IMPLICATIONS OF STREET UPGRADING ON ACCESS AND USE OF STREET SPACES IN INFORMAL SETTLEMENT, A CASE OF SILANGA IN KIBERA

BY

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DECLARATION
This Planning Research Project is my original work and has not been presented for a degree in any other university

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Mr. Karisa Charles Dadu
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DEDICATION

To my great dad Samuel, lovely mum Lucy, awesome brothers James and Peter, all friends and anyone interested on street upgrading in informal settlements, this I dedicate.
ACKNOWLEDGEMENTS
First, I would like to acknowledge Almighty God for granting me the opportunity, zeal, grace and favour in undertaking this research project.

Sincere gratitude is hereby extended to the following through whose help the structuring of this research project was possible:
To my supervisor, Mr. Dadu Karisa- Special acknowledgement for your continuous guidance, counsel and input in this project. Your constant reminder that “the ball is on my court” is something I will hold in my heart forever.

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ABSTRACT

Streets in the informal settlement are multifunctional entities where different activities are undertaken. They are not only physical entities for mobility and accessibility but also provide space where social, economic, cultural activities are articulated, reinforced and facilitated. For this reason, the expectation is that they are given priority in settlement upgrading. Street-led slum upgrading is not only route map to physical integration of slums into formal neighbourhood but also process of regularization and secure tenure.

Unfortunately, this multi-functionality is often flouted in the street design process. The conventional representation of the street as a link has tended to reinforce the linear representation of the street, defined only through its mobility function, and subverting the other function of the street as a space. The ideal way of street upgrading in slums is articulating different functions of the street based on the needs of the community in the design. The result will be transformation of a slum into a functional neighborhood with coordinated street activities and reduced conflict between street users.

This study was carried out in Silanga Village in Kibera, being one of the first beneficiary of street-upgrading program by the NYS via Ministry of Planning and Devolution. The purpose of this study was to understand the dynamics of use and access of the street spaces upon upgrading by NYS. This research project operationally sought to come up with recommendations based on the findings that would guide street upgrading in other informal settlement worldwide. Both qualitative and quantitative data were collected through questionnaire administration to business operators on the street, households and street users, interviews with key informants, measurement, physical observation, mapping and photography. The information collected was analysed and presented in the report with maps, photos, charts, sketches and graphic illustrations.

The study revealed that the settlement lacks a land-use plan to guide upgrading process. In the implementation of the project, there was minimal participation of stakeholders. However, there were a few that were involved in the implementation stage and mainly acted as casual labourers for the NYS. This contributed to lack of articulation of the various needs and activities of different community members in the street design. Therefore, the upgraded street lacks flexibility as it is biased on motorized transport and the result is reduced safety on the street. This has led to displacement of some users such as children and women making the street less vibrant. This study further found out that economic activities especially along the street have increased and hence there are more cases of street encroachment by vendors into the carriage way causing user conflict. Among other things, the street lacks provision for NMT, pedestrian crossing, and signage; poor solid waste management on the street is very evident. This has led to negative perception towards the new street.

The study concludes that there is need to prepare a land use plan for the settlement in order to guide the upgrading process. There is need to create street spaces that are more accessible and usable by different users inclusive of the all age groups, gender and physically challenged.
Therefore, this study recommends place making approach as way of street-led settlement upgrading with the local community being the main stakeholders. The up-scaled result would be functional neighbourhoods with vibrant streets where every member of the community is accommodated. Such a model of streetscape will serve the objectives of equity, social justice, and the right to the city.
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<td>EMCA</td>
<td>Environmental Management and Coordination Act</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<td>NEMA</td>
<td>National Environmental Management Authority</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>NCC</td>
<td>Nairobi City County</td>
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<td>NYS</td>
<td>National Youth Service</td>
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CHAPTER ONE: INTRODUCTION

1.0 Introduction
The word “Street” is derived from the Latin word “strata” which simply meant that which is paved. Street can be defined as a public road in a city or town, typically with houses and buildings on one or both sides (http://www.oxforddictionaries.com/definition/learner/street). Streets support not only mobility functions like the roads but also serve other place functions. According to Jane Jacobs, the street is one of the fundamental components of authentic urbanism. She observed that: Streets in cities serve many purposes besides carrying vehicles and city sidewalks. On top of that, the pedestrian’s parts of the streets serve many purposes besides carrying pedestrians (Jacobs, 1961). In their simplest form, streets allow people to be outside, and thereby undertake a plethora of social activities that contribute to the transformation of neighbours into neighbourhoods (Neal, 2003).

Streets make up the greater part of the public realm. They occupy 30-40% of the urban land (Manual for Streets, 2013). Better-designed streets therefore contribute significantly to the quality of the built environment and play a key role in the creation of sustainable, inclusive, mixed communities consistent with the policy objectives of Planning. Streets have to fulfil a complex variety of functions in order to meet people’s needs as places for living, working and moving around in. This requires a careful and multi-disciplinary approach that balances potential conflicts between different objectives.

Urban streets play a strong role on how cities are built and function. They form the backbone of infrastructure development in informal settlements. They are not only physical entity for mobility and accessibility but also act as common good and public space where social, cultural and economic activities are articulated, reinforced and facilitated (UN HABITAT, 2012). They also create a pathway for sewerage and water pipes, power lines and drainage systems. Proper street patterns lay the basis for land regularization and security of tenure in the informal settlements.

Streets in the informal settlement play a greater role than the streets in the planned neighbourhoods. Being the only form of open spaces in many situations, the streets act as the only recreational/playing ground for children due to lack of/ inadequate open spaces. The streets provide space for informal markets in the slums that include food vendors, green grocers, water
Kiosks etc. This street economy supports majority of households in the slums as it is their only source of income. Streets also play the role of social interaction as well as political role for the slum dwellers. Unfortunately, these streets have been encroached by structures and have become dumping places for the waste that include both solid and grey water in the settlement. Their irregular pattern also encourages high crime rates in the slums.

Based on the multi-functional role of the streets in the informal settlement, street upgrading should mainly focus on creation of accessible spaces on which all the users interact without conflicts. However, this is not the result of street upgrading in Kibera. The upgrading was implemented by the NYS in conjunction with the Ministry of Planning and Devolution with an aim of improving the livelihood of the slum dwellers who have for a long time been neglected and received little attention in terms of national developments. Kibera being the largest slum in Kenya became the first beneficiary of the project. This was done by enhancing slum connectivity and accessibility through the construction of Collector Street of 3.5 Km linking the settlement with Kibera drive Rd and Mbagathi way. This study will mainly focus on the major street cutting across Silanga village in Kibera in a stretch of 1KM. It aims at analysing the impacts of the street upgrading on use and access of street space use in Silanga village in Kibera.

1.1 Problem Statement
In 2000, the Government of Kenya acknowledged the presence of slums and the focus shifted from demolition to a wider context of sustainable development, involving in situ improvement approaches. In essence, in situ slum upgrading often consists of two key components: formalizing slums through legal and regulatory instruments and improving housing, public spaces, streets and basic services (UN HABITAT 2013). Streets contribute greatly in defining the economic, cultural, social, environmental and political functions of cities. They were the first element to mark a change in status of a place, from a village to a town, from a town to a city or from a commercial centre to a capital city (UNHABITAT, 2012). It is on this basis that the government of Kenya shifted from project-based approach to street-led slum upgrading that aims at integrating the slums with the urban fabric hence curbing isolation of slums.

In slums, streets are not only physical entities for mobility and accessibility but also are public domain where social, economic, cultural activities are articulated, reinforced and facilitated. This means that streets should be the entry point for a physical integration of slums into the
formal and official systems of planning and urban management. This should be articulated in the
designs of the street to ensure that the multifunctional roles of the street are well reinforced. The
result will be a transformation of a slum into a formal neighborhood with coordinated street
activities and reduced conflict between street users. Unfortunately, this multi-functionality is
often flouted in the street design process. The conventional representation of the street as a link
has tended to reinforce the linear representation of the street, defined only through its mobility
function, and subverting the other function of the street as a space. This has not been different for
the street upgrading in Silanga Village in Kibera.

The upgraded street is tarmacked and biased on motorized transport. It is approximately 12
meters wide constituting of one carriage way of two lane of 3 meters each and storm water
drainage of approximately 1 meter on each side. The remaining two meters meant for pedestrians
walkway on each side is highly encroached by temporary business structures which are uneven.
The street does not provide cycle paths and hence the cyclist and pedestrians are forced to share
the street with the motor vehicles causing traffic conflicts. Due to high traffic flow especially
from pedestrians, the street business has boomed and hence more vendors are using the street as
their market space. The vendors have encroached the carriage way and placed their goods there
for easy access to their customers. This has led to narrowing the carriage way causing traffic
congestion of the vehicles and pedestrians. Lack of recreational spaces within the settlement
makes young children use the street as play space. However, the high motorized transport along
the street pose high risk of accidents to the young children.

There are no road markings on the street, which would include zebra crossing for pedestrians and
road signage, even in areas with major community facilities such as Undugu Primary school. The
whole street lacks the provision of bus stops, thus the public vehicles pick and drop passengers at
any point of the street. The storm water drainage system is in form of open channels that are used
as alternative dumping sites for solid waste by the community, which also poses high risk for
children as they play around such sites. In some sections, the community has hipped all their
waste on the street. This not only makes the street lose its aesthetic value but also reduces size of
the carriage way for the street users.
In summary, the upgraded street in Silanga fails to meet the multi-functional role of a street in a slum settlement. This has affected the way different users’ use and access street space in the settlement. This calls for redesigning of the street to ensure that the street spaces are easily accessed and used by different users without conflict.

1.2 Purpose of the Study
The study seeks to understand how the dynamics of use and access of the street spaces by different users have changed through the Kibera street upgrading project by NYS. The study will further identify key issues and indicators associated with the street upgrading that can generate analysis and recommendations that can guide the design and implementation of future street upgrading projects in the informal settlement both in Kenya and beyond.

1.3 Research Objectives
The specific objectives of this study are:

1. To find out the kind of street upgrading that the NYS is doing.
2. To find out the nature of access and use of the street in Silanga.
3. To identify the impact of street upgrading on access and use of space by different types of users in Silanga Village.
4. To identify Planning intervention that will safeguard the access and use of space in street upgrading in the informal settlements

1.4 Research Questions
1. What kind of street upgrading is the NYS undertaking in Silanga?
2. What was the nature of access and use of the street by different users in Silanga before upgrading?
3. What is the impact of street upgrading on the access and use of space in Silanga?
4. What are the possible planning solutions and policy options that would bring out improvement in street upgrading in the Silanga in the view of current and future demands of the street space?

1.5 Assumptions
This study assumed that:

1. Street transformation affects the access and use of space in a human settlement.
2. Planning interventions can influence the level of access and utilization of space in street upgrading.

1.6 Justification of the Study
In the words of Jane Jacobs, “Think of a city and what comes to mind? Its streets” (Fyfe 1998, 1). Great urban places are judged by their street life. Streets play a vital role in informal settlement as they are multipurpose spaces in which all the ingredients of city life are combined. They are not only physical entities or mobility and accessibility but also public domain where social, economic, cultural activities are articulated, reinforced and facilitated. Silanga as part of the urban fabric deserves better street designs that are multifunctional and sustainable as the needs of the resident dictate. There is need to enhance the use and access of street space by various users without conflicts. This requires a careful and multi-disciplinary approach that balances potential conflicts between different objectives. This can only be achieved if every street user’s needs are identified and articulated in the planning and design process of the street.

Street upgrading can trigger a wide range of benefits for the slum residents and generate multi-dimensional outcomes to the street users. There is a need to bring about a transformation in the quality of streets that brings orderly development and enhanced sense of public safety especially for users. This requires a fundamental culture change in the way that streets are upgraded, designed and adopted, including a more collaborative approach between the design professions and other stakeholders. There is need to think creatively about their various roles in the process of delivering streets, breaking away from standardized, prescriptive, risk-averse methods to create high-quality places especially in the informal settlement. Such upgrading also ought to be responsive to the settlement form and function.

1.7 Scope of the Study
The study was carried out in Silanga Village which is one of the twelve villages that make up Kibera slum. Administratively, it is located in Silanga Sub-location, Kibera Location and Lang’ata Division. Politically, Silanga is in Kibera Ward, Lang’ata Sub-county, and Nairobi County. The site lies at 1° 18' S 36°47’ E to the West and 1° 19' S 36° 47’ S to the East. It is approximately 7 Km from Nairobi CBD. The village is neighbored by Nairobi Dam to the South, Soweto Village to the East, Laini Saba to the North and Lindi to the west. The study will mainly focus on the Makina Street which is the main street cutting across the village. The study will
concentrate on 1 Km stretch which is a section of 3.5 km of the total street upgraded by the NYS in Kibera Slums.

The street is served by several community facilities that include Silanga Police Post, Undugu primary school and several churches. There is a bridge along the street as well as a junction that connect the street to the street leading to highrise estate and Karanja Estate. The street is also characterized by informal street vendors as well residential structures along the whole stretch. The study will mainly focus on the economic, social, and environmental outcomes of the street upgrading on the use of the stated activity nodes.

1.8 Research Methodology
The study will employ a case study research strategy which is oriented towards having empirical enquiry that investigates a contemporary phenomenon within its real-life context in order to have a broader understanding about the phenomenon in question (Yin, R. K. [2003] and Philip, E. [2007]). This section provides a detailed methodology that will be utilized throughout the study. It details out the data types and needs, data collection methods, instruments, process and analysis and presentation techniques. A summary of the research methodology will be presented through the use of a comprehensive data needs matrix identification of the limitations of the study.

1.8.1 Data Needs and Sources
The data needs in this research project entails the following: Aspects of street upgrading in terms of changes in street size, street alignment, paving materials network infrastructure and development of community facilities; Categories of street space users and activities on the upgraded street; the challenges in accessing and using the street space; Impacts of street upgrading on access and use of street spaces. The sources of the stated data needs include: to direct observation, physical measurement, photography, questionnaire administration (household, business and street users’), key informant interviews, transect walking, focus group discussions and available secondary sources

1.8.2 Data Collection Methods
Both primary and secondary data sources were used as well as both quantitative and qualitative data.
a) Primary data
This form of data formed the main data source that informed the study: as data directly from the field and from those in contact with the study area was the most valuable in giving the best picture of the situation at hand. The methods used to collect primary data included:

❖ **Questionnaires administration**
This consisted of open and closed ended questions and other prompts for the purpose of gathering information from the household respondents. The questionnaires were presented to the respondents and answered in written form.

❖ **Interview and Interview Schedules**
Interview schedules were prepared to target mainly the key informants and stakeholders involved in the upgrading and maintenance of the street. These includes: NYS Officials, Local Community leaders, Nairobi City County officials, and KURA officials, MOLHUD officials.

<table>
<thead>
<tr>
<th>Table 1 Interview Schedule with Key Informant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key informant</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>NYS Officials</td>
</tr>
<tr>
<td>Village chairman and Sub-chief</td>
</tr>
<tr>
<td>City Council of Nairobi (Planning and environment Department), MOLHUD, KURA</td>
</tr>
<tr>
<td>Institution- schools and NGOs</td>
</tr>
</tbody>
</table>

Source: Author’s Construct, 2016
Discussions and discussion guides
Non-structured and structured questionnaire schedule and discussion guides were used in the data and information gathering process. However, structured discussion and investigation guides were used to provide both quantitative data (numbers) that can be statistically analyzed and qualitative information that can be summarized.

Discussions with key sources took the form of individual or group interviews facilitated using a specific agenda of either directed/structured or non-directed/open ended or unstructured questionnaire schedules as appropriate. Discussions were be useful in obtaining in-depth understanding of street upgrading process and its impacts to the users and space within Silanga Settlement and future expectation (development projection achievements, impacts and sustainability).

Direct household interviews:
This was in the form of household survey and quantitative analysis as an additional measure to support the study and further establish an understanding of the impact of street upgrading on the use of space in Silanga. This helped in gathering information on the traditional users of the streets, emerging users after street upgrade and space conflicts in terms of users. This was important in providing pieces of information, which are not readily available or obtainable by direct observations and which people may be shy to disclose in group discussions.

Rapid appraisal
This tool of assessment involved actual observation of various street users in Silanga. e.g the types and the number of users, conflicts and their implication on access and use of street space.

Direct observation
This involved the systematic selection, observation and recording of the characteristics depicted on site. A checklist was used as the tool to aid in the observation exercise for example to traffic count both peak and off-peak hours.
Mapping, Photography And Sketching

Maps were employed to establish the spatial distribution of the streets and activity nodes along Makina Street. Photographs and sketches of the area were taken to facilitate the analysis of the spatial/physical layout of the Makina Street and Silanga Village.

Focus Group Discussion

This was done by grouping different street user in a specific groups e.g household group, street vendors, children and women. Community leaders within the settlement were also invited to discuss and give opinions on the role played by the street, their nature of access and use of the street, challenges faced in using the street as well as give opinions that would see the improvement of street to guide future upgrading. The informative discussion was recorded and the issues rising in the discussions are articulated and incorporated in the report.

Secondary data

This data type was obtained through literature review of existing publications relevant to the topic of study. This was aided in the understanding of the area of study and establishing what had been previously uncovered by others in the same area of study. This data type was sourced from journals, internet sources, government publications, articles, and maps.

Target Population

This research targeted the residents of Silanga Village in Kibera, the business operators, street users and institutions in the area. The study was inclusive of all member of the society i.e children, adults and aged, gender (male and female) and persons with disabilities as they are all street users at one point. This study also targeted all stakeholders involved in street upgrading in Silanga such as NYS officials and City Council of Nairobi (Planning and Environmental Departments).

Data Collecting Process

Sampling Design

Sampling is the selection of part of an aggregate of material to represent the whole aggregate/population (Mugenda, 2003). In the case of this study various sampling techniques was be employed to collect data. These include:
i. **Purposive Sampling and non-probability** - These were applied to select individuals who concerned themselves to the topic under study (Richie, Lewis and Elam (2003). For example it targeted the various Key informants, groups, Organizations and administrators who have relevant information concerning Silanga Village and street upgrading; hence the selection is purposeful. Four categories of informants consulted in this study included; NYS Officials, NCC officials in the City Council of Nairobi-Department of City Planning, Environment and Geo data (Mapping), MOLHUD-Physical Planning Department, KURA officials.

In accordance with Yin, R. K. (2003) recommendation of discussions with above key sources will provide in-depth understanding as well as enrich the findings of such studies more in particular how Makina Street upgrading has impacted on access and use of space in Silanga.

ii. **Random stratified and probability sampling** was employed based on the linear alignment of the study area. The study area comprises of 5 parts/ strata of an interval of 100 meters in a stretch of 500 meters which is the total study area. Random sampling were then used to further select the samples from within each of the 5 strata at a radius of 100 meters from the center of the street. To determine the sample size for the households, the following formula was applied:

\[
\text{New SS} = \frac{SS}{1 + \frac{(SS - 1)}{Pop}}
\]

\[
SS = Z^2 \times P \times (1-P) / C^2
\]

\(Z\) = the standard deviation, normal deviate at the required confidence level

\(P\) = the proportion in the target population estimated to have the characteristics being measured;

\(C\) = Confidence interval, expressed as percentage

\(Pop\) = Population.


In this case, \(C = 10\%\), \(Z\) = confidence level = 95\%, \(Pop = 43250\). Thus, a total of 96 questionnaires were administered in this order:
Table 2 Sample Size Distribution

<table>
<thead>
<tr>
<th>Category</th>
<th>No. Questionnaires</th>
<th>No. per Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Households</strong></td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td><strong>Business</strong> (street vendors and fixed shops/businesses)</td>
<td>15 each Total 30</td>
<td>3 each Total 6</td>
</tr>
<tr>
<td><strong>Street Users</strong> (Cyclist, Motorist, pedestrians, children, women and Youth)</td>
<td>6 each Total 36</td>
<td>Random along the street based on activity node</td>
</tr>
</tbody>
</table>

Source: Author’s construct, 2016

This sample size is justified on grounds of homogeneity of impacts of street upgrading across the study area among the respondents but also in consideration of time and budgetary constraints.

1.8.5 Data Analysis Methods and Presentations

Data analysis entails the use of appropriate methods to examine, interpret, and synthesize data to answer the research questions as stated below:

Both qualitative and quantitative data has been reviewed and analyzed along the themes provided by the detailed methodology and summarized under the four components outlined in the scope of work. This is therefore the aspect that seeks to make meaning of the data collected. At the end of the fieldwork all data collected from the structured questionnaires were coded, entered, cleaned and analyzed using the Statistical Package for Social Science (SPSS) to generate various frequencies, cross tabulation simple tables, sketches, pie charts, bar graphs etc.

The analysis of both the qualitative and quantitative data collected is presented using simple frequency distribution and analytical reports. The analysis of the quantitative data collected is also be presented by the use of maps, plans, sketches, illustrations and photographs.

