Household's Living Conditions in Informal Settlements: Influence on Access to Domestic Water in Nairobi City.

By

Abigail Wagala

T51/11330/2018.

A Research Project Submitted to the Institute for Development Studies, University of Nairobi, in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Development Studies.

NOVEMBER, 2020

UNIVERSITY OF NAIROBI

DECLARATION OF ORIGINALITY FORM

Name of Student	ABIGAIL WAGALA
Registration Number	T51/11330/2018
College	HUMANITIES AND SOCIAL SCIENCES
Faculty/School/Institute	INSTITUTE FOR DEVELOPMENT STUDIES
Department	DEVELOPMENT STUDIES
Course Name	RESEARCH PROJECT PAPER
Title of Work	HOUSEHOLD'S LIVING CONDITIONS IN INFORMAL SETTLEMENTS: INFLUENCE ON ACCESS TO DOMESTIC WATER IN NAIROBI CITY.

DECLARATION:

1. I understand what Plagiarism is and I am aware of the University's policy in this regard
2. I declare that this PROJECT is my original work and has not been submitted elsewhere for examination, the award of a degree or publication. Where other people's work or my own has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work
4. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it off as his/her own work
5. I understand that any false claim in respect of this work shall result in disciplinary action in accordance with the University Plagiarism Policy

Signature: _____

Date: _____

DECLARATION

I, Abigail Wagala declare that this project is my original work and has not been submitted at any institution for examination.

Signature ……. Date ……...

Abigail Wagala

T51/11330/2018

This Research Project has been submitted to the University for examination with my approval as the University Supervisor.

Signature……. Date……...

Dr. Joseph Onjala

Institute for Development Studies

University of Nairobi

DEDICATION

To all the informal settlement dwellers in Nairobi City, Kenya and the whole of Sub Saharan Africa.

ACKNOWLEDGEMENTS

To God, the Almighty I am very humbled that I got the opportunity to begin this phase of my life (Master's degree) at the Institute for Development studies. I am thankful for the insight and guidance that saw me through the whole process at IDS, University of Nairobi till now. All the choices that may have seemed deliberate were all guided by God. To my parents, Mr. William Wagala and Mrs. Isabela Ogutu I am very thankful to God for you. My education wouldn't be possible without you.

I would like to render my sincere gratitude and appreciation to my project supervisor Dr. Joseph Onjala who has been very instrumental in the whole process from the conception of the idea, to the concept note, the proposal and now the project paper. His guidance and insights throughout the whole process especially since I had to switch to a new topic from the initial one. His swift responses and actions have played a key role in this paper. He was quick to respond to all the copies/drafts that I sent as I journeyed towards this final paper. I am very appreciative of the expertise, immense support and encouragement that Dr. Onjala availed to me the entire time. I am thankful that apart from the guidance as a supervisor, Dr. Onjala was also like a father figure to me throughout the whole journey especially at a time when circumstances were tough in my life. May you forever be rewarded.

Third, I want to thank all the Lecturers that taught and guided my journey at the Institute for Development Studies since 2018 when I joined IDS. To Fredrick Onyango Odhiambo, Sam Balongo and Brian Kenor I am thankful that you took your time to help me understand and work through the data set for this project. The value that you added to this paper is immeasurable.

Lastly, to all my classmates from the Institute for Development Studies and friends getting through IDS would not have been possible without you. The encouragements that we offered each other and the shoulders that you all offered to me lean on especially at times when you believed in me more than I believed in myself got me this far. To my friends outside the institute thank you for your support, prayers and understanding my absence in your daily lives for the past two years. May you all forever be blessed.

TABLE OF CONTENTS

DECLARATION OF ORIGINALITY FORM ..... **i**
DECLARATION ..... **ii**
DEDICATION ..... **iii**
ACKNOWLEDGEMENTS ..... **iv**
TABLE OF CONTENTS ..... **v**
LIST OF TABLES ..... **viii**
LIST OF FIGURES ..... **ix**
ACRONYMS ..... **x**
DEFINITION OF TERMS ..... **xi**
ABSTRACT ..... **xiii**
CHAPTER 1: INTRODUCTION **1**
1.1 Problem Statement 3
1.2 Research Questions 4
1.3 Research Objectives 5
1.4 Study Hypotheses 5
1.5 Justification for the Study 5
1.6 Scope and Limitations of the Study 6
CHAPTER 2: LITERATURE REVIEW **7**
2.1 Introduction 7
2.2 Theoretical Framework 7
2.3 Empirical Literature 10
2.3.1 Socio-Economic Characteristics of Informal settlement dwellers 11
2.3.2 Overall Living Conditions in Informal Settlements 13
2.3.3 Sources of Water Supply in Informal settlements 14
2.3.4 Access to Domestic Water in Informal settlements 17
2.3.5 Barriers to Water Provision and Access in Informal Settlements 19
2.3.6 Legal and Policy Frameworks for Water Provision and Access in Kenya 22
2.4 Conceptual Framework 24
2.5 Summary of Literature 26
CHAPTER 3: RESEARCH METHODOLOGY **28**
3.1 Introduction 28
3.2 Research Design 28

3.3 Study Site 30
3.4 Target Population and Population for the Study 32
3.5 Sampling 32
3.6 Data Collection Procedure 33
3.6.1 Data Collection Tools and Methods 34
3.6.2 Pretesting of Questionnaires 34
3.7 Data Processing and Analysis 34
3.8 Ethical Consideration 36
CHAPTER 4: RESEARCH FINDINGS, INTERPRETATIONS AND DISCUSSIONS 38
4.1 Introduction 38
4.2 Descriptive Analysis Results 38
4.2.1 Sex of the Respondents 38
4.2.3 Employment Type 39
4.2.4 Water Sources 40
4.2.5 Land/Structure Tenure 40
4.2.6 Environmental Conditions 41
4.2.7 Structure Construction Materials 41
4.2.8 Access to Domestic Water 42
4.3 Bivariate Analysis Results 43
4.3.1 Household Size 43
4.3.2 Employment Type 44
4.3.3 Water Source 44
4.3.4 Land/Structure Tenure 44
4.3.5 Environmental Conditions 44
4.3.6 Structure Construction Materials 45
4.4 Regression Analysis Results 45
4.4.1 Model Fitness 46
4.4.2 The Influence of Water Sources on Access to Domestic Water. 48
4.4.3 The Influence of Land/Structure Tenure on Access to Domestic Water. 48
4.4.4 The Influence of Environmental Conditions on Access to Domestic Water. 49
4.4.5 The Structure Construction Materials on Access to Domestic Water. 49
CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 52
5.1 Introduction 52
5.2 Summary 52

5.3 Conclusions 54
5.4 Recommendations 55
REFERENCES **57**
APPENDICES **61**
Appendix 1: Survey Questionnaire 61
Appendix 2: A sample for Socio-Economic Survey in Nairobi County 89

LIST OF TABLES

Table 1:Roles and Responsibilities of WSS Sub Sector Institutions 23

Table 2: A Summary of Methodologies Used in various Studies assessing the Relationship between living conditions and access to Domestic Water..... 29

Table 3: DataNeedsTable 33

Table 4: Sex of Household Respondents..... 39

Table 5: Household Sizes 39

Table 6: Employment Type 40

Table 7: Water Sources 40

Table 8: Land/Structure Tenure..... 41

Table 9:Environmental Conditions 41

Table 10: Structure Construction Materials..... 42

Table 11: Access to Domestic Water 42

Table 12: Bivariate Relationships between Access to Domestic Water and Predictors .. 43

Table 13: Regression Results for the Influence of Predictors on Access to Domestic Water 46

LIST OF FIGURES

Figure 1: The Living Conditions Diamond 9
Figure 2: Water Supply (%) in Settlements 15
Figure 3: A conceptual Framework on the Influence of Household Living Conditions on Access to Domestic Water in Informal Settlements 25
Figure 4: Distribution of Informal Settlements in Nairobi County, ... 31

ACRONYMS

AFD	Agencie Française de Development
FGD	Focus Group Discussion
IDS	Institute for Development Studies
ISD	Informal Settlements Department
KISIP	Kenya Informal Settlements and Upgrading Programme
KES	Kenya Shillings
KEW	Kenya Water Institute
MDGs	Millennium Development Goals
MWI	Ministry of Water and Irrigation
NACOSTI	National Commission for Science, Technology and Innovation
NCWSC	Nairobi City Water & Sewerage Company
PPD	Pre Paid Dispenser
SIDA	Swedish International Development Cooperation Agency
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
SEC	Settlement Executive Committee
UN	United Nations
UNDP	United Nations Development Programmes
WAB	Water Appeals Board
WARMA	Water Resources Management Authority
WHO	World Health Organization
WSTF	Water Services Trust Fund
WSS	Water Service Sector
WSP	Water Service Providers

DEFINITION OF TERMS

Domestic Water - Refers to water that is used for the usual domestic purposes, inclusive but not limited to food preparation, consumption, bathing, brushing teeth, washing of clothes, dishes and all kinds of household cleaning. Domestic Water is useful for both indoor and outdoor household chores.

Dwelling units- These are structures that are used as places of residence or homes by people in a specific area or settlement. They house the people that occupy them. They provide self-contained living facilities.

Environmental Conditions- the state of one's surroundings. This is inclusive of natural resources like water sources/surface water. They also include built environment, exposure to dangerous substances and occupational hazard.

Household – A person or group of people that live together, answering to the same Household head, pool together their finances for various activities and all share a common source of food as a single unit, meaning they all have same housekeeping arrangements.

Informal Settlements – Refers to the areas where several housing units have been constructed on land that the owners of the units have no legal claim to. They are unplanned and mostly do not comply with city/country regulations on planning and building. They are characterised by inadequate access to services like water supply.

Living Conditions - The situation of a person's life with regards to their shelter/housing, food, their clothing, access to various basic services like water provision, local surroundings and their security/safety among others in their places of residence and surroundings.

Socio-economic characteristic- Profiling of a population in terms of; gender, marital status, household size, religion, education, employment and income levels, basically the social and economic characteristics of a group of people.

Tenure – The conditions under which land, structures/houses are held or occupied. A holder can be the owner or renter. Tenancy agreements can be formal or informal.

Water Access – Being in a close proximity (within 1 Km) to a water source that provides clean/safe water free from any microbes/bacteria. The water needs to be available for almost 12 hours a day and should be able to sustain all domestic uses. The water should be free/affordable to everyone that needs it.

Water Source – Refers to the origin of water/supply that is utilised by various Households. Examples of water sources; rivers, streams, piped water connections to taps, rain water, borehole/well water among others.

Water Kiosks- Is an example of a water source. Involves collecting water in big containers and storing in a shop like structure. Residents of an area in need of water then buy water from the shops. They can also be referred to as booths where the sale of tap water takes place. It can be water that was fetched early and stored or one that is coming through the taps at the moment of purchase.

ABSTRACT

Access to domestic water in the Informal settlements of Sub Saharan Africa and the larger developing world is a problem that has been widely investigated. Living conditions in Informal settlements have been reported to differ across cities, countries and regions although there are similar characteristics exhibited by each and every one of them. Access to domestic water in the informal settlements have been attributed to several factors. While a number of factors have been presented to affect access to domestic water in informal settlements, Household Living are some of the most recent focus that influence the access to domestic water in the areas. The role of Household Living Conditions as an influence on access to domestic water in informal settlements has not been widely explored by studies. The study employed primary data that was collected from selected Informal settlements in 2017. Using a cross-sectional design, the initial 2017 study collected both quantitative and qualitative data using questionnaires and Focus Group Discussions. This study employed the quantitative data and drew focus to 4 informal settlements of Nairobi city from 11 in the initial study. The 4 settlements included; Mathare Mashimoni, Kosovo, Mathare 4A and Mathare 4B with a total sample size of 521. Descriptive results showed that most of the respondents (more than 50%) were female and that household sizes were mostly 3-5 people. The results also showed that most of the respondents were casual workers. From the descriptive results most of the respondents sourced their water from water kiosks, in terms of the environmental conditions, most of the respondents reported flooding as a problem in their places of residence. The structure construction materials of the respondent's units (walls) was mostly corrugated iron sheets/tin and lastly in terms of the Land/Structure Tenure, most of the respondents were renting their residential units. From the bivariate analysis to determine relationship conducted through Chi-Square tests showed that access to domestic water differed across Water Sources, Environmental conditions, Structure Construction Material and Land/Structure Tenure. The regression analysis results derived from a Binary Logistic regression showed that some elements of Household Living Conditions; Environmental conditions and Structure Construction Materials had a significant influence on access to domestic water in the settlements under study while others (Water sources and Land/Structure Tenure) did not. The direction of the relationship between the dependent variable and the independent variables in the model suggested that there is a possibility that all the predictors/independent variables could influence access to domestic water in the study sample. The study concludes that Household living conditions had influence (both significant influence and non-significant influence) on access to domestic water in the settlements under study.

