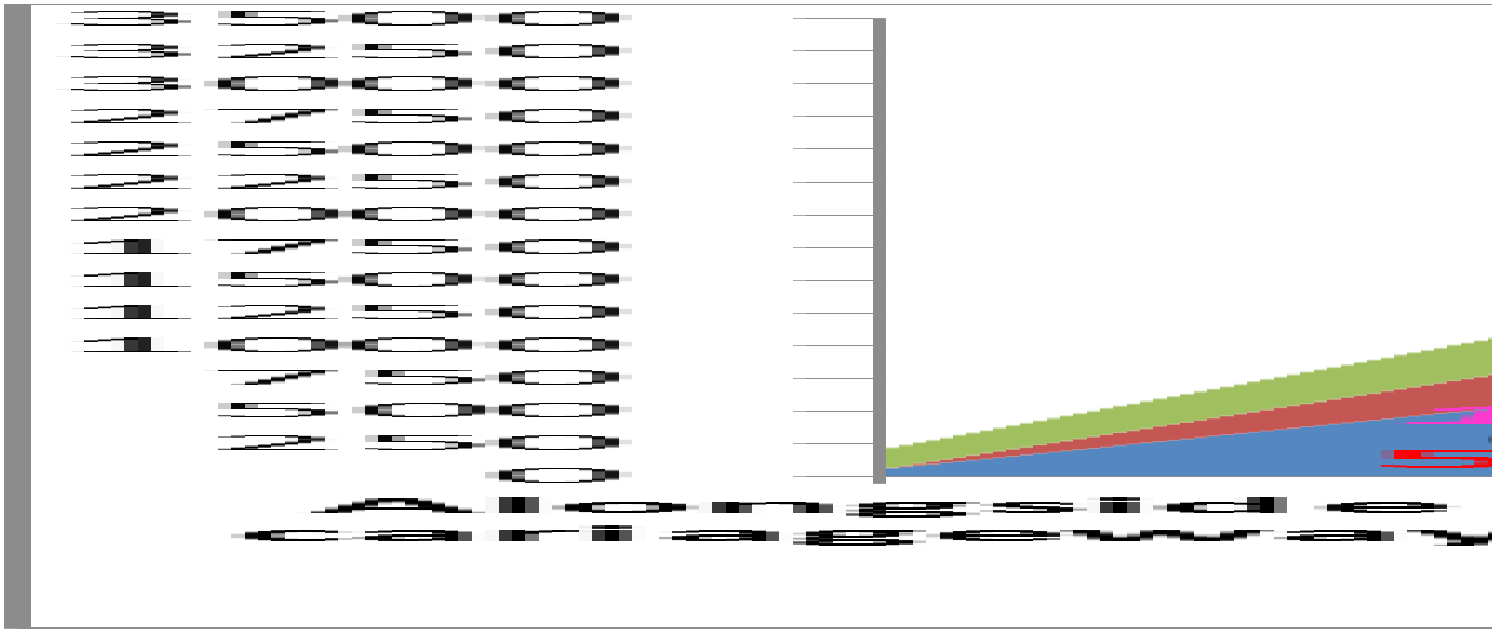


Figure 2.6: Distribution of riding location relative to the roadway

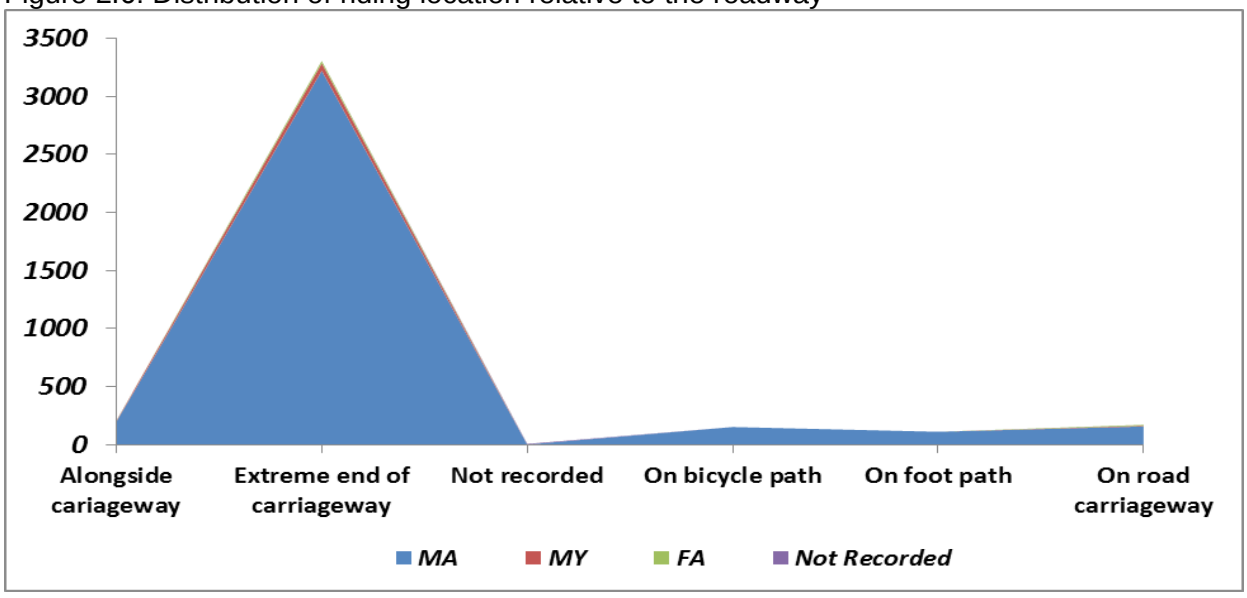


Figure 2.7: Distribution of riding location by gender

Majority of cyclists surveyed along the three corridors operate on the extreme end of the carriageway, for lack of cycling lanes (Outering and Waiyaki way) and in violation of the provided cyclist lanes (Thika road). A few cyclists ride on the provided cycle path along Thika road. Along Waiyaki way corridor, no cyclist lanes provided forcing conforming cyclists to share foot paths with pedestrians. For Outering road, cyclists are mostly forced to share the carriageway with motorists or ride alongside the carriageway on unpaved surface, which discourage cycling.

Figures 2.8 to 2.10 illustrates cross tabulations for cycling locations and traffic flow category.

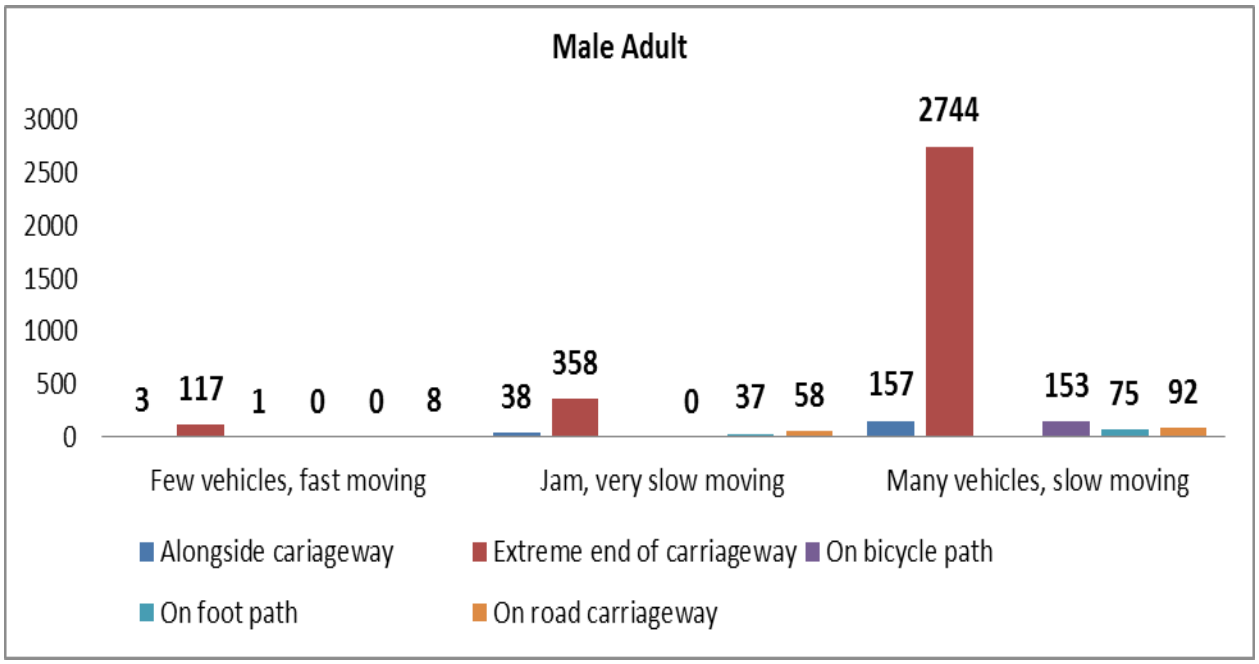


Figure 2.8: Distribution of riding locations by gender and traffic flow condition-male adults