Sketches and photographs are equally used to illustrate data, which had been discussed in descriptive analysis for example in illustrating various space use conflicts, types of activities and users of the street. The in-depth interviews, reviews of policies and regulations relevant to street upgrading in Silanga are analyzed and organized as well then presented in form of descriptive and analytical report.

Geo-spatial data is extracted from the digitized satellite images, base maps and structure plans. This is analyzed to provide an understanding of the spatial dimension of street upgrading in...
Silanga village. The results of geo-spatial analysis is matched with emerging descriptive results from other secondary and primary data to facilitate in-depth understanding of the problem situation.

1.9 Organization of the Study
The study will be organized in the following chapters:

Chapter One: Introduction
The introduction chapter will outline the background information, problem statement, research purpose, research questions and objectives, justification and significance of the study, the scope of the study as well as the methodology followed in carrying out the research.

Chapter Two: Literature Review
This chapter will focus on the review of related literature on what has been written on this topic. It also examined related case studies and best practices and developed a conceptual framework which guides street upgrading in the informal settlement.

Chapter Three: Background to the Study Area
This chapter will outline the current state of the existing situation of Makina Street in Silanga Village in Kibera. It presents the historical aspects of the site, physical setting, land use patterns, as well as the administrative aspects within the Silanga Village. It further describes the nature of use and access of street space and its impacts after upgrading.

Chapter Four: Presentation of Research Findings
This chapter will present the data collected from the field articulating the real issues of the problem with respect to the field findings. The data will be presented in the form of charts and graphs among other methods of data presentation.

Chapter Five: Planning Implications of Street Upgrading on Access and Use of Space
This chapter will evaluate and critically discuss the emerging issues realized and outlined in every chapter in detail looking at the implications of street upgrading on the access and use of space in Silanga Village
Chapter Six: Summary of Recommendations and Conclusions

This chapter will summarize the findings and conclusions of this research and thus make recommendations and proposals that may accommodate both the current and future street upgrading and development.

1.10 Definition of Terms

Informal Settlement/ Slum- According to UNHABITAT (2012), a slum has the following characteristics: Inadequate access to safe water, inadequate access to sanitation and infrastructure, poor structural quality of housing, overcrowding, and insecure land tenure status.

Street- Streets are the connection or linkages between spaces and places

Slum Upgrading- consists of physical, social, economic, organizational and environmental improvements undertaken cooperatively and locally among citizens, community groups, businesses and local authorities

Street Access- The right to obtain, link or make use of any part or services on the street.

Street Use- The right to obtain or make use of the street spaces and services there on.

Street Space- Any part, area or portion of a street that is usable for street activities such as mobility, recreation, social interaction, and business are undertaken.

Below is a table showing Data need Matrix
<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Data needs</th>
<th>Data sources</th>
<th>Data collection methods</th>
<th>Data analysis methods and tools</th>
<th>Data presentation methods</th>
<th>Expected output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To find out the kind of street upgrading that the NYS is doing.</td>
<td>street size, street alignment, paving materials, network infrastructure, and development of community facilities</td>
<td>Secondary sources. Field survey</td>
<td>Literature review, Observation, Photography, measurement, questionnaires and key informant interviews</td>
<td>Descriptive analysis, SPSS MS EXCEL Arc GIS</td>
<td>Maps Photographs Descriptive and analytical Report</td>
<td>The changes/improvements in the physical layout and design of the street The Process used in upgrading</td>
</tr>
<tr>
<td>2. To find out the nature of access and use of street in Silanga.</td>
<td>Categorise the street user types; children: Children, pedestrians, motorist, cyclist, street vendors. Major activity nodes, Activities undertaken on the</td>
<td>Secondary sources. Field survey</td>
<td>Literature review Observation Interviews questionnaires, Key informant interviews, Observation, transect walking and photography</td>
<td>spatial analysis Arc GIS MS EXCEL SPSS Descriptive statistics</td>
<td>Maps Photographs Descriptive and analytical Report</td>
<td>A physical layout the settlement showing the location of activity nodes and also a descriptive report on access, use and challenges of using the street.</td>
</tr>
</tbody>
</table>
street by each user as well as challenges faced in accessing and using the street

| 3. To identify the impact of upgrading on access and space use to different types of users | Mode of access to the street and user patterns and outcomes (Social, economic, environmental). | Secondary sources. Field survey | Literature review Observation Interviews Photography questionnaire | spatial analysis through GIS MS EXCEL SPSS | Maps Photographs Descriptive and analytical Report | A physical layout showing impacts as result of upgrading: mapping of access points; user activities, conflict point between users and also a descriptive report. |
4. To identify Planning intervention that will safeguard the access and use of space in street upgrading

<table>
<thead>
<tr>
<th>Planning Policy guidelines.</th>
<th>Secondary sources.</th>
<th>Literature review Observation Interviews Synthesis of finding</th>
<th>spatial analysis through GIS</th>
<th>Maps Photographs Descriptive and analytical Report</th>
<th>Socio-spatial planning strategies for optimization of access and use of street-level space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of space on streets Management structures; Hiearchy of street Public attitude/awareness. Geo-Spatial layouts. Land administration</td>
<td>Field survey Key informants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s construct, 2016

**Below is a research framework showing the research methodology**
Figure 1 Research Methodology Framework

Stage 1: Research Proposal
- Identification of the study problem
- Formulation of Study Objectives and Research Questions
- Identification of the Research Purpose and Scope of study
- Identification of Data needs and Sources

Stage 2: Literature
- Concepts, theories and Legislation on street, slum and street-led slum upgrading
- Case Studies/Best practices on street upgrading in the informal settlements

Stage 3: Empirical Case
- Street upgrading in slums and its implication to access and use of spaces in Silanga
- Primary Data Sources
  - Quantitative
    - Determination of Sample size
    - Administration of household, business and street user’s questionnaire. Measurement of the street
    - Statistical Analysis
  - Qualitative
    - Interview Schedule: NCC, MOLHUD, NGOs, School KURA, NYS, Village Chairman
    - Direct Observation, Mapping, photography
- Secondary Data
  - Books, journals, articles. Maps, photos
  - Content Analysis

Stage 4: Report
- Data processing and analysis
- Presentation of data and study findings
- Recommendation and conclusion

Source: Author’s Construct, 2016
CHAPTER TWO: LITERATURE REVIEW

2.0 Overview
This chapter presents a review of street related literature both in the formal and informal settlements. All this is to help the researcher develop a deeper understanding of various dynamics on the roles of streets in the informal settlements, street upgrading and its implications to access and use of spaces which are relevant this study. The chapter examines the concept of streets, historical perspective and its development over time, street hierarchy, and its current features, in the global, regional (Africa) and local (Kenya and Nairobi) contexts; street as land use and the related interactions; the concept of street upgrading; Street planning and designing models; theoretical, legal, policy, and institutional frameworks relevant to development of streets; case studies; and conceptual framework.

2.1.1 Concept of Street
Streets are the connection or linkages between spaces and places. Kostof (1992) describes street as an entity made up of a roadway, usually a pedestrian way and flanking building. The Oxford English Dictionary, defines street as a road in a town or village [comparatively wide, as opposed to a lane or alley] running between two lines of houses; usually including the sidewalks as well as carriageway.

Streets are designed as public space with residential houses, commercial buildings and other structures on one or each side, therefore, has social and economic functions that are integral to urban life (UNHABITAT, 2012). Streets have for a long time been the center of planning of cities and towns. The street designs were mainly to address issues of public health, social equity, and economic development. They provide the basic structure of urban form, and their design through history narrates the story of the city. Streets and street patterns speak not only of technological changes in transportation, but also of notions of social equity, the environment, and the role of economic development (Sylvia. N, 2007).

Urban streets play a strong role in how cities are built and function. They form the backbone of infrastructure development. The street is at the intersection of ideas of public and private, of infrastructure and public space, of urban form and ecology (Sylvia. N, 2007). In the informal
settlements, they are not only physical entities for mobility and accessibility but also act as common good and public space where social, cultural and economic activities are articulated, reinforced and facilitated (UNHABITAT, 2012). Streets play the role of wayleaves by providing a pathway for sewerage and water pipes, power lines and drainage systems. Proper street patterns lay the basis for land regularization and security of tenure in the informal settlements.

2.1.2 Concept of Street as Space
This is the aspect of a street a physical space/Place on which various activities are undertaken. This is the street function that distinguishes a street and a road. Streets create a strong relationship between streets, buildings and spaces that frame it (Street Manual, 2012). Street as a place is mainly depicted by:

i. **The open spaces** - Streets are the public realm that are owned by the society at large. They provide the terrain for social, economic, and political activities interaction through activities such as markets, relaxing, playing and meeting up with other members of the society. Street network form an effective, flexible framework for building a community in every sense of the word. In the informal settlements, streets being the only spaces left due to congestion and overcrowding of structures play a great role as open spaces for the slum dwellers.

ii. **Green Spaces** - green/sustainable streets promote, enhance, the natural features and ecological system of its urban environment. It integrates storm water treatment and incorporates storm water treatment into the design, solid waste management. Streets that are more NMT oriented and less of motorized to reduce pollution. In street upgrading in the informal settlement, green space are always overlooked and more focus on motorized transport rather than NMT.

iii. **Movement** - Streets maximizes transportation choice. All people should be able to travel within their community in safe, dignified and efficient manner. Sustainable streets ensures that the choice of transportation modes and routes are integrated appropriately within the street to reduce traffic conflict.

iv. **Network of pavement and pedestrian** - Walking is the first thing that defines public realm. Streets ought to have finely woven fabrics of streets and blocks and that walkways are made interesting to encourage more people to walk.
v. Sustaining Economic Activities- Streets provide a template for a rich combination of housing, shopping, and transportation choices. They support robust mix of culture and commerce. Sustainable street networks are magnets for businesses light industry

2.2 History of Streets
Streets are key indicators of evolution, civilization and technological advancement. According to Levias (1986), streets were non-existence in the hunter/gatherer community where there were no strong boundaries between public and private, and villages were generally circular and worked as a unit for resources. When the family became the unit of production, rectangular homes and the accompanying streets emerged. Upon the emergence of religious and political leadership, linear streets connecting the religious facilities and administrative offices to homes were developed. They indicated social organization and status according to the placement along the streets (Sylvia. N, 2007). The emergence of the street seems to symbolize or express a gradual awareness of the separation of private and public, family and larger community (Levias, 1986). Kostof (1992), attributes the first street to Khirokita Cyprus around 6000-5000 BC. Which was paved with limestone and it navigated the ascent of a hill and descended to a riverbank.

2.2.1 Street in the Ancient Cities
Streets in ancient cities were the result of a vision of civilization rather than a function of the economy, (UNHABITAT, 2012). The ancient urban settlements was characterized by a central meeting places for different activities such as trade, political, governance and religious functions. It was surrounded by neighbourhoods with the richest and influential inhabitants living closest to the center while the poor lived in the periphery and crowded places. It was a typical monocentric cities.

Streets radiated from the core of the city, which was usually the seat of political power or place of worship, such as a mosque, a temple or a cathedral, or some other structure of political,
commercial or cultural significance, such as a royal palace or suq (covered Market Street that is characteristic of Arab cities), (UNHABITAT, 2012). The coastal cities constituted of one main street that linked the harbours to the markets. Streets thus played fundamental role on the social and economic aspects of these settlements. Streets were therefore planned, designed and connected with an aim not only shaping the urban form but also linking different places of interest within the city.

2.2.2 Indus Valley
The grid pattern was the commonly used in Indus City back in 2600 BC. It was characterized by street running at right angles to each other forming rectangular block of development with weak center. The City was composed of two sections connected through large streets of about 30 meters of width intersecting at right angles with one street placed on an artificially elevated ground and one located at ground level. Houses were located at the lower level while other buildings of the city, such as assembly halls and religious structures, were located at the elevated level. The layout of the grid system stimulated social interactions and commercial exchanges that made streets play their full function as public spaces. In addition, it facilitated the provision of basic services such as water, sanitation and sewerage systems.

2.2.3 Ancient Chinese Cities
The ancient Chinese cities assumed the grid plan since 1500 BC. The guidelines outlined that the CBD should be a square on a plan. The design of the streets had to consider three gates on each side of the perimeter leading into nine main streets of the city. It was shaped along four main directions, linking other important enclosed public spaces such as the Royal Court situated in the south, the marketplace in the north, the Imperial Ancestral Temple in the east and the Altar to the Gods of Land and Grain in the west. This indicates that streets were fundamental component of Public space as well as network links of both public and private spaces.

2.2.4 Greek and Roman Empires
Ancient Greek cities adopted by the Grid street network as well. This was later primarily adopted 5 Century BC. This system was preferred as it eased movement of military units and commerce
from one city to the next. Additionally, this grid design facilitated and aided the expansion of empires especially in Europe.

The Roman empires had grid system that was designed such that in a way that street intersections would be sited along important public buildings, in much the same way as central business districts are located in the Centre of modern day metropolitan areas. The concept of a grid pattern became a common feature of town planning in many cities of Europe and North America until the 20th Century.

2.2.5 Industrial revolution and Modern
Many cities in the in the pre-industrial era assumed the monocentric form of street designs and planning. This started to change in the 18th and 19th Century at the beginning of industrial revolution which saw Europe and North America becoming more polycentric and hierarchical, partly as a result of stratification of society along class lines (UNHABITAT, 2012). Rural-urban migration increased in the industries revolution due to more employment opportunities the cities. This led to transition from monocentric cities to polycentric cities is also associated with changes in street patterns for the grid system to other types of street patterns, particularly hierarchical systems. Hierarchical street designs are those that assign different levels of importance and functions (UNHABITAT, 2012). This hierarchical designs became more prevalent as cities became more polycentric. The changes in the occupation of space led to changes in urban form and structure. Grid pattern city planning gave way to hierarchical planning.

The shift to hierarchical street patterns in most cities of the developed world has been associated with the more prominent role of the automobile in the 20 century that allowed people to easily commute longer distances (UNHABITAT, 2012). The poor lived outside the town while the rich remained in the city center. High use of vehicles led to increase in car accidents and this attributed to the revision of the street network system that discouraged traffic to residential areas.

2.2.6 Organic streets in Cairo
A number of restrictions governed the city’s spatial expansions of Cairo through time (UNHABITAT, 2012). The walled city took the organic pattern urban form which consisted of
highly integrated urban fabric with high number of cul de sacs. Some of the streets include: Al Fustat City 640AD, Al Askar (870 AD), and Fatimid Cairo (969 AD).

2.2.7. Evolution of street pattern since 1900
The figure below illustrate the evolution of street pattern since 1900.

Figure 2 Evolution of street pattern

Source: Chen, 2011

2.2.8 Informal Street Development
Informal street are as a result of unplanned urban expansion and growth. According to UN HABITAT (2013), these areas are characterized by informal land use, combined with a lack of infrastructure, public facilities and basic services, and often accompanied by a lack of both public transport and adequate access roads. Lack of organization in these settlement lead to formation of multiple small un-planned roads with cul-de-sacs. These small streets are developed informally by the local residents and are mainly used to access different properties and hence end
at the gate/ entrance. This is a common occurrence in developing countries and contribute to numerous problems in the area including insecurity, inaccessibility of services and isolation. In solving these challenges, street planning ought to take center stage in redevelopment of these areas. It is through street planning and design that planned neighbourhoods and street activities be revitalized in a coordinated manner leading to prosperous urban areas.

2.2.9 Classification of Streets
Road classification systems are the basis for defining function and in turn, the design criteria for the world’s street networks. The traditional classification systems have been based on the mobility and access functions of roads for motor vehicle traffic. The differentiation of streets began in Beycsultan, Turkey (1900-1750 BC) where arterials differed from residential streets (Sylvia. N 2007). At around the same period, courtyards and lanes with a similar features were found in Hacilar and Netherlands Turkey. Some of the street features such as sidewalks appeared in ancient streets in Kultepe, Turkey (2000-1900 BC).

The classification/hierarchy is developed according to the main movement, transition, distribution and collection of traffic. The result was the less of pedestrian prioritization. Road classifications differ from one country to the other. In Kenya, Public Roads Act (2007) are classified in three broad category which road:

i. National- Class A, Class B, Class C
ii. Rural Roads- Class E, Class D, Class F, Class R
iii. Urban Roads-Highways, Arterial, Collector (Primary distributor, Secondary distributor), Local Roads (Minor Distributor, local distributor and access roads)
iv. Highways-
v. Arterial,
vi. Collector (Primary distributor, Secondary distributor),
vii. Local Roads (Minor Distributor, local distributor and access roads)

Based on this this classification, Makina street fall under Secondary Distributor hence it is a collector street.

2.2.9.1 Hierarchy of urban Roads
This is the hierarchy of urban road classification as stated in Physical Planning Handbook (2007):

i. Urban Highway/ Regional Trunk- 60m
ii. Primary Distributor/ Arterial street -25m
iii. Secondary Distributor/ Collector Street-18m
iv. Local street/ Access Road-15m
v. Service Lanes- 6m

Figure 3 Hierarchy of Urban Streets

Source: Author, 2016
2.3 Street Spaces in Human Settlement

2.3.1 The Need for Great Street spaces in Human Settlements

Streets are the key indicators for urban prosperity and transformation. Good urban places are judged by their street life (Montgomery, J. 1998). Human settlements require great streets that accommodates multimodal transport systems i.e motorized and non-motorized transport. Streets that ensure co-efficiency of infrastructural systems and support integrated infrastructure development and thereby enhancing efficiency, access and use these resources. Additionally, human settlements should have streets that accommodate all kinds of users (pedestrians, cyclist, and motorist). According UNHABITAT (2012), Prosperous streets promote connection to services that contribute to good health, productivity such as clean water, sewerage facilities, drainage systems, power supply, and information and communication technologies. In the informal settlements, streets have multifunctional roles being the only public open spaces that can be used by the residents without pay. This depicts the need of a street that provides spaces that are accessible by the different street users for various activities at all time without conflict.

2.3.2 Uses of Street Spaces in Human Settlement

The street is the basis for our experience of cities (UNHABITAT, 2012). This is because streets are multifunctional urban spaces in which communities and societies takes pride in. This includes social, economic, environmental functions in which the street needs to coordinate and integrate to ensure that each role is served without compromising the other. This can only be achieved in the designs of the streets. According to Eichner and Tobey (1987), the major uses of street spaces can be categorized into two broad groups:

i. **Functional uses**- These are the main uses of the streets and hence the reason for their construction. They include mobility through vehicular and pedestrian circulation, parking, urban life support that entails provision for infrastructural utilities such as sewer line, water and communication cables and street lighting.

ii. **Social uses**- These are the uses that emerge as a result of street construction. These include shopping areas, recreational activities along the street, eateries and art works displays.

The following are the detailed uses of the streets spaces in human settlements.
2.3.2.1 Street as Public Space
Public spaces are spaces within urban areas that promote social interaction among the community members. In the words of Kostof (1992), "the only legitimacy of the street is as public space. Without it there is no city." This means that streets spaces are open and accessible for use for the members of the public. The design, the physical form and the location of the street determines the public’s perception and the social roles of the streets in the human settlements (UNHABITA, 2012). In the informal settlements, the streets act as the only recreational/playing ground for children due to lack of / limited open spaces. This is where the youth, women groups and general members of the public meet and interact. This means that there is need to create safe and vibrant street life that nurtures spontaneous optional and necessary activities.

2.3.2.2 Streets for Mobility
Movement is the major role played by the streets in the human settlement and urban spaces in general. Mobility status can be expressed in terms of traffic volume and the importance of the street within a network – either for general traffic or within a mode specific (e.g., bus or cycle) network. Another way of assessing the movement status of a street is to consider the geographical scale of the network in which it sits (Chapter 2: Manual for Streets).

In the informal settlement, majority of the residents walk or cycle to their places of work. This is attributed to the proximity distance of the slums to the town center or the industries where majority work. However, this does not mean that there is no motorised transport within the slums. The street design should be able to accommodate all the traffic modes that include both NMT and motorised. This is by providing walk paths for pedestrians, cycle paths for the cyclist, Bus Terminus traffic signals to harmonise movement between the NMT nad the motorised transport within the street.

2.3.2.3 Street for Safety and Security
According to UNHABITAT (2012), Building streets to improve access into and within slums has been proven to enhance safety and reduce fear of crime. Streets with clear origins and destinations not only provide a sense of orientation in an area but also generates an experienced feeling of security for both dwellers and outsiders.

Unfortunately, most slums are characterized by narrow streets with dead ends. This makes it very inaccessible and pose a lot of crime issues within the settlement. Street upgrading not only opens up the streets but also connects the slums with other neighbourhoods or the city. Additionally,
the introduction of street light along the streets improves the security of the area. Wide streets promotes safety in the informal settlement especially in cases of fire outbreaks as they reduce the spreading of fire as they act as fire breaks.