CHAPTER 1: INTRODUCTION

Informal settlements expand as larger populations across the world migrate to the urban areas in search of better employment/income to provide for their needs and those of their families, among other reasons. The demand and the cost of housing rapidly increase as urbanization heightens (Araya et al., 2019). This drives low-income residents into the city's periphery. Consequently, the development of informal settlements is one of the consequences of urbanization. The settlements are residential areas outside the planning rules of a city. In some literature, informal settlements are referred to as "a failure of standardization, and therefore, defy governance by standards" (Kovacic et al., 2019, p. 2). They are argued to arise from limits/inadequacies of formal housing systems to provide for the urban poor. Informal settlements are also said to have resulted from failures of housing policies, basic infrastructure delivery systems and national/urban policies. The absence of standards in these areas has been interpreted as a malfunction in governance.

Informal settlements vary across and within countries (Schrecongost et al., 2015). Equally, the challenges they pose are of different magnitude in different countries and within them. Nonetheless, informal settlements in many places around the world are characterized by relatively high poverty rates and unemployment (Araya et al., 2019), and illegal or uncertain land ownership. The informal settlements have been reported to inadequate or no access to basic services. These services are mostly: water provision and supply, sewerage, electricity, sanitation among other services (Araya et al., 2019; Blomkvist et al., 2019; Dovey, 2013, 2015; Kovacic et al., 2019; Schrecongost et al., 2015).

Water is a crucial commodity in human life and an essential item in the quest to achieve human development across the globe. Provision and access of quality domestic water supply to the urban populations in Sub Saharan Africa is presented to be hindered by several issues: limited public water infrastructure services, insufficient water in most urban areas and low capacity of the public water service providers among others (Dakyaga et al., 2018a). The continuous growth of the urban population has led to an increased demand for the already limited municipal water supplies. In Sub Saharan African countries, only 64% (Dakyaga et al., 2018a) of the populations have access to quality water sources. Water supply is argued to be favouring the formally planned areas against the informal settlements. Private water actors have emerged to salvage the emerging water demands in the Sub Saharan African cities (Dakyaga et al., 2018a). These actors serve more than half of the urban populations. The quality of the water

provided by the alternative water supply actors to different settlements has been questioned and assessed by several studies over the years. The private water supplies have also been associated with high costs and their general accessibility questioned.

Sustainable access to water has been on the agenda of global development goals in the past and present. Most recent examples being the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs) (Dakyaga et al., 2018b). This global acknowledgement demonstrates its criticality in achieving human development. It can be argued that the developed nations are on a steady path to realizing targets of SDG 6: Ensuring availability and sustainable management of water and sanitation for all (UNDP, 2016).

In Sub Saharan Africa, SDG 6.1 target (universal and equitable access to safe and affordable water for all) is argued to be far from being achieved. Its attainment requires a collaboration between the public and informal water suppliers (Dakyaga et al., 2018b). Informal water suppliers supplement the state's incapacity to meet water demands for all. They majorly supply informal settlement dwellers in several parts of Sub Saharan Africa. This has been enabled by inadequate or absence of public water extensions propelled by increasing population in urban areas, none justifiable occupancy rights and haphazard developments in informal settlements. The limited/no access to public water extensions predisposes informal settlement dwellers to frequent inaccessibility to safe water. The dwellers are most likely to be faced by water poverty (Dakyaga et al., 2018b).

Water provision and availability in informal settlements is greatly demanded in cities with unpredictable water supplies. In communities with limited access to public water supplies, there are scattered water points. This leads to overcrowding and long waits causing residents to spend reasonable amounts of time that would have been otherwise put into income-earning activities (Schrecongost et al., 2015). Water reliability in these cases is still intermittently leading to alternatives water supply seeking. In such cases, people have turned mainly to informal water vendors that are costly and mostly transfer the cost of water treatment to the buyers. Despite the fact that the water vendors are costly, they are useful in water provisions to the consumers.

Water scarcity affects more than 40% of the world's population (UNDP, 2016). The unsustainable access to water supply is likely to predispose the informal settlement dwellers (urban poor) to ill- health (Dakyaga et al., 2018b). Economic inequalities in the cities of the global South have also been associated with disparities in access to safe water (Blomkvist et

al., 2019). Amidst various debates among experts, no quick fix has been displayed. To try and address the unsustainable access to water countries in the global South have had to become innovative over the years. In Kenya for instance, the Nairobi City Water and Sewerage Company (NSWSC), the main actor in water supply employing a non- conventional technology, Pre Paid Dispenser (PPD) that was targeted at the poor in the informal settlements. PPD is an automated device tasked with delivering a specified amount of water used for drinking against the fixed charge (Blomkvist et al., 2019). Such efforts supported by donors in Kenya have made steps to enabling access to water in the informal settlements, but much has not been achieved.

Inadequacies in the public water systems in urban areas of countries in global South, have been attributed to inability in meeting the water demands of the urban populations (Dakyaga et al., 2018a). The public water systems are argued to be of low capacities. Despite the fact that water is key to human well-being, provision and availability of municipal water supply remains demanding in several parts of Sub Saharan Africa. A large portion of the urban populations (about 80%) depend on informal water suppliers (Dakyaga et al., 2018b). Estimation by Dakyaga et al. (2018b) indicates that only 5% -10% of Nigeria's population has access to the public water supply system while the other proportions buy water from vendors. "In Tanzania, Kenya, Niger, Angola, women, and children travel to purchase water from water vendors" (Dakyaga et al., 2018b, p. 121). The vendors buy the water and store them before sale; the water may not be in the best state/quality by the time of purchase. In some cases, the vendors are not readily available, and the women and children spend hours looking for them to buy water. In the informal settlements, water provision and supply are scarce, costly and often uncertain (Crow & Obada, 2009). Family units in the informal setups incur costs of an estimate of 20% of their incomes on water (Crow & Obada, 2009). To save on expenditure, they forego some tasks on some days; baths, washing clothes, among others.

1.1 Problem Statement

An overwhelming number of empirical studies have indicated that access to domestic water is a hurdle in the different informal settlement setups in Sub Saharan Africa (Araya et al., 2019; Blomkvist et al., 2019; Crow & Obada, 2009; Dakyaga et al., 2018b, 2018a; Kovacic et al., 2019). Inadequate access to water services in the informal settlements have been associated with poor polices and governance failures (Kovacic et al., 2019). In Kenya, there has been rapid urbanization rates over the years as people strive for access to better economic opportunities. (Kamau & Njiru, 2018) The situations have given rise to and supported the expansion of

informal settlements; Kibera and Mathare among others. They are among the largest informal settlements in Africa. In these settlements access to water is minimal, uncertain and costly. In Nairobi, 60% (25% in Kibera alone) of the population occupy about 160 informal settlements (Crow & Obada, 2009). A majority of the city's population live in the informal settlements yet they have no adequate access to quality domestic water. The challenge in accessing domestic water in some of these settlements in Kenya is presented to arise from an array of interlocking factors: unwillingness of the government to accept the legitimacy of the settlements post colonialism, unregulated vendors and landlords and the presence of gangs and cartels operating with links to city government (Crow & Obada, 2009).The living conditions in the informal settlements and geographical conditions (Dagdeviren & Simon A., 2009; Gulyani et al., 2012)

Since devolution, there have efforts through Nairobi City Water and Sewerage Company (NCWSC) with support from the World Bank and other international agencies to address the inadequate access to domestic water in the city (Crow & Obada, 2009). A midst such efforts, access to domestic water by a majority of Nairobi's population in the informal settlement continue to be problematic. The continued scarcity of water in these areas has remained a problem that has been assessed severally over the years. Considering the history of emergence of informal settlements and factors that continue to support their existence in Kenya, a question arises on how the living conditions and the socio-economic characteristics in the settlements influences access to domestic water. Adequate access to domestic water is critical for socio-economic development (Kamau & Njiru, 2018). It is also critical in the achievement of SDG 6. Although studies indicate that inadequate access to domestic water in informal settlements has been attributed to by several the factors, very limited sources have presented arguments that a combination of different household living conditions influence the access to domestic water by the informal settlement populations.

1.2 Research Questions

What factors influence access to domestic water in the informal settlements in Nairobi City?

Specific Research Questions:

1. What are the socio- economic characteristics of the Informal Settlement dwellers?
2. What are the living conditions in the informal settlement?
3. How do the living conditions influence access to domestic water in the informal settlements?

1.3 Research Objectives

The general objective is to investigate the influence of Household living conditions on access to domestic water in the informal settlements.

Specific Objectives:

1. To analyse the socio-economic characteristics of Informal settlement dwellers.
2. To assess the living conditions in the informal settlements.
3. To investigate how living conditions influence access to domestic water in the settlements.

1.4 Study Hypotheses

The study developed two hypotheses;

1. The elements of Household Living Conditions have a positive and significant effect on access to domestic water
2. The higher the score of Household Living conditions, the higher the likelihood of access to domestic water.

1.5 Justification for the Study

As rapid urbanization continues to spread across the globe, the informal settlements continue to be an option to low income earners as a huge number of people migrate from the rural areas in search for better economic opportunities (Kamau & Njiru, 2018). "In 1971, only a third of Nairobi's population was living in informal settlements. It is estimated that between 60% and 70% of Nairobi residents live in slums" (Kamau & Njiru, 2018, p. 322). The continued expansion of informal settlements against the inadequate availability of key infrastructure and amenities like the supply and access to domestic water have been widely discussed by several scholars over the years. The inadequacies in the settlements have been largely attributed to poor policies/inadequate governance among other factors. There have been different debates supporting different arguments behind inadequate access to domestic water supply in the informal settlements. Inadequate water supplies in the settlements have led to serious health consequences over and over again yet situations in these settlements do not seem to be addressed adequately.

Access to clean water has become a political concern to local and national governments across the globe (Garland & Herzer, 2009). Despite this concern informal settlements in Kenya continue to face challenges in accessing adequate water supplies. This study seeks to

investigate household living conditions and socio-economic characteristics as influencers of access to domestic water in the informal settlements of Nairobi city. In the process the study also seeks to find out water sources in the settlements to aid in coming up with recommendations that can be useful to the county government in easing the situations in the settlements. This study will contribute to the existing debates and broaden understanding on this subject.

1.6 Scope and Limitations of the Study

The study focused on analysing the influence of Household Living Conditions on access to domestic water in the informal settlements of Nairobi City, Nairobi County. The study utilized data from a previous survey on informal settlements in Kenya. The previous survey from which the study utilizes data was conducted in 2017 in Nairobi and Kilifi Counties. The study focuses on 4 informal settlements of Nairobi City: Mathare Mashimoni, Kosovo, Mathare 4A and Mathare 4B. The 4 informal settlements were purposively selected to be included in the study as they were all (and the only Mathare villages included in the earlier 2017 study) villages from the wider Mathare Informal Settlement.