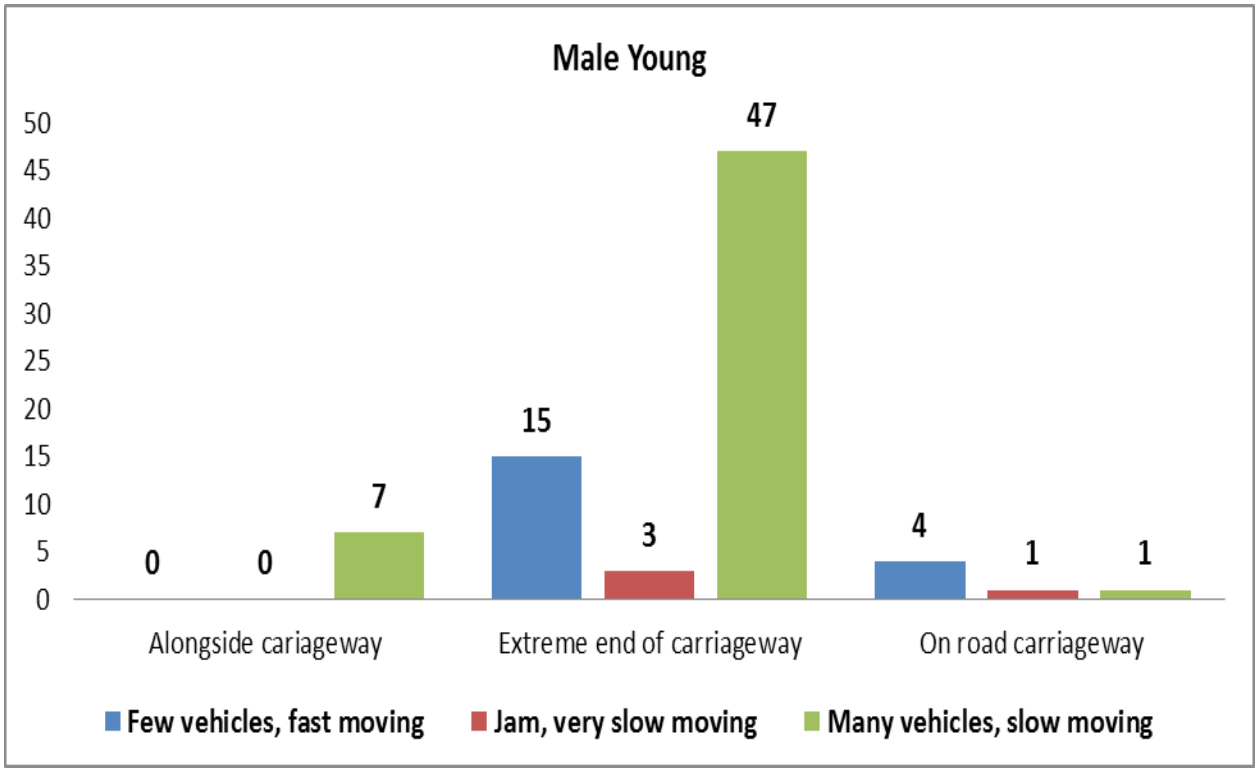


Figure 2.9: Distribution of riding locations by gender and traffic flow condition-young adults

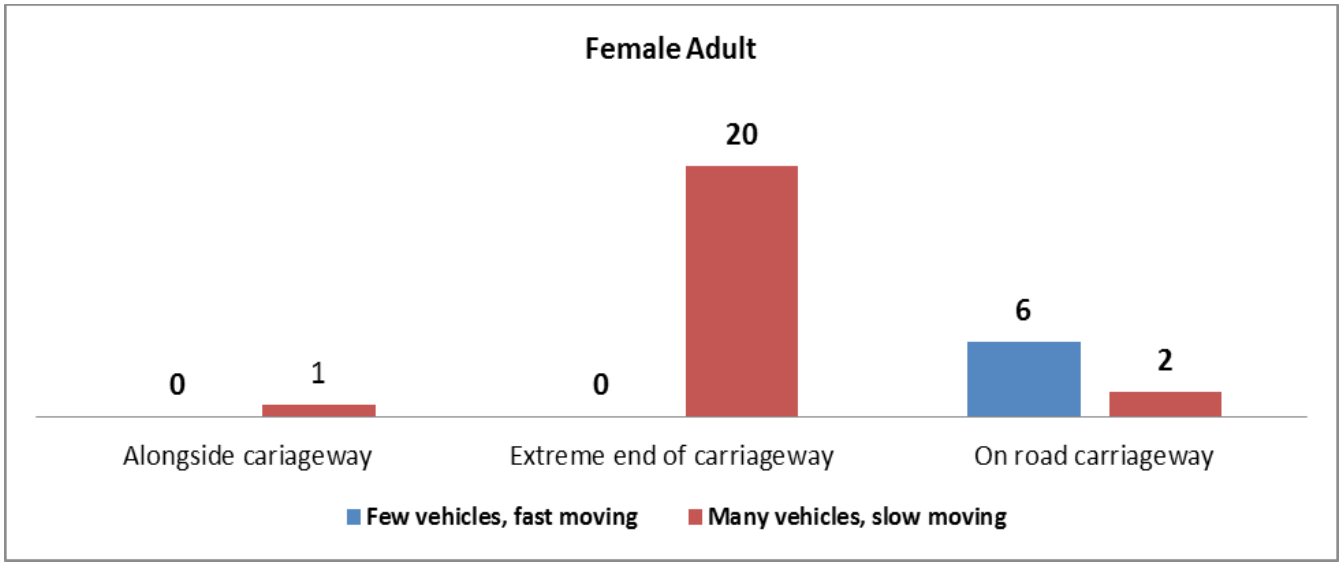


Figure 2.10: Distribution of riding locations by gender and traffic flow condition-female adults

Most cyclists ride on extreme side of roadway, where it is “safe” to cycle irrespective of the prevailing traffic condition along the entire cyclist transit corridor surveyed. Almost an equal proportion of gender class would ride along the carriageway during fast moving conditions. This is likely to cause conflict between cyclists and motorist. The data collected does not clearly illustrate the risk taking behaviour across the gender and age cross-sections.

1.4Bicycle Travel Demand Forecast

Introduction

This section provides a brief overview of the traditional travel demand modelling process and how bicycle travel relates to this process. Several research studies focused on improving specific steps or aspects of the modelling process exclusively for bicycle travel.

A travel demand forecast is often developed to depict the most probable central demand. Travel demand forecast for bicycle trips is based on:

a. Anticipated population growth in urban population distribution
b. Estimates for growth in development within the area of influence
c. Growth of bicycle ownership
d. Development of various land uses

Historical Perspective

Generated demand would occur if a significant reduction in travel time or cost opens up new opportunities for bicycle use within the Nairobi CBD. If current inhibiting effects to cycling are removed and cycling facilities provided, then modal shift effect will be experienced; where more people may opt to cycle to work and to other activity zones.

Given the nature of densification and land-use changes within the core and surrounding areas of Nairobi city, non-motorised transport modes will continue to play an important role in meeting transport demand. Figure 2.11 shows sample land uses along some arterials within Nairobi city. The JICA study (2006) forecasted total trips in Nairobi to roughly double from 4.82 million trips per day in 2004 to 8.28 million trips per day in 2025. The study found that nearly 76.8% of travel is within 5km. Out of the sampled respondents, 48.4% said they most often walked for distances less than 5km, while 16.2% cycled.

The modal split along the roads studied in Nairobi point to the need to integrate NMT facilities in transport planning. Findings from this study differs from the observations made by, Climate.xl field survey in 2009 for UNEP. JICA survey of 2006, was however more comprehensive, and has been adopted to provide a rough bicycle use model that can provide future bicycle use demand model.

Generated Bicycle Travel Demand

The travel demand modelling process is the means by which transportation planners attempt to estimate the future travel demand on a network, (Shawn, Hottenstein and Shunk, 1997). There are a number of approaches used in modelling future bicycle uptake. One simple method is based on generation of bicycle trips based on profiled land uses. An example of this approach is represented by Rhodes Island Study in 1982. The generations were estimated following the methodology shown in table 2.5 below.

Table 2.5: Bicycle Trip Generation Rates

Trip Purposes	Estimated Average Daily Bicycle Trips
Utilitarian/Destination To Work To School To Personal Business	 4.9 per 1,000 Employed 20.3 per 1,000 Enrolled 11.5 per 1,000 Population
Recreational/Destination To Recreational Facility	 19.1 per 1,000 Population
Recreational/Non-Destination To Visit Friends Riding in Neighbourhood Long Distance	 22.4 per 1,000 Population 57.3 per 1,000 Population 2.6 per 1,000 Population

The bicycle trip generation equations were aggregated by trip purpose to simplify calculations, and the following bicycle trip generation equations were used:

- Total Bicycle Trips = Trips (1) + Trips (2) + Trips (3)
- Trips (1) = 4.9 x 1,000 Employment
- Trips (2) = 20.3 x 1,000 School Enrolment
- Trips (3) = 112.9 x 1,000 Population

The factors necessary to estimate bicycle trip generation were employment, school enrolment, and population for the segment. This approach requires proper profiling of socioeconomic data and projections for the design life of the bicycle trips estimation project and resultant data applied to generate total bicycle trips for each analysis segment.

The equations above are used in conjunction with the **Bicycle Trip Elasticity Curve (BTEC),** shown in figure 2.12 below. The Bicycle Trip Elasticity Curve estimate the Probability of Cycling by Land Use and Distance. Probability factors have been developed and are shown in table 2.6.