2.3.2.5 Street for Economic Prosperity
The street economy is a wide concept that embraces all the commercial and business activities that to some extent profits from the street (UNHABITAT, 2012). These business constitutes of both formal and informal economy. Unlike the formal street economy that pay revenue to the urban authorities, informal street economy do not and hence are considered illegal. The formal street economy usually have designated selling point along the street unlike the informal who encroach the street spaces. This reduces the street space and in turn leads to traffic conflict and congestion.

Majority of slum dwellers rely on street vending as their main source of income. Most of the activities that are undertaken include: green grocers, fruit vendors, shoe mending, malimali etc. Majority of these vendors are located in areas where it is more accessible by most pedestrians. This means that, the street designs should be more pedestrianized to increase accessibility of goods and services along the street which play a key element in street economy.

2.3.2.6 Street and democracy
Streets form part of open/ public spaces. It is along the streets that local leaders, politicians, preachers, organizations hold demonstration to create awareness on various issues of the society. In some settlements where streets have been upgraded like Korogosho, the local community has reclaimed the street as their recreational grounds through skating. On Sundays, they put road blocks along the street to prevent any vehicles from passing through leaving the space safe for skating or holding religious functions. This not only promote social cohesion among the residents but also are able to exercise their Civil Right roles.

2.3.2.7 Streets for environmental conservation and ventilation
A clean city/ neighbourhood is judged by the waste management along the streets. Streets with proper storm water drainage and proper solid waste management tend to be more attractive than the streets that lack the two. In the informal settlement, the solid waste management is very poor. The grey water and solid waste that include both organic and inorganic are thrown in the street. The drain are also open and hence tend to tend to be bleeding places for mosquitoes.
Street designs need to be such that storm water as well as grey water are well drained. Provision of waste collection bins along the street as well as garbage collection by the local authorities. It is also important to incorporate trees along the streets. They not only add to the aesthetic value of the street but also act as carbon sink from the emission of motor vehicles.

2.3.2.8 Streets for aesthetic

Streets add to the aesthetic of a neighborhood. Well organized streets with ample pedestrian walkways, cycle paths form beautiful urban spaces. Landscaping the streets with vegetation that include grass, flowers and trees form the soft part of the streets. This makes it attractive to walk through. Some streets also have monuments, Art work and crafts and the building along the streets are given some design many a times the cultural identity. This not only give street identity but also add to the beauty of the street.

2.3.3 Indicators of Great Street Spaces

Streets are key indicators of economic growth and prosperity of any given nation. Streets whose design concepts and standards enhance livability, accessibility, economic opportunity, safety, and quality of life play a key role in how a settlement function. The following are indicators of great street spaces.

i. **Streets that are user friendly**- Great streets provides great spaces that are friendly to user. They should provide for the orderly, efficient, and safe movement of people, goods, and services. All the users of transportation system i.e. pedestrians, cyclist and motorists should ample space to allow their movements to their destinations without conflict with one another. Street vendors should have great spaces to run their small scale business to enhance economic growth and prosperity for the residents. Street space that allow child children to undertake some recreational activities such as skating and at the same time feeling safe. Streets that allow residents to meet up and relax on the streets.

ii. **Streets that accommodate both motorized and non-motorised transport**- mobility being the major use of the street should be well articulated. All users of the transportation system enjoy order, safety, security, and efficiency when using the street. Streets that allow rapid and economical movement of people, goods, and services while at the same time minimize risk of harm/ damage to people and property. The street that users including people with disabilities feel secure and safe in their preferred mode of transportation.
iii. **Street that enhance environmental conservation**- Streets are key indicators of green and sustainable cities. Their design component should enhance environmental conservation within the settlement. By introducing spaces that encourage a lot of NMT reduces the use of motorized vehicles which in turn reduce the carbon dioxide emission in the air. Presence of waste bins along the streets that enhance solid waste management along the street as well as great storm water drainage enhances sustainability. Presence of trees and other vegetation on the street are clear indicators of green streets.

iv. **Street that contribute greatly to the aesthetic nature of human settlements**- presence of well-connected streets that are organized within cities and human settlements contribute greatly to the exquisiteness of the city. Presence of great landscaping create the soft part of the street. Clean streets that are well maintained and neighboured by great façade of buildings making the street interesting.

v. **Safety**- Street that are safe for all users are very important. Street with great signage, pedestrian crossing, bus terminus enhance safety. This reduces accidents along the streets. Closed drainage system along the street prevents children from falling into the drains when accessing the buildings along the streets. Streets especially in the slums act as fire breaks hence enhancing safety for the residents in case of fire break-outs.

vi. **Security**- Street contributes greatly to the security of a human settlement. Connected streets with clear destination enhance the user’s security unlike poorly connected with dead ends especially in slums. Presence of street lighting that ensures that the users use the street even at night.

**2.3.4 Benefits of great street spaces**

There various benefits attributed to great street spaces. These include:

i. **Equity and social inclusion**- street spaces allow free movement and social interaction of people of all kind of life. Proper planned and designed streets allow accessibility even for the people with disabilities. Street upgrading especially in slums and connecting them to the other urban fabric reduce exclusion of slums and hence equal benefits for development.

ii. **Productivity**- great street spaces contributes to economic growth and development. In slums for instance, street vending contribute is the main source of income for most
residents. Street upgrading that enhances more pedestrian movement creates large market for the street vendors and hence promoting economic prosperity.

iii. **Quality of life**- great street spaces enhances the use of public spaces in order to increase social cohesion, civic identity, and ensures the security and safety of lives and property. These makes human settlement more livable.

iv. **Environmental sustainability**- Great Street enhances environmental conservation in human settlements. Enhancing proper ventilation in the settlement, street vegetation that act as carbon sinks as well as promoting storm water drainage.

v. **Infrastructure development**- street create pathways for the passage of infrastructure such as water pipes, and sewer lines, information and communication technology lines (Fibre optic cables) in order to improve urban living and enhance productivity, mobility and connectivity.

### 2.3.5 Street Spaces Users Categories

The uses of the streets are based on the functional roles of the streets. Different street users have different determinant for use. This is summarized in a table as shown below:

**Table 4 Street User Category**

<table>
<thead>
<tr>
<th>Uses categories</th>
<th>Uses</th>
<th>Users</th>
<th>Determinants for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>Mobility</td>
<td>Motorists</td>
<td>Street/Road Connectivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Size of street</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Parking spaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality of the paving</td>
</tr>
<tr>
<td>Cyclist</td>
<td></td>
<td></td>
<td>Cycle paths availability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connectivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality of the paving</td>
</tr>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Walk ways availability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climate and Weather</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Distance to a given goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality of paving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Availability of services e.g.Kiosks</td>
</tr>
<tr>
<td>Social</td>
<td>Recreational</td>
<td>Children</td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality of paving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Size of the street</td>
</tr>
</tbody>
</table>
### 2.3.6 Physical Planning Variables and the Use of the Street

In the planning of a street, the physical factors that appear most to influence street use are: user density, land-use mix, pedestrian-vehicular interaction, and configuration of street and context. (Schumacher, 1991). Mixed land use encourage bicycle and pedestrian access. However, this is determined by their safety based on their interaction with the motor vehicles in the street. In many instances, so much conflict on the street overconcentration of the mobility use of the street excluding the other uses. This calls for the need for a balance between space use of the street and movement.

#### 2.3.6.1 The Balance between Space and Movement

Mobility is the major function of the street. In the past, street design hierarchies have been based almost exclusively on the importance attributed to vehicular movement. This has led to the marginalisation of pedestrians and cyclists in the upper tiers where vehicular capacity requirements predominate. The principle that a road was primarily for motor traffic has tended to filter down into the design of streets in the bottom tiers of the hierarchy.

This approach has created disjointed patterns of development. High-speed roads often have poor provision for pedestrian activity, cutting residential areas off from each other and from other parts of a settlement. In addition, the hierarchy does not allow for busy mixed use arterial streets, which feature in most traditional towns and cities (Chen, 2011). Theory suggests that there is a distinct conflict between mobility and local place that might result in displacement of some street users.
Streets should no longer be designed by assuming 'place' to be automatically subservient to 'movement'. Both should be considered in combination, with their relative importance depending on the street's function within a network and often varying along their length and at different times of the day. Upon considering the two aspects, the right balance will be achieved.

Place status denotes the relative significance of a street. A Chen (2011) states, locations with a relatively high place function would be those where people are likely to gather and interact with each other, such as outside schools, in local town and district centres or near shops. This clearly depict the street function in the informal settlement and hence reflect the need for incorporation of “place” status in the design.

Movement status of the street can be expressed in terms of traffic volume and the importance of the street, or section of street, within a network either for general traffic or within a mode specific (e.g. car, cycle, walking) network (Chen, 2011). It is very important to consider the three modes in the design element of the street.

Theory suggests that there is a distinct conflict of mobility and local place that might result in functions which essential for the residents being pushed out from the settlement

2.3.6.2 Place and Movement Matrix
Defining the relative importance of particular streets/roads in terms of place and movement functions should inform subsequent design choices. For example:

Motorways - high movement function, low place function;

High streets - medium movement function, medium to high place function; and

Residential streets - low to medium movement function, low to medium place function

This way of looking at streets can be expressed as a two-dimensional hierarchy where the axes are defined in terms of place and movement (Chen, 2011). It recognizes that, whilst some streets are more important than others in terms of traffic flow, some are also more important than others in terms of their place function and deserve to be treated differently. This approach allows designers to break away from previous approaches to hierarchy, whereby street designs were
only based on traffic considerations (Chen, 2011). There is a great relationship between street hierarchy and the place and movement status as illustrated in the table below:

Table 5 Place and Movement Status

<table>
<thead>
<tr>
<th>Road/ Street Category</th>
<th>Significance as a route</th>
<th>Movement status</th>
<th>Place status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Highway</td>
<td>National</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Primary Distributor</td>
<td>Regional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Distributor</td>
<td>Local</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Local Street</td>
<td>Local</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: Author’s Construct, 2016)

2.4 Street Based Settlement Upgrading

2.4.1 Concept of Informal settlement

Slums are a physical and spatial manifestation of urban poverty and intra-city inequality (Space Syntax, 2010). Slums result from a combination of poverty or low incomes with inadequacies in the housing provision system, so that poor people are forced to seek affordable accommodation and land that can become increasingly inadequate. The numbers of urban people in poverty are, to a large extent, outside the control of city governments, and are swelled by a combination of economic stagnation, increasing inequality and population growth, especially growth through rural to urban migration.

There are many conditions that can be used to describe informal settlements/slum areas. Slums in Kenya are characterised by overcrowding, high unemployment and crime rates, unhealthy environmental conditions, and insufficient access to basic infrastructure, such as water, sanitation, housing and roads (UN-Habitat KENSUP Team 2008). The United Nations Human Settlements Programme (UN-Habitat) uses a model to measure the degree of deprivation of basic infrastructure for households in urban areas. The model is designed to facilitate quantitative assessment of an area’s living standards and is based on five conditions:
1. Durable housing of a permanent nature that protects against extreme climate conditions.
2. Sufficient living space which means not more than three people sharing the same room.
3. Easy access to safe water in sufficient amounts at an affordable price.
4. Access to adequate sanitation in the form of a private or public toilet shared by a reasonable number of people.
5. Security of tenure that prevents forced evictions.

The above model gives guidance on prioritization of programs and projects that are to be taken by the government and NGOs in slum upgrading. The outcome is improved living standards for all urban residents.

2.4.2 Slum upgrading

**Slum Upgrading** consists of physical, social, economic, organizational and environmental improvements undertaken cooperatively and locally among citizens, community groups, businesses and local authorities (UNHABITAT, 2012). Actions typically include:

i. Installing or improving basic infrastructure, e.g., water reticulation, sanitation/waste collection, rehabilitation of circulation, storm drainage and flood prevention, electricity, security lighting, footpaths, streets.

ii. Removal or mitigation of environmental hazards

iii. Providing incentives for community management and maintenance

iv. Constructing or rehabilitating community facilities such as nurseries, health posts, community open space

v. Regularizing security of tenure, security from eviction

vi. Home improvement

vii. Relocation/compensation for the small number of residents dislocated by the improvements

viii. Improving access to health care and education as well as social support programs to address issues of security, violence, substance abuse, etc.

ix. Enhancement of income-earning opportunities through training and micro-credit

x. Building social capital and the institutional framework to sustain improvements.
This study will mainly focus on improving basic infrastructure and specifically the street as a way of improving the living standards of the slum dwellers.

2.4.3. Street-led slum upgrading
This aim at focusing on streets improvements in creating better and healthy neighbourhoods, public spaces as well as connecting slums to the rest of the urban street network. Streets have been treated in slum upgrading interventions around the world as natural conduits for retrofitting services and facilitating the movement of people, goods and vehicles (UNHABITAT, 2012). As discussed above, streets have multifunctional roles in human settlement. However, the main focus of street upgrading informal settlement in the past has been to improve mobility neglecting the social, economic and environmental roles that are articulated on the same street.

Street-led upgrading approach recognizes increased development by engaging and empowering community and stakeholders to participate in this kind of development. This together with local and national political enhance paradigm shift from the usual welfare and hygiene orientation initiatives towards the physical, social and economic integration of these settlements (UNHABITAT, 2012). The result is improvement of the quality of urban life of people and the economic productive of cities.

For this approach to work, streets are proposed as the starting point of settlement upgrading. This entails preparation of a master plan of the entire settlement with the streets as the backbone. Through the street hierarchy, the settlements are connected and integrated with both the city transport network and its development plan. Bridging the gap between city and the informal settlement through street development lead to city wide urban transformation.

2.4.4 Why streets?
Street-led upgrading approach promotes better planning and urban restructuring of slums and informal settlements in order to improve mobility, accessibility and provision of basic services. The following explain the need for street upgrading in the informal settlements:

1. **Street support incremental approach** - This is the kind of slum upgrading that aims at improving the slums through phases rather than the fully pledged slum upgrading that is very complicated. The incremental approach based on the prioritisation of streets will ensure that
strategic choices are made and that the streets selected for improvement or implementation are actually the ones that are likely to generate the highest impact on poverty reduction in terms of the economy, accessibility, optimisation of land use and generation of wealth as a result of increase in property values (UNHABITAT 2012). As soon as street is laid, basic infrastructure network such as water pipes, sewer lines are laid down and executed. The public spaces, squares and other amenities follow incrementally. This lead to overall slum upgrading eventually.

2. Enhances Community Participation- Street-led upgrading involves initial planning of not only the whole settlement but also the city as a whole. The Slum planning entails enumeration and structure mapping in order to come up with the layout design of the whole settlement. The community is trained and hence participated in the whole process of planning. The community is given the priority of choosing the appropriate location and the hierarchy of the street as well as employment opportunities in the actual implementation of the streets construction. This not only promotes ownership of but also help maintenance of the project. Slum Dwellers International (SDI) undertakes this kind of enumeration in various countries including Kenya. The enumeration data is also profiled and used in other upgrading projects.

3. Streets are the starting point for a physical integration of slums into the formal and official systems of planning and urban management that govern a city. A street pattern and hierarchy are laid down by an area-based plan that results in a final urban settlement layout connected to the overall city plan. This provides a strong spatial frame to deal with the challenges of regularising tenure and providing services as part of urban networks

4. Streets in slums have multiple functions- slums are characterized by congestion and overcrowding of structures. This leaves the slum streets as the only available public spaces that are used by the residents. They are host to multiple activities which co-exist and replace each other at different times of the day. They serve and provide the pathway for pipes, power lines, street lighting and drainage systems in upgrading projects. They are the areas for informal commerce such as hawking and vending as well as for economic activities like small manufacturing, repairs, garbage recycling. Cultural activities such as processions, celebrations and performances takes place on the streets. Children play and residents have informal
interactions in streets. This means that upon upgrading the street, social, economic and environmental status of the street is improved.

5. **Land regularization and security of tenure** - Research has shown that most of the slum dwellers do not own the land they occupy. In Kenya, most of the land occupied by the slums belong to Government. The constitution also allows for the right of land tenure upon land occupation for more than 10 years without paying any land rates. This has been the case for most slum dwellers and hence they feel that they have the right to own the land they occupy. Street upgrading in line with an urban layout plan defines the future urban configuration of a settlement. This lays the foundation of the future legalization and regularization of land tenure which will in turn be the transformation of slums and informal settlements into official neighbourhoods of the city.

### 2.5 Street-led Slum Upgrading Approach

The street-led approach to citywide slum upgrading fully involves local residents and their grassroots organizations in a simple and practical participatory process to rationalize the urban structure of these settlements through an area based plan and street pattern (UNHABITAT, 2012). The following are some of the steps followed in a street-led approach upgrading for a successful transformation:

#### 2.5.1 Enumeration and mapping

Enumeration is also known as Social Mapping. It was developed by an Indian affiliated NGO under SDI (SPARC) IN 1980s. This has been emulated in other countries including Kenya. This process highly involves the local slum dwellers. They are trained and hence are capacitated to engage in community development projects. Enumeration entail the following:

a) **Numbering** - This entails numbering of all structures in the slum. Each structure is given a unique number based as determined by the community. The settlement may divided into clusters or by the number of villages within the slum. Each cluster is given a unique code for identification.

b) **Questionnaire administration** - Household questionnaires are administered to record individual housing units, their number and record, and a cadastre of the residents and their status, size, tenure condition, income. This information is helps in getting the
actual slum population per structure and settlement. The data collected is then analysed and this forms the basis of any planning decisions to be made.

c) **Mapping** - This entails showing spatially the location of each structure that was numbered. It mainly preparation of the base map of the whole slum and then the community do the verification on the ground. Each structure is mapped based on the unique number given to it. Other facilities such as churches, schools, utility lines are also mapped to help in making the planning decision. The map indicate the existing streets and their sizes and hierarchy. This guide the community in choosing the appropriate sites for the proposed streets. The data is then analysed using GIS software. Mapping is the backbone of spatial plan and layout design. Based on the hierarchy of the street, the width of the street is determined and hence the structures that are in the street reserved are marked for demolition and relocation to pave way for the upgrading.

The challenge experienced in the enumeration and mapping phase is that structure construction takes place overnight. This is due the fact that most of the are temporary and are constructed very fast. This leave some structures not numbered and mapped.

**2.5.2 Planning and layout design**

This is the second phase of the street-led upgrading. It is participatory just like enumeration and mapping. The existing streets are identified, prioritised laid down as part of a slum upgrading plan that is discussed, amended and endorsed by residents and their grassroots organisations before the project is launched for execution. The community is highly involved in determining the hierarchy of the street as used by them. The plan and the design layout is based on the multiple functions of streets and open spaces, fulfills the requirements of mobility, accessibility, public safety and access to basic infrastructure, and enables future house improvements (UNHABITAT, 2012). The layout design tool is efficient in demonstrating the alignment, widths and gradients of streets and pathways for infrastructure networks and pedestrian routes. All the street are interconnected with other neighbourhood and city wide transport network and allocated adequate land for its implementation. Other proposals based on the needs of the community are articulated in the plan proposal as obtained from the enumeration data. Before the implementation of the project, the plan is presented to all stakeholders for visualization before implementation.
2.5.3 Street marking
This entails marking the areas where the streets are going to pass through. It done on the ground usually marked with letter “X” in red colour. This done with the guidance of the map and the layout design in the above. The residents in the structures within the street reserves are given time to relocate. Street addressing is also crucial as it brings the symbolic attainment of citizenship rights and inclusion in the city. Street addressing enables the slum dwellers to obtain an official recognition of their neighbourhood. This is the one step towards formalization of slums.

2.5.4 Demolition and relocation
This is most sensitive issue in the street-led slum upgrading. This process entails demolition of all the structures that occupy the land designated for the street upgrading. Having the community involved from the beginning makes the process easier as they tend to understand the importance of the project i.e. Demolition in exchange of improved living standards, investment opportunities, improved accessibility as well integration into the city system.

For smooth transition, the relocation plan should be prepared before the project commences. The proximity of the new location is vital to prevent adverse impacts on social networks and livelihoods of residents (UNHABITAT, 2012). This is because it breaks social ties that existed in the slum settlement. Most of the slum dwellers do not have security of tenure. This does not mean that they do not have right of compensation. Different forms of compensations and swap of locations in exchange for better and secure housing should be put on the table while designing and approving the area-based plan with its street layout pattern (UN HABITAT, 2012).