The scope of the study is limited to the influence of household living conditions on access to domestic water in the selected informal settlements of Nairobi City. The living conditions in the study are informed by the theoretical framework: The Living Conditions Diamond and additionally an interplay of socio-economic factors.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section presents a review of the literature, both the theoretical and empirical. This section also presents a model used by the researcher to show the relationship between concepts and the direction of those relationships in the form of a conceptual framework. It is divided into five sections; 2.1covers the introduction, 2.2 covers theoretical framework, 2.3 covers empirical literature, 2.4 covers conceptual framework and 2.5 covers the summary of literature.

2.2 Theoretical Framework

Informal settlements majorly in Sub Saharan Africa have been presented to have inadequate supply of fundamental services such as safe water for domestic purposes by several authors. From literature, access to these services in the informal settlements has been associated to several factors (ranging from the creation of such settlements and the ideals with which they continue to exist) both historical, institutional, political, urban poverty and socio-economic demographics of the dwellers of the informal settlements. To be able to understand and dissect the interaction of these factors and how they influence access to domestic water in informal settlements, this study adopts the Living Conditions Diamond Framework as the basis of the study. It has been used in studies on understanding the state of living in Informal settlements (Gulyani et al., 2010, 2012; Gulyani & Bassett, 2010).

The Living Conditions Diamond Framework indicates that there are four dimensions that can be used in the understanding of living conditions (inclusive of mapping poverty) in the informal settlements inclusive of the inadequate state of basic infrastructure like water connections and other forms of deprivations (Gulyani et al., 2010; Gulyani & Bassett, 2010). It also states that it can be used to differentiate informal settlements and rally for intervening measures addressing different inadequacies. The Living Conditions Diamond framework was developed by Sumila Gulyani and Debabrata Talukdar in their writings of 2007 & 2008. The aim was for better understanding of needs and deprivations that are experienced in different informal settlements across cities (Gulyani & Bassett, 2010). It was to enable identification of unacceptable living conditions and design context specific interventions. The four dimensions used in the Living Conditions Diamond are: tenure, infrastructure, unit quality and neighbourhood & location. They interplay and cumulatively influence living conditions experienced in the informal settlements of cities.

It is represented diagrammatically as a diamond that has four vertices. This is illustrated in Figure 1 below. The interactions of the four vertices result to the overall living conditions. Changes in one dimension could easily affect the next one (Gulyani & Bassett, 2010). Each of the four dimensions are themselves composites of other indicators. **Tenure;** it refers to the right of an individual to hold land or structures. Land and house tenure in informal settlements in literature are often a minimum condition for investments in housing improvements. The fact that informal settlements are mostly considered illegal infringements of public or private land, investments in various forms are kept at bay (Gulyani & Bassett, 2010).Tenure has five characteristics that have been shown to affect the state of living in urban areas. The first one is *type of tenure* held by residents in the settlements, it splits into tenancy and ownership. Taking note of conventional wisdom, proprietorship gives a positive accord to living conditions as there is a drive to maintain dwelling units and neighbourhood conditions for financial benefits (Gulyani & Bassett, 2010).

The second characteristic is *tenure formality.* Dissects whether the occupancy right is officially documented and recognised by the relevant authorities in the city as a lease or a deed. It connects with the third characteristic, *security of tenure.* Is there a guarantee that the tenant or owner will not be displaced (Gulyani & Bassett, 2010). In these cases, formal tenure is assumed secure and very hard to come by in the settlements. The forth one is *tenure mix,* assessment of composition of settlement residents, the ratio of owners to tenants. There are more tenants in the informal settlements and they often feel less empowered to demand for service provision. The last one is the *duration of stay*. Long-term residents are likely to advocate for better living and neighbourhood conditions. **Infrastructure;** are the stocks and services that make housing and settlements functional. They determine living conditions, they include physical stock and assets; road networks, drains, water mains, electrical lines and the provision of public services like potable water supply and solid waste collection (Gulyani & Bassett, 2010).

Infrastructure level of access constitutes; coverage-example; water main line needs to be connected to a settlement to deliver drinking water & household residents have get a connection to use it, level of service, service reliability; availability when needed and affordability; to enable usage instead of seeking alternatives like unlined well water. **Unit;** the housing units in the informal settlements are made of different materials that vary across geographies and climates (Gulyani & Bassett, 2010).To depict unit quality; structural integrity of building materials and the density of occupancy/overcrowding are examined. In consideration to dwelling unit's construction materials & living conditions, three aspects are measured: roofing

material, foundation and exterior walls. Roofing materials like plastics and cardboards are vulnerable to fires and unsafe. In regards to occupancy /overcrowding, it is dangerous in settlements that are underserviced as health issues that arise are not properly dealt with (Gulyani & Bassett, 2010). A difficulty is depicted when there is no hard rule for overcrowding in the housing units and the in the informal settlements at large.

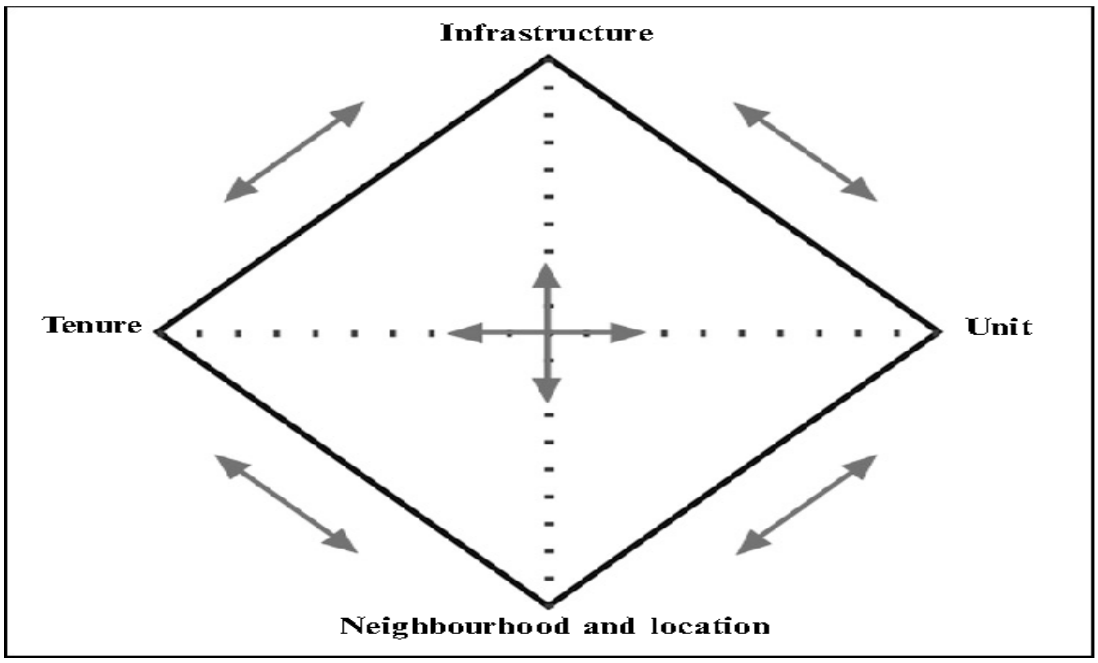

Figure 1: The Living Conditions Diamond
Source: (Gulyani & Bassett, 2010, p. 2203)

Neighbourhood and Location; the location of a settlement, quality and the amenities available determine the overall living conditions. The geographical location; density, physical layout and circulation and the amenities directly influence the living conditions of the informal settlements (Gulyani & Bassett, 2010). Spatial location encompasses the centrality/connectedness in terms of access to jobs, markets, schools, transport services and health facilities. Spatial location also entails physical/environmental vulnerabilities; settlements characterized by vulnerabilities like floods are a burden to the residents, dealing with infections from contaminated water (Gulyani & Bassett, 2010). The density, physical layout and circulation are determined by physical planning as it is useful to manage population density, laying a foundation for delivery of services like water and basic circulation. Informal settlements in most of the cities in the world are haphazard occurrences. Informal settlements are located in the periphery of cities or on formerly unused lands; flood plains, hills, desert lands that cannot be able to support certain structures among others.

All these four vertices interact to cumulatively determine the living conditions of the informal settlements. The four dimensions greatly influence each other and should not be considered in isolation, example; security of tenure will motivate improvement of housing units and empower residents to demand service provision (Gulyani & Bassett, 2010). Any of the four dimensions can act as intervention entry point to improve living conditions. As applied in my study, these interactions are argued to have had a great influence on access to domestic water in informal settlements across different cities of the world. The conditions in the informal settlements have made it difficult to access sufficient water connections. This is in conjunction with several other institutional and economic factors. In their writings on the Living Conditions Diamond framework, the year in which it was developed is not quite clear. In their propositions, the role of the state and non-state actors is not quite defined; the role played in resulting to the conditions nor how they alleviate the situation.

In addition to the provisions in the living conditions diamond, access to domestic water in urban informal settlements might also be influenced by the interplay of the following factors: Socio-economic/demographic factors; access to education influences access to jobs that directly affect household's income (Gulyani et al., 2010). Improved access to education improves access to jobs that are sources of household's income. When there are high rates of unemployment, poverty incidences are high as well. These factors lead to poor living conditions (Gulyani et al., 2010). The costs tied to safe water influence its access. Households with stable income sources tend to have more access to basic services like water as compared to those with no/unstable source of income. Risk perceptions of water quality from different sources influenced sourcing drinking water from piped and non-piped sources in various towns in Kenya (Onjala et al., 2014). The decision to use piped or non-piped sources greatly depended on its availability to households, example; households that preferred piped water had access to it.

2.3 Empirical Literature

Informal settlements have been dubbed common occurrence in developing countries and have been associated with several factors but majorly poor housing policies. It has however been emphasized by several studies that each these informal settlements have unique living conditions. There are several studies that have been done on informal settlements in the developing world, especially in Sub Saharan Africa. One of the major topics of research in the informal settlements is access to basic services like water. World development agendas, both past and present; SDG 6.1, MDGs have included and relied on achieving access to safe water

by all populations. Despite the fact that access to domestic water is critical to the health of populations and achievement of other development goals, there is inadequate supply of water in informal settlements as documented by studies across developing countries.

Supply of potable water in informal settlements of Sub Saharan Africa has been documented on by several scholars focusing on the sources and cost of water, policy factors that contribute to the inadequate water access in the areas, physical factors contributing to the same, urban poverty among others that studies highlight. In order to be able to understand the situation; supply of domestic water in informal settlements, the review of studies was divided into various thematic areas: Socio-economic characteristics of informal settlement dwellers, overall living conditions in Informal settlements Sources of Water Supply in the Informal Settlements, Access to Water in the Informal Settlements, Barriers to Water Provision and Access in the informal settlements and the Legal and Policy Frameworks for Water Provision and Access in Kenya.

2.3.1 Socio-Economic Characteristics of Informal settlement dwellers

Profiling the Informal settlement dwellers plays a major role in putting several issues into perspective. Literature on several topics/issues with regards to informal settlements have profiled the dwellers in terms of; gender, marital status, household size, religion, education, employment and income levels. These factors are useful in shading more light/informing on all the other themes that are discussed in this review. Drawing from household surveys conducted in various informal settlements in the urban areas of Lilongwe, Malawi, Adams (2018a) examined intra-urban inequalities in water supply among households. The study was conducted between July & September of 2014. The three engaged informal settlements were: Kauma, Mtandire and Area 36. The estimated total population was 6000-9000. The three survey sites were selected through a two-stage randomized cluster technique (Adams, 2018a). Using a probabilistic sampling the study sampled; 155, 258 and 232 from Mtandire, Kauma and Area 36 respectively. A total of 645. Questionnaires that covered variety of information were used in the survey.