Table 2.6: Probability of Cycling by Land Use and Distance

Trip Attractor Type	**Miles from Attractor**			
	0.5	**1**	**1.5**	**2**
Parks/Recreation	0.28	0.23	0.2	0.17
School	0.36	0.29	0.23	0.18
Employment	0.28	0.24	0.2	0.17
Shopping	0.29	0.25	0.21	0.17

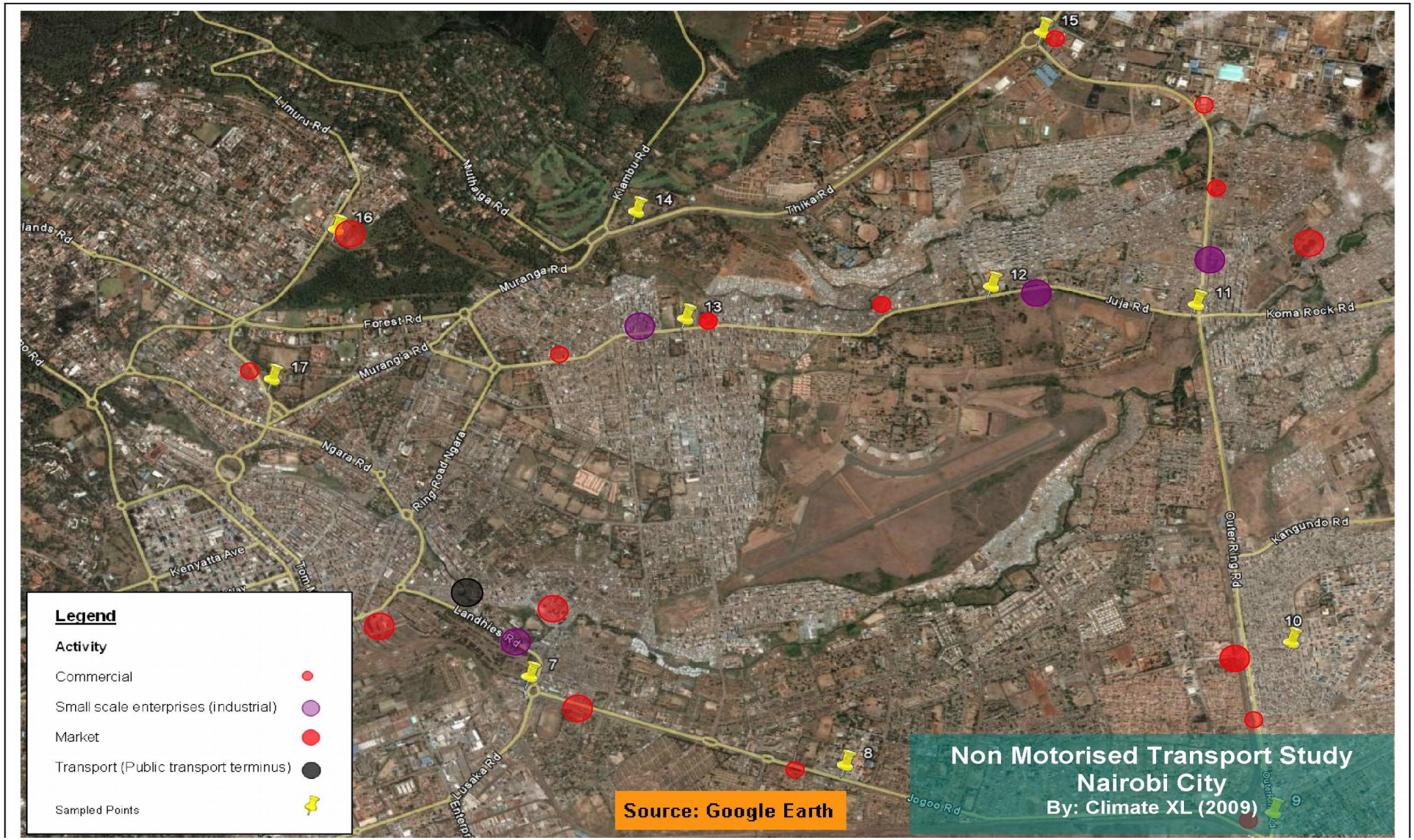


Figure 2.11: Land use-transport linkage: Thika, Juja, Outering and Limuru roads
Source: Climex for UNEP

Accurate estimation of generated bicycle trips can be determined by calibrating these models to reflect the local conditions.

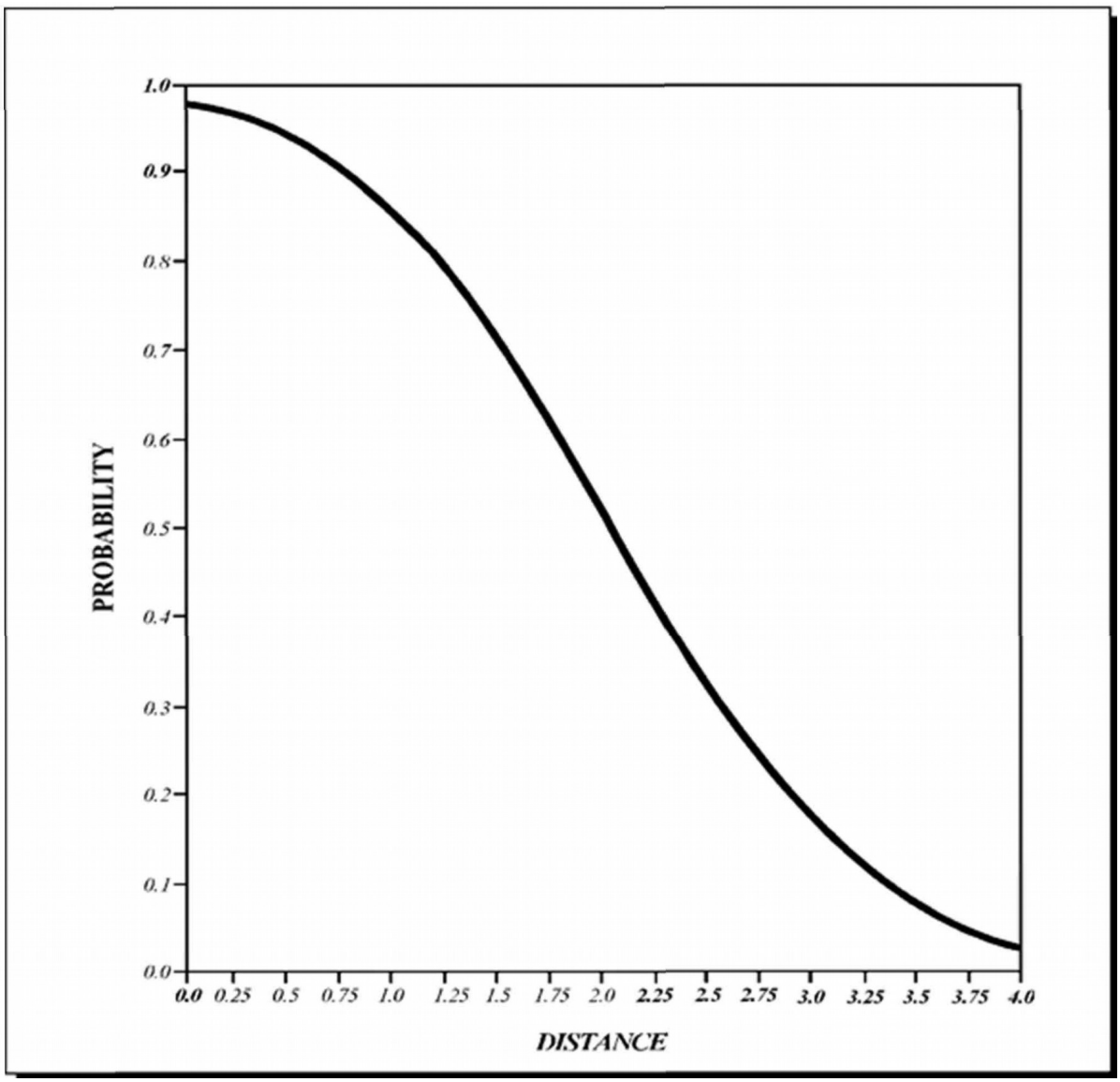


Figure 2.12: Bicycle Trip Elasticity Curve
Source: Turner, Hottenstein, and Shunk, 1997

In cases where comprehensive household and land use data are not available, a simple model of estimating the bicycle future trips can be used. The equation for estimating future trips is given by Barnes and Krizek, 2004 and is expressed as;

A = 0.3% + 1.5*C

Where;

A = % of population who bicycle in a day

C = bicycle commute share %

Data in table 2.7 has been used to project future cycling uptake. Table 2.8 shows the projected bicycle trips in intervals of 5 years, for base case, 10%, 20% and 30% increase in bicycle uptake.

Table 2.7: Basic data

Year	***Trips * 10^6***	***Years elapsed***	***Growth rate***
2004	4.82	0	
2025	8.28	21	2.6%
Note	76.80%	Travel is within 5km.	
Note	48.40%	Walk for distances less than 5km	
Note	16.20%	Would Cycle	

It is assumed that urban cycling would only be possible for trips extending up to 5 kilometres.