2.5.5 Infrastructure and amenities
Slums that were previously neglected by public service providers (water, sanitation, garbage collection, drainage, etc.). The constitutions (2010) justify the reason to break the cycle of inequality in the slum settlement since every citizen has the right to access these facilities. Upgrading of the street and neglecting the utilities eventually affects economic prosperity of the area. Laying down of these facilities long after the street has been upgraded tend to be more expensive than the initial installation. Infrastructure and amenities upgrading should therefore hand in hand with the street upgrading.
2.5.6. Tenure security
This aims at facilitating land ownership for the slum dwellers. Most of the land occupied by slums is owned by the Government and hence the fears of eviction. However, the constitution allows for any land occupant to demand full tenure upon using the same land for a period of 10 years without payment of any rent or rates. In Kenya, tenure security has been a big challenge as both the land lords and the tenants demand a piece of land in the settlement. This hinders regularization.

Street upgrading defines the future of legalization and regularization of land tenure which is the transformation of informal settlement to formal neighbourhoods. This approach creates planned framework for incremental development through which the settlements and local practices regarding land use and building will gradually adapt to those governing city planning and management (UNHABITAT, 2012). Many a times, this goal of land regularization is not achieved due to the long and expensive process involved. For this reason, street form pillars for collective ownership as it marks the boundary clearly. In this case, enumeration data is very important as only the residents within that area and given the right of communal ownership.

In some slums, the community is involved in demarcation boundaries of each individual within the settlement. Upon regularization, the local authorities are able to obtain a cadaster which help in capturing property tax and user tariffs on public infrastructure provisions such as garbage collection, public lighting etc.

2.5.7 Management and maintenance
This is the post-upgrading phase. It ensures that the project continues to deliver the desired outcome that were expected by the community from the beginning which include economic impact and urban transformation. Lack of proper maintenance of the street leads to wastage of resources. This means that this phase should be clearly be drawn from the beginning of the project. Management and maintenance in this approach entails:
Repairs of streets, public spaces, squares, parks and leisure areas that have been introduced as part of the slum upgrading plan. Authorities in charge such as City councils, county government, Highway authorities should be clearly be listed and responsibilities allocated to each listed. The
community who are the primary beneficiary of the street also play a great role in management and maintenance of the street. It is therefore important to involve them in the project.

The figure below shows street-led slum upgrading approach:

**Figure 4 Process of street-led slum upgrading**

Source: UNHABITAT, 2012

### 2.6 Legal, Policy and Institutional Framework

Policy approaches to slums in some cities are the same as they were over 100 years ago. For example, slum eviction and clearance in 19th century European cities is still practiced in some Places today. Clear changes in the accepted wisdom of how to best deal with slums have occurred and resulted in changes to policy approaches, but many ‘old’ approaches continue to be in practice today (UNHSP, 2003).

There is a complex set of legislation, polices and guidance applying to the design of streets. There is a tendency among some designers and approving authorities to treat design guidance as hard and fast rules because of the mistaken assumption that to do otherwise would be illegal or
counter to a stringent policy. This approach is wrong. It restricts innovation, and leads to standardized streets with little sense of place or quality. In fact there is considerable scope for designers and approving authorities to adopt a more flexible approach on many issues. Below are some policy and legislative documents that affect planning and designing for streets in urban areas which can be applied in informal settlements:

2.6.1 Policy Framework

2.6.1.1 Vision 2030
This is the country’s new development blueprint covering the period 2008 to 2030. This Vision aims in transforming Kenya into a newly industrializing middle-income country providing a high quality life to all citizens by year 2030. Provision of infrastructure that include roads, railways, ports, airports, and water and sanitation facilities is not only aimed at promoting accessibility and interconnectivity of places and neighbourhoods but also improve the quality of life of the people.

2.6.1.2 Nairobi Metro 2030
It aims at introducing transport oriented development (TOD) within the Nairobi region. This is expected to be achieved through functional integration of land of land use and transport through the creation of compact, walkable, mixed use communities within walking distance of transit station. The principles entails:

a) Making the pedestrian the focus of the development strategy without excluding the car.
b) Create active and places and livable communities that service daily needs
c) Incorporate retail into the development if it is a viable use at the location without the transit component, ideally drawing customers both from the TOD and a major street.
d) Introduce creative parking strategies rather than divide the site and reduce the sense of auto domination.

Ensure compatibility and connectivity with the surrounding neighbourhoods

2.6.1.3 Integrated Kenya National Transport Draft Policy (2009)
The policy points out that the road transport sector’s main aim is to provide an integrated, efficient, reliable and sustainable road transport infrastructure that meets national and regional passenger and freight transport goals and supports the government’s socio-economic development strategies to promote accessibility to services and the safe movement of people and goods, while being environmentally and economically sustainable. Collector streets being one of
the road hierarchy need to consider the above in the design elements especially based on the fact that they are located mainly in residential areas.

2.6.1.4 Millennium Development Goal (MDG Goal 7)
This was established in September 2000, where World leaders met at the United Nations Millennium Summit to establish a series of goals for humanity in the 21st century. The summit resulted in the ratification of the Millennium Declaration and the Millennium Development Goals (MDGs).

Of the interest of this study is Goal 7. This goal aims at integrating the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. This means that street designs solution need to be sustainable. This goal also aimed at achieving significant improvement in the lives of at least 100 million slum dwellers by 2020. Street upgrading in the informal settlement is one of the major project that will see the improvement of livelihood in slums based on the multifunctional roles played by the street in the informal settlement.

2.6.2 The Legal Framework
2.6.2.1 The Constitution of Kenya (2010)
The Constitution of Kenya, 2010 outlines that every person including persons with any disability has the right to equity, reasonable access to all places, public transport and information. Therefore, it is important to ensure that this fundamental right are practiced in the small town as new developments come out. The development should not marginalize others and leave others to enjoy the fruits of the developments. In the street development, the design solution should be socially responsible to accommodate the needs of the members of the society and mostly women, children and people who are physically challenged.

2.6.2.2 EMCA (1999)
This act aims at promoting safe, clean and healthy environment. Sections (4) and (7) provides for the establishment of environmental conflicts and the national environmental management authority (NEMA) respectively as the institution responsible for the execution of the requirements stipulated in the act in relation to policies related to the environment. In the second schedule, identifies a number of projects for which Environmental Impact Assessment has to be done before their undertakings. Some of these projects are of the transportation category which include bypasses, highways, all roads in scenic, wooded or mountainous areas and wetlands. It
also gives an audit on the expected carbon emission and pollutions expected on the environment as a result of the roads. Street upgrading fall under the transportation sector and hence before the implementation of the street, an EIA must be done.

2.6.2.3 Physical Planning Act (1996)
According to cap 286 section 24(3) of the physical planning act, the main purpose of a local Physical development plan is to guide and coordinate development of infrastructural facilities and services for specific areas. This Act identifies the streets as roads which can either be private or public that allows the passage or movement.

It provides for the development of Local Physical Development Plan which ensures that every planning area provides or reserves adequate land for the construction of streets. The local authorities in consultation with the Director of Physical planning may impose all land owners whose plots are sited to form a terminus feature to a street or may prominently be displayed to comply with the siting, size, height, shape and appearance of such building in order to safeguard, maintain or impose the dignity or preserve the amenity and general appearance of street.

2.6.2.4 County Government Act (2012)
The act has a provision for county authorities, which are given power to formulate with regulations of the integration of economic, physical, social, environmental and spatial planning issues. County planning should harmonize the development of county communication system, infrastructure and related services. The act mandates the county government to do spatial planning and identifying areas where strategic interventions measures are needed. This is done by indicating where public and private land development and infrastructure investment should take place.

2.6.2.5 Urban Areas and Cities Act (2011)
AN ACT of Parliament to give effect to Article 184 of the Constitution; to provide for the, classification, governance and management of urban areas and cities; to provide for the criteria of establishing urban areas, to provide for the principle of governance and participation of residents and for connected purposes. Kibera slums fall within the jurisdiction of Nairobi city. This means that among other things, it must have the following: have traffic control and parking, water and sanitation, street lighting, storm water drainage, local distributor roads. Local
distributor roads have been constructed and Makina Street being one, it should be able to serve the above factors in making the City complete.

2.6.2.8 Traffic (Amendment) Act (2012)

The Act seeks, among other things, to enhance the penalties for various traffic offences in order to deter commission of those offences and consequently minimize loss of lives on Kenyan roads through accidents. Some of the traffic offences are directly linked to traffic congestion and so penalizing the offenders in such respects may also help to control traffic congestions. This Act is very applicable in Makina Street since there has been rise of the number of accidents especially among children as a result of street upgrading.

2.6.3 Institutional framework

The institutions in charge of streets and roads in general include:

2.6.3.1 Ministry of transport and Infrastructure Development

The ministry has the general responsibility of provision and maintenance of roads infrastructure, with the help of Kenya National Highway Authority, Kenya Rural Roads Authority and Kenya Urban Roads Authority. At its capacity as the main player in the road transport, the ministry provides policies and regulations governing the entire transport sector.

2.6.3.2 Ministry of lands and Physical Planning

The physical planning department is mandated with the production of physical development plans. The urban areas as well as the rural areas in the country are facing numerous problems with respect to sustainable space utilization, resources utilization and distribution, poor infrastructure, poverty, declining urban areas and environmental degradation. All these have a direct impact on the well-being of the society and the physical planning department is duty-bound in conjunction with other players to provide solutions to these pressing issues. Being part of an urban area, the ministry has the mandate to oversee developments in Kibera. Street upgrading in Kibera is their jurisdiction so the street are implement in line with the plan to reduce land use conflict.

2.6.3.3 Ministry of planning and devolution

This was the ministry that did the actual implementation of the street in Kibera with the help of NYS. It was their mandate to oversee that the ideal standards of the street in informal settlement are enforced.
2.6.3.4 **Nairobi City County (NCC)**
Empowered to undertake development works relating to urban development, development control, urban renewal activities and the general servicing of the city and its neighbourhoods. Kibera is in the Jurisdiction of NCC. NCC is expected to have plans for all its areas and hence oversee its implementation. It should coordinate development within its area.

2.6.3.5 **Kenya Urban Roads Authority**
Its role is the Management, Development, Rehabilitation and Maintenance of all public roads in the cities and municipalities in Kenya except where those roads are national roads.

2.6.3.6 **Kenya Roads Board**
Its mandate is to oversee the road network in Kenya and thereby coordinate its development, rehabilitation and maintenance and to be the principal adviser to the Government on all matters related thereto.

2.6.3.7 **Traffic Police**
The Traffic Police helps in the management of flow of traffic and in controlling violation of traffic rules.

2.6.3.8 **NEMA**
Under the EMCA of 1999, NEMA is mandated to: coordinate the various environmental activities being carried out by lead experts; promote the integration of environmental concerns into development policies, plans, programs and projects, with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of the quality of human life in Kenya. In the implementation of the street in Kibera, NEMA ought to have provided environmental management principles along the street that will see the not only realize its sustainability but also environmental conservation and management as a whole.

2.8 **CASE STUDIES**

2.8.2 **Korogosho street upgrading**

2.8.2.1 **Introduction**
Korogosho is the slums within the City of Nairobi. It is located 11 kilometers North East of Nairobi CBD, within Nairobi County, Kasarani Constituency and Korogosho Location. It currently covers an area of 1.5 square kilometers which was originally owned by the government. The settlement started in 1960s by the rural migrants to the city. It consists of 7 villages that include Highridge, Grogan, Ngomongo, Githaturu, Kisumu Ndogo, Ngunyum and
Korogosho. The area is overcrowded with temporary structures made of recycled materials. There is no central sewer, piped water and the crime rates are very high.

Street upgrading initiative was done in 2007 by the Government of Italy and Kenya. It was aimed to implement some initial physical changes that would foster trust building with the community members for the preparation of situational analysis for planning purposes. The streets were implemented as quick win projects before the planning was done because planning had to await enumeration and a socio-economic survey (UNHABITAT, 2012). The project was done for a period of two years and the total cost was Ksh 210 million. The Street upgrading project (incl. drainage system, pavements, streetlights, etc. took a total of Ksh 141 million

2.8.2.2 Strategies involved

1. Prioritization of streets to be upgraded- This was done in 2008 by the technical team in conjunction with the community members in the training workshops. The streets that needed upgrading were identified and the supporting infrastructure such as street lighting, drainage systems were identified. The streets were prioritized on the basis that they did not require much relocation and ensured circulation in all 7 villages.

2. Integration and connectivity- The street upgrading aimed at integrating the settlement with the other parts of Nairobi. This was done by opening up the settlement by connecting every village with streets that also linked up with road network connecting the neighbouring estates. Connectivity of the streets increased business activities in the slum as more customers could access the market via the streets. Street upgrading was also seen as a way to regularization of land hence promoting land tenure among the residents in the slum.

3. Implementation- This was the actual implementation of the street. It involved marking of the streets, relocation of the people who settled on the road reserves and the actual street construction. The streets were implemented such that they enhanced opening up the settlement reaching all the villages so that every community member felt the benefits of the upgrading. Some of the streets upgraded include: Kamunde Road, Market Road, Community Lane and Mama Ngendo Road. They cover a total distance of 3.64 kilometers. Other supporting infrastructure such as drainage and street lighting were put in place.
Table 6 the streets upgraded in Korogosho

<table>
<thead>
<tr>
<th>STREETF</th>
<th>LENGHT (km)</th>
<th>ROAD RESERVE (m)</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamunde Road</td>
<td>1.64</td>
<td>18</td>
<td>A</td>
</tr>
<tr>
<td>Market Road</td>
<td>0.9</td>
<td>18</td>
<td>B</td>
</tr>
<tr>
<td>Community Road</td>
<td>0.75</td>
<td>12</td>
<td>C</td>
</tr>
<tr>
<td>Mama Ngendo Road</td>
<td>0.39</td>
<td>12</td>
<td>D</td>
</tr>
</tbody>
</table>

Source: Author’s construct, 2016

The streets being upgraded varied in terms of streetscaping element.

4. Impacts of street Upgrading- The street upgrading process had numerous positive impacts on the area. Streets were interconnected enhancing mobility throughout the settlement even in rainy season. Security in the area increased as a result of installation of street lighting. The streets enhanced more pedestrian flow in the area hence attracting more businesses along the street. The streets became more vibrant at different hours as a result different users and activities. Some parts of the streets attracted different users due to the facilities provided on the street. For instance, Kamunde Road and Market road became the most attractive areas due to provision of shades and other facilities that provided shades for the people relaxing on the street. These street activities have led to numerous conflicts on the street. For instance at peak hours, numerous pedestrians walk to work, school as well as performing their daily chores causing conflicts between vendors and shoppers not forgetting the motorists. It is therefore important to ensure that all these activities are incorporated in the street design. Safety

2.8.2.3 Stakeholders involved

Table 7 Roles of stakeholder’s in Korogosho street upgrading project

<table>
<thead>
<tr>
<th>Role</th>
<th>Stakeholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>• pre-study of the streets to ascertain the</td>
<td>Local Resident Chairman, Secretary, Treasurer and community liaison Committee, Project Surveyor (Ministry of local Government)</td>
</tr>
<tr>
<td>road reserve</td>
<td></td>
</tr>
<tr>
<td>• Identification of structures to be demolished.</td>
<td>Project Quantity Surveyor, (Ministry of Local Government)</td>
</tr>
<tr>
<td>• Identification of profits that would be</td>
<td></td>
</tr>
</tbody>
</table>
realized as a result of street upgrading

- Project Monitoring during implementation- Street Design, Excavation and street construction

project Engineer Programme Management Unit (PMU), (Ministry of Local Government), the Italian Cooperation) through the Programme officer City Council of Nairobi

Source: Author’s construct, 2016

2.8.2.4 Major Findings of the street upgrading

a. Korogocho Has Become More Spatially and Socially Integrated within Nairobi and Mobility inside the Area Has Increased- The upgraded street was connected with the other Nairobi transport network. This made the residents feel included in the Nairobi development strategies.

b. Increased Business Activities and Increased Accessibility and Availability of Everyday Commodities: Business activities became more Vibrant as a result of high pedestrian flow along the street especially in the peak hours. The delivery of goods from suppliers also became easier.

c. Residents’ Perception of Safety Has Improved: The study found that the general perception among residents is that the perceived and experienced safety within Korogosho has improved mainly due to three different aspects; increased activity, the form and design of the streets, and the facilitated mobility in the area (UN-HABITAT, 2012).

d. The Form of the Street Does Not Respond To, or Exploit Options for Different Uses: Street are multifunctional public entities. The study indicates that the streetscape has failed to adequately accommodate the multiple functions, uses and activities that are competing over space in Korogosho. Some of this functions include the cycle ways provision, the recreation aspect of the street.

e. The Modes of Participation in the Planning Process did not respond to All Groups in Korogosho: The implementation of the project lacked a strong community participation. The few representatives chosen were and specific interests as well as political pressures. The outcome was one group favoured while the need of the majority were concealed.
2.8.3 Lessons Learnt from the Street Upgrading Korogosho

The key lessons from this study can underpin street upgrading interventions in slums.

1. **Participation:** Public participation of the stakeholders and mainly the residents is very crucial in street upgrading process. As streets in slum settings are largely residential, participatory methods are the key to finding sustainable solutions to the design and implementation process. Different participation strategies are possible but a vital key is to include residents from all parts of the area, since they tend to use the streets for different purposes. Gender and age are also important to consider, as they use public spaces differently; women and children are more vulnerable to insecure places and children are often the victims in traffic accidents (UN-HABITAT, 2012).

2. **Safety:** The safety of a street has many dimensions. Primarily, streets have to be designed in such a way that they accommodate all users of the street and complicate criminal activities. Widened and paved streets facilitate high speed traffic. Therefore it is important to consider high-risk places where pedestrians are more vulnerable, such as crossings, busy areas, and streets in connection to schools and children activities. Zebra crossings, bumps and traffic division could accommodate protection and slow down motor vehicles. Further, it is important to consider what users will be in the streets - pedestrians, vehicle etc. - to be able to create a design that is secure and successful. Overview and streetlights can generate protection from criminal actions as criminals can be spotted and seen from a distance. An open and clear street also minimizes the number of hideouts used by criminals. Streets as public places increase the amount of people moving on the streets, which also generates protection from criminal activities.

3. **Mobility:** As part of the infrastructure system streets facilitate mobility within the area. Streets function as links between destinations. Good access is crucial for a slum settlement to feel included and connected to a larger context. Main entrances and important places such as markets and hospitals need good access, as they often play an essential role in the daily life for many residents. The designs should accommodate all transport modes in order to avoid conflict.
4. **Liveability:** One of the main roles of streets in slum settlements is its significance as a vibrant public meeting place. The street is the place where democratic processes of the society take place, as well as optional and necessary activities. This function of the streetscape becomes even more important in slum areas where public open space is scarce. A well-organized street has the prospect to accommodate functions which increase the livelihood of an area.

5. **The Existing Social Context:** Is key to develop the design of streets in slum settlements in relation to the situation prior to the design. Through the studying of street patterns in terms of density, attraction points, functions and activities it is possible to understand exciting places and values that are important to preserve. If the street is to accommodate a wide variety of necessary activities and functions it has to be organized in relation to existing social context found on site prior to the layout (UN-HABITAT, 2012).

6. **Flexibility:** As streets in slum settlements make up one of the few open spaces, a large amount of different groups operate on the streets at different times of the day. The streets need to be flexible to satisfy all needs and provide temporary structures as well as permanent ones. In a slum settlement, streets as public spaces tend to accommodate different functions and uses. The edge zones are used for activities such as dwelling, vending, shopping, social interactions, eating, parking and playing. A flexible design could create flexible streets and edge zone. During daytime, when traffic is low, some places could be used as playgrounds or hangouts for residents, if they are provided with shadow and benches. In evening, when the streets are more crowded, this space might be used by vendors and motorcycles.

7. **Maintenance:** Providing long-term maintenance in terms of waste management, cleaning and repairing of the streets in slum settlements can bring resilience. Considering current values and including them in the design can achieve social, economic and environmental sustainability. It is important to think of the street in slum settings as an organism carrying a variety of different functions and values that should be kept in the new design. By changing street patterns, new conceptions and functions are also created that will
change the future for many of the residents. By maintaining, cleaning and repairing the streets those values can be kept and resilience reached.