Data analysis employed descriptive and inferential statistics using multiple ordinary least square (OLS) and logistic regressions (Adams, 2018a). The study results revealed that; the respondents were mostly female (87.91%), this was explained by the fact that most of them were housewives whose husbands were at work in the period in which the survey was conducted. The household size was reported to range from 1-13 with a range of 5 (Adams,

2018a). In all the study sites, the highest level of educated completed was Primary School with 55.6% of the respondents having completed. 81.2 % of the respondents were married, 44.96% were unemployed and 84% of the respondents were migrants from different areas (Adams, 2018a). Around 45% had ownership of their dwelling units while 49.46% were rent paying tenants while others lived in units that were owned by their relatives. Different sizes in dwelling units were reported; about 37% of the respondents lived in two bedroom units while 33% lived one bedroom units.

In a different study, Simiyu, Cairncross, & Swilling (2018) used results from an earlier study to design a cross-sectional survey, with the aim to understand living conditions and deprivations in the Informal settlements of Kisumu. The sample size was shared uniformly among four informal settlements: Bandani , Nyalenda A & B and Obunga (Simiyu et al., 2018). The settlements are divided into units; two that had the highest density were intentionally selected from each. From each unit, twenty compounds were selected; 40 compounds from each settlement, a total of 160 compounds. One household was then randomly selected from. 180 respondents were interviewed (Simiyu et al., 2018). From the study results; 82% of the respondents were women that were 30 years old on average. The household size was 1-9 with an average of four people. 71% of them were married. 33.9% attained no level of education ,54% attained primary education and 12.2% secondary education and above. 42.2% of the were self-employed (majorly sale of groceries), 36.1% had no employment and 18.3% were casual workers.

In Dakyaga et al.(2018b) the sustainability domestic water access under informal water supply markets in Dar es Salaam, Tanzania is examined. Informal settlements under study were selected through a multi-stage sampling technique. Out of the five municipalities one was randomly selected; Ubungo, it was largely dominated by informal settlements (Dakyaga et al., 2018b). Three informal settlements were then selected from Goba ward. The sample size was 292 persons. The study employed a mixed method, largely drawing from qualitative than quantitative data. There were three levels of data collection; institutional, community and households. Socio-economic characteristics of households equally influenced water access sustainability (Dakyaga et al., 2018b). 55.5% of the respondents attained primary education, 23.3% secondary education and 21.2% tertiary level. 29.1% of the respondents aged 26-30 years old. 40.1 % of the households had an average size of 5-6 persons. 44.2% earned wages from small trading activities, (purchased water daily from their sales), 19.5 % earned from small to medium size businesses and 16.8% had formal employment.

Three informal settlements in Sub Saharan Africa were surveyed in a comparative study of Africa's informal settlements. (Kovacic et al., 2019). 300 questionnaires were administered in the settlements; Enkanini in Stellenbosch, South Africa, Kasubi-Kawala in Kampala, Uganda and Mathare in Nairobi, Kenya. A mixed methods approach was employed in the study. In Enkanini, a pilot study involving 100 households was conducted in 2015 (Kovacic et al., 2019) and replicated in 2017 in all the three. Results showed generally young populations similar to national figures. Gender asymmetry was reported in working age adults (20-34 years old); 60% in Kasubi-Kawaala, 63% in Enkanini and 75% in Mathare more women. (Kovacic et al., 2019). Men mostly worked outside the settlement while women worked within; washing clothes, cooking. Single mother households; 20% in Enkanini, 24% in Kasubi-Kawala and 30% in Mathare. In Enkanini, while men were mostly employed as security guards, women were cleaners and domestic workers. About 30% of the working age population were unemployed.

In a mixed method study of women's sanitation utilization in informal settlements in Kenya, data was collected from 11 villages in Mathare. Sampling was stratified across the villages (Winter et al., 2019). The first round involved In-depth interviews conducted with 5 women purposefully sampled from each village (55). The second round involved a study of 550 households. They were randomly selected from each village. Qualitative portion of the study examined broad questions (Winter et al., 2019). The results from quantitative sample (550) indicated that the average age of respondents was 32 years old with a range of 18-70. 45 % of the respondents had completed primary education and about 31% completed secondary education. Approximately, 37% were employed and 23% owned businesses. 54% were legally married yet 57% of them lived in female headed households (Winter et al., 2019). In the qualitative sample, 50% of the respondents were 25-30 years old, ranging from 18-72. 57% completed primary school and 17% completed secondary school. Over 60% were reported no formal employment. Over 50% were married.

2.3.2 Overall Living Conditions in Informal Settlements

Using world bank data, Gulyani et al.(2010) assessed poverty, living conditions and infrastructure access in the informal settlements of Dakar, Johannesburg and Nairobi. In Nairobi and Dakar, the conduction of household surveys was from February to March of 2004. The sampling methodology differed a little in the two cities but both produced stratified randomized samples from informal settlements under study. In Nairobi the study covered 1755 households and in Dakar 1960 households (Gulyani et al., 2010). In Johannesburg, the survey took place in 2001 in the months of August and September. It involved the survey of 5,100

households but for comparison purposes only data from 1618 informal settlement households were analysed. Poverty in the slums of the cities under study was mapped into 4 elements; living conditions ,monetary welfare, education and employment (Gulyani et al., 2010). They are presented as a 4 dimensional development framework that is posited to interact over time to determine the welfare of households in the informal settlements.

The results from the surveys in all the three cities indicated; high incidences of poverty, high rates of unemployment, education that is almost universal and poor living conditions. Clear variations in the three cities were recorded (Gulyani et al., 2010). Dwellers in Nairobi were much more educated and overall those in Dakar enjoyed better living conditions. In Johannesburg informal settlement dwellers had the greatest access to regular jobs and yet were still the most unemployed. The interconnections between the 4 dimensions were presented to be weak (Gulyani et al., 2010). It suggested that a reduction in incomes poverty is alone insufficient to improve living conditions in the same way that improved access to education is not sufficient for improved access to jobs. In regards to monetary welfare, 72% of slum dwellers in Nairobi were poor, calculated using poverty line set by the government of Kenya (Gulyani et al., 2010). In Dakar 82% were below the set poverty line and Johannesburg had no information on income. In Dakar, a third of adults had completed primary education level and less than 10% had completed secondary education level.

In Nairobi,70% of the respondents had completed primary level education and 31 % secondary education. In Johannesburg 70% completed primary level education and 44% secondary education. Unemployment was widespread in Johannesburg compared to 26 % unemployment rates in Nairobi's informal settlements and 6% in Dakar (Gulyani et al., 2010). Johannesburg had 28% regularly employed adults, Nairobi 25% and Dakar 8%. Living conditions was assessed using two indicators; access to piped water and electricity and the second access to piped water, electricity and permanent external walls. On the first indicator, 76% of Dakar's informal settlements had piped water and electricity, 31% in Johannesburg and 7% in Nairobi. On the second indicator, 74% of households in the informal settlements under study had a supply of piped water and electricity and resided in units with permanent external walls and in Nairobi 3%. There was no housing information on Johannesburg's informal settlements.

2.3.3 Sources of Water Supply in Informal settlements

This section examines the various sources of water available in the informal settlements. In examining the barriers to access improved water and sanitation in poor peri-urban settlements

of Abidjan, Cote d'Ivoire, across sectional study was conducted in June 2015 (Angoua et al., 2018). The survey took place in six poor peri-urban settlements in Yopougon. The six settlements: An 2000, Banco, Beate cocoterie, Depot Sotra, Gouro and Sikasso. It involved randomly selected 556 households from the six peri-urban settlements. To test validity and applicability a pilot survey was conducted (Angoua et al., 2018). The study results revealed several sources of water supply; tap water, water for resale, well water, rain water and hand pump water. Figure 2 below, illustrates the sources of water supply in the six informal settlements. Tap water was the major source; over 90% in Banco & 35% in Depot Sotra. Water resale was common in the settlements; approximately 70% in Depot Sotra and about 5% in Banco (Angoua et al., 2018). Over 90% of water supply in Sikasso was well water and rain water supply was estimated at over 80%.

Generally, across the settlements, tap water was a major source of water supply at an average of 57%, close to tap water was water resale at an average of 40%, well water at 12%, rainwater at 12 % and hand pipe water at 9%. The sources supplement each other.

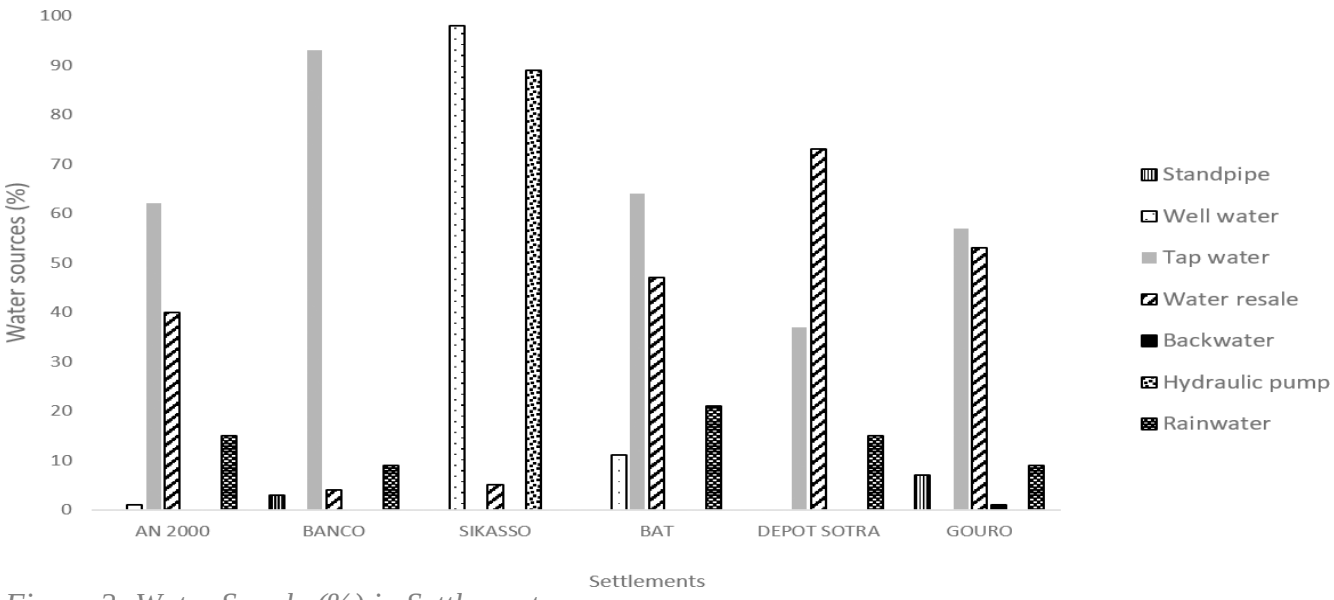

Figure 2: Water Supply (%) in Settlements

***Source**: (Angoua et al., 2018, p. 6)*

In a different study, the assessment of household's water quality and services in the Informal settlements of Dar es Salaam, Tanzania, was conducted in three purposively selected sub wards: Chaurembo ,Kunguru & Kibululu (Dakyaga et al., 2018a). The study targeted households especially those involved in water collection, directly or indirectly. It draws from qualitative (drawn from 35 purposively sampled water actors & state led water departments)

and quantitative data drawn from 292 households randomly sampled from the three sub wards. The study results indicated a direct relationship between household income and the source of water supply (Dakyaga et al., 2018a). All the surveyed households had access to more than one source of water supply. The sources of water supply recorded: tanker trucks. Mechanized boreholes, private water taps, pushcart water, well water and water kiosks. Medium & large business owners (58.3%) and government workers (57.1%) largely depended on tanker trucks for water. Small scale business owners also sourced water from tanker trucks in addition to mechanized boreholes and water kiosks (Dakyaga et al., 2018a). Water source was also determined by household size; larger ones sourced from truck tankers and smaller ones from mechanized boreholes.