Table 2.8: Projected bicycle trips, in millions

Year	Base -Bicycle Trips	10% Increase in Bicycle Trips	20% Increase in Bicycle Trips	30% Increase in Bicycle Trips
2014	1.53	1.69	1.84	1.99
2015	1.57	1.73	1.89	2.05
2020	1.79	1.97	2.15	2.33
2025	2.04	2.24	2.44	2.65
2030	2.32	2.55	2.78	3.01
2035	2.64	2.90	3.16	3.43
2040	3.00	3.30	3.60	3.90
2045	3.41	3.75	4.09	4.43
2050	3.88	4.27	4.65	5.04

Graphical plot of the projected trips is shown in figure 5 below

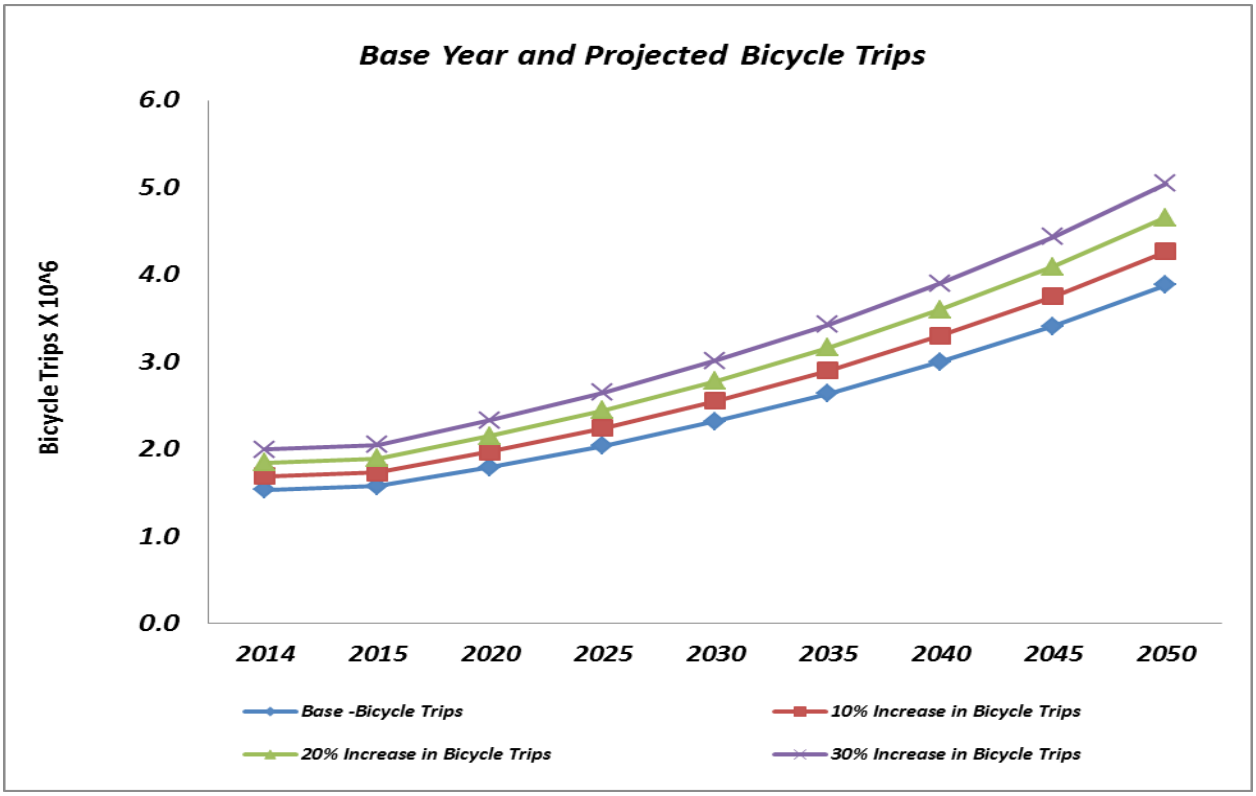


Figure 5: Projected future bicycle uptake in Nairobi.

Figure 5 above shows various cases of future bicycle uptake in Nairobi. The percentage increase represented by 10%, 20% and 30% represents inferred various levels of cycling preferences if pro-cycling programs are developed and implemented in Nairobi.

In summary, potential population of 5million could revert to cycling if pro-cycling programs are adopted in Nairobi. This is an optimistic preposition and call for development of robust, appropriate and sustainable bicycle network design and implementation programs.

Chapter 4

Chapter 5 Planning Issues in Development of Cycling Facilities

1.1Introduction

Planning cyclist's facilities is the basis for creating a functional cyclist transit corridor. Functional cyclists corridors must be easy to use, coherent, must provide desired connectivity and adaptable to various users. In Kenya, advocacy and promotion of cycling as an alternative travel model has been facilitated by studies conducted under the auspices of Sub-Saharan Africa Non-Motorised Program, SSATP Working Paper No. 71, (Wilson, 2002).

The NMT Program introduced "mobility planning" techniques to local authorities in Kenya, including Nairobi. The system seeks to improve mobility and accessibility, but at a lower overall cost and caters for non-motorized traffic, attempting to balance the needs of NMT with the needs of motorized traffic, and meeting the needs of all residents, rather than simply the needs of motorists.

In summary, the report summarises Non-motorised mobility planning in the context of the following interventions:

i. The preparation of Urban Mobility Plans for pedestrians, bicycles and other forms of non-motorized transport
ii. The provision of non-motorized transport infrastructure in accordance with an overall Urban Mobility Plan
iii. Modifications to motorized transport infrastructure to accommodate the needs of NMT

However, the working paper observes that preparation of the Mobility Plans is a complex process that requires significant inputs from external consultants in most SSA cities and recommends provision of spot improvements to motorized and non-motorized transport infrastructure within the context of a mobility plan that requires relatively "little technical know-how". This approach has resulted in borrowing of concepts on a small scale and hinders full development of non-motorised mobility plans in pilot towns like Nairobi, for which are meant to benefit from the ideas generated for NMT planning.

The technical inferiority mentality coupled with limited commitment to the development of the NMT sector by the relevant ministries and city council of Nairobi overtime, has led to a reactionary approach to provision of NMT facilities. Consequently, development of a complete, coherent, functional and sustainable NMT mode of travel such as a modern cycling network plan connecting residential neighbourhood to an economic activity zone or a mass transit station remain unavailable.

1.2Identified Issues Constraining Cycling Development

Barriers to the growth of cycling as a transportation mode in Nairobi is generally affected by insufficient facilities such as designated lanes, safe crossings and incoherence of the NMT network. Though there

is an increasing trend towards integration of NMT infrastructure including cyclist lanes in the urban networks, a lot more needs to be done to get to a satisfactory level of safe, secure and efficient NMT network that connect residential neighbourhoods, mass transit stations and employment zones.

In Nairobi, the primary barriers to cycling can be summarized as follows:

i. **Conflict with motor traffic**: Most arterials in Nairobi are heavily motorized, and characterised with high traffic volumes that consume most of the effective carriageway space the cyclist are meant to share with the motorists.

ii. **Poor driving culture and motorists' attitude** towards cyclists making cycling ventures unsafe.

iii. **Conflict with other utilities**: Utility service lines for water supply, sewerage, storm drains, telephone/internet, and power cables are a disruption to walkaways that are designated as mixed use for pedestrians and cyclist.

iv. **Poor maintenance** of cycling lanes where provided.

v. **Encroachment by business activities:** cyclists and pedestrian facilities are attractive locations for informal business activities such as fruit vendors, grocers, second hand cloth dealers and cobblers as can be seen.

1.3 Characteristics of Cycling Market Segments

Planning and improving cycling uptake levels in Nairobi requires an understanding of the various market segments for cycling and potential cycling population. In general, bicycle riders can be classified into eight broad groupings based on previous studies. The broad groups are described in Table 4.1 below.

Table 4.1: Bicycle rider characteristics

Category	Rider characteristics	Riding environment
Non-cyclists and potential cyclists	Do not currently ride; have potential to with effective encouragement.	Generally would begin with off-road paths, footpaths (where permitted) or very low volume residential streets.
Primary school children	Cognitive skills not developed, little knowledge of road rules, require supervision.	Similar to that of non/potential cyclists.
Secondary school children	Skill varies, developing confidence.	Generally use on-road facilities or off-road paths where available.
Recreational	Experience, age, skill vary greatly.	Desire off-road paths and quiet local streets, avoid heavily trafficked routes, more experienced will prefer to use road system for long journeys.
Commuter	Vary in age, skill and fitness, some highly skilled and able to handle a variety of traffic conditions.	Some prefer paths or low stress roads, willing to take longer to get to destination, others want quick trip regardless of traffic conditions, primarily require space to ride and smooth riding surface, speed maintenance.
Utility	Ride for specific purposes (e.g. shopping and delivery), short length trips, and routes unpredictable.	Not on highly trafficked roads, needs include comprehensive, low stress routes, appropriate end of trip facilities.
Touring	Long distance journeys, may be heavily equipped, some travelling in groups.	Often route is similar to that of other tourists.
Sporting	Often in groups, two abreast occupying left lane, similar needs to commuters.	Travel long distances in training on arterials, may include challenging terrain in outer urban or rural areas, generally do not use off-road because of high speed and conflict with other users.

Further work has been undertaken to understand the motivations and concerns of non-cyclists who are interested in cycling. This group is detailed in Table 4.2.