2.9 Conceptual framework
Figure 5 Conceptual Framework Literature Review

Implication of street upgrading on access and use of space in informal settlements

STAKEHOLDERS INVOLVED
Street vendors, Undugu primary school.
CBOs and NGOs within Silanga
Residents /Households along the street
Chairman of the village
Street users( Pedestrian, cyclist, Children, youth, motorist)

Best Practices/ Case Studies
Dharavi-India
Korogosho-Kenya

Source: Author 2016

CHALLENGES
Low community participation, Lack of safety
Encroached street spaces by street vendors
Intermodal Traffic conflict
Environmental degradation

Effects
Pollution- Solid waste, noise and air
Displacement of some former street users eg. Children
Entrance of new street users e.g. more street vendors
Street space contestation and accidents
Poor street maintenance of the street

INTERVENTIONS
Integrating land use planning with street design
Redesigning streets into multifunctional spaces
Environmental conservation
Integrating NMT into the street design
High Community and stakeholders' participation in redesigning the streets

DESIRED STATE
Usable, accessible, Sustainable and multifunctional streets in Silanga, Kibera

Benefits of great street Spaces
Environmental sustainability
Enhance equity and social inclusion
Improve quality of life
Enhance infrastructural development
Enhance street productivity

Policy Interventions
Vision 2030, Nairobi Metro 2030, Integrated Kenya National Transport Policy, MDG, National development plans, draft urban development policy

Legal Interventions
CONSTITUTION 2010, PPA, UACA, Road Act, Traffic Act, EMCA, CQA, Way Leave Act, Traffic Act, Local Government Act

Institutions
CCN, MLHUD, NEMA, NYS, Ministry of planning and devolution, KURA, KRB, Ministry of transport and infrastructure, traffic police, NEMA
CHAPTER THREE: BACKGROUND OF THE STUDY AREA

3.0 Overview
This chapter presents the general background of the study area. The historical development of Nairobi City, the historical development of Kibera informal settlement, the socio-cultural and the physical characteristics of Silanga informal settlement. The details are presented here below

3.1 Background of the study area
3.1.1 Historical Development of Nairobi
The origin of Nairobi dates back to the year 1898 as a grazing front for Maasai and the Kikuyu. In 1899, a trading centre emerged as a result of the construction and passage of the Kenya Uganda Railway. The moving of the railway headquarters from Mombasa to Nairobi resulted in the subsequent growth of Nairobi as a commercial and business hub of the then British East Africa protectorate (Situma, 1992). As Mwaura (2002) states, the provincial headquarters was moved from Machakos to Nairobi in 1899. In 1903, Nairobi was granted the status of a township. In 1908, it became the official capital of Kenya Protectorate and was granted Municipality status in 1919. It was declared a capital city in 1963 after independence.

By mid 1920s, Nairobi was planned as a settle capital with emphasis being laid on residential zoning strategy, but with racial segregation (Mwaura, 2002). The Europeans comprised of 10% of the population were located in the best areas in the northern and western parts of the town, on 2700 acres (1093ha) or 42% for residential purposes. The Asian community who comprised of 30% of the population settled both in Parklands and Pangani on 300 acres (121.4ha) which is equivalent to 4.7% of the total area for residential use. The Africans, forming 60% of the total population and were mainly the labourers of the white. Initially, they did not have permanent residence and were either accommodated in tents behind railway sheds or were expected to seek accommodation outside the Railway Town in Kileleshwa (Maskini area) and across Nairobi River in Ngara, Kariakor and Pangani areas. Later, they were allocated the land in Pumwani location, an area less than 5% of the total area of Nairobi.
With an aim of trying to bring order and co-ordination in the town, a Master Plan for Nairobi was advocated for. This 1948 Nairobi Master plan was prepared by South African Planners with a neighbourhood concept that emphasized on racial segregation. The Africans were still the biggest victims. The plan advocated for the density for African locations was 30 persons per acre (80 persons per hectare). The neighborhood units were planned such that workers in the industrial area could walk through a distance of at most 2 miles to their work places. The present layout of both the Industrial area and the Road Network is attributed to the 1948 master plan (Mwaura, 2002).


The boundary of Nairobi was extended in 1927 to cover 30 square miles (77km$^2$) as a result mainly of the rapid growth of the urban centre both in terms of population and infrastructure. From 1928 to 1963, this boundary remained the same with only minor additions and excisions taking place. In 1963, the boundary of Nairobi was extended to cover an area of approximately 266 square miles (686km). There have not been any boundary changes since then and is currently Nairobi County.

3.1.2 Historical Development of Kibera
Initially, “Kibra” was bushy place covered partly by forest and empty grasslands that were used by Maasai as grazing grounds. This happened until the colonial period when they were pushed away from Nairobi region. Kibera started as a military exercise grounds. A total area of 4197.9 Acres. The Kibera area was surveyed by the government only in 1917, and gazetted as “Nairobi Military Area” in 1918 (Johan. V, 2011). At that time, majority of the soldiers were Nubians.

In 1947, the Kibera area had shrunk from the original 4198 acres to about 1700 acres as a result of expansion of Nairobi Golf Club from 216 Acres to 429 Acres as well construction of road. This led congestion of settlement though they had enough space. Immediately after the world war 11, The Nairobi Dam was built right followed by railway line to Uganda cutting through
Kibera in 1948 including a small railway station. At the same time, there was high influx of people into Nairobi in search of jobs. Kibera was the best place where they would find cheap accommodation. As Johan. V (2011) points out, 1948 Census suddenly indicated that 1472 of the residents in Kibera were outsiders mainly Kikuyu, Luo and Ugandans. Despite one of the MP Yunis Ali’s effort to table and pass a motion in parliament that would see the clearance of Kibera slum with citizens having full tenure security, the Act was not implemented.

Industrialization in Nairobi led to high influx of people in Nairobi and Kibera was more attractive as the rents were cheaper. With high demand for rooms, the construction of more structures was done to accommodate the people. Kibera is now divided into villages 12 Villages. Each village has its own history and dominant ethnic group. These include: Gatwikira, Kambi Muru, Kianda, Kisumu Ndogo, Laini Saba, Lindi, Makina, Mashimoni, Raila, Silanga, Soweto East and Soweto West. Laini Saba is dominated by Kikuyu owners/inhabitants, with Kamba, Luhya and Luo tenants.

**Map 2 Kibera Villages Map**

![Kibera Villages Map](image)

Source: Author, 2016
3.2 Physical Setting (Regional and Local)

3.2.1 Location

The study site is located Silanga Village which is one of the twelve villages that make up Kibera slum. Administratively, it is located in Silanga Sub-location, Kibera Location and Kibera Division. Politically, Silanga is in Kibera Ward, Lang’ata Sub-county, and Nairobi County. The site lies at 1° 18' S 36° 47’ E to the West and 1° 19’ S 36° 47’ S to the East. It is approximately 7 Km from Nairobi CBD. The village is neighbored by Nairobi Dam to the South, Soweto Village to the East, Laini Saba to the North and Lindi to the west.

Map 3 Locational Context of Kibera in Kenyan Context

Source: Author, 2016
3.3 Physical Environment Characteristic

3.3.1 Topography
This is the arrangement of the natural and artificial physical features of an area.

3.3.1.2 Altitude
This is the height above sea level. The Nairobi County has its topography falling from the edge of rift valley in the west at an elevation of 2300m to 1500m to the east of the city Centre with itself being 1700m (Morgan, 1967).

3.3.1.3 Geology and Soil
Dominant in the study area are phonolites of middle Pliocene rocks. They are found 2-3 feet below the ground. Soils within the area are basically Red Volcanic soils which are 2-3 feet deep in ground. They are fertile and hence support agricultural activities especially along Nairobi Dam. Currently the soils are used by the local residents as an alternative building material.

3.3.1.4 Drainage
The area is gently slopes from North-west to South-East. This facilitates natural flow of storm water into the river and the dam. However, along the upgraded street, there are two concrete drains on each side of approximately 0.6 m. as a result of poor solid management in the site, the local community deposits the solid waste into the drains causing blockage. This has attributed to water-borne diseases to the residents.
3.3 Climatic Characteristics

3.3.1 Temperature
Silanga’s climate doesn’t differ much from the climate of the rest of Nairobi. Nairobi enjoys a moderate climate, classified as subtropical highland climate under the Koppen climate classification. January is the hottest month with average maximum temperatures of 26°C with the average minimum 14°C Daily. June is the coldest month with an average maximum is 24°C with a minimum of 13°C.
3.3.2 Rainfall
The area has a bimodal rainfall pattern in which the long rains occur in March-April while the short rains occur between November and December. The average rainfall amount is 30 inches while the average number of rain-days is 90-100 per year. The wettest month for Nairobi is November with an average of 151.0mm of precipitation falling while the driest month is July with 14.5mm falling. The area, just like any other part of Nairobi, has however a 30% chance of receiving less than 30 inches of rainfall from year to year and a 10% chance of getting less than 20 inches of rain.

3.3.3 Wind Patterns
The winds are predominantly Easterly throughout the year. The wind direction flows from the North-East to East from October-April and between East to South-East in May-October. The average wind speed is 19KM/h throughout the year. In recent years the maximum sustained wind speed has reached 111 km/h, that’s the equivalent of around 69 mph, or 60 knots.
3.3.4 Humidity
The maximum humidity occurs near dawn at the time of minimum temperature, while, the minimum relative humidity will occur during the rainy season. The relative humidity ranges from a daily maximum of 55% in May to minimum of 36% in April.

3.3.5 Sunshine and Solar Radiation
Nairobi experiences a total of about 2500 hours of bright sunshine per annum, which is equivalent to annual mean of approximately 6.65 hours of sunshine per day. July and August are characterized by cloudiness and during these months the average daily sunshine in Nairobi is 4 hours. There is about 30% more sunshine in the afternoon than in the morning and it follows that westerly exposures receive more isolation than easterly ones.

3.3.6 Evaporation
Annual variation of evaporation is expected from consideration of temperature, wind speed, direction and sunshine factors. The peak evaporation periods are during March, followed by January, February and October. The mean annual evaporation is 172mm.

3.3.7 Vegetation
The study area is generally built up with temporary structures in every open space within the settlement. The only vegetation cover in the site is mainly around Nairobi Dam where there are a few planted vegetation mainly herbaceous crops that includes food crops such as, beans maize, vegetables and arrowroots.

3.4 Existing Water Bodies
3.4.1 Nairobi Dam
The Nairobi Dam is located in the southern part of the site. The Dam was constructed in 1953 as a reservoir with storage capacity of 98,000 m$^3$ and surface area of 350,000 m$^2$ (86 acres). Its average Depth is 2.76m. The size has currently reduced due to over encroachment by the local community using the site for house construction. The main inlet is Nairobi River as well as the unsewered storm water from Kibera settlements while the outlet is mainly evaporation and Ngong River. Currently, the dam is characterized with high siltation on which agricultural activities takes place. Due to high pollution of the main Inlet, the water polluted and the Dam has become one of the dumping site of both solid and human waste from the settlement. It is covered
with hyacinth hence preventing any fishing or sailing activities. Efforts to reclaim and rehabilitate the Dam have not been successful.

Plate 2 Photos showing Pollution and Agricultural activities in Nairobi Dam respectively

3.4.2 Rivers
Nairobi River lies within the site and it drains its water to Nairobi dam. It also act as the boundary between Silanga village and Soweto East Village. The river is highly polluted with both grey water from Human settlement, solid waste, and human waste as well over encroachment into the riparian and the space used for house construction. The other river is Ngongo River which is mainly an outlet from Nairobi River. It is on the southern side of Silanga. Based on the fact that its source (Nairobi dam) is polluted, the water is also polluted.

3.4.3 Wetlands
The area around Nairobi dam is marshy and swampy. This is characterized by the kind of vegetation that grows there. The local community use the wetlands to plant crops such as arrowroots.

3.4.4 Environmental Pollution
The study are lies in the largest slum in Africa. The overcrowding of structures and high population is a major contributor to lower environmental quality in the site due to various factors

i. Poor solid waste management- The area is highly congested with structures and is also characterized by high population. The community lack a proper system of solid waste management and hence any unbuilt space within the settlement is used as a dumping site. This includes the open drains and tunnels in which solid waste accumulates causing
blockage. These becomes breeding sites for mosquitoes hence posing high risk of Malaria to the community.

ii. **Water Pollution** - the site has a river on the Eastern Side the settlement and a dam on South-Eastern Side. Due to overpopulation and overcrowding, the community has encroached into the riparian reserves and constructed their structures there. They also throw both solid waste and human waste into the river. Grey water from the settlement is also drained into the river which drains its water into the dam causing the water to black and smelly. This kills the recreation and apathetic factors associated with the river and dam.

iii. **Noise pollution** - The site experience Noise pollution from the railway line as well as the moving vehicles especially along the upgraded street. The vehicles also cause a lot of exhaust fume causing air pollution.

iv. **Air Pollution** - The settlement is characterized by congestion and overcrowding of structures making it poorly ventilated. Some part of the settlement are characterized with bad odours as result of poor solid waste disposal which is left to accumulate on the few open spaces in settlement. Increase in the number of vehicles using the street has also resulted into high air pollution from exhaust fumes.

All the physiographic features described above already influence or may influence planning and development as follows:
Table 8 Influence of Physiographic feature on Planning and Development

- The average rainfall amount of 30 inches and the average number of rain-days at 90-100 per year.
- The average volume of flow at 5 to 8 cusecs for 7 to 9 months of the year rising to peaks of 30 to 60 cusecs in April and May
- The mean direction of prevailing wind within the corridor being Easterly with 19KM/h
- The dominance of red volcanic soils (which are 2-3 feet deep) in most parts of the site.
- The river and Nairobi dam (which are highly polluted) forming the Eastern and southern boundaries of the corridor respectively.

- These are to be considered in planning for drainage systems in the area
- This is crucial in the orientation of building openings
- This will be considered when determining the building densities allowable.
- This raises matters of environmental conservation even as the built environment is altered to meet the demand for various facilities.

Source: Author’s construct, 2016

3.5 Population and Demographic Characteristics

3.5.1 Population Size and Density

Kibera is the largest in Africa. However, the population figures are ambiguous with every institution having a different figure. The preliminary results of the most recent survey, done by MSF-Belgium in May 2009 indicated the population of Kibera as between 201,000 and 244,000 which is a lower figure than the KBS Census in the same year. The report also indicated that the average number of persons per room is 2.9 persons. According to KENSUP (2010), there is a big difference between Kibera’s daytime and nighttime population, and many of the ‘cousins and friends’ that sleep all over Kibera without any regular or fixed home, may not have been included in the above mentioned surveys and low population estimates.

However, the population collected from KENSUP and the provincial statistics officer in 2012 are as indicated in the table below.
Table 9 Population Statistics of Kibera

<table>
<thead>
<tr>
<th>Village</th>
<th>No. of Structures</th>
<th>Population estimates</th>
<th>Estimated Area (Ha)</th>
<th>Population Density per Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gatwekera</td>
<td>2217</td>
<td>55425</td>
<td>28.55</td>
<td>1940</td>
</tr>
<tr>
<td>Kambimuru</td>
<td>424</td>
<td>10600</td>
<td>7.758</td>
<td>1366</td>
</tr>
<tr>
<td>Kianda</td>
<td>1344</td>
<td>33600</td>
<td>15.764</td>
<td>2131</td>
</tr>
<tr>
<td>Kisumu Ndogo</td>
<td>1105</td>
<td>27625</td>
<td>16.987</td>
<td>1626</td>
</tr>
<tr>
<td>Laini Saba</td>
<td>2130</td>
<td>53250</td>
<td>23.682</td>
<td>2248</td>
</tr>
<tr>
<td>Lindi</td>
<td>1818</td>
<td>45450</td>
<td>26.213</td>
<td>1733</td>
</tr>
<tr>
<td>Makina</td>
<td>2769</td>
<td>69225</td>
<td>42.666</td>
<td>1622</td>
</tr>
<tr>
<td>Mashimoni</td>
<td>905</td>
<td>22625</td>
<td>12.159</td>
<td>1860</td>
</tr>
<tr>
<td>Raila</td>
<td>914</td>
<td>22850</td>
<td>7.797</td>
<td>2930</td>
</tr>
<tr>
<td><strong>Silanga</strong></td>
<td><strong>1730</strong></td>
<td><strong>43250</strong></td>
<td><strong>22.445</strong></td>
<td><strong>1926</strong></td>
</tr>
<tr>
<td>Soweto East</td>
<td>2149</td>
<td>53725</td>
<td>21.379</td>
<td>2512</td>
</tr>
<tr>
<td>Soweto West</td>
<td>622</td>
<td>15550</td>
<td>7.088</td>
<td>2193</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>18132</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The table below indicates Silanga’s population data as per 2009 housing and population Census data.

Table 10 Population Data of Silanga

<table>
<thead>
<tr>
<th>Village</th>
<th>Total population</th>
<th>Households</th>
<th>Area is Sq.Km</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silanga</td>
<td>17,363</td>
<td>6,164</td>
<td>0.2</td>
<td>71,072</td>
</tr>
</tbody>
</table>

Source: Adapted from KBS (2009) and compiled by author, 2016
3.5.2 Cultural Dynamics
Initially the local culture was Nubian Culture. Some of the names within the settlement originated from the Nubis. They carried out their traditional cultural activities and never allowed other Non-Nubi to participate. However, with influx into Kibera, more ethnic groups came in and as a result of intermarriages, the original Nubian Cultures depleted and people became more urbanized. The Kinubi language gradually incorporated more Swahili words and was, in the younger generation, often even replaced by Swahili (Johan.V, 2011).

![Ethnic Composition in Kibera](image)

**Source: Umande Trust, 2007**
Traditionally, Nubians were farmers mainly undertaking agriculture and livestock keeping. With time, as a result of overpopulation, the need for more land for human settlement was needed and hence eventually agricultural activities stopped. Some of the original names also disappeared. Each village currently has a dominant ethnic tribe though all the tribes are represented. In Silanga, majority of the residents are Kikuyus.

3.6 Infrastructural Utilities and Community Facilities
3.6.1 Infrastructural Utilities
The area is connected to Electricity. Except for the few structures along the Makina street which have legal connections, the other structures have illegal connections. Despite legal connection, households prefer to use illegal electricity to escape paying the bills. There is piped water though not connected into individual plots. There are several water points within the settlement and the local residents buy 10 Ksh per 20 Litres jerry can. There is no sewer line in the settlement. There are several VIP toilets mainly constructed by the NYS which the community pay 5 Ksh to use. There are a few incidences of Flying toilets as well as bush. There are two concrete drains along the upgraded street that drains storm water into the Nairobi River. It is open and mainly filled with solid waste which cause blockage.
3.6.2 Community Facilities

There are several community facilities within the settlement. These include schools, churches, NGOs, Health centers, police post. Primary school include: Undugu primary, Soweto Baptist Academy, Green Card Academy and Jesus Transformation Academy. The secondary schools include: P.C.E.A High School, St Mary’s Academy. Churches include P.C.E.A, Baptist and Jesus Transformation Church. NGOs include: Green Card Mtaani and Lisha Toto. The site also holds Silanga Police post, NYS ablution block as well as Beyond Zero Clinic. The commercial facilities are mainly small shops which within the same room occupied by the shop owners. Most of them are located along the street. There many vendors along the street who include food vendors, green groceries, and fruit vendors.
Figure 9 Illustration to show some of the community facilities in the study area

**COMMUNITY FACILITIES**

These are facilities include churches, schools, police post, institutions, clinic and recreational grounds. All these facilities are accessed using the Makina Street. Being the among the activity nodes in the area, the community facilities have great impact on the functionality of the street activities.

Abution Block—Constructed by the NYS for the community. Has toilet and hot shower bathrooms connected to sewer. The people are charged Ksh 5 for use.

Community Health Clinic—Introduced through the Beyond Zero campaign aimed at reducing maternal deaths. It provides free prenatal and postnatal clinics for women and children including laboratory services.

Njanga primary School playing Ground is the main open space in the area. Lack of open spaces in the area makes the local community to use the play ground for recreation during the weekends.

Njanga Police Post—This is an initiative by the NYS to beef up security in the area. The police officers maintain law and order in the area.

Unduga primary school—It is a public primary school with classes from pre-primary to class 8. Other schools in the site include: Soweto Baptist Academy, Green Card Academy, Jesus Transformation Academy, P.C.E.A High School, St Mary’s Academy.

Source: Author, 2016
3.7 Neighbourhood Analysis

3.7.1 Patterns of Development
From the establishment of the settlement, the development took a clustered kind of pattern with each clan having its own village. With high influx of other communities and high natural population growth rate, the demand for more settlement increased. The result was development of structures in any unbuilt space available without any order to some extent leaving no space for access and recreation. This formed the organic kind of urban development.

Map 5 Organic pattern of development

Source: Author, 2016

3.7.2 Views and streetscape
Street character is established by the width of street, regular or irregular patterns of buildings facing the street and the design feature of the street such as street lighting, furniture, paving etc. Before the street was upgraded, the street scape was of irregular width ranging from 1-3 meters, it was earthen, and the structures on the street were dilapidated and irregular. No street light or furniture were provided. The existing streetscape is approximately 12m wide. However, poor development control has led to encroachment of structures on the street narrowing the street and making the streetscape irregular. There has not been much change on the building abutting the street as they are still construct temporary structures due to lack of tenure. However, there are few instances of permanent structures.
3.7.3 Activity Nodes

This is focusing on major sections of the study area with major activities and contributing to heavy movement on the street. Patterns and location of existing activity nodes is useful in guiding the location of the future activity nodes either as expansion of the existing nodes or
creation of entirely new ones. Currently, the major activity nodes destinations include: school, church, NGO, Police Post, clinic, toilet and business.