In a study on household water insecurity in urban informal settlements of Lilongwe, Malawi, a survey was carried out in three peri-urban informal settlements: Kauma, Mtandire and Tsabango, in Adams (2018b). The settlements under study were suitable since; they were densely populated, experienced inadequate access to potable water & high poverty rates. Through a two-stage randomized sampling, a sample size of 645 households was obtained. Data was mainly collected through household structured surveys and supplemented by focus group discussions, observations and policy documents (Adams, 2018b). The study results indicated communal water kiosks as primary sources of water for about 60% of the households surveyed. Second to this were taps (private or neighbour's), provided water to about 11% of the households. Only 9.3% of the households had water supply from own tap or shared compound tap. In totality, 37% of the households under study sourced water from a neighbour's tap or shared compound tap, protected well water/boreholes as their primary sources of water instead of the water kiosks available in the community as the majority of the respondents.

In a separate study, a cross-sectional survey was carried out in Mathare informal settlement, Nairobi, Kenya. It aimed to evaluate water, sanitation and hygiene situation in Kenya's urban informal settlements (Kamau & Njiru, 2018). The study was conducted in May 2012. Four of the seven villages that constituted Mathare at the time were randomly selected. A sample size of 380 was obtained and household questionnaires were administered. The results indicate that 84% the households under study obtained water for domestic use from standpipes. 16% of the respondents obtained water for use from water peddlers (Kamau & Njiru, 2018). Despite having iron sheet roofs, rain water harvesting was not mentioned by the respondents. Apart from the two common sources of domestic water, they reported alternative sources of supply during downtimes: piped water transported from other areas was an alternative source for about

52% of the households, Water vendors 21% of the households, 16% sort alternatives from borehole water and about 2% from distant stand pipes.

Drawing from several empirical studies, Crow & Obada (2009) discusses the scarcity, cost and uncertainty of water access in Kibera, an informal settlement in Nairobi, Kenya. Women and children in Kibera have been depicted to mostly purchase water from water vendors. They purchase water using 20litre jerry cans that formerly contained cooking oil. The vendors collect, store and sell water from standpipes (Crow & Obada, 2009). On average, 650 water vendors were reported in Kibera. The vendors had both legal and illegal connections to the few water mains running near and through Kibera. Water supply through the mains were reported rationed and uncertain. The vendor sold water from the standpipes in front of their houses or offices (Crow & Obada, 2009). The water spots have been commonly referred to as water kiosks by authors in several literatures. Community based organizations installed about 20 storage tanks and kiosks at the time. The only alternative to the water vendors in Kibera at the time was recorded as one borehole at the mosque on a high point.

2.3.4 Access to Domestic Water in Informal settlements

In November, 2002, the UN Committee on Economic, Social and Cultural Rights with General Comment 15, set a criterion for the right to water. Stating , every human is entitled to: sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses (Ruíz, 2015; WHO, 2011). **Sufficient;** 50 to 100 litres of water per individual per day is required to meet basic needs; personal and domestic purposes. **Safe;** water must be potable and fit for other domestic activities. Free from any kinds of bacteria, chemical, physical and radiological hazards. (Ruíz, 2015; WHO, 2011). **Acceptable**; the colour, odour and taste of the water must be acceptable for personal and domestic use by individuals. The water services must be culturally appropriate and gender sensitive. **Physically accessible**; water services should be in close proximity to households. A water source should be within 1,000 metres of a home and collection time should not be more than 30 minutes. **Affordable;** water must be affordable to all. Costs of water should not be more than 5% of a household's income and their ability to afford other basic services like food should not be incapacitated (WHO, 2011) .

In examining the water, sanitation and hygiene situation in Kenya's informal settlements, a cross-sectional survey was carried out in Mathare informal settlement in Nairobi, Kenya. Engaging 380 households, the survey was conducted in 2012 (Kamau & Njiru, 2018). The

results from the study indicated that most of the households (87%) under the study paid for water. At the time of the study the average cost of water was KES 3.3 per 20litre jerry can. They bought water from water vendors. Increase in the cost of water led to a decline in the household's water consumptions. They experienced erratic supplies (58% of the respondents did not have a supply of water throughout) leading to practice water storage (Kamau & Njiru, 2018). Water storage in 67% of the households was in containers with lids while 30% of the households had some covered and some left open. A small portion of the respondents treated their drinking water, about 32% of them. Of the portion that treated their drinking water, 58% used chlorination and the other 38% boiled their drinking water.

In the assessment of household's water insecurity in the urban informal settlements of Lilongwe, Malawi, results from a study conducted in three informal settlements: Kauma, Mtandire & Tsabango were used. A sample size of 645 households was used (Adams, 2018b).It employed a mixed methods technique in the data collection. The study results showed that the average walking time to water collection points was 3.89 minutes and return time after collection 4.5 minutes. Waiting time at the water collection points as gathered from the respondents was averaged at 38 minutes (Adams, 2018b). In extreme cases, waiting time at the water kiosks averaged to 3 hours. Making averages of four trips per day to the kiosks as it was their primary source of water, time was determined as a major constraint. Women and girls waited for long in the long lines to be able to fetch water. The situation was reported worse in the morning hours (Adams, 2018b). The respondents reported irregular supply of water as their major problem. Water storage was highly practiced yet water treatment was uncommon (only 19% of households treated water before use).

While investigating the factors that hinder the access to improved water and sanitation services in poor peri-urban settlement of Abidjan, Cote d'Ivoire, access to clean water among other parameters was examined. A study was undertaken in six informal settlements: An 2000, Banco, Beate cocoterie, Depot Sotra, Gouro and Sikasso (Angoua et al., 2018). Data collection was done in June 2015 and 556 households were engaged. The results revealed that a majority of the respondents (424 out of 554,76%) had access to clean water. Households with inadequate access to clean water of larger sizes (6-10 persons), this was majorly the case in Sikasso. These households were also reported to belong to non-Christians (Angoua et al., 2018). Adequate access to water was related to living in Banco in addition to the presence of a household's head wife. Inadequate supply of clean water was linked to low class socio-economic status, Sikasso and Beate cocoterie presented to further the argument (Angoua et al., 2018). Erratic water

supply was reported to divert the people into unsafe sources of water as they seek alternative supplies. In the evaluation of water supply, sanitation and health risks in Yaounde, Cameroon, a study conducted in seven informal settlements was employed.

The seven settlements/quarters; Tongolo, Mbankolo, Etoudi, Nkomkana, Ngousso, Nkol- Eton and Nfandena (Dorice et al., 2008). Located in the Northern part of Yaounde. Data was collected in March 2007 engaging 1,397 households (192-206 per quarter). Stratified sampling was used in the selection. The study results indicated that drinking water was not yet accessible to all the seven settlements. 17% of the households under study had private connections to the national company of drinking water (Dorice et al., 2008). The households that were unable to afford piped water (56% of the households) had access to; public paying fountains from the company of drinking water, wells (17% of households), springs (4% of households), boreholes (0.07% of households) and 0.01% of households using water from rivers (Dorice et al., 2008). The water sources were largely unsafe and 50% of the users chlorinated them before use, others boiled, filtered and used cooking salt.

To understand the living conditions and deprivations in the informal settlements of Kisumu, Kenya, Simiyu et al. (2018) used a study that had a sample size of 160 compounds that was equally divided among four informal settlements: Nyalenda A & B, Bandani and Obunga. The results showed that approximately 8% of the compounds had access to water supplies. The remaining proportion depended on the nearby water points. The water points were in a distance of nearly 5 minutes' walk and in some cases the use of bicycles and motorcycles or wheelbarrows was employed (Simiyu et al., 2018). On average one 20litre jerry can of water cost KES 3 at the time of study. Main water points were mainly unreliable (73%), and scenarios of dry taps were reported. In such situations they turned to alternative sources such as boreholes and springs. The alternative water sources were located further away from the dwellings. Simiyu et al. (2018) do not indicate the time/period in which the data interrogated was collected.

2.3.5 Barriers to Water Provision and Access in Informal Settlements

Drawing from the first three sub sections, water provision and access is deemed problematic in several informal settlements of Sub Saharan African countries. This portion focuses on some of the reasons why that is connecting the situations to the first three sub sections. Dagdeviren & Simon A., (2009) are of the agreement that water access in informal settlements is inadequate because of the: inadequacies of public policies that are implemented with regards to the

settlements, insecure land and housing tenure as the dwellers are often denied legal status with the reasoning that they are encroaching into private or public land or either they do not meet the required building standards (Dagdeviren & Simon A., 2009). The third argument on the inadequate provision and access to water in informal settlements has been termed as technical barriers. They are presented as a deterrence to formal water network expansion in the informal settlements. They have been classified into three categories: physical conditions of the settlements, topographical locations and the quality of housing units (Dagdeviren & Simon A., 2009).

Topographical location of the settlements; in some cases, informal settlements are located at the edge of cities or in formerly unused lands like hills, flood plains or desert land. These topographies have been argued to make the expansions of formal utilities network like water connections technically difficult (Dagdeviren & Simon A., 2009). **Physical conditions of the settlements;** the haphazard development patterns in most informal settlements have been presented as an obstacle when it comes to construction and laying connections for water utilities. **Quality of Housing units;** the materials used in dwelling units constructions in the informal settlements have been deemed inadequate for holding balance and permanence of water pipes and taps (Dagdeviren & Simon A., 2009). Examples of the materials named; plant leaves and stems, thickened mud, tins, plaster boards and old iron sheets among others. The nature/conditions of informal settlements vary from country to country (developing countries) and from one to another, many of them may experience one, two or all of the above difficulties.

Dagdeviren & Simon A. (2009) illustrated that in Abidjan, Cote d'Ivoire, the rising of plateaus to 50 metres led to the geographical segregation of informal settlements, creating significant challenges in the development of urban services. In Dar es Salaam, Tanzania, areas located within river valleys, flood-prone areas and hill slopes developed into unplanned informal settlements. Servicing these settlements deemed hazardous had been difficult because of the terrains, population density and their layout (Dagdeviren & Simon A., 2009). In Egypt, informal settlements located in the desert lands presented a set of difficulties associated with the stability of water infrastructure (pipes and taps) as well as the stability of housing infrastructure. In Rio de Janeiro, many informal settlements were reported situated on hills, swamps or along roads where it is impossible to extend water connections (Dagdeviren & Simon A., 2009). In Sao Paulo, dwellings were built with tins, cans and cardboards that offer no permanency to water pipes and taps.

In assessing the challenges to improved water and sanitation in six informal settlements of Abidjan, Cote d'Ivoire, using a cross sectional study, Angoua et al. (2018) showed that ,inadequate technology and inaccessibility of water sources was a major hindrance to domestic water access in the informal settlements of Abidjan. In addition to this, living in households regarded socio-economically low class was a ticket to inadequate access to safe/clean water. The people ranked highly socially had a higher likelihood of access to clean water because of their ability to turn to private alternative water supplies during shortages of the formal supply mechanisms (Angoua et al., 2018). The presence of women and girls in the households in this study and referencing from previous studies was presented as a factor likely to increase a household's access to safe water as they are associated with fetching water. Their absence was highly linked to the consumption of unsafe water (Angoua et al., 2018). Lack of education did not stand out as a hindering factor in the access of safe water (increased rates of unemployment were presented to have mostly deterred educational achievements from translating to high paying jobs).

The analysis of Intra-urban inequalities in water access among households in Malawi's informal settlements; three informal settlements in Lilongwe, in Adams (2018a) indicated that households whose heads were in employment, individually had access to higher volumes of water. They were able to cater for the costs of water compared to the households whose heads were unemployed. Income was shown to improve access to clean water even in such a set-up; informal settlement where one would assume that income earning are of almost the same level (Adams, 2018a). More income was shown to lead to better access to clean and required volumes of water. Household income levels have been shown as the barriers to water access among the households in the three informal settlements in Lilongwe that were under study (Adams, 2018a). This study however does not demonstrate the different levels of income and the variations that have been stated to directly affect the access to water (in terms of safety and volumes).