Table 4.2: Non-cyclists who are interested in cycling

Category	Reasons for not cycling	How to encourage people in these groups to cycle
Women	Safety/comfort (perceived and actual), cycling attire including helmets, greater desire to cycle for leisure/fitness than for commuting, safety, health and fitness issues	Exclusive bicycle lanes and off-road routes, increased motorised driver awareness, more end of trip facilities, more cyclists on the road increased opportunities for casual surveillance opportunities.
Elderly	Safety (perceived and actual), health and fitness issues	Exclusive bicycle lanes and off-road routes, increased driver awareness, more end of trip facilities, more cyclists on the road
Less educated persons	Restricted access to cycling information and safety campaigns, as well as cultural barriers.	Improve availability of information on cycling and safety campaigns in languages that can be understood

Development of cycling plan should recognise these groups and their concerns and offer mitigating strategies. There could be other road user groups who are negatively affected as bicycle networks grow. Therefore, in planning a cycling network, commuter perceptions and attitudes, addressing

physical barriers, determination of key motivational factors specific to users groups may direct and guide cycling promotional strategies and need to be investigated.

1.4Development of Bicycle Use Plans

Introduction

Cyclist facilities are part of a wider bicycle use plans that are developed in a sequential manner. In developed countries where cycling uptake levels are high, Local Government Bicycle Plans are prepared and presented to state jurisdictions for funding applications. Development of bicycle use plan is often a well-established practice and should be continued through the use of a defined methodology. Often, the Local and relevant State Transport Authorities offer guidance and assistance in the development bicycle use plans.

The following steps are involved in the development of bicycle use plan.

Public Consultation

Public consultation is an integral part of the bicycle network planning and project identification process. In order to evaluate projects, decision makers need to know that the project has public support, or at the very least, does not have public opposition. Stakeholders therefore should detail what level of public consultation was undertaken and, more importantly, the outcome of that process.

Identification and Endorsement of Local/ Regional Cycling Groups

The role of cycling groups is to represent the needs and opinions of cyclists. The differentiation between cyclists and the public is a crucial one and has significant implications. The project prioritisation process should be taken from a public good point of view, rather than a purely cycling point of view. Cycling groups may not be as supportive of a tourism, school or recreational path if the bicycle use plan is of a commuter based improvement.

The opinion and endorsement of a local cycling group is however, an important indicator of the suitability of the project and needs to be sought out and considered in the light of the agendas and issues surrounding these organisations. Where such support is not forthcoming for a project, this may be a result of the specific interests of the group rather than a deficiency in the project and the reasons for the lack of support should be noted.

Acceptable Design Standards

Guides to Traffic Engineering Practice, that sets out the key requirements for design and construction of bicycle facilities must be sought and adopted. These documents set out what is the equivalent of ‘acceptable development’ requirements for development approvals in planning – if these design and construction parameters are met, the project is regarded as complying with requirements. The aim is to create a bicycle network that is functional, safe and sustainable.

However, it is not always possible to accommodate specified designs (e.g. due to space constraints) and in some cases alternative ways of providing for cyclists may achieve a better outcome. Rather than disqualify projects on the grounds that they do not comply with guidelines, stakeholders in the bicycle use plan should be encouraged to set out the case for the alternative, but always in terms of the projects ability to achieve the objectives of the guidelines.

Maintenance Cost/Arrangements

It is important that decision makers are aware of the complete financial impact of a development in order to effectively prioritise proposals. In addition to the initial capital cost of a development, the maintenance and rehabilitation costs must also be taken into account. Life Cycle Costs Analysis (LCCA) is the most effective way to equitably compare different proposals from a cost perspective.

The LCCA is defined as the present value of all future expenditure for each option, over the determined analysis period. This means tabulating all those costs, including their likely timing, costs incurred as a consequence of operating, maintaining and disposing of the asset.

Council Financial Commitment

This refers to the proportion of total project cost which is funded by the stakeholder, and conversely the decision maker. The criterion should relate to three aspects:

i. The cost of the project – the proportion to be funded by each agency;

ii. The whole-of-life cost as well as the up-front capital cost; and

iii. The cost/commitment relative to the financial resources of the local government.

1.5 Developments of Cycling Strategic Objectives

Mapping City Cycling Networks

The completion of strategic bicycle networks must be identified as the highest priority in bicycle use plan. Extensive planning and complete networks will often shift funding priorities towards the proposals which complete or extend designed networks. Under this objective stakeholder must clearly identify and confirm that the project forms part of a strategic network. Any relevant information relating to strategic cycling networks should be included.

A qualitative assessment should detail the current cycling traffic on the network elements to which the proposal is linked. This information can be used by the decision maker – with some caution – to assess the likely level of usage for the project.

Creating Connectivity

The most intrinsically important aspect of a cycling infrastructure development is its ability to connect people with their destinations. For this reason the objective of “Connectivity” has been given prominence in strategic bicycle network plan. Employment Zones, Schools, Recreational, Tourism and Public Transport are the most important demand generators to be serviced by cycling infrastructure.

The connectivity objective is designed to bring the wider network impacts of a proposed development to the decision making process. Therefore it is important that the stakeholders look beyond the direct connections of their proposal. For example, a bicycle lane may only improve cycling access along one small stretch of road, but in terms of connectivity it may, encourage people to cycle to destinations further afield. The stakeholders should include these details in the qualitative impacts section under these connectivity sub-objectives.

Mapping of Employment Zones

Qualitative assessment of this criterion should discuss the proximity to and size of employment zones. This may take the form of incidental connectivity or may be the purpose of the development.

Land use assessment should detail, where possible, the numbers employed at commercial centres with reasonable cycle access to the project.

Cyclist Infrastructure Linkage to Schools

School student cyclists are a particularly important part of the transport network. Not only are they cyclists themselves but they reduce the car trips to and from school. The qualitative impacts under this criterion should include details of the types and number of schools involved and the impact the development will have on student’s ability to ride to school. The current traffic situations around schools, safety issues, and the number of cyclists must be documented.

The parametric data used to support these qualitative statements should include the number of primary and high schools and the total number of students with reasonable cycle access to the project.

Creating Recreational/Tourist Cycling Events

Access to recreational and/or tourism facilities also need to be estimated. This includes parks, playgrounds, sporting facilities, and shopping precincts. The nature (e.g. scenery) of the environment through which a proposed facility passes may also be relevant. The amount of generated bicycle traffic can then be computed.

Profiling Public Transport Impacted

Good functional cycling infrastructure should provide access to mass transit stations and bus routes. The stakeholders should supply the details of public transport services that will be impacted by the

project and the wider accessibility effects that this may have. For example, if a bicycle path runs from a suburban development to a train station, it is improving the connectivity of the public transport system.

Patronage data for any public transport service to which the project is directly linked should be included only if that service allows bicycles to be carried on vehicles or has secure parking facilities.

Mode Shift Assessment

This addresses how the project will contribute to the goal of reducing the proportion of trips taken by private car and other competing commute modes. In order to provide some guidance on the extent of modal shift, an assessment of the population that would be captive to cycling must be determined from interviews.

1.6 Cycling Safety and Cycling Aid Facilities

Safety

Safety is an important component of bicycle use plan development strategy. Perception of cycling as unsafe mode of travel has been shown by many studies in Nairobi to inhibit cycling. In development of a bicycle plan, cycling safety for bicycle infrastructure need to ascertained. The safety aspects include residential neighbourhood and employment zone security, planning of safe crossings of motorised arterials and safety and bicycle parking places. The analyst engaged in the development of cycle plans should provide analysts with a simple methodology by which the safety of a bicycle network plan project can be measured.

Signage

At the very least, signage should provide clear and unambiguous way finding for cyclists using a particular cycle route. Signs should be displayed at every junction or decision point and should also provide indicative journey distance.

Specific Facilities

Incorporation of specific facilities and amenities along the route or at the end of the trip for bicycle riders can greatly enhance cycling uptake. Examples of such facilities are bicycle pumps, watering points, bicycle maintenance workshops along cycling routes and safe rest areas.

Traffic management experts can help you determine the suitability of these facilities along the cyclist networks and the most appropriate locations to install them. The location of facilities must reflect the types and number of cyclists expected to use them. Photos 4.4 to 4.4 illustrates some of the facilities.

Photo 4.1: Signalised crossing for cyclists

Photo 4.2: Bicycle head start box at traffic signals

Photo 4.3: On Street Bicycle Pump

Photo 4.4: Dedicated cycle lane

1.7 Integrating Cycling and Mass Transit

Cycling and public transit work well when linked together. Transit is effective for moderate- and long-distance trips along busy corridors, while cycling is effective for shorter-distance trips with multiple stops. Integrating transit and cycling can provide a high level of mobility and efficiency in operating

bicycle networks. The combination of cycling and public transit often replaces trips that could otherwise only be made by automobile.

One step to achieving this objective is to provide bike parking at transit stops and terminals. A high level of security is required by many commuters, for storing a bicycle at mass transit terminals. In some cases, bicycles may be accommodated on transit vehicles. This allows a bicycle to be used at both ends of the journey, and provides an option when cyclist cannot ride due to a mechanical failure, changes in weather or other any other reason. This would require public transit agencies to install special racks to carry bicycles. Photo 4.5 below illustrates typical linkage between bicycle trips and mass transit systems. Photo 4.6 illustrates a typical parking area of a small portion of the bicycle parking at train stations in Groningen and Delft, Netherlands.