Map 6 Activity Nodes in Silanga

Source: Author, 2016

3.7.4 Architectural Character
The site is basically a slum and is characterized by informal temporary structures that are overcrowded. The buildings are mainly low-rise row temporary structures with 5-10 rooms. The building materials are mainly mud-walled, earthen Floors and corrugated iron sheets. However, along the upgraded street, permanent structures are mushrooming. The development is mainly horizontal but there are few highrise temporary structures made of iron sheets especially along the street. The houses are built closely together leaving narrow irregular paths for accessibility.
3.8 Land Ownership and Control

3.8.1 Land Tenure and property ownership
Land is still a sensitive issue in Kibera since the beginning of the settlement. The land belongs to the Government and it’s under Nairobi City County. The residents lack secure tenure and they have fears of evictions from the settlement any time. However, there exist landlords who were either the initial inhabitants of the settlement or allocated the land by the chief or village elders. They have built temporary rental structures, which is their main source of income. Lack of secure tenure is the reason behind construction of temporary structures. Efforts to give tenure have failed partly because both the landlords and the tenants claim equal share of the land.

3.8.2 Previous Planning effort
Since the establishment of the settlement, there has not been a formal zoning and land use plan for the settlement. For this reason, there is no existing design guideline to help in development control of the settlement. At some point, the government restricted construction of more structures but the local chief would allow the community at a fee. The locals undertake any kind of development on the available land which has resulted to incompatible land uses being located together. This clearly depicts the need to have a plan for the settlement.

3.8.3 Land use types
The main land use type of the study area is high density, low-rise, residential. Other land use types include educational, public purpose, transport and recreation. It is important to note that the few structures used for commercial activities during the day are the residential structures at night. High demand for residential land due to high population growth rate has resulted to
absence of open spaces in the settlement. There is no proper land use allocation and location and hence there are many instances of land use conflict due to incompatibility.

Map 7  Map showing existing land use map

3.9 Governance
The governance structure of Silanga can be classified into two:

3.9.1 Political Structure
The political structure constitutes of the County Governor, County Senator, Member of National Assembly, County Women Representative and Member of County Assembly. The site lies in Nairobi County, Lang’ata Constituency, Kibera Ward and Silanga Village. These office bearers serve for a period of 5 years as stated in the constitution after which their seats are open for contestation through elections. At the village level, there are opinion leaders who are appointed by the politicians to represent the people in political matters.
3.9.2 Administrative structure
This structure is anchored on the national government system and comprises of the: County Commissioner, District Officer, Chief, Sub-chief, and Village chairman / chairlady and youth Leaders. The study area is under a sub-chief who works closely with the village chairman. The Sub-chief is a representative of the office of the president and his roles entails solving disputes as well as ensure that law and order is maintained for peaceful co-existence. The village chairman roles include conflict resolution, community mobilization and sensitization, management of the village affairs such as Nyumba Kumi initiative as well as monitoring the NYS casual labourers etc. There civil society representation mainly from the local NGOs such Muungano wa Wanavijiji who are actively involved in settlement upgrading projects such enumeration, mapping and planning exercises.
CHAPTER FOUR: FINDINGS AND ANALYSIS

4.0 Overview
This chapter elaborates on the findings of the study in response to the questions that the researcher endeavored to dig deep into. Basically it expounds on the effects of street upgrading on access and use of street space by various users in Silanga, Kibera. The findings are further analyzed to enable a deeper comprehension of the nature of problem under inquiry. The analysis further makes it possible to think of and articulate the planning implications of the findings which when well spelt out, it becomes possible to provide appropriate planning policy recommendations.

4.1 NYS upgrading criteria
4.1.1 Upgrading process and project
This program was launched in 2014 with Kibera being the first beneficiary as it is the largest slum in the country. This aimed at improving the livelihood of the slum dwellers who have for a long time been neglected and received little attention in terms of developments. This was to be done by improving the sanitation standards through: clean-up exercises, construction of abolition blocks connected the sewer, construction of police post to enhance security measures and establishment of Beyond Zero (Maternal clinic) clinics. To enhance, slum connectivity and accessibility, access road of 3.5 Km linking the settlement with Kibera drive and Mbagathi way was constructed and tarmacked. Some parts had flood lights as well as street light installed to enhance security of the settlement.

4.1.2 Eviction and relocation
In order to pave way for this infrastructural improvement projects, there was need to create space in the congested slum. The NYS presumed that there was free open space that these developments would take place which was not the reality on the ground. Being Governments land, there is not a single existing plan for the settlement. For this reason, no land could be regarded as public land for such development or way leave / road reserve to pave room for road construction. A series of evictions and conflict between hired NYS cohorts and local community members ensued. The community members were not informed and neither were their political and local leaders. The community members just received eviction notices from Nairobi City County and surprisingly, the NYS did not have a relocation or compensation plan for the affected families. This led to conflicts between the community members and the NYS officials. In some
parts like Mashimoni, the community rejected the development. In the implementation process, the soil from the excavation process was deposited in Undugu primary school which affected the learning activities. At that time, the field was too dusty for children to play and afterwards, the NYS did not level the playground. One of the classrooms currently is halfway buried by the soil. This also affected the community members who use the space for recreation especially during weekends.

Plate 4 Photo showing Heap of Soils Deposits in Undugu Primary School

In many cases when the government fails to provide basic services to the people, the local community have a tendency of organizing themselves to offer alternative services which end up being expensive and of poor quality. Before the NYS initiative, there were groups, CBOs and NGOs in Kibera that worked with the community in provision of some services such as toilet, urban farming, clinics and garbage collection. Unfortunately, NYS program did not incorporate the already existing service providers in the settlement and hence their efforts were discarded. These groups were some of the main source of income for the residents and hence were forced to seek alternative sources of income though some were incorporated as casual labourers in the NYS program. The sudden stop of the NYS program has led deterioration of the situation in the slum than it was before. Solid waste management has been neglected as the former youth groups which cleaned up the settlement were discouraged. The result is heaps of garbage thrown into the river, street and drains.

Field survey indicate that there was minimal consultation and stakeholders’ involvement in this program. Only 10% of the respondents interviewed were involved in the implementation of this
program. Employing local youth for the NYS project as laborers does not necessarily amount to community participation but rather can be viewed as tokenism youth development. This has contributed to low ownership and poor maintenance of the street and other development in the settlement

4.2 Changes on the street

4.2.1 Size
This is the one of the most visible changes on the street. Initially, the street was narrow and irregular as result of haphazard encroachment of structures into the street space. In some areas, the street was as narrow as one meter while the maximum size before upgrading was 4 meters. This made it very hard for vehicles to navigate their way through the slum. The current street size is 12 meters which constitutes of 2 lanes of 3 meters each, storm water drainage of 1 meter on each side of the street and the rest is used for infrastructure utilities. However, this is not uniform in across the study area due to lack of development control framework. In some parts, structures mainly the ones used for business have already encroached into the street space. Street vendors in turn have placed their temporary structures along the street reducing the carriage way. This causes heavy traffic conflict among the motorist.

Source: Author, 2016
4.2.2 Paving materials
The street was initially earthen and in some parts marram. This made it very inaccessible especially during the rainy season and very dusty during hit season. Currently the street is tarmacked and hence very accessible and usable in all seasons.

4.2.3 Development of other community facility
Before the street was upgraded, the development of community facilities in the settlement was very low. This was mainly attributed to poor accessibility of the facilities which reduced its efficiency. With street upgrading several community facilities including institutions have mushroomed in the study area. The street is well connected with other streets and with the transport fabric of Nairobi and making facilities accessible to both users and workers.
4.2.4 Safety on mobility-walking, cycling and driving

This is the state of being certain that adverse effects will not be caused by some agent under defined conditions. The respondents were asked about their safety level when using the streets for different activities. Safety level was measured by the frequency of lack of/reduced safety when using the street spaces by respondents as well as occurrence of accidents on the upgraded street. 80% of drivers experienced safety when using the upgraded street and they attributed this to tarmackinng and connectivity of the street with other transport corridor in Nairobi. However 60% of the cyclist and 70% of the pedestrians felt unsafe when using the upgraded street. As illustrated in the figure below, the safety levels among the pedestrian and cyclist reduced by 50% and 30% respectively when using the upgraded street as there has been incidences of accidents. The upgraded street was designed mainly to accommodate motor vehicles excluding the cyclist. Encroachment of pedestrian walk way by street vendors has pushed the pedestrians into the carriage way meant for vehicles causing numerous traffic conflict. The vehicles move at high speed and the street lack signage to warn the drivers on major community facilities such as schools along the street hence posing risk of accidents to school going children. The street lack designated pedestrian crossing hence exposing the pedestrians to high risk of accidents when crossing the street. Additionally, there is a sharp steep corner near Undugu primary school that has a number of accidents occurring.
4.3 The nature of access and use of the street in Silanga

4.3.1 Accessibility
Street upgrading in the informal settlement brings numerous changes on how the street is accessed and used. This may affect how a community function and relate. This forms the basis of the need to plan street rather than engineering them. Accessibility can be view in terms of Physical Access, Regulation in accessing the street, user conflict, Space availability and affordability.

4.3.1.1 Physical access
The researcher sought to find out the ability of Silanga residents to physically access and use the street space. From field survey, 90% of motorist are able to access and use the street space unlike 20% who accessed the street previously. The 70% increase is attributed to improved paving materials, proper alignment and increase in size. The street design is mainly for cars and hence encouraging a lot of motorist to use the street. The use and accessibility by pedestrians, children, youth and cyclist have reduced by 10%, 50%, 30% and 40% respectively mainly as a result of reduced safety in using the street. Street space contestation is attributed to lack of provision cycle lanes for cyclist and encroachment of pedestrian walkways by the street vendors causing congestions on the street. The study area is currently more accessible than it was before the
upgrading. This is attributed to the street connectivity to other street networks connecting neighbouring estates. The study area can be accessed from Mbagathi Way via Nyayo Highrise Estate and from Kibera Drive via Makina Street and from Kibera Drive via Laini Saba. There is no street network within the settlement and hence pedestrians, cyclist, youth and children access the street directly from the abounding buildings.

Map 8 Site Accessibility Map

Source: Author, 2016

Figure 13 Accessibility and use of street space

Source: Author, 2016
4.3.1.2 Regulatory
The respondents were asked if there were any restriction in using and accessing street spaces. Before the street was upgraded, the street was partially private. The landlords whose structures were abutting the streets controlled the street. They regulated the vendors who undertook business outside their plots. However, the street was open to all residents for other uses which included recreations, mobility and social interaction. Upon street upgrading, the street became more public and the structure owners do not control the number of businesses along the street. This explains why there is 20% increase in use and accessibility of street space by vendors after upgrading.

4.4 Nature of Street Uses
This focuses on different users and different activities undertaken on the street.

4.4.1 Traffic Level
In determining the number of users using the street, the researcher conducted a traffic count at two points, i.e. entry and exit of the study area. The count was done at three different time’s i.e. morning, midday and evening for five minutes each. The researcher surveyed people considering the gender, age and vehicles based on the type and pedestrians. The total flow is as indicated in the table below:

Table 11 Traffic levels along the Street

<table>
<thead>
<tr>
<th>Type</th>
<th>7:00-8:00 Am</th>
<th>12:00-1:00 Pm</th>
<th>5:00-6:00Pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>40</td>
<td>50</td>
<td>76</td>
</tr>
<tr>
<td>Men</td>
<td>40</td>
<td>20</td>
<td>56</td>
</tr>
<tr>
<td>Children</td>
<td>42</td>
<td>20</td>
<td>74</td>
</tr>
<tr>
<td>Motorbikes</td>
<td>7</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Bicycles</td>
<td>6</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Car</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Matatu</td>
<td>15</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: Author, 2016

4.4.2 Street User Categories
There are various street user categories in Silanga. They include Pedestrians, motorist, cyclist, children, vendors, youth and women.
4.4.2.1 Pedestrians
Pedestrians are the most important street users. This is because everyone is a pedestrian before they drive, cycle, shop, interact, and relax on the street. They make the street vibrant and hence their needs in the design should be prioritized. In the case of Silanga, pedestrians make the largest number among other street users. This constitutes of people (men, women and children) walking/ strolling along the street on their way to their destination which is mainly work, school and church. Peak hours for the pedestrians are: 6:00 Pm-8:00 Pm, 12:30-2:00 Pm and 4:00Pm-8:00Pm. From the traffic survey conducted by the researcher, the total number of pedestrians on the street were 122, 90 and 206 at 7:00-800 Am, 12:00-1:00 Pm and 5:00-600 Pm respectively. Lack of provision for walk ways cause heavy traffic conflict with the other street users.

4.4.2.2 Cyclist
These are people who use two wheeled bicycles either for mobility or for recreation purposes. Mainly, the bicycle users use the street when supplying or delivering goods to business premises. The highest number of cyclist is mainly at peak hours, i.e. morning and evening. The total number of cyclist using the street between 7:00-800 Am, 12:00-1:00 Pm and 5:00-600 Pm were 6, 4 and 15 respectively. The street does not provide cycle lanes and hence the cyclist use the carriage way together with other vehicle. The number of cyclist using the street has reduced due to safety concerns. This has forced most cyclist to use public transport for mobility.

4.4.2.3 Motorist
This constitutes of both public cars, private cars and two wheeled motorcycle. Public cars are mainly for public transport and their number increases at the peak hours as they come to pick and drop passengers. There is no provision of bus station/terminus on the street and hence use some part of the street as the turning point reducing carriage way and hence causing heavy traffic in the evening. From traffic count conducted between 7:00-800 Am, 12:00-1:00 Pm and 5:00-600 Pm, the total number of vehicles that 15, 4 and 26 respectively. Private cars are mainly for the suppliers who supply goods to the business premises. There is no provision of parking spaces and therefore park on the street for long duration interfering with the traffic flow. Motorcycles have increased in number since the upgrading of the street. The motorbikes are at 7:00-800 Am, 12:00-1:00 Pm and 5:00-600 Pm were 6, 4 and 15 respectively.
4.4.2.4 Vendors
These constitute of temporary informal business along the street. They include green grocers, shoe makers, food vendors and hawkers. Usually, they open their business at peak hours to target most customers. Despite the fact that this vending contributes a lot into the economy of the residents, the vendors encroach the street space on both sides by placing their tables and commodities on the street. This reduces the street space and hence the pedestrians and cyclist are pushed further into carriage way causing conflict with the moving cars. It can be said that vendors are the highest contributor of congestion in street in Silanga.

4.4.2.5 Children
This is a street user category that needs street space for both mobility and recreation. Lack of open spaces in the settlement has forced the children to use the street as an alternative playing ground. However, due to congestion and the risk of accidents that has caused high number children’s death, the number playing on the street has reduced drastically. During the weekends, they are allowed to use the Undugu primary school ground for their recreational activities. The study areas holds 5 schools and the children use the street from home to school. From traffic count, the total number of children using the street were 42, 20 74 between 7:00-800 Am, 12:00-1:00 Pm and 5:00-600 Pm respectively. The highest number of children is in the morning on their way to school and evening on their way home. The street lack signage for schools and pedestrian crossing and hence motorist are not warned of the children crossing. This has resulted into high number of accidents.

4.4.2.6 Youth
The youth mainly use the street for social interaction. This is where they meet their friends and share ideas which contributes to social cohesion among the community members. In some instances, they skate on the street though this is a rare occurrence as a result of high conflict. According to Kibera Statistics, 50% of the youth are unemployed and this idleness is what result to high demand for space for social interaction on the street.

4.4.2.6 Women
Women are major street space users. They mainly use the street for shopping for their households and holding their women self-help groups meetings. As a result of congestion on the street, the women have been displaced and hence use the Undugu primary school ground to hold their meetings where they have to pay a Ksh 200 to use the space. 60% of women respondents’
concern with regard to street space use is the rising number of accidents on the street. This has forced them to use the go pick their children from school which never used to happen before the street was upgraded. The other concern is the poor drainage as a result of accumulation solid waste in the drains provided. This has resulted to high spread of diseases such as malaria and cholera which affects their family in great way.

4.4.3 Use of space
About 60% of the respondents claimed that the street is not user friendly. Like stated above, the street design is mainly biased on motorized transport. It failed to articulate the role of street as a public space in the slum. For this reason, there is increased user conflict due to contestation of street space. This conflict has resulted into reduced safety on the street and the result is some users being displaced from the street. Limited number of open spaces in the settlement made the former street as an alternative playground for children. After upgrading, the recreational aspect of the street is incompatible with the mobility and economic aspect. This has reduced street accessibility especially for the children. The displacement of some users from the street has reduced the number of activities.

The principle of universal accessibility stipulates that urban spaces should be suitable for all age groups and gender. If street spaces are adaptable for the most vulnerable users such as women, children, disabled and elderly, then they will be suitable for everybody. Universal accessibility promotes wider social inclusion and invites everybody to profit from the urban experience. Space availability is the major contributor of street accessibility. The upgraded street only provides space for motorist. Pedestrians, cyclist and disabled lack space provision. This forces them to use the carriage way together with the vehicles. The only available space on the street has been encroached on by street vendors and hence the community lack space to undertake their social activities. The main victim of space contestation are the children, women and the disabled. This has reduced street accessibility hence reduced vibrancy of the street.

4.3.5 Street Activities
Makina Street like other streets in the informal settlement are multifunctional spaces which play vital roles in the settlements. This is indicated by the kind of activities that takes place on the street. They include: Mobility, Recreation, democracy, business, and social interaction. The following table summarizes street activities:
### Table 12 Street Activities and category of Users

<table>
<thead>
<tr>
<th>Street Activity</th>
<th>Sub-categories</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>Cyclist-cycle</td>
<td>All community members</td>
</tr>
<tr>
<td></td>
<td>Motorist- Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pedestrians-Walk</td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td>Playing</td>
<td>Children and youth</td>
</tr>
<tr>
<td></td>
<td>Strolling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sitting</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>Hawkers</td>
<td>Men, women</td>
</tr>
<tr>
<td></td>
<td>Vendors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>shops</td>
<td></td>
</tr>
<tr>
<td>Democracy</td>
<td>Chief Baraza</td>
<td>Churches, politicians, local</td>
</tr>
<tr>
<td></td>
<td>Political meetings</td>
<td>community</td>
</tr>
<tr>
<td></td>
<td>Religious functions</td>
<td></td>
</tr>
<tr>
<td>Social interaction</td>
<td>Informal meetings</td>
<td>Women and youth</td>
</tr>
</tbody>
</table>

Source: Author, 2016

Field survey indicated that all the community members (100% of the residents) use the street for mobility. However, some have changed their modes of travel e.g from walking to car mainly using public transport. Business activities have increased by 20% which is mainly attributed by opening up of more sops along the streets as well as increase in the number of street vendors. This is because there is high market for goods due to heavy flow of pedestrians along the street especially during peak hours. Recreational activities which were mainly undertaken by children on the street have reduced by 60%. This is due to congestion of the street by both street vendors and pedestrians. The street is also unsafe for children as many have lost their lives due to accidents. Social functions of the streets have also reduced by 40% and this is attributed to lack of social spaces on the street. The following chart gives a summary of the street uses before and after upgrading.
Figure 14 Street Uses before and After Upgrading

Source: Author, 2016
Figure 15 Pictorial analysis of street activities

**STREET ACTIVITIES**

The main activities along the street include mobility, social interaction, recreation, religious functions, economic activities and meetings. The main street users include women, youth and children, cyclist, motorist.

**Existing Land Use Map**

- **Women group meeting along the street near Mthanga Police post.**
- **Economic Activities. Street Vending along the street due to.**
- **Social Interaction- Youth chatting on the street. No provision of street furniture.**
- **Religious Function- A group of Christians dancing on the street as onlookers observe.**
- **Mobility- The street is used for mobility by pedestrians, cyclists, motorists, cars.**
- **Fixed shop along the streets. Economic activities thriving due to high pedestrian flow.**
- **Children playing on the street. Lack of open spaces in the area makes them use the street as play space.**
- **Public Transport- The street accommodates public transport.**
- **On street parking. Off loading goods for the business premises along the street.**

Source: Authors Construct, 2016
Figure 16: Problems caused by Street Activities

Solid waste disposal on the street. Dilapidated street scape due to aged temporary structures.

Entrance to Undugu primary, Beyond Zero clinic, NYS Abolition block, Green Card Academy, Green Card Mbaani - No signage on the street and pedestrian crossing.

No designated bus bay or terminals in the area. The mixture turning point causes numerous conflicts at peak hours among passengers, pedestrians and street vendors.

Street business encroachment into pedestrian walkways hence pushing them into the lanes.

Encroachment of riparian reserve by structures. Water pollution due to solid waste disposal into the river.

No provision of off-street parking. Vehicles park on the street narrowing the carriageway.

Lack of provision of facilities for persons with disabilities.