In their writings on ,scarcity, cost and uncertainty of water in Kibera informal settlements, Nairobi, Kenya, Crow & Obada (2009) draw from several studies to address some of the barriers to water provision and access in the settlement. Water supply to the area was reported to be highly rationed, out of the seven days of a week, water traders expected 3 days of supply and depending on the conditions of reservoirs this was likely to reduce (Crow & Obada, 2009). To counter this, the traders reported to have sort refuge in illegal connections. From household surveys, women had grievances over the high costs of water and the time spent getting it. The

women narrated that water collection occupied a large part of their day and a significant portion of their earnings. In some cases they had to forego some activities(washing clothes and taking baths) to preserve water for more important ones; food preparation (Crow & Obada, 2009). Another impediment to water access discussed was inadequate water storage capacities by households as storage tanks/jerry cans take up large portions of their dwelling units.

2.3.6 Legal and Policy Frameworks for Water Provision and Access in Kenya

There are institutional frameworks that govern water provision and access in Kenya. Water governance frameworks in Kenya have undergone reforms over and over since independence. Focus will be drawn beginning from the **Water Act of 2002**. It divided the management of water resources and water services provision. It mandated for the creation of Water Service Providers (WSP) in Kenya (Shurie et al., 2017). It also established the Water Resources Management Authority (WRMA). WRMA took over the issuing of permits. The act led to the creation of Nairobi City Water and Sewerage Company (NCWSC). NCWSC took over the responsibility of water services provision (autonomously) in Nairobi and other WSC did the same in their respective towns and cities, a function that was previously undertaken by the city council (WSUP, 2018). The water act of 2002 introduced a lot of changes in the legal framework for the management of the sector in Kenya. Initially all the functions in the water sector were mandated to the Ministry of Water Development.

In addition to the creation of functions of Water Service Providers, it also mandated for the separation of other functions leading to the creation of: Water Services Regulatory Board (WASREB), Water Service Boards, Water Services Trust Fund (WSTF), Water Appeals Board (WAB) and WARMA (Ogendi & Ong'oa, 2009; WSUP, 2018). The Water services and Sewerage unit as a sub sector was mandated functions that it was to deliver on together with the institutions under it. The roles and responsibilities of these institutions are summarised in Table 1 below. The changes made by Water act of 2002 were argued to have greatly improved the policy environment in the water sector. In 2009, there was a creation of the Informal Settlements Department (ISD) within the Nairobi City Water and Sewerage Company. Since its creation, it has been reported to be expanding in terms of capacity to serve the informal settlements (WSUP, 2018). By 2018, ISD had opened zonal offices in: Kibera, Mukuru, Kariobangi and Kayole Soweto to improve effectiveness of services to informal settlements residents.

WSUP (2018) reported that there were 85,600 direct beneficiaries from new connections borne by the ISD. Water network installed in the settlements at the time was estimated at 330,383m.

Table 1:Roles and Responsibilities of WSS Sub Sector Institutions

Institution	Roles and responsibilities
Ministry of Water and Irrigation (MWI)	1. Development of legislation, policy and strategy formulation, sector coordination and guidance, and monitoring and evaluation 2. Overall sector investments planning and resource mobilization.
Kenya Water Institute (KEWI)	1.Training and Research
Water Services Regulatory Board (WASREB)	1.Regulation and monitoring of service provision (Water Services Boards and Providers) 2.Issuing of licenses to Water Services Boards 3.Setting standards for provision of water services 4.Developing guidelines (water tariffs etc.)
Water Services Boards (WSBs)	1. Efficient and economical provision of water services 2. Developing water and sewer facilities, investment planning and implementation 3.Rehabilitation and replacement of infrastructure 4. Applying regulations on water services and tariffs 5.Procuring and leasing water and sewerage facilities 6.Contracting Water Service Providers (WSPs)
Water Service Providers (WSPs)	1.Provision of water and sanitation services, ensuring good customer relation and sensitization, adequate maintenance of assets and reaching a performance level set by regulation
Water Services Trust Fund (WSTF)	1.Financing provision of water and sanitation to disadvantaged groups (pro-poor) as water poverty fund
The Water Appeals Board (WAB)	1.Arbitration of water related disputes and conflicts between institutions and organizations
National Water Conservation and Pipeline Corporation (NWCPC)	1.Construction of dams and drilling of boreholes

Source: National Water Services Strategy(2007-2015)

The works of ISD were funded by; WSTF, WASREB, African Development Bank, World Bank, UN-HABITAT, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Swedish International Development Cooperation Agency (SIDA) among others including WASH implementing organizations (WSUP, 2018). **The Water Act of 2016** was developed to allow the alignment of the provisions to the Constitution of Kenya, 2010 that delineated the functions of national and county governments. Water resource Management was established as a function of the national government while water services provision a function of the county governments (Kariuki Muigua, 2017; Shurie et al., 2017). In Nairobi, NCWSC is responsible for the supply of water to all the residents including informal settlement dwellers that are

grouped under the Informal Settlements Region (ISR), as an administrative unit (WSUP, 2018). With all the milestones, water provision in the informal settlements has remained a challenge.

2.4 Conceptual Framework

The conceptual framework is presented in Figure 3. It shows the relationship between the main variables under study. Access to Domestic Water is defined in terms of quantity of clean water the study population had access to in the past 1 year. The Access to Domestic water (Dependent Variable) is influenced by several factors that lead up to the existence and the Makeup of Household Living conditions (Independent Variable); the Household living conditions; tenure, structure/dwelling units materials (Walls) & the settlements environmental conditions, the socio- economic characteristics of the informal Settlement dwellers; employment type, household size, sex of the respondents among others that discussed in sub section 2.3.1 are suspected to have an effect/influence on access to domestic water in informal settlements in the study sample. The sources of water that are available in the Informal settlements in combination with the targeted legal and Institutional framework and Barriers to water connections; institutional, technical, personal and situational have been presented as the intervening variables between access to domestic water and the Household's Living Conditions in Informal Settlements (see figure 3) in the study.

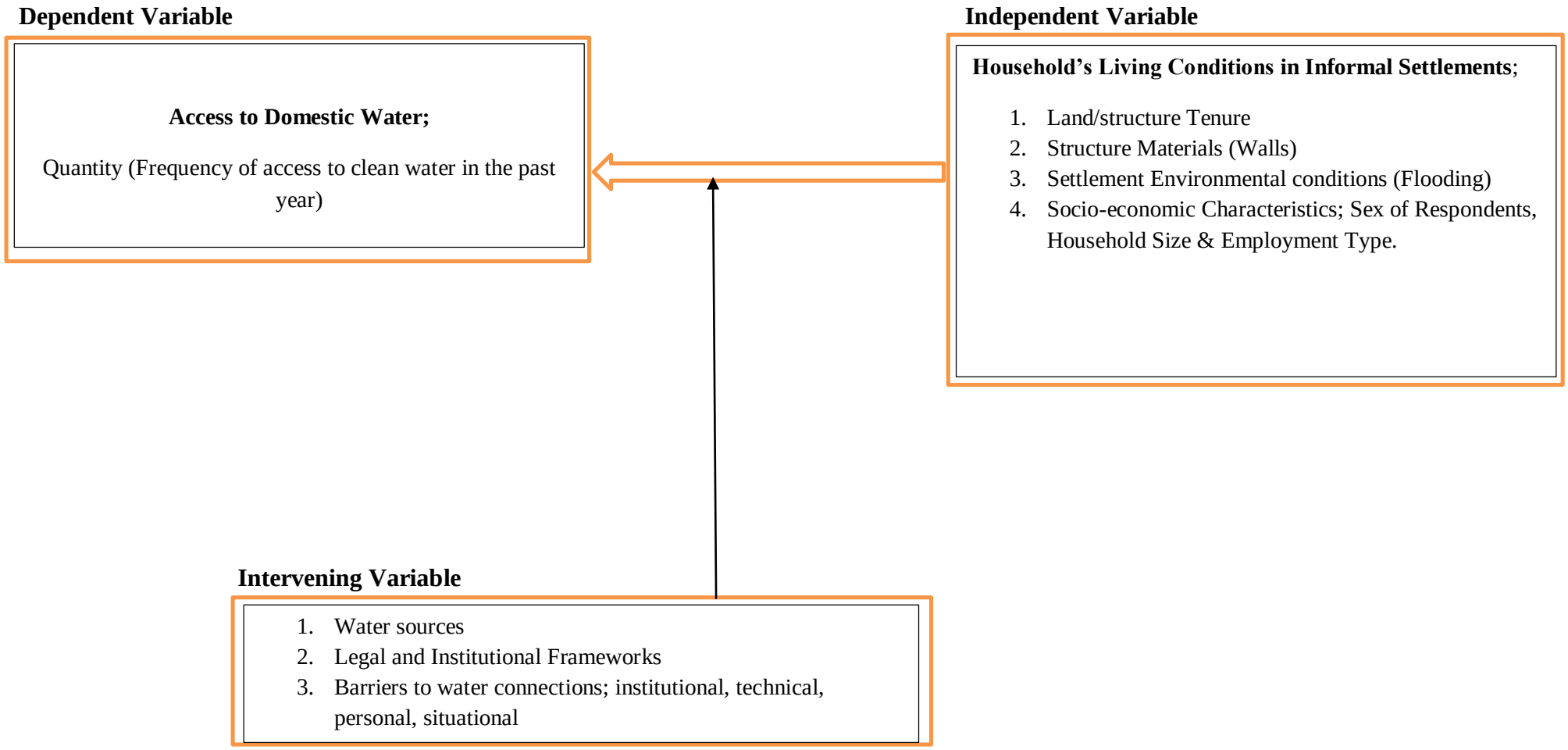

Figure 3: A conceptual Framework on the Influence of Household Living Conditions on Access to Domestic Water in Informal Settlements

***Source**: Author's own Conceptualization (2020)*

2.5 Summary of Literature

This chapter has discussed the theoretical and empirical literature for the study. The theoretical framework employed by the study; Living conditions diamond framework outlined a number of dimensions that are used to dissect service delivery and its nature in the informal settlements. These dimensions are; Tenure, Infrastructure, Unit of dwelling and the neighbourhood/location of the settlements. The four have been discussed in relation to living conditions and effect on service delivery such as water services. The framework posits that the four dimensions are used in determining living conditions in Informal settlements. The study also draws from an interplay of socio-economic economic and risk perception factors as influencers of access to domestic water in the informal settlements. Drawing from the empirical literature that has been reviewed in this section, the relationship between access to domestic water and Household's Living Conditions in informal settlements has been widely discussed. A number of summaries can be drawn from the reviewed studies.

First, the fact that the populations under study are already living in the informal settlements there are already limited options when it comes to access of various basic services such as water provision. Second, the haphazard nature of informal settlements, mostly in Sub Saharan Africa predisposes their dwellers to inadequate access to domestic water services. The structures in these areas have been argued to crop up without any plans approvable by city planning authorities. They mostly hinder water connection infrastructures from cutting across the settlements. Third, the topographical nature of informal settlements has been argued to be a major influence on access to water services. Informal settlements have been shown to crop up in lands that were formally not in use because of their nature; hilly, sandy desert lands, flood plains among others. Some of these topographical natures have been presented to hinder water provision and access as the water infrastructure required couldn't be supported with the environment in the informal settlements.

Household living conditions in the informal settlements have been discussed as major influencers of access to domestic water; example is land/house tenure, affects investments in water provision as most occupants of informal settlements are regarded to be encroaching on public or private land. The material of the dwelling units has been presented to hinder the support of water pipes and taps as are mostly mud, cupboards among others that do not support the permanency of infrastructure for water provision. The household's socio-economic characteristics for example income as a major determinant of access to domestic water has been widely discussed by several authors in the studies reviewed, those with higher incomes in the

settlements were presented to have choices when it comes to sourcing water for their domestic uses/purposes.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

In this section, the methodology that has been employed in the study is presented. According to Babbie (2014), methodology could be referred to as the science of finding out. It is regarded as a branch of epistemology. The same text describes epistemology as the science of knowing (how do we know what we know and what is regarded as acceptable knowledge). With regards to methodology, the source of knowledge has been a debate in social research. Methodology is how social researchers find out about human social life in the various study contexts (Babbie, 2014). Simply put, a research method refers to the technique(s) used in the data collection process. Involves designed instruments (Bryman, 2012). This section documents these procedures. The section is sub divided into; 3.1; this introduction, 3.2; discusses the research design, 3.3; discusses the study sites, 3.4; illustrates the target population and the population for the study, 3.5; discusses the sampling techniques employed, 3.6 data collection procedures, 3.7 illustrates the data processing and analysis and lastly 3.8; discusses the ethical considerations.