Photo 4.5: Typical linkage between bicycle trips and mass transit systems

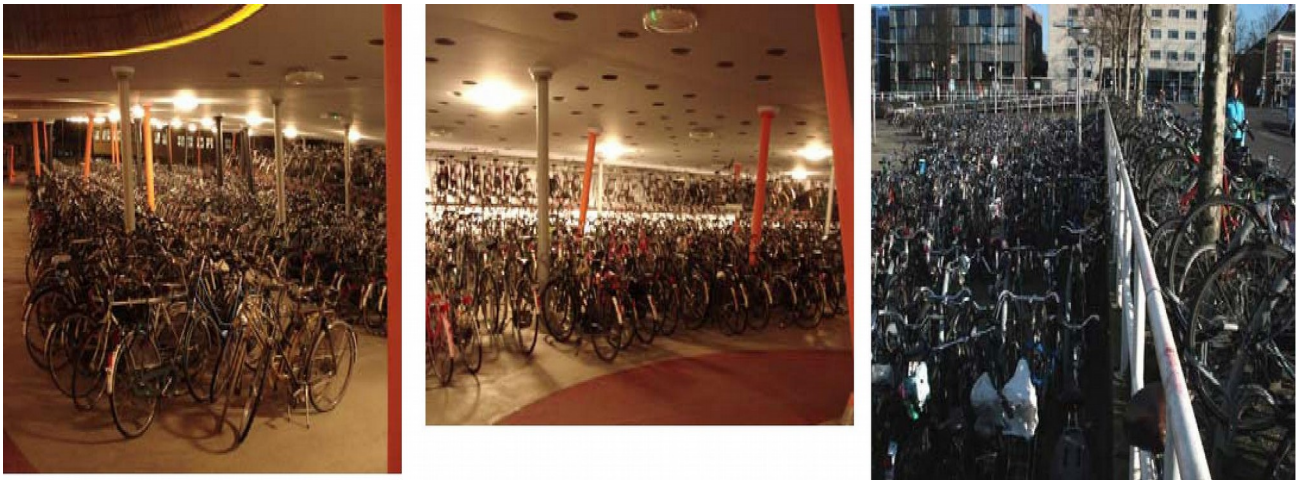


Photo 4.6: A small portion of the bicycle parking at train stations in Groningen and Delft, Netherlands

Chapter 6 Cycling Policies and Legislations

1.1General

"There is no provision for cyclists in Nairobi at all. Even for pedestrians there is hardly any provision. Cyclists compete for space with cars. Cyclists are not considered as road users at all -not just by motorists. I think the problem begins with planning. City planners have not considered pedestrians and cyclists as effective road users"

Quote from Frederick Kwame, Regional Director for Oxfam in the Horn East and Central Africa, two days after he was knocked down by a bus in Nairobi, Kenya, although he had right of way. This was his first serious accident in 17 years of cycling in many countries (July, 2009)

Conflicts between motorised and non-motorised travel are particularly acute in Nairobi primarily because of "policy blindness" towards NMT, which has resulted in lack of basic facilities like footpaths and cycle lanes because they were not planned for in the first place. Observation by Climate XL- Africa, September, 2009. Share the Road: Minimum Standards for Safe, Sustainable and Accessible Transport Infrastructure in Nairobi report for UNEP.

"If there is money for a road, there is money for a walkway and cycle way in as much as somebody constructing a house also provides doors and windows. Whoever is paying for a road should also pay for facilities for non-motorised transport". Gamelihle Sibanda, Transport Infrastructure Engineer as quoted in Climate XL- Africa, September, 2009.

The above statements are research opinions and observations made on the Non-motorised policy issues in Nairobi city. The opinions point to lack of commitment and policy gaps in developing the NMT facilities including cycling as an alternative mode of travel.

From a historical perspective, advocacy and promotion of cycling as an alternative travel model has been facilitated by studies conducted under the auspices of Sub-Saharan Africa Transport Policy Program, The World Bank and Economic Commission for Africa, (Wilson, 2002). In this study, it is reported as a policy statement that The Road Sector Management Strategic Plan will provide for

provision for pedestrian and bicycle routes along future roads. This is recorded in the Republic of Kenya National Development Plans, 1997-2001. The Development Plan noted of lack of foot paths for pedestrians, separated lanes for cyclists and street lighting to improve security. The 1997-2001 development highlights the need for development of NMT facilities to include;

i. Inclusion of footpaths and cycle paths in road designs
ii. Promotion of non-motorised transport such as bicycle use, carts and cycle trailers,
iii. Promotion of intermediate technology in the production of NMT equipment through application of appropriate technology that is easily accessible.

It is also reported that the NMT policy is covered under the Kenya Road Sub-Sector Policy. However, the policy is properly detailed or articulated. A discussion held with the Nairobi County, Department of Transport and Infrastructure officials in the course of study revealed that its policy principles address safety, environment, modal options and health but does not include NMT.

The most robust effort in Nairobi was a sustained NMT funding by International Development Agency (IDA), under Kenya Urban Improvement Project (KUTIP). However, only a part of the NMT program, proposed by the international consultants, was implemented in Nairobi. Decision-makers and the professional staff in Nairobi considered these proposals too disruptive to motor vehicle traffic flow. In addition, the efforts to establish linkage to the Kenya Urban Transport Infra-structure Project (KUTIP) were not successful partly because of timing and partly because of the clients' unwillingness (SSATP, 2005).

Another effort toward mainstreaming provision for NMT was the development of the Ministry of Nairobi Metropolitan Nairobi Metro 2030 strategy document that envisages working groups on various themes such as infrastructure, including for NMT. Currently, the Ministry of Roads has ***a new but unwritten*** policy making the provision of cycle tracks and pedestrian walkways mandatory at the design stage, for all new roads. This has been enforced on roads such as the design review at Mariakani along Mombasa Road, Thika road and Westlands – Ngong road ring road. Finally, new road designs have cyclist and pedestrian walkways within all built-up areas.

From these reviews, it is clear that no specific policy designed to address the needs of cyclists in particular, has been developed for Nairobi city. The design policy issue aggregates cyclists together with pedestrians and carts and design requirements addressed in a holistic manner despite the variation in travel needs amongst pedestrians and cyclists. This inhibits the realisation of the full potential of cycling in Nairobi.

It is also noted that there no coordination in development of NMT facilities among various government agencies and Nairobi county transport department. Different ministries and agencies within the

ministries appear to focus on addressing NMT needs from different perspectives. There is need to have a single focal point in development of NMT facilities, to broaden the description of NMT by class and design needs.

1.2Design standards

Design standards in transport infrastructure sector are guidelines used to size transport infrastructure facilities. Existence of design standards for a particular infrastructure is a clear statement of the need of it. Countries such as the Netherlands, Australia among others, where cycling is a tradition have manuals that govern development of bicycle ride facilities. Some of the manuals that are used in sizing NMT and by extension cyclist infrastructure include;

- Guidelines for Pedestrian and Bicycle Traffic in African Cities, World Bank, SSATP NMT pilot Projects in Kenya and Tanzania, May 2000.
- Recommendations for Traffic Provisions in Built-up areas, ASVV, Record 15, March 1998, CROW, The Netherlands.
- Best Practice to Promote Cycling and Walking, A Research Project of the EU Transport RTD Programme, European Commission, Directorate General for Transport, 1998.
- Sign Up for the Bike, Design Manual for a Cycle-Friendly Infrastructure, Record 10, 1993, CROW, The Netherlands.
- Highway Capacity Manual 2000, Special Report No. 209, Transportation Research Board, National Research Council, May 30, 1998 Edition

A study by JICA Study (2006) proposed 3m wide walkways, 2m wide cycle tracks, 1m wide greenbelt/planter buffer (for Minor Arterials, Principal Arterials and International Highways and if required for Local Roads and Collector Roads). Table 5.1 shows the proposed typical layout of facilities for motorized vehicles and NMTs.

Table 5.1: Typical relative location of sidewalks and cycle ways for 2-lane road

ROAD RESERVE 60m Wide												
3m	2m	5m	2.5m	2.5m	2x3.5m	16m	2x3.5m	2.5m	2.5m	5m	2m	3m
Walk way	Cycle way	Green belt	Drain	Shoulder	Carriage way	Median	Carriage way	Shoulder	Drain	Green belt	Cycle way	Walk way

Source: JICA, 2006

In Kenya, there is no specific manual that gives design principles and guidelines in provision of cyclist infrastructure. Recently, the Government of Kenya, through the Ministry of Roads employed a consultant to review the design manuals but excluded NMT design in scope of design manuals review work. Promotion of bicycle uptake in Nairobi must be supported by best practice guidelines that can be adopted in implementation of cyclist's facilities.

1.3Bicycle Taxes and licences

In the past, bicycle import taxes have applied to bicycles since they were considered a "luxury good". In 1986, 80% import tax applied to bicycles and 17% sales tax in Kenya. Over the years, there has been a continuous reduction of the import duty on bicycles, indicating change in understanding of the role bicycle as a transport mode. The last reduction of import duty was in 1995 was contradictory because although the percentage was reduced from 30 to 15% the other clause "or a minimum of Ksh 500" was actually higher (i.e. 30% on the lower end of the price scale). The bicycle wholesalers therefore informed the media of "Bicycle prices go up despite pledge in Budget" as a campaign to lower import duty and to inform the public of this contradiction. Consequently, the minimum" tax fee was reduced to Ksh 300 from Ksh500.