Mixed Traffic on the street. Pedestrian, motorist, cyclist and carts use the same space leading to numerous conflicts.

Sharp slope near major community facilities. No signage to warn the driver of these facilities. No pedestrian crossing hence being a major block spot on the street.

Source: Authors Construct, 2016
4.4.4 Affordability

This is based on the cost of accessing facilities and services on the street. Street upgrading has resulted to increase in rents and hence the cost of doing business has increased. Before the street was upgraded, the average rent paid per room was Ksh 2500. Currently, the rent is as high as Ksh 8000. This has prevented some business men to relocate to other places where the rents are affordable thus gentrification is a result.

4.4.5 User versus Facility provision Analysis

Table 13 User versus Facility Provision Analysis

<table>
<thead>
<tr>
<th>user versus Facility provision analysis</th>
<th>Standard</th>
<th>Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sidewalk - frontage/building zone,</td>
<td>0.8 m</td>
<td>Existing - Encroached by business temporary structures</td>
</tr>
<tr>
<td>effective walk way/path of travel,</td>
<td>2m</td>
<td>Existing in some part but in others it is encroached by street vendors</td>
</tr>
<tr>
<td>Curb zone/planting zone</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Crossing facilities - Zebra crossing,</td>
<td>In designated area</td>
<td>Not Existing</td>
</tr>
<tr>
<td>stop lines,</td>
<td>In designated area</td>
<td>Not existing</td>
</tr>
<tr>
<td>street lighting,</td>
<td>Regular distribution</td>
<td>Irregular,</td>
</tr>
<tr>
<td>signage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>street furniture - benches,</td>
<td>Benches</td>
<td>Not existing</td>
</tr>
<tr>
<td>Shelter and bus bay,</td>
<td>In designated area</td>
<td>Not existing</td>
</tr>
<tr>
<td>terminus</td>
<td>In designated area</td>
<td>Not existing- just a turning point for Public vehicles</td>
</tr>
<tr>
<td>physically challenged</td>
<td>2m paved</td>
<td>Not existing</td>
</tr>
<tr>
<td>Cyclist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle path/lane</td>
<td>2m</td>
<td>Not existing</td>
</tr>
<tr>
<td>kerb,</td>
<td>1.5</td>
<td>Not existing</td>
</tr>
<tr>
<td>Bike rack placement, signage bike route</td>
<td>In designated area</td>
<td>Not existing</td>
</tr>
<tr>
<td>Item</td>
<td>Existing/Not Existing</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Handcarts</strong></td>
<td>Not existing</td>
<td></td>
</tr>
<tr>
<td><strong>Motorist</strong></td>
<td>Existing</td>
<td></td>
</tr>
<tr>
<td>Lane, 2 Lanes 3m each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>road marking, Separating the road</td>
<td>Not Existing</td>
<td></td>
</tr>
<tr>
<td>Bollards, Along the street</td>
<td>Not Existing</td>
<td></td>
</tr>
<tr>
<td>Signage, Designated areas</td>
<td>Not Existing</td>
<td></td>
</tr>
<tr>
<td>Parking, Designated areas</td>
<td>Not Existing</td>
<td></td>
</tr>
<tr>
<td>speed bumps, Raised crossing,</td>
<td>Not existing</td>
<td></td>
</tr>
<tr>
<td>paving</td>
<td>Uniform paving</td>
<td></td>
</tr>
<tr>
<td>Road delineation</td>
<td>Not existing</td>
<td></td>
</tr>
<tr>
<td>Open side drain</td>
<td>Existing</td>
<td></td>
</tr>
<tr>
<td><strong>Children and youth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skating surfaces</td>
<td>Non Existence</td>
<td></td>
</tr>
<tr>
<td>Space to play benches</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Street Vendors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premises, storage facilities</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>parking spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Women and Youth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street Furniture</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Benches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk ways, 2m</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Shopping areas, Along the street</td>
<td>Available</td>
<td></td>
</tr>
<tr>
<td>Meeting spaces, space</td>
<td>Not available</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author, 2016

4.5 Environmental impacts of the street
This constitutes of solid waste management, storm water drainage, air pollution, noise.

4.5.1 Storm water drainage
Storm water drainage before the street was upgraded was very poor. This was attributed to the fact that there was no drain that channeled the storm water from the settlement hence causing flooding. The channels that existed were earthen and hence could not free flow of water. After street upgrading, storm water drainage has improved due to provision of two concrete drains on
both sides of the streets. However, 30% of the respondent are not satisfied with the storm water drainage because of deposit of solid waste into the drains causing blockage

4.5.2 Air Pollution and Noise
About 50% of the respondents indicated that air pollution is on the rise. This is mainly as a result of motor vehicles on the street which release exhaust fumes into the air. Other cause of air pollution is from solid waste deposited on the streets causing an awful smell in the settlement. Noise within the settlement has increased by 20% and this is a result of moving cars especially public vehicles on the street.

4.5.3 Solid Waste Management
Solid waste is poorly managed in the settlement. This is clearly postulated by heaps of garbage on the street and drains. As shown in the chart below, the solid waste management has reduced by 30% upon the upgrading of the street. Before the NYS started their cleaning up exercise in Kibera, the local youth had organized themselves into groups that collected solid waste from the individual plots from which they earned some income. The settlement was fairly clean. Unfortunately, the NYS program did not incorporate them in the managing of solid waste of the settlement. For this reason, they stopped the exercise and even after the NYS program was terminated by the government, these youth groups are hesitant to continue with the clean-up exercise. The result is heaps of garbage on the street and in the Nairobi River. This is a clear indication that community participation in the upgrading project is very important.

4.5.4 Water pollution
Nairobi River passes through the site. However, just like before the upgrading, the riparian reserve is highly encroached by structures and is still an alternative dumping site for solid waste. The water is black in colour and has an awful smell.

The chart below shows the changes on the environment before and after street upgrading.
4.6 Economic impact

4.6.1 Nature of businesses

The respondents were asked about the nature of their business. From field survey, 92.3% of the businesses in the study site are informal while 7.7% are formal. Informality means that they do not have business permit from the Nairobi City County. 67% of business structures are temporary and 33% are permanent. The types of business include Food vendors, green grocers, shops, fruit vendors, shoes makers, and hawkers. 90% of the business respondents chose Makina Street for their businesses due to high flow of pedestrians who are their main customers. Some of the major challenges faced by vendors include:

i. Lack of shelter preventing business operation during rainy seasons, wind that blow some goods and leaving them dust, sun which causes some goods to wither fast.

ii. Lack of storage facilities for their goods and hence they are forced to buy small quantities of stock which limits the growth potential of the enterprise.

iii. Lack of supporting infrastructure such as clean water for use especially for the food and fruit vendors, Toilet facilities and poor solid waste disposal. This has led to spread of hygiene related diseases such as typhoid and Cholera.
iv. Low safety when operating the business because some of them are located on the carriage way due to lack of space.

The general perception of the residents is that the total amount of business has increased throughout the area. There are several upcoming permanent business structures along the street as well as small scale vending businesses that are mushrooming within the area. This has led to high competition reducing the sale volumes for some businesses.

**Figure 18 Nature of Businesses in Silanga**

Source: Author, 2016

**4.6.2 Working Hours**

The researcher sought to find out the working hours of the business people within the study area. From field survey, working hours for 38.5% business is mainly between 6:00 A.M and 10:00 P.M 30% of business open their business between 4:00 P.M and 8:00 P.M and this mainly constitute of green grocers who target customers at peak hours. The highest flow of customers is mainly in the evenings and is between 5:00 PM-8:00P.M and it comprise of 61.5%. However, 30% of the business mainly along the street close by 8:00 P.M due to insecurity fears. It is important to note that working hours for the businesses with permanent structure have increased their working hours after the street upgrading. This is mainly when the street light are operational. This calls for security measures integration in the street design to allow long working hours to improve the economy of the residents.
4.6.3 Sources of Goods
The respondents’ were asked about the sources of goods for their businesses and their means of delivery. Generally, Silanga has good access to goods everyday as a result of improved accessibility of the area. Improved size and quality of the paving material on the street have enabled the suppliers as well as business men to deliver their goods for trade every day. 30% of business vendors get their goods from Marikiti Market in Nairobi. Others 14%, 24%, 20%, and 12% get their goods from suppliers, Makina, Nairobi CBD and Toi Market respectively. The goods are delivered in their premises by car, human, cart, Motorbike and bicycles at 31%, 23%, 16%, 15% and 15% respectively. Despite the fact that 31% of goods are delivered by car, there is no provision of parking spaces on the street.

Figure 20 Means of Sources of Goods and Means of Delivery
4.6.4. Cost of doing Business
The business people within the study area were asked about the impact of street upgrading on cost of doing business. The research found out that the cost of doing business along Makina Street has increased after the street upgrading. This is as result of increase in house rents since only 30% of the business people own their premises. Before the street was upgraded, the rent per room was Ksh 2500 are as high as Ksh 8000. Increase in rent is a clear indication that land values has increase though the residents lack land tenure of the land they occupy.

4.6.5 Level of Street Satisfaction
The researcher wanted to find out the level of satisfaction as well as challenges in accessing and using street spaces Field survey indicates that only 30% of the respondents are satisfied with the current size and condition of the upgraded street.

![Figure 21 Level of Street Satisfaction](image)

The rest 70% is not satisfied because of the challenges they face on the street. These challenges include street encroachment (20%), low safety (30%), mixed traffic 15%, poor solid waste management (20%), insecurity (10%) and poor drainage (5%).

Source: Author, 2016
4.6.6 Challenges in Accessing and using the street after Upgrading

The respondents were asked about the challenges in accessing and using street spaces. From field survey, one challenge of using the street contributes to another challenge. For instance, 30% of the residents are not able to access the street due to safety issues. This is mainly attributed by mixed traffic on the street that see all the traffic modes use the same carriage way. Improved size and paving of the street has encouraged more vehicles to use the street unlike before the street was upgraded. The vehicles move at a high speed leading accidents especially at the peak hours when children are playing the street on their way home from school.

Source: Author, 2016

Being a collector street, all the properties abutting the street should not have direct access to the street. Unfortunately, all the schools that include within the study area use the Undugu primary school gate which has direct access to the street. Poor safety has reduced the number of activities such as recreation on the street as some users have been displaced eg. Children. The area lacks land use plan and hence development control of the area is very hard. This has resulted into encroachment of temporary structures as well as vendors on the street taking up the part meant for pedestrians. This pushes the pedestrians to the carriage way hence leading to traffic conflict with other vehicles and motorcycles. Poor solid waste management is as result of poor stakeholders’ participation in the process of street upgrading. There existed some youth groups and CBOs that collected the solid waste in the settlements. They were replaced by the NYS officers who hired some community members to clean the settlement. When the project stalled, the solid waste is left to accumulate on the street and in the storm water drains. This has led to high spread of diseases such as cholera in the settlement. Generally, the security Silanga has improved after the street was upgraded. This is mainly attributed to installation of street lighting...
and construction of police post in the area. However, the street is still insecure when the street lights fail to function making the street vendors to close their businesses early.

4.7 Respondents recommendation on street improvement

The researcher sought to find out the communities/ respondents suggestion on the future improvement of the street. Field survey indicates that only 10% of the residents were involved in the upgrading of the street and that was in the implementation stage. This 10% is the same number that has positive perception of the upgraded street. The residents feel that their involvement from planning and design stages would have enabled them to give their concerns which would have reduced the challenges the currently face in using the upgraded street. Being the residents, they are directly affected by the street upgrading process and hence their involvement is very vital. Some residents who occupied spaces meant for road expansion were evicted with a short notice and without a relocation plan. Not only did it separate families but also made the residents have negative perception of the street.

The community understands that street upgrading cannot solve all the problems faced in the settlement. However, there are things it ought to articulate in the design element in order to meet the needs of the society. The street should not only meet the mobility functions but be the public space that is safe and easily accessible for all the users. The flexibility of the street would attract more users and the result would be a vibrant settlement. Community participation enhances ownership and this would enhance maintenance of the street.

The respondents were asked to give their suggestions of street improvement. 30% NMT provision, 33% relocation of street vendors from the street through market provision, 15% solid waste management on the street, 10% street light installation and 12% street landscaping. This is summarize in the figure below.
Figure 23 Areas of street improvement

Source: Author, 2016
CHAPTER FIVE: PROBLEM ISSUES AND PLANNING

5.0 Overview
The purpose of this study was to investigate the impacts of street upgrading on access and use of space in Silanga and their consequences, with the view to propose appropriate intervention measures to this problem. It thus sought to dig deep into the nature of problems that led to the persistent congestion irrespective of past efforts to curb the situation.

Chapter four has clearly provided a detailed discussion of the findings which have sought to respond to the first three objectives of the study i.e. To find out the kind of street upgrading that the NYS is doing, to find out the nature of access and use of the street in Silanga and to identify the impact of street upgrading on access and use of space by different types of users in Silanga Village

5.1 Summary of the main findings
The summary of the findings are as described below:

5.1.1 Lack of Integrated land use plan for the settlement
One of the major facing Silanga and other slums in Nairobi is lack of integrated land use plan. In the preparation of previous plans for Nairobi such as Nairobi Integrated Plan, Kibera was zoned as slum settlement but no detailed land use plan for the settlement. The slums are not regarded as priority investment areas as they are regarded as poor and too big a problem to tackle. This has resulted into land use conflicts that affect the access and use of street space. There upgrading has resulted into high rate of development of community facilities along the street with direct access to the street which is against the standard of a collector street. Lack of a physical plan means that there is no policy guidelines to guide development within the settlement. The result is high encroachment structures into the road reserve since development control is very difficult. Lack of plan prevent of adequate space for specific land uses such as markets, and terminus. This has led to high encroachment of vendors into the street as a result of lack of market. The street lack provision of terminus and hence they public matatu pick and drop passengers at any point causing conflicts. There is need to integrate street upgrading with land use planning to enhance coordination of activities in a neighbourhood.
5.1.2 Lack of street flexibility
As this study has indicated, streets in the informal settlements are multi-faceted. The street have different users undertaking different activities at different times of the day. Some of the activities undertaken on the street include dwelling, vending, shopping, social interactions, eating, parking and playing. During the day when the traffic is low, the youth and women mainly place benches on the street to observe the activities on the street as well as interact amongst themselves. This happens for a short period of time because vendors stream in the market from 11:00 AM to open their businesses. The street needs to be flexible to satisfy different user needs in a coordinated manner without conflicts. However, in the case of Silanga, the upgraded street is mainly for mobility purposes and the design is inclined to motorized transport. It has therefore failed to serve the purpose of public space as the needs of the community dictate. This has resulted into high level of conflicts among the users leading to displacement and accidents. There are few instances where the community is reclaiming the street for democracy and recreation for instance on Sundays the community close some part of the street to hold crusades or skating. This causes inconveniences for other street users. This creates the need to redesign streets into multi-faceted entities that accommodates other functions mobility.

5.1.3 Reduced safety on the street
Safety is a major concern for both Silanga Residents street users. As indicated in figure 2, safety levels have reduced by 30% for the cyclist and 50% for the pedestrians. This is mainly attributed by lack of NMT space provision on the street leading to traffic conflict due mixed traffic on the street. The increase in the number of motorbikes and cars on the street have resulted to increase in the number of accidents. The street also lack traffic calming measures and signage to warn the drivers on some major conflict points especially near schools. Reduced safety on the street has resulted into the displacement of some users on the street and this has led to poor perception of street upgrading in Silanga. This creates the needs to create safe streets for all street users.

5.1.4 Low community participation
Stakeholders’ participation is key in reaching social sustainability in the informal settlements. This study found out that only 10% of the community was involved in the process of street upgrading and it was in at the implementation stage. Lack of community participation contribute to failure to articulate different needs for different users of the street. Participatory methods are
the key to attaining sustainable solutions to the design and implementation process. Local participation lead to ownership of the project and hence maintenance becomes very easy.

5.1.5 Disconnect between institution managing slums and infrastructure
There are many institutions in charge of street upgrading in urban area and Slum. These includes: KURA, Traffic Police, City Inspectorate Departments and National, County and City Planning Authorities, MOLHUD, Ministry of Planning and Devolution NYS, UNHABITAT, KENSUP. However, there are no clear measures to ensure coordination between them. The effect therefore is that conflicting decisions on the same issues tend to arise and as such no effective implementation of transport development goals. There is therefore a need to integrated different institution overseeing street upgrading in slum settlements to ensure coordination of activities.

5.2 Causes and Effects of the main Problems
Figure 24 below shows the issues, causes and effects.

5.3 Conclusion
In a nutshell, apart from offering benefits to the society this study has played other roles. First, it has helped to bridge the knowledge gap. The reason behind minimal benefits of the program and projects related to slum upgrading as implemented by both the Government and other organisations is lack of integration between land use plan and the upgrading projects at hand. This is the root problem for failure in slum upgrading project. It is therefore a wakeup call to all land use planners that in any slum upgrading project, implementers must take into account the interactions between slum upgrading projects and land use planning. This study has clearly stipulated the roles of street in informal settlement. Being the backbone of settlement transformation, streets design should accommodate all the users need. The result will not only be an improved neighbourhood but also happy residents.
Figure 24 Causes and effects of challenges in accessing and using street spaces

<table>
<thead>
<tr>
<th>Main Issue</th>
<th>Cause</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-harmonious co-existence Between street upgrading and other</td>
<td>Lack of integration of street with other slum upgrading projects</td>
<td>Land use conflict</td>
</tr>
<tr>
<td>Poor Street design-Inclined to motorized transport</td>
<td>Lack of NMT space provision/Mixed Traffic on the carriage way</td>
<td>Traffic conflicts/ Accidents</td>
</tr>
<tr>
<td>Street space encroachment vendors</td>
<td>Lack of market space provision</td>
<td>Inefficient use and access of Street spaces by users leading to conflicts/Congestion</td>
</tr>
<tr>
<td>Poor solid waste Management</td>
<td>Lack of community participation/ Bin provision</td>
<td>Loss of street aesthetic/spread of diseases</td>
</tr>
<tr>
<td>Reduced safety on the street</td>
<td>Lack of signage and NMT spaces</td>
<td>Accidents/ Displacement of some street users</td>
</tr>
<tr>
<td>Poor maintenance of the upgraded street</td>
<td>Lack of community participation</td>
<td>Dilapidated streets</td>
</tr>
</tbody>
</table>

Challenges in Accessing and using street spaces

Source: Author, 2016
5.4 Normative View of Impacts of Street Upgrading To Access and Use of Spaces

Successful Street upgrading in the informal settlement is the one that enhances great access and use of the street space by different users any time of the day without conflicts. Street should therefore be:

1. **Easily accessible by all users**- each street user should have designated street space. For instance, pedestrian walkways, cycle path for the cyclist, adequate lanes for the vehicles.

2. **Multi-functional**- the street should be able to accommodate other uses other than mobility. This includes social interaction, relaxing and democracy.

3. **Sustainable**- Street should be developed in a sustainable manner. For instance, enhancing sustainable storm water development, planting trees to be carbon sink.

4. **Enhance the economy growth of the settlement**- Street should enhance economic prosperity for the local residents.

5. **Safe street**- Safety in street development is key in enhancing accessibility and use spaces in the street

6. **Beautiful/ aesthetic** – Street should enhance the aesthetic aspect of a neighbourhood. This is achieved through landscaping.

7. **Create sense of a place**- street design should create unique urban spaces

5.4.1 Design of responsive streets

5.4.1.1 Principles

i. **Vibrant**- Streets need to be vibrant to attract more users. It needs to have diverse activities and great destinations that are memorable and interesting suit every user. This is by creating spaces and facility provision that encourage different activities such as shopping, social activities, recreational activities and mobility activities to be undertaken the street.

ii. **Safety**- This is the prime concern for all street users and hence need to be addressed. Safety is influenced high traffic speeds and mixed traffic as result of lack of/ inadequate provision of NMT. Articulation of traffic calming measures as well as road signage and pedestrian crossing will enhance street safety. As Jane Jacob stated, people will voluntarily use the street when their safety in using the street is enhanced.
iii. **Aesthetic**- Every street user is a pedestrian before they become shoppers, drivers or cyclist. They therefore need to walk through streets that are well-designed and well-furnished. Great streets are the result of thousands of tiny details that involve the design of their buildings, landscaping, sidewalk features, and street layout itself. The relationship between the street and its adjacent buildings should be organic, conducive to walking, and inviting to people.

iv. **Contribute to the economic vitality of the city**- Great Streets facilitate the interaction of people and the promotion of trade. They serve as destinations, not just transportation channels, providing location value to these businesses that power the local economy.

v. **Green**- Great street enhance environmental conservation and hence sustainability. They incorporate environmentally sensitive design standards and green development techniques, including generous provision of street trees and other plantings and application of modern storm water management practices.

vi. **Facilitate place making**- Street be multifunctional. They should be able to accommodate different users and activities at different times with minimal conflict.

vii. **Mobility**- Great Streets strike a balance among the three elements of modern mobility: through travel, local circulation, and access. The street should provide safe and convenient space for walking, cycling and motor vehicles.