3.2 Research Design

Research design is meant to guide the execution of the method employed and analysis of the data generated from the study (Bryman, 2012). "A research design provides a framework for collection and analysis of data. A choice of research design reflects the decisions about the priority being given to a range of dimensions of the research process"(Bryman, 2012, p. 46). Among the dimensions is expressing the causal connections of variables under study. Five different research designs are illustrated; experimental design, cross sectional/survey design, case study design, longitudinal design and comparative design (Bryman, 2012). According to Babbie (2014), research design involves the plan to observe and analyse data (there is need to determine subject under observation and analysis: why and how). The two texts are in agreement with what research design entails. This study utilizes data that employed a cross-sectional study design. The study used data collected by a Kenyan Government project study jointly designed and prepared by the World Bank, the Swedish International Development Agency (SIDA) and the Agencie Française de Development (AFD).

The initial study from which data was drawn involved 11 informal settlements in Nairobi City County. Data was collected more or less simultaneously and the data was quantifiable. Empirical studies examining the relationship between the household's living conditions and access water in informal settlements have employed a variety study designs. A major use of

cross-sectional design has however been realised in most the literature reviewed for this study. Example: (Adams, 2018a, 2018b; Angoua et al., 2018; Dakyaga et al., 2018a, 2018b; Kamau & Njiru, 2018; Simiyu et al., 2018; Winter et al., 2019) all employed a cross-sectional design. A comparative design is employed in the study by (Kovacic et al., 2019). A summary of the methodologies employed in the various empirical literature reviewed is presented in table 3.1 below. The KISIP study employed a cross sectional design. According to Bryman (2012), a cross-sectional design is also called a survey design. Various research methods are employed for this design. In a nutshell;

> A cross-sectional design entails the collection of data on more than one case (usually quite a lot more than one) and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables (usually many more than two), which are then examined to detect patterns of association (Bryman, 2012, p. 58).

Table 2: A Summary of Methodologies Used in various Studies assessing the Relationship between living conditions and access to Domestic Water

Study	Methodology
Adams (2018a)	Informal Settlements engaged in the study was selected through a 2-Stage Randomized Cluster Sampling technique. A total of 645 Households were surveyed; Employing Systematic Sampling using the east, west, north and south transect-walks. Analysis employed descriptive and inferential statistics using Multiple ordinary least square (OLS) and logistic regressions. ANOVA was used.
Adams (2018b)	A Two-Stage Randomized Cluster Sampling was employed in selection settlements under study. 645 HH selected through a 2 stage randomized sampling. Structured Household surveys mainly used to collect data. Other information obtained through; FGDs, secondary sources &observation. Descriptive analysis were employed (aid of Stata software)
Simiyu et al. (2018)	The use of Secondary data to generate a sample for a cross-sectional survey. Units of settlements under study were purposively selected. Transect walks used to approximate compounds and systematically select them. Households were randomly selected. Respondents were 180. Employing Stata, Descriptive statistics were used to summarize continuous variables, chi- square tests were used to assess relationships among categorical variables. Thematic analysis also used
Dakyaga et al. (2018a)	A Households Surveys conducted. A case study with a cross-sectional survey design was employed. In the selection of a case study area, multi-stage sampling technique was engaged. Qualitative & quantitative data collected. Analysis of quantitative data through SPSS v.21. Triangulation was used to ensure validity of data collected.

Dakyaga et al. (2018b)	A Multi-stage sampling Techniques used in selection of settlements for the study. To narrow down municipality of study, random sampling was used and in the selection of households (n= 292). A mixed method approach was employed. Analysis in SPPS V.20 and thematic analysis for qualitative data. Presented in tables and figures.
Winter et al. (2019)	A mixed methods approach (Quantitative-550 surveys and Qualitative 55 cases) was employed. Sampling was stratified across 11 villages in Mathare. Latent Class Analysis (LCA) was employed, in Stata. Atlas.ti software was used for cross-case analysis of responses from the 55 qualitative interviews.
Kamau & Njiru (2018)	A cross sectional study conducted in Mathare Informal settlements. A random selection of the villages engaged in the study. A sample size of 380 HH participated in the survey selected through systematic random sampling. No information on analysis.
Angoua et al. (2018)	Settlements under study purposively selected. Across-sectional survey conducted. 556 HH engaged in the survey; Randomly sampled. Descriptive analysis was used to determine proportion of access. Univariate logistic regression was used to assess factor association.
Dorice et al. (2008)	Households survey of 1397HH. Households selected through stratified sampling technique. Data treated using SAS (Statistical Analysis System) software. Averages calculated using H-tests.
Kovacic et al. (2019)	A comparative design was employed. Multi-Scale Integrated Assessment of Societal and Ecosystem Metabolism (MuSIASEM) accounting method was used to analyze patterns. Data collected through Household surveys. Quantitative & Qualitative data collected. 100 HH from each country. Thematic analysis (analysis of quantitative data not indicated)
Crow & Obada (2009)	Secondary data from several empirical studies incorporated and analyzed thematically
Dagdeviren & Simon A. (2009)	Secondary data from several empirical studies incorporated are incorporated and analyzed thematically & statistically.

***Source**: Author's summaries from literature reviewed*

Details to the methodologies of the study are discussed into details later in the chapter.

3.3 Study Site

The study used household survey data collected from the informal settlements in Nairobi. The study targeted informal settlement dwellers. Figure 4 illustrates the distribution of informal settlements across the boundaries in the city county.

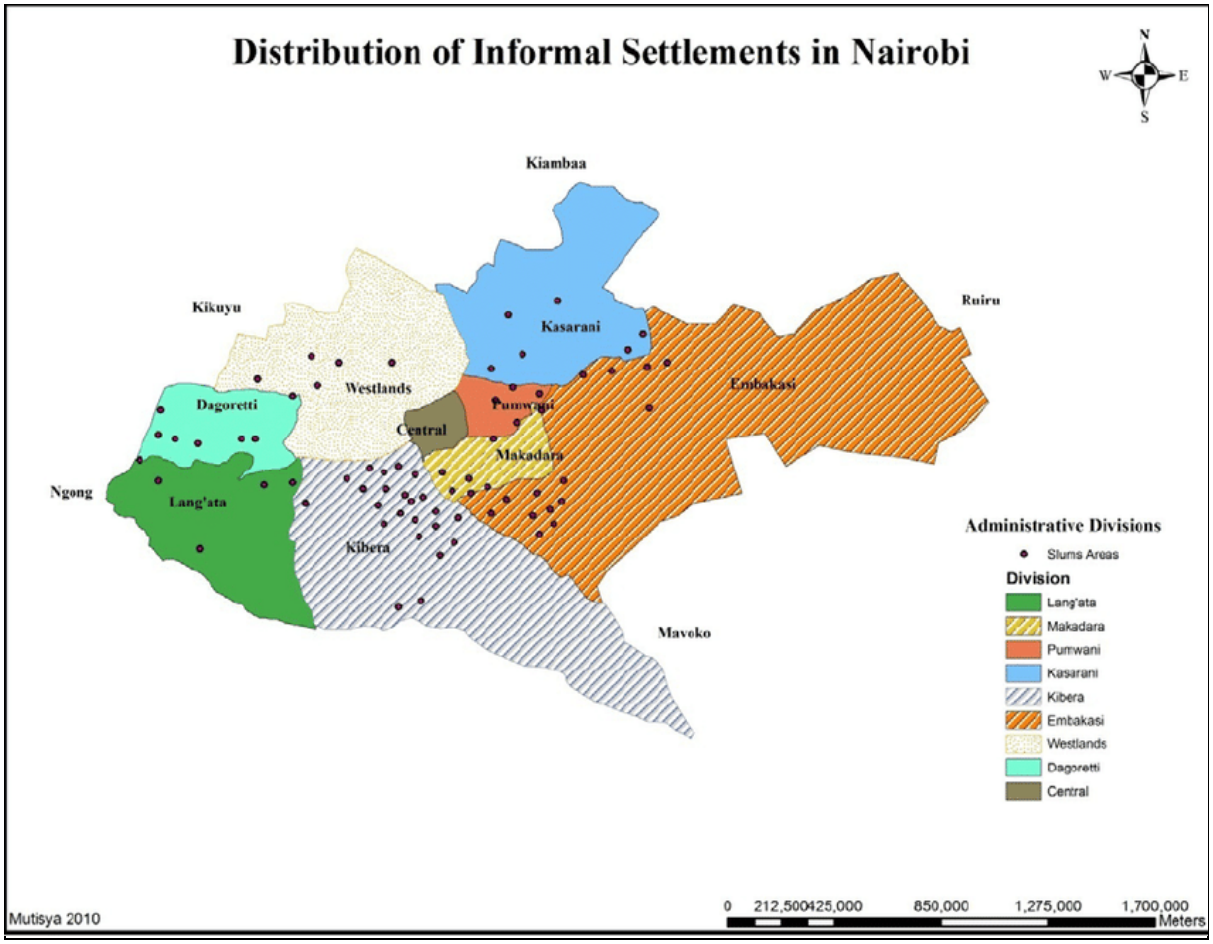

Figure 4: Distribution of Informal Settlements in Nairobi County,

Source: Mutisya 2010

The study targeted 11 informal settlements of Nairobi county; Kinyago Kanuku, Kahawa Soweto, Kosovo, Gitathuru, Njiku, Embakasi Village, Ghetto, Kambi Moto, Mathare 4A, Mathare 4B and Mathare Mashimoni (KISIP, 2017). Out of the 11 informal settlements targeted by KISIP, this study will focus on four villages of Mathare settlements: Kosovo, Mathare 4A, Mathare 4B and Mathare Mashimoni. **Kosovo;** the newest village in the larger Mathare Informal settlement. It is home to approximately 25,000 people. They were relocated from nearby land that belonged to a mosque. It has defined road networks and footpaths (KISIP, 2017). **Mathare 4A;** the population size is not well established. It is one of the oldest in Mathare valley. **Mathare 4B**; one of the oldest, it is situated on public land belonging to Nairobi City Council. It is a home to approximately 12,000 people (KISIP, 2017). **Mathare**

Mashimoni; it is home to approximately 4,000 people. It is located on public land belonging to Kenya Air force.

3.4 Target Population and Population for the Study

The study targeted informal settlement dwellers. The KISIP study aimed to assess the socio-economic characteristics, tenure systems, infrastructure and service delivery systems in the informal settlements (KISIP, 2017). The targeted informal settlements are discussed in section 3.3 above.