Currently, there is a 15% import duty on most spare parts coming into Kenya, with an exception being a 40% duty on bicycle tires. The reason for the high duty on tires is that there is a local bicycle tire manufacturer; Avon.

There is currently no established licencing protocol for bicycle ownership in Kenya. In other words, bicycle ownership is not regulated by any section of the Kenyan law.

1.4Cycling Safety Education

Education of cyclists is essential for safety and cyclist's mobility enhancement. This is a penetrative and one of the most cost effective ways of reducing collisions and encouraging cycling. However, cycling education is a personal initiative in Kenya and by extension, Nairobi. Driving schools focus on motorised driver training and seldom include cycling learning courses in their driver training programs. However, excellent safety education resources are now available. A number of types of programs can be implemented:

- In-schools, pedestrian and cycling classes can be integrated with school trip management programs (reducing child auto travel to, and traffic around schools), personal safety and fitness, and physical education programs.
- Adult cycling skills classes, such as Can-Bike programs, may be taught at recreational facilities, or provided through local traffic safety associations.
- Public education campaigns targeting motorists, cyclists, and pedestrians covering cyclist's rights and safety.

Where cycling programs to educate a significant portion of the population are unavailable, effort can be made to focus target groups so that responsibility for such programs is not fragmented.

1.5 Traffic Laws and Enforcement

In Kenya, traffic operations are governed by Cap 403, Traffic Laws of Kenya. In many instances, cyclists share the road with motorists and experience the same cycle times at intersections. Education and enforcement of appropriate traffic law can prevent conflicts and collisions, and help instil traffic safety habits for cyclists. Safety experts recommend targeting of the following cycling traffic violations:

- Motorist's failure to yield or stop for cyclists when required by traffic law.
- Excessive motor vehicle speed at cyclist crossing zone.
- Cyclist's failure to yield when required by traffic law.
- Cyclist riding in the wrong direction, against traffic.
- Cyclists riding at night with inadequate lighting without reflective illumination.

Alternatively, a bicycle program that allows offending cyclists to take a cycling safety workshop as an alternative to paying a traffic fine can be devised. Police departments can run such workshops internally or contract an outside expert. Such programs are popular because they emphasize on safety rather than punishment, and help develop cooperation among police, cyclists and bicycle safety advocates.

1.6 County/Municipal Laws

Municipal by-laws regulate the actions of residents of the municipality including regulations on traffic operations. However, a discussion with Nairobi County officials, department of Transport and Infrastructure revealed that its policy principles address safety, environment, modal options and health but does not include NMT.

Bylaws can be legislated to provide more safety for non-motorized travel, and to establish development and design standards that consider pedestrian and cycling needs. For example, bylaws may:

- Require provision of safe and well-signed alternate bicycle routes.
- Allow child cyclists to ride on sidewalks, provided they yield to pedestrians since children generally cycle at low speeds and do not have the skills to deal with traffic on the roads.
- Require bicycle parking and allow reductions in automobile parking requirements where cycling is likely to reduce vehicle use.
- Require adequate cycling facilities in new developments, such as sidewalks on both sides of streets, and public paths that connect the ends of new ***cul de sac*** streets.
- Specify road and parking facility designs that accommodate cycling, and control vehicle traffic volumes and speeds where appropriate.
- Require adequate cyclist facilities in new developments on both sides of streets, and public paths that connect the ends of new ***cul de sac*** streets.

- Specify road and parking facility designs that accommodate cycling, and control vehicle traffic volumes and speeds where appropriate.

Chapter 7 Bicycle Use Stakeholders Mapping

1.1 Identified Stakeholders

The following organisations have been identified as the key stakeholders;

- Ministry of Transport and Infrastructure
- Nairobi City County Government
- Kenya Urban Roads Authority
- Kenya National Highways Authority
- The Kenya Roads Board
- National Road Safety Authority
- The Kenya Police, Traffic Department
- Green Africa Foundation
- UN Habitat
- Neighbourhood and Business Associations
- Cycling organisations
- Bicycle workshop repair managers.

These stakeholders have diverse roles as far as cycling promotion is concerned. A brief description on the roles of these bodies is highlighted in subsequent sections.

1.2 Government/Government Agencies and Support Organizations

Successful implementation of pro-cycling programs is based on the commitment and support the Government and its agencies provide to cycling initiatives. The government is responsible for cycling network infrastructure development, leverage for international for funding of cycling programs and infrastructure from supportive organizations, development and enforcement of favourable cycling laws, pricing of bicycles and bicycle spare parts, registration of cycling clubs and organizations.

The government is also responsible development of cyclist infrastructure design manuals and network plans, security, preservation of parking spaces for cyclists among others. Other key areas include development of curriculum for cyclist road safety education and training.

1.3 Working with Cyclists Organizations

Cyclist's organizations and clubs are a key segment in implementation of pro-cycling programs. In Nairobi the main cyclist organizations and clubs can be found at Kenya Mountain Biking website and include Uvumbuzi Club, Wheels of Africa, Kenya Riders etc that are involved in organizing recreational cycling and promotional events on cycling. A list of all bicycle organization and cycling clubs are found on the ***Kenya Mountain Biking website***. These groups can be organised in a Kenya Matatu Owners Associations like model to promote pro-cycling activities.

Cyclist organization and clubs are the best platform for implementation of cyclist training and safety, mobility enhancement strategies for those cycling to work and broad advocacy. Cyclist organization can also be used

to create partnerships to promote pilot cycling to work projects, availing promotional cheap bicycles for potential cyclists and advocacy for enforcement of laws that enhance cycling safety and cyclist's traffic rights protection.

1.4Bicycle Repair Managers

Even though there are few bicycle repair workshops, it is to be expected that when cycling becomes more popular, more bicycle repairers will be required. In Nairobi bicycle repair shops are few and scattered. During field investigations, it was observed that some bicycle repairers have already formed a loose association and can easily be networked into pro-cycling programs. The bicycle repairers contacted had moderate to no formal education. Those interviewed indicated that they engage in the repair works as a source of income but do not store bicycle spare parts because they operate "open workshops" and are either sheltered under trees operate under no shelter at all.

Bicycle repairers could improve their turnover by engaging in spare parts business. Currently, they require customers to obtain the spare parts themselves or have visit workshops themselves at the point of repair need. If they had the capital, getting into the bicycle hiring business would also be a more lucrative supplement to their business.

1.5Working with Neighbourhood and Business Associations

Residential neighbourhood and business associations may support bicycle improvements as part of efforts to improve their local street environments. They may be particularly interested in sidewalk improvements to accommodate bicycle ride facilities and traffic calming. These groups should be consulted to help identify and prioritize problems and concerns related to bicycle network planning.

Planning departments can establish a process for partnerships where residents and businesses can design and implement specific improvements. For example, this may include a list describing acceptable traffic calming strategies and cycling improvements, legislation requirement that residents or business owners sign a petition requesting for cycling improvements before developments are considered for approvals and by property owners in the neighbourhood.

In some cases, neighbourhood and business associations can provide sponsorships or development funds; contribute in-kind goods and services, or volunteer labour for implementing cycling facilities improvements, and take responsibility for landscaping and maintenance of the cycle track facilities.

1.6Private Developers

Often, developers or landowners may be willing to trade part or donate part of their land for implementation of cycling facilities. In this way, municipalities such as Nairobi County can acquire lands that can be used for the development of bicycle facilities. On a smaller scale, developers may be asked to provide cyclists access to an adjacent street from the end of a ***cul de sac***, or allow the urban authorities to buy a suitable property when it comes onto the market, subdivide to provide a cyclists right of way, develop cycling path and resell

the property. This arrangement crates a residential neighbourhood that is attractive to those who prefer cycling as travel to work mode.

Chapter 8 Gender Issues in Cycling

1.1Introduction

Through its Bill of Rights, the Kenyan Constitution recognizes the rights of women as being of equal importance to those of men. On the other hand, at a more practical level, there are now many more women represented in government bodies. Women are the biggest consumers of resources and are the hardest hit by the lack of accessible, efficient and cheap mode of travel in Nairobi.

The Kenya Government has also shown its commitment to gender through Affirmative Action. The Constitution protects Affirmative Action and provides that people who have been discriminated against in the past should receive special treatment or opportunities to right or correct previous wrongs. This is happening a lot in the workplace where many more women are being employed, because the past prejudice and vulnerability levels prevented them from getting jobs. This is surely a positive action and is a way to ensure equality in the future.

Today, many businesses and the government have affirmative action policies. This is more visible in the government's procurement policies where mention is made of women and youth for particular tenders. Many of these procurement policies indicate that the candidate must be either woman, youth or disabled.

1.2Issues Inhibiting Cycling Uptake by Women in Nairobi

It needs to be noted that South Africa is still faced with many challenges with regard to achieving a society free of racism and sexism. These have to do more with how people relate to each other and how resources are allocated. Fortunately the challenges have been translated into national priorities, all of which have compelling gender dimensions which need to be addressed if the country is to advance towards gender equality. The key challenges are:

Gender Relations

Kenya is in a process of transition, a key objective of which is the transformation of gender relations. The challenge is to shape the broad transformation project in a way which acknowledges the centrality and compatibility of the transformation of gender relations to the broader process. This includes mainstream gender concerns in formulation of cycling guidelines and laws.