5.4.1.1 **Concepts**

1. **Equity and social inclusion**- street spaces allow free movement and social interaction of people of all kind of life. Proper planned and designed streets allow accessibility even for the people with disabilities. Street upgrading especially in slums and connecting them to the other urban fabric reduce exclusion of slums and hence equal benefits for development.

2. **Productivity**- great street spaces contributes to economic growth and development. In slums for instance, street vending contribute is the main source of income for most residents. Street upgrading that enhances more pedestrian movement creates large market for the street vendors and hence promoting economic prosperity.

3. **Quality of life**- great street spaces enhances the use of public spaces in order to increase social cohesion, civic identity, and ensures the security and safety of lives and property. These makes human settlement more livable.
4. **Environmental sustainability**- Great Street enhances environmental conservation in human settlements. Enhancing proper ventilation in the settlement, street vegetation that act as carbon sinks as well as promoting storm water drainage.

5. **Infrastructure development**- street create pathways for the passage of infrastructure such as water pipes, and sewer lines, information and communication technology lines (Fibre optic cables) in order to improve urban living and enhance productivity, mobility and connectivity.

To adequately respond to the above problems and to achieve the normative view of a good implementation of multifunctional street spaces in the informal settlements, the following are recommended

**Figure 25 Solution responding to problems**

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PROPOSED SOLUTION</th>
<th>OUTCOME</th>
</tr>
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<tbody>
<tr>
<td>Lack of integrated land use plan</td>
<td>Develop an integrated land use plan to guide slum upgrading with street as the entry point.</td>
<td>Formal and liveable Neighbourhood.</td>
</tr>
<tr>
<td>Lack of street flexibility</td>
<td>Redevelopment of a multifunctional Street that accommodate other street uses other than mobility</td>
<td>Vibrant street spaces</td>
</tr>
<tr>
<td>Reduced safety on the street</td>
<td>Safety measures such as traffic calming, road signage, pedestrian crossing, street light provision</td>
<td>Improved safety on the street which increases street accessibility and usage</td>
</tr>
<tr>
<td>Poor environmental management</td>
<td>Enhance solid waste management and storm water drainage, tree planting</td>
<td>Clean neighbourhood</td>
</tr>
<tr>
<td>Lack of market</td>
<td>Creation of market place to relocate street vendors. Mixed use development to enhance more commercial activities on the street</td>
<td>Economic prosperity</td>
</tr>
<tr>
<td>Disconnect between institutions managing slums</td>
<td>Co-ordination of slum upgrading projects and all stakeholders involvement</td>
<td>Improved livelihood</td>
</tr>
</tbody>
</table>

Source: Author, 2016
5.4.2 Policy Recommendation
Having analysed the existing problems, this project has the a few policy recommendation. With regard to Vision 2030 and MDG-7, it is important to enhance environmental management and conservation in street upgrading projects. This can only be achieved through preparation of land use plans before upgrading which are integrated with street designs. This will ensure implementation of streets with street activities well-coordinated with the adjacent land uses. Additionally, research with regard to street upgrading should be carried to analyse the changing demands of streets elements.

5.4.3 Planning Intervention
5.4.3.1 Place making approach
This approach focuses redeveloping the street into a multifaceted entity that provides liveable street spaces, free circulation of different modes of transport and enhance economic productivity. This is achieved through Rightsizing concept. Rightsizing is a process of reallocating a street’s space to better serve its full range of users. This entails redesigning the street with the following goals:

- Increasing safety and access for all users
- Encouraging walking, biking, and transit use
- Supporting businesses and the local economy
- Creating places that foster community livability

In the case of Silanga, this will entail street expansion to create room for different activities. Being a collector street, the ideal street size should be 18 meters. In order to achieve this, demolition of structures must take place and therefore relocation plan is necessary. Land scarcity and the need to relocate the people to an area located in proximity distance to the former area, re-blocking and densification which will see construction of multi-family dwelling units should be undertaken. This calls for highly participatory platform with local community and other stakeholders.

With enough space for street redevelopment, provision of NMT facilities that include cycle lanes, and walk ways are constructed. To enhance street safety, provision for pedestrian crossing as well as traffic calming measures are necessary. Residential properties and community
facilities such as schools abutting the street should not have direct access to the street and hence the need to create space for access streets. Mixed-use type of development should be done to create space for commercial activities for properties abutting the street with an aim of promoting economic productivity. Improved safety and space creation will encourage more users to use the space and the result would be a multi-functional street that is flexible and accessible by all age group, gender and physically challenged.

5.4.3.2 Creating space for Market Development

From the findings, congestion on the upgraded street is a result of encroachments of business structures as well as vendors on the street. High flow of pedestrians on the street especially in the evening is a major contributor of increased businesses especially during peak hours. However, street economy cannot be ignored as it is the main source of income for the residents of Silanga. This calls for a relocation strategy for the street vendors into a formal market space. This will not only decongest the street but also increase sale volumes for the vendors who are complaining of high competition on the street. Provision of a market will also enable them to undertake their businesses in all seasons.

Currently, there is no plan indicating any location of market and there is not available space that can be used as a market. This therefore call for the identification of a suitable location for market which will entail relocation of some residents. Re-blocking and infill densification will be done to accommodate the displaced residents. Having relocated the street vendors, the pedestrian walk ways can be constructed. However, this approach will not provide adequate space for the cyclist.

5.4.3.3 Prepare Land Use Plan for Silanga

Currently, there is no existing land use plan for the Silanga and Kibera as whole. This approach will offer solution that will allow for an exploration of the existent relationships between land use and the transport systems at large. For the re-organization to be done a thorough study and situational analysis of the area will have to be undertaken. This includes enumeration and mapping exercises. This strategy will ensure that street upgrading is integrated with other slum upgrading approaches such as land regularization and tenure security with the street as the entry point. Preparation of a land use plan will also secure space for development of bus terminus and market which are not existing currently. Formulation of policy guidelines to guide re-
development of the settlement will help in development control which will reduce street encroachment.

5.4.3.4 **Fostering safety on the street**
Safety is the main concern for the street users. From the findings, safety on using the street has reduced after street upgrading. This has in turn displaced some users such as children due to fear of accidents. High speed moving vehicles being the major cause of accidents, calls for introduction of traffic calming measures especially in parts with the highest flow of pedestrian. The introduction of different texture of street paving, bumps and signage will enhance street safety. To reduce mixed-traffic conflict, there is need to develop pedestrian walkways whose space is currently encroached by street vendors. Provision pedestrian crossing such as zebra crossing and signage is very crucial. Street lighting and mixed use along a street is likely to bring more usage and Social interactions amongst residents that create more social control of public spaces with positive impacts on the sense of public safety.

5.5 **Assessing the Alternatives**

**Figure 26 Evaluation of Alternatives**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Merits</th>
<th>Demerits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Making Approach</td>
<td>-High stakeholders participation</td>
<td>Long process and time consuming</td>
</tr>
<tr>
<td></td>
<td>Formalisation and regularization of the settlement</td>
<td>Cost of relocation and redevelopment</td>
</tr>
<tr>
<td></td>
<td>Land use plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase in street size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NMT provision</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic prosperity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased safety on the street</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lively multifunctional street</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental conservation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved neighbourhood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development control</td>
<td></td>
</tr>
<tr>
<td>Create space for market</td>
<td>Economic prosperity</td>
<td>Cost of relocation</td>
</tr>
<tr>
<td>development</td>
<td>Reduced street congestion</td>
<td>Only emphasize on mobility function of the street.</td>
</tr>
<tr>
<td></td>
<td>Improved street safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Create space for pedestrian crossing</td>
<td></td>
</tr>
</tbody>
</table>
| Prepare land use plan for Silanga | Reduced land use conflict with the street  
Land regularization and tenure security  
Integrate economic, social and environmental concerns of the settlements  
Development control  
Community participation | Long process and expensive  
Lacks to address the multifunctional role of the street. |
|-------------------------------|-----------------------------------------------|
| Fostering safety on the street | Improved street safety  
Increase in access and use of street spaces by different users | Does not address congestion issues |

Source: Author, 2016

5.6 Choice of the Preferred Alternatives
From the above discussion, the option of place making approach gets the upper hand since it stands the highest chance of offering not only a comprehensive approach but also a long lasting solution to the problem at hand. It is important to note that streets are not the ultimate solution to slum problem. However, based on the roles that the street serve in settlements such as mobility, democratic and open spaces and as platforms for social and economic development, street upgrading should be given a priority. This alternative aims at achieving this in Silanga which can be replicated in other street upgrading projects in slum upgrading both in Kenya and beyond.

5.7 Benefit of the Research
This research was worth undertaking. It has tried to find out the criteria of slum upgrading strategies being undertaken by the Government of Kenya through the Ministry of Planning and Devolution currently. It is with an aim of investigating the impacts of the projects to the livelihood of Slum residents with an aim of identifying loopholes that hinder maximum benefit which will guide future upgrading projects. Being the first beneficiary, this study offers good lessons that can guide street-led slum upgrading in Kenya and beyond.

Secondly, there are crucial recommendations that accrue from this study that when implemented, it will lead to a formal modern neighbourhood with compatible land uses adjacent to one another with great linkage and urban spaces with the street as the backbone. For instance, the aspect of place making approach strategies, re-blocking the settlement in the process of land use plan for the settlement would lead to an organized neighbourhood. Rightsizing the street to create ample
spaces for social interaction, NMT, Recreation as well as transforming the design of the buildings lead to a transformed neighbourhood. As this study has stipulated, community participation is very crucial in settlement upgrading as it enhances ownership of the project and maintenance.

What follows therefore is that there are costs that would be suffered by the society if this research was not done. Slum upgrading without a plan is similar to fixing patches of different colours on a garment. The government would continue spending a lot of money on projects that hardly benefit the resident or rather the maximum potential of the project is not fully exploited.

Even more importantly, it has to be mentioned that this research would remain useless if the recommendations in it are ignored. It does not make any difference to understand the nature and impact of a problem and do nothing about it. That is non-implementation of the important recommendations made in this study would mean that no problem will be solved and so the economy will continue to deteriorate and the public will continue to suffer.

### 5.8 Areas of Further Research

There is need to study roles of streets in slum settlement. This will guide the appropriate design that will inform street upgrading in neighbourhoods. Similarly, with all the works on going on slum upgrading, there in need for the policy makers to conduct further research on Integration of street development as a energy a component into slum upgrading interventions.
REFERENCES

113
25. UN-HABITAT (2013), Streets as Public Spaces and Drivers of Urban Prosperity. UNON publishing Services Section, Nairobi, Kenya.
26. UN-HABITAT (2012), Korogocho Streetscapes: documenting the role and potentials of streets in citywide slum upgrading. UNON publishing Services Section, Nairobi, Kenya.
APPENDICES

Appendix 1: Household Questionnaire

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING

RESEARCH PROJECT: IMPLICATION OF STREET UPGRAADING ON THE USE OF SPACE IN INFORMAL SETTLEMENTS: CASE OF SILANGA-KIBERA, NAIROBI

Declaration: This questionnaire is meant for academic purposes only and the information obtained will remain confidential.

HOUSEHOLD QUESTIONNAIRE

QUESTIONNAIRE NO........

PART A: RESPONDENTS DETAILS

1. Name of respondent (Optional)……………………………………………………………………………
2. Date of interview……………………………………………………………………………………………
3. Age………………………………………………………………………………………………………………
4. Sex:    (1) Male ☐  (2) Female ☐

PART B:

5. What is the approximate distance from your home to Makina Street?
6. What kind of activities takes place along Makina Street?
   a)Mobility  b)Business    c) Recreation    d) Meeting
7. How often do you use Makina Street?
   a) Daily   b) Weekly    c) Once in Two weeks
   d) Monthly  c) Never
8. Why do you use the street?
9. Who are the main users of the street?

<table>
<thead>
<tr>
<th>People</th>
<th>Uses Before Upgrading</th>
<th>Use After Upgrading</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. 

4. 

5. 

9. How long does it take you to walk from home to the following destinations through Makina Street?

<table>
<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
<th>TIME TAKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Less than 5 minutes</td>
</tr>
<tr>
<td>1.</td>
<td>Home – Work/School</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Home – Market</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Home – Church</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Bus station</td>
<td></td>
</tr>
</tbody>
</table>

10. What changes have taken place on the street?

<table>
<thead>
<tr>
<th>CHANGE</th>
<th>BEFORE UPGRADING</th>
<th>AFTER UPGRADING</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paving Materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development of other facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>safety</td>
<td>Walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cycling</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Driving</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. What are some of the environmental impacts that are as a result of street upgrading?

<table>
<thead>
<tr>
<th>Impact</th>
<th>Before</th>
<th>After upgrading</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm water</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. What are the social impacts as result of street upgrading?

<table>
<thead>
<tr>
<th>Impact</th>
<th>Before</th>
<th>After</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime Rates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Interaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. What are the economic impacts as result of street upgrading?

<table>
<thead>
<tr>
<th>Impact</th>
<th>Before</th>
<th>After</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>House rents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of doing Business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to goods and services</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. What are the main challenges that you face in using Makina Street?

11. Are you satisfied with the current size and condition of the street? Yes [ ] No [ ]

B. If, yes give reasons

C. If no give reasons

13. Were you involved in the process of street upgrading?

a) Yes                          b) No

If yes, what Level

a) Planning          b) Implementation   c) Maintenance

If no give reasons

13. What do you dislike most about Makina Street?
15. What kind of improvements would you like to see along Makina Street?
Appendix 2: Business Questionnaire

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT: IMPLICATION OF STREET UPGRADING ON THE USE OF SPACE IN INFORMAL SETTLEMENTS: CASE OF SILANGA-KIBERA, NAIROBI

Declaration: This questionnaire is meant for academic purposes only and the information obtained will remain confidential.

BUSINESS QUESTIONNAIRE
QUESTIONNAIRE NO........

PART A: RESPONDENTS DETAILS
1. Name of respondent (Optional)……………………………………………………………………………………………………
2. Date of interview……………………………………………………………………………………………………………………
3. Age………………………………………………………
4. Sex:    (1) Male    (2) Female

PART B:
4. Nature of Business
   i) a) Formal   b) Informal
   ii) a) Permanent   b) Temporary
5. When did you start your Business?.............................................................................................................................
6. What made you decide to locate your business in this area and along Makina Street?
7. Do own the business premise?       Yes              No
   B. If No, how much do pay as rent for your business premise?
.........................................................................................................................................................................................
8. Do you receive any services from the County Council of Nairobi? Yes               No
   B. If yes, which ones?
9. Do you have any employees that assist you in running the business? Yes     No

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B. If yes, how many? ........................................................................................................................................
C. How many did you have before the upgrading of the street?..............................................................
10. What are your working hours?................................................................................................................
B. What time do you have the highest flow of customers?........................................................................
11. Where do you get your goods/commodities from?
B. How are they delivered to your premise?
   a) Car    b) bicycle   c) Motorbike    d) Carts    e) Human
C. Do you have parking spaces for your customers or suppliers?
12. How has street upgrading affected your business?

<table>
<thead>
<tr>
<th>IMPACT</th>
<th>LEVEL</th>
<th>REASONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessibility to commodities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Level a) High    b) Medium    c) Low

17. Are you satisfied with the current size and condition of the street? Yes □ No □
B Give reasons
16. What are the challenges that you face in running your business along Makina Street?
19. Were you involved in the process of street upgrading?
   a) Yes          b) No
b) If yes, what Level
   b) Planning     b) Implementation    c) Maintenance
20. What kind of improvements and facilities that you would you like to see along Makina Street and Silanga in general that will improve your business?
Appendix 3: Interview Schedule: CCN Environment Department

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING

RESEARCH PROJECT: IMPLICATION OF STREET UPGRADING ON THE USE OF SPACE IN INFORMAL SETTLEMENTS: CASE OF SILANGA-KIBERA, NAIROBI

Declaration: This Interview Schedule is meant for academic purposes only and the information obtained will remain confidential.

INTERVIEW SCHEDULE

STAKEHOLDER INVOLVED: CCN-ENVIRONMENT DEPARTMENT

PART A: RESPONDENTS DETAILS

1. Name of Respondent (Optional): ……………………………………………………………
2. Date of Interview (Optional): …………………………………………………………………
3. Phone Number (Optional): …………………………………………………………………
4. Email Address (Optional): …………………………………………………………………

PART B:

5. What role did you play in the upgrading of streets in Silanga?
6. What was your level of involvement in the following before and after street upgrading in Silanga?

<table>
<thead>
<tr>
<th>Impact</th>
<th>Before</th>
<th>After upgrading</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid waste collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm water drainage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air pollution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey Water</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Are there any measures that have been put in place to enhance environmental conservation in Silanga?
a) Yes 

b) No

ii) If yes, which ones?

8. What are the major challenges experienced in the conservation of the environment along the upgraded streets of Silanga?

9. What kind of developments/improvements have you initiated to create awareness on environmental conservation?

10. What recommendations or any other suggestions do you have towards improvement of the environment in the process of streets upgrading?
Appendix 4: Interview Schedule: Physical Planning; MLHUD and NCC

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT: IMPLICATION OF STREET UPGRADING ON THE USE OF SPACE IN INFORMAL SETTLEMENTS: CASE OF SILANGA-KIBERA, NAIROBI

Declaration: This Interview Schedule is meant for academic purposes only and the information obtained will remain confidential.

INTERVIEW SCHEDULE
STAKEHOLDER INVOLVED: MLHUD AND NCC, PHYSICAL PLANNING DEPARTMENT

PART A: RESPONDENTS DETAILS
1. Name of Respondent (Optional): .................................................................
2. Date of Interview (Optional): .................................................................
3. Phone Number (Optional): .................................................................
4. Email Address (Optional): .................................................................

PART B:
5. What criteria did the NYS use in the process of street upgrading?
6. Were you involved in the street upgrading process?
   a) Yes  b) No
   If yes, what Level? Explain.
   i. Planning.............................................................................................
   ii. Implementation...................................................................................
   iii. Maintenance...................................................................................
7. Was there any enumeration done before the street upgrading?
   a) Yes  b) No
ii) If yes, when was it done?

8. Do you have a plan for Silanga village and Kibera settlement as a whole?

9. What kind (hierarchy) of streets are suitable for the Kibera settlement to cater for both now and the future growth of the settlement?

10. What amount of land is allocated for the street and other infrastructure development in Silanga?

11. If there is a plan, did the NYS follow the plan in the street upgrading?

12. Are there any measures that have been put in place to control encroachment of structures into the streets/paths within Silanga?

13. What are the major challenges experienced in the upgrading and maintenance of streets in Silanga?

14. Are you satisfied with the current condition, size, and design of the upgraded street?

15. What recommendations or any other suggestions do you have towards improvement of the streets?
Appendix 5: Interview Schedule: NYS Officers

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT: IMPLICATION OF STREET UPGRADING ON THE USE OF SPACE IN INFORMAL SETTLEMENTS: CASE OF SILANGA-KIBERA, NAIROBI

Declaration: This Interview Schedule is meant for academic purposes only and the information obtained will remain confidential.

INTERVIEW SCHEDULE
STAKEHOLDER INVOLVED: NYS OFFICERS

PART A: RESPONDENTS DETAILS
1. Name of Respondent (Optional): .................................................................
2. Date of Interview (Optional): .................................................................
3. Phone Number (Optional): .................................................................
4. Email Address (Optional): .................................................................

PART B:
5. What is the reason/objectives behind the street upgrading in Silanga?
6. What criteria did the NYS use in the process of street upgrading?
7. Are you aware of any Local physical Development Plan previously prepared for Silanga village and Kibera settlement as a whole?
8. If there is a plan, did you follow the plan in the street upgrading?
9. Which stakeholders did you involve in the process of the street upgrading

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Level of involvement</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. Who were the professionals involved in the process of street upgrading?

<table>
<thead>
<tr>
<th>Professional</th>
<th>Roles</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. What is the impact of street upgrading on life in Silanga in general?

<table>
<thead>
<tr>
<th>Impact</th>
<th>Before upgrading</th>
<th>After Upgrading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. What are the major challenges experienced in the upgrading and maintenance of streets in Silanga?

13. Are you satisfied with the current condition, size, and design of the upgraded street?

14. What recommendations or any other suggestions do you have towards improvement of the streets?
Appendix 6: Silanga Traffic Count Form

<table>
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<tr>
<th>TIME</th>
<th>Women</th>
<th>men</th>
<th>children</th>
<th>Private car</th>
<th>Matatu</th>
<th>Bicycle</th>
<th>Motorbike</th>
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