Poverty

This is a major problem for women in Kenya that prevents their access to money for acquisition of bicycles among other items. The systematic and socially-engineered placement of women in lower economic strata and the underdevelopment of infrastructure in these areas have been directly responsible for the poor conditions under which the majority of women in Nairobi live. Previously repressive economic environment coupled with customs and traditions that have disempowered women in ways is taking long to reverse. While the democratic government has established enabling legislation,

it must be matched with economic empowerment programs. Economic empowerment would improve socio-economic standing of women, improve their purchasing power and instil equality that would spur involvement in perceived male dominated activities such as cycling.

Globalization

Globalisation is an emerging world challenge that threatens women. It is a system of redistribution of opportunities and benefits which may enhance the economy or lead to rising economic inequality and aggravated poverty for capital vulnerable groups such as Kenyan women. The challenge for Kenya is to ensure that women benefit equally with others in society. In reality, Kenya has a good gender equality policy environment with regard to women because the constitution is gender-sensitive and accommodates the rights of women.

Safety and Security

Cycling safety was a concern for the majority of people but is greater for women. Pro-cycling initiatives tend to focus on how to improve the safety of cyclists. There is need for government agencies to ensure cycling safety for women, since the risk taking behaviour among women is much lower than men. Women are also more vulnerable and would not cycle unaccompanied on lonely cycle tracks as they are more prone to criminal attack than men due to their inferior muscle power. Women need to be taught the best way of cycling, as a way of mapping the way forward for pro-cycling activities.

Perception and Attitude

It appears that men are still split on this issue. The indication is that cycling is seen more often as a man's venture and some men still view women who ride bicycles strangely. However, younger men accept women's right to ride bicycles. Some women may be discouraged from cycling because men do not support the idea.

Chapter 9 Employment Opportunities in NMT

1.1 Introduction

Development of a robust cycling industry is an opportunity for employment creation. For urban set up, there are opportunities for growth in employment resulting from a shift to cycling. This section presents a summary of the areas that would support employment in the cycling industry.

1.2 Mobilization and Marketing of Affordable Bicycles

Urban mobility challenges resulting from lack of adequate and easily accessible transport continues to severely limit the ability of many people in Nairobi to access economic opportunities. Low cost mobility is a key element in addressing poverty, gender imbalance among other developmental issues in Nairobi. Mobilization and sale of cheap affordable bicycles would promote higher mobility rates and execution of business trips, and create income opportunities among those involved in sales and marketing.

1.3 Skills Training

Implementation of pro-bicycle programs would mandate organizations to teach basic and advanced mechanics and bicycle operation skills to beneficiaries. This would be realized by training shop managers on bicycle repair, assembling of parts and management of the shop. The exercise would empower shop managers who currently are exposed to running a small business. Such a venture would allow workshop managers an opportunity to become future entrepreneurs and further their business.

1.4 Job Creation

Increased bicycle uptake would enable many spare shops; parking areas and maintenance workshops to be established. This would spur job creation via a vibrant local bicycle economy, employment of security to control and manage bicycle parking areas, additional spare parts and maintenance shop attendance personnel. When carefully and properly implemented, a comprehensive cycling program for Nairobi will ensure employment to several people. These observations suggest the viability and sustainability of bicycle plan implementation program.

1.5 Investment in Awareness Raising

Pro-cycling programs would include awareness campaigns that involve advertising cycling as a mode of travel and as a sport. Advertisement and sporting ventures would spur investment in the recreational aspect of cycling. Cycling will also increase mobility and enable individuals to spend significantly less time and money on transport and improve their access to education, markets and services, work stations thereby improving their economic output.

Chapter 10 Summary of Key Findings and Recommendations

1.1General

This section presents summary findings from bicycle use study within Nairobi Business District. The study was conducted to address the objectives that formed the scope of the study. The results or key findings from the study and recommendations are presented in the foregoing sections.

1.2Key findings

ix. Among the three cyclists corridors investigated, Outering road corridor had the highst bicycle utilization (almost double) than other corridors surveyed, due to its orientation towards industrial area. The diurnal variation showed utilization levels along all the corridors peaked in the morning and evening; with the morning peak more spread and cascaded, while the evening peak is distinctly high and compact.

x. The analysis of future cyclist demand revealed that potential population of 5million could revert to cycling if pro-cycling programs are adopted in Nairobi, which call for development of robust, appropriate and sustainable bicycle network design and implementation of pro-cycling programs.

xi. From the field observations, it was found that along the roads/arterials surveyed, the cyclist/NMT network is largely incoherent and inconsistent. Major interruptions - garbage/uncollected waste, parked vehicles, missing drainage grates, shallow drainage channels, roadside barriers and small scale industrial activities on most arterials were noted. A single conventional but poorly maintained cyclist parking zone was observed. Recently, the bicycle parking area has also been invaded by motorcyclist and very few bicycles were found parked at the time of the survey

xii. In Nairobi, the primary barriers to cycling can be summarized as follows:

- **Conflict with motor traffic**: Most arterials in Nairobi are heavily motorized, and characterised with high traffic volumes that consume most of the effective carriageway space the cyclist are meant to share with the motorists.
- **Poor driving culture and motorists' attitude** towards cyclists making cycling ventures unsafe.
- **Conflict with other utilities**: Utility service lines for water supply, sewerage, storm drains, telephone/internet, and power cables are a disruption to walkaways that are designated as mixed use for pedestrians and cyclist.
- **Poor maintenance** of cycling lanes where provided.
- **Encroachment by business activities:** cyclists and pedestrian facilities are attractive locations for informal business activities such as fruit vendors, grocers, second hand cloth dealers and cobblers as can be seen

It is also proposed that a comprehensive approach to development of bicycle use plan and mapping of strategic objectives be included in the planning and implementation of bicycle networks. Safety and connectivity to mass transport systems are factors the study noted would upscale bicycle use uptake.

xiii. A review of cycling policies was undertaken and results revealed that no specific policy designed to address the needs of cyclists in particular, has been developed for Nairobi city. In general, lack of coordination in development of NMT facilities among various government agencies and Nairobi county transport department was noted. It is suggested that there is need to have a single focal point in development of NMT facilities and that promotion of bicycle uptake in Nairobi would be supported by best practice guidelines that can be adopted in implementation of cyclist's facilities.

xiv. Several stakeholders and their roles in promoting pro-cycling programs have been highlighted in this report. The report observes that closer coordination between the government and support agencies, cycling groups and associations, bicycle maintenance managers and working within business associations and private property developers would create a strong partnership for effective implementation of pro-cycling programs.

xv. The key issues inhibiting cycling among women include, gender relations, poverty, globalization, safety and security and perception and attitude towards women. Mainstream gender concerns in formulation of cycling guidelines and laws, ensuring financial independence for women, promotion of equality and equity, improving security and change in perception and attitude towards women are steps that would have a catalytic effect in stimulating cycling among women.

xvi. Finally, it noted that ddevelopment of a robust cycling industry is an opportunity for employment creation. Mobilization and sale of cheap affordable bicycles would promote higher mobility rates and execution of business trips, and create income opportunities among those involved in sales and marketing. Implementation of pro-bicycle programs mandates concerned organizations to teach basic and advanced mechanics and bicycle operation skills to beneficiaries. Increased bicycle uptake would enable many spare shops; parking areas and maintenance workshops to be established which would spur job creation via a vibrant local bicycle economy, suggesting the viability and sustainability of bicycle urban mobility use plans and programs.

1.3Recommendations

The following recommendations are suggested measures to improve cycling uptake in Nairobi.

xii. There is need to energize existing promotional efforts and initiates in order to upscale the adoption of cycling as a mode of travel in Nairobi.

xiii. Concerted effort need to be directed towards developing pro-cycling legislations.

xiv. Pro-cycling stakeholders need to engage the road authorities the developing cycling design guidelines and manuals that are responsive to Kenyan local travel conditions

xv. Special advocacy for cycling uptake among women in light of the low a cycling uptake among the female gender. This effort should be geared towards strengthening participatory capacity of women in cycling by focusing in eliminating factors that inhibit cycling among women.

xvi. It is recommended that the pro-cycling agencies endeavor to provision avenues for acquisition of cheap or affordable bicycles to improve cycling uptake.

xvii. There is need to strengthen the cyclist workshop maintenance managers skills, coordination and information dissemination capacity to make them a useful medium for transfer of pro-cycling information and initiatives.

xviii. Investment in development of a direct, coherent and connecting pilot bicycle network plan to be used a demonstration of best practice cyclist infrastructure designs in a safe and secure environment. This can be used as a reference for development future bicycle facilities network plans.

xix. Further studies to map the origins and destinations of cyclists trips is required for preparation of a comprehensive pilot bicycle use plans and to provide guidance of the utilization levels along typical cyclist corridors in Nairobi.

xx. There is need to incorporate cycling education and cycling safety education in driving school curricular to provide a platform for teaching of cycling rules and traffic laws to cyclists.

xxi. There is need for greater investment in the potential employment areas in cycling industry to improve cycling uptake and to create job opportunities

xxii. Finally, there is need for the involvement and development of closer ties with various stakeholders mapped in the course of this study, in order to tap in their contribution and broaden the positive aspects of pro-cycling programs. This would make bicycle use plans acceptable to most of the stakeholders and ease implementation of the bicycle use plans where and when developed.

Chapter 11 References

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Appendices

Appendix A: Inventory Photos

Appendix B: Bicycle Volumes Data

Appendix C: Data Sheet