3.5 Sampling

The study employed a probabilistic sampling design for the selection of households from the targeted informal settlements to be engaged in surveys. The probabilistic design was used to ensure that every household in the settlements had a chance of being selected in to the survey sample (KISIP, 2017). For the selection of households, a circular systematic random sampling method was used. In each settlement, adequate sample sizes for the survey were determined using the following criteria; In most cases of survey where indicators are measured using proportions or percentages and population size is small, the Sample Size (n) is given by;

$$n = \left[\left[\frac{1}{N}\right] + \frac{N-1}{N}\frac{1}{(p)(1-p)}\left\{\frac{k}{z_{1-\alpha/2}}\right\}^2\right]^{-1}$$ Where N= Population size, p=population proportion, k=admissible error, and z1-α=normalized standard co-ordinate for desired level of confidence (1-α). For each of the settlement area, the sample size is determined at 5% sampling error, 95% confidence level, and 50% population proportion of response to key study indicators (KISIP, 2017). Appendix 2 summarizes the information on the samples; column 4 illustrates the minimum size of the population. It is comprised of populations of all ages. Assuming that the sample size is reduced to the number of households in column 6, the actual number of household samples to be covered in the survey are indicated in column 7. An oversampling is done to compensate for non-response in the key indicators during the survey (KISIP, 2017). The settlement areas covered are indicated in column 7 & 8 (see appendix 2). The targeted settlements were first divided into sampling areas/equal zones depending on the size of individual settlements. Number of HHs to be covered in each cluster are determined by dividing total number of households for each settlement – column 7, by column 9, the approximated size/area of the settlement. The result is given is column 11, which is further adjusted to column 12 to allow for the number of households to be divisible by 4 (KISIP, 2017)

3.6 Data Collection Procedure

The initial study of the 11 informal settlements aimed at both qualitative and quantitative data. The study involved the review of secondary data and the collection of primary data (quantitative and qualitative). To gather qualitative data, the study employed Focus Group Discussions (FGDs) (KISIP, 2017). The FGDs engaged the community members and other stakeholders in the settlements. FGDs were carried out in each of the eleven informal settlements. They were conducted as a final procedure in the engagement of communities. They were aimed to validate data collected from the Household surveys. Household surveys in all the settlements were conducted more or less simultaneously/during the same period of time (KISIP, 2017). Enumerators were recruited and trained to aid in the data collection process. There were supervisors and FGD coordinators that were tasked with overseeing and guiding the process. The settlements' maps provided by Nairobi County government guided boundary demarcations during the data collection process (KISIP, 2017).

The study collected data on a wide spectrum of issues in the informal settlements however this study focuses on the Module covering Physical Infrastructure and services among others, specifically provision of water in the Informal settlements and other relevant modules like the economic status. Based on the data collected with regards to the topic of interest, the following data needs table was devised (see table 4). It is based on the research questions in section 1.3.

Table 3: DataNeedsTable

Research Question	Data Needed	Source	Data Type	Instrument
What are the socio- economic characteristics of the Informal Settlement dwellers?	Sex of Respondents	KISIP Data set	Nominal	Questionnaire
	Household Size	KISIP Data set	Ratio	Questionnaire
	Household's Employment Type	KISIP Data set	Nominal	Questionnaire
What are the living conditions in the informal settlement?	Land/Structure Tenure	KISIP Data set	Nominal	Questionnaire
	Structure/Unit Material	KISIP Data set	Nominal	Questionnaire
	Environmental Conditions(Riparian Flooding)	KISIP Data set	Nominal	Questionnaire
	Water Sources	KISIP Data set	Nominal	Questionnaire
How do the living conditions influence access to safe water sources in the settlements?	Access to Clean Water in Past Year	KISIP Data set	Nominal	Questionnaire

	Land/Structure Tenure	KISIP Data set	Nominal	Questionnaire
	Structure/Unit Material	KISIP Data set	Nominal	Questionnaire
	Environmental Conditions(Riparian Flooding)	KISIP Data set	Nominal	Questionnaire

Source: *Author's Conceptualization (2020)*

3.6.1 Data Collection Tools and Methods

The study designed a questionnaire for use in the households' survey. The questionnaire was designed after a review of study instruments that have been used in similar HH studies in Kenya, prototype surveys from the World Bank Group guides and questionnaires used in earlier projects (KISIP, 2017). The survey questionnaire was divided into 8 modules; Module 1: Household Roaster, Module 2: Household Income and Expenditure, Module 3: Health and Nutrition, Module 4: Crime and Violence, Module 5: Land, Tenure, and Housing Conditions, Module 6: Physical Infrastructure and services, Module 7: Social Amenities, Issues, and Community Support and Module 8: Contingent Valuation (CV) of the KISIP housing improvement project (contains open-ended questions) (KISIP, 2017).See (annex) for full questionnaire. The collection of qualitative data through FGDs was conducted in a participatory manner using a checklist of open ended questions. Participants included; community groups, members of the Settlements Executive Committee (SEC), local youths, disabled persons, representatives from CBOs, NGOs, religious groups, landlords, tenants among others. This study drew focus to sections of Module 1, 2,5, 6 and 7 (see annex 1).

3.6.2 Pretesting of Questionnaires

Pilot surveys were conducted by the enumerators and two members of SEC in the settlements. Piloting was necessary to enable identification of questions that needed more clarification or had a potential to be problematic to the respondents. Piloting also enabled the determination of general perceptions/attitudes of the community towards the study and the numbering of structures using unique identifiers in all the settlements under study.

3.7 Data Processing and Analysis

The study used SPSS v.22 for data analysis after the recoding and cleaning of the availed data set appropriately. The variables used in the study were as follows;

a. **Access to Domestic Water** (dependent Variable). This was drawn from Question 2.14b (See appendix 1 for Questionnaire). The Question stated: Over the past 1 year, how

often, if ever, have you or anyone in your family gone without clean Water? The study defined this as the dependent variable. The responses were coded to 2 options from the initial 8 in the original data set, close options were linked. The two final options: Either a respondent had never gone without water (in which case they always had access to domestic water) or they have gone without water severally (in which case they had no access to domestic water severally). The responses were coded to two options in order to make the dependent variable a binary variable.

b. **Respondent Sex-** one of the independent variables. This was drawn from Preliminary sections of the questionnaire. It: Household Member Sex (one that was being interviewed). Respondent was either Male or Female. The study redefined it to Respondent sex.

c. **Household Size –** another independent variable. Question 1.5 in the Questionnaire. It stated: How many people overally currently live in your Household? Figures were given but the study grouped them to come up with three categories (Less than 3 people, 3-5 people and More than 5 people). And operationalized as Household sizes.

d. **Type of Employment**- it was indicated in the introductory portions of the Questionnaire. Stated as: Respondent/Spouse Livelihood. The responses initially input were grouped into: Regular Employment, Casual Work and Self-employment by the study and operationalized as type of employment.

e. **Water Sources**- under module 6 of the questionnaire. Question 6. a1. It stated: Over the past 1 year which sources of water did your Household typically use? Based on the entries in the data set, the responses were coded into 4 options: Private connections to piped water, compound taps, water kiosks and other sources of water.

f. **Land/Structure Tenure-** It was under module 5 in the Questionnaire. Question 5.1 a. the Question stated: Do you own this Land and Structure, rent it, or is there a different arrangement? The study coded responses into four categories: own both land and structure, own structure but not land, rent paying Tenants and other arrangements. Responses like N/A and refused to answer were coded as missing values.

g. **Environmental Conditions –** drawn from module 7 of the questionnaire, Q.7.2b. It stated: Tell me the condition state of the following: The area floods on a riparian area. The responses stated the level in which this condition was a problem. The study coded the responses into two options; the conditions were either a problem or not a problem. Close responses were linked. The study operationalized this as the environmental conditions.

h. **Structure Construction Materials** –Module 9 of the Questionnaire. The study drew focus to the walls of the structures. Q.9.2: What Materials have been used for the construction of the house: walls? The study coded the responses to: Stone/Brick/Block, Mud/Wood, Corrugated Iron sheets/Tin and Mud/Cement for an easier analysis.

In summary, the study employed Descriptive analysis, Bivariate analysis and Regression analysis. Descriptive analysis was useful in showing the descriptive statistics, mostly the percentages, median values and modal scores in different sets of the variables under study. The descriptive analysis was conducted for the demographic variables (sex of the respondents, Household sizes and Employment Type) and all other variables (frequency of access to clean water, Land/structure Tenure, Structure/Unit Materials, Water Sources and Environmental conditions. The results of this analyses are presented in section 4.2 of the paper.

The second stage of analysis conducted cross-tabulations between the dependent variable (access to domestic water) and each and every independent variable. Then Chi-Square tests were run to assess relationship between the dependent variable and the independent variables. The results of this stage of analysis are presented in section 4.3.

The last stage of analyses was the regression analysis. The study conducted a Binary Logistic Regression. The Dependent Variable was a binary variable; either there was access to water severally or no access to water severally throughout the past 1 year to the study. The independent variables were fed into the model as predictors. The regression analysis was run to test the two hypotheses (H_1 & H_2) and possible reject the null hypothesis.

Different elements of the independent variables were settled on based on the survey data and what appropriately suit this study. Some of the elements that the study had the desire to include and that were encompassed by the theoretical framework were not availed by the secondary data. Examples of these elements of the Household Living Conditions that were excluded based on the data available were; elements of Infrastructure in the informal settlements inclusive of water services infrastructure.

The dependent variable; access to domestic water has been operationalized as the frequency of access to clean water in the past year (Quantity).

3.8 Ethical Consideration

The respondents in the study were engaged willingly, it was explained to them that participation in the study was voluntary. A verbal consent was obtained before engaging the respondents.

Prior to the data collection exercise the study sought the NACOSTI permit as required of any research conducted in Kenya. However, this study wasn't able to get access to that permit and attach a copy as the data collection was conducted in 2017.

CHAPTER 4: RESEARCH FINDINGS, INTERPRETATIONS AND DISCUSSIONS

4.1 Introduction

The main objective of the study was to assess the influence of living conditions on access of domestic water in informal settlements. The specific objectives were to understand the socio-economic characteristic of the targeted informal settlement dwellers, to assess the living conditions in the settlements and lastly to assess the influence of the living conditions in the settlements on access to domestic water. The study sought to understand both the descriptive and inferential analysis. This chapter will cover the introduction section (4.1), descriptive analysis results (4.2), Bivariate analysis results (4.3) and regression analysis results (4.4).

The study drew focus to 4 informal settlements of Nairobi City: Mathare Mashimoni, Kosovo, Mathare 4A and Mathare 4B. The data set used for this analysis as discussed in Chapter 3, was data obtained by the KISIP survey of Informal settlements in 2017. Mathare Mashimoni had a total of 136 respondents, Kosovo a total of 123 respondents, Mathare 4A a total of 116 respondents and Mathare 4B a total of 146 respondents. A total of 521 respondents were drawn from the 4 informal settlements that the study draws focus to. There are cases of missing data in various variables that

4.2 Descriptive Analysis Results

This section discusses the results for the descriptive analysis. Descriptive analysis was performed for specific socio-economic variables that were deemed most relevant to the study and as per the information available from the data set. These were: sex of respondents, Household Size and Employment Type. Descriptive analysis was also conducted for the other variables: Land/structure Tenure, Household Water Sources, Structure Construction Materials, Environmental conditions and access to domestic water (dependent variable). This section presents the results for the descriptive analysis.

4.2.1 Sex of the Respondents

As discussed in section 2.3; empirical evidence showed that most of the respondents in the informal settlements studies on domestic water access were largely the females. This was mostly attached to the speculations that men weren't home and had gone to work as opposed to the female that were represented to be largely unemployed or working very close to home. Table 4 illustrates the descriptive results for the sex of respondents in all the four informal settlements; Mathare Mashimoni, Kosovo, Mathare 4A and Mathare 4B.

Table 4: Sex of Household Respondents

Sex of Respondents	Frequency	Percent
Male	192	37.1
Female	325	62.9
Total	**517**	**100.0**

Source: Survey Data (2017)

According to the results, there were more female respondents than male respondents (see table 5). Out of 517 respondents, 325 were female; 62.9% and 192 were male; 37.1%. As the findings in (Adams, 2018a; Kovacic et al., 2019; Simiyu et al., 2018).

4.2.2 Household Sizes

As discussed in section 2.3; empirical literature, different household sizes are registered in informal settlements. The household sizes were painted to influence the quantity of domestic water consumed and even water sourcing. This section represents the descriptive results for the household sizes. Table 5 represents the descriptive results for household sizes for all the four informal settlements under study.

Table 5: Household Sizes

Household Size	Frequency	Percent
Less than 3 People	105	20.3
3-5 People	236	45.7
More than 5 People	175	33.9
Total	516	100.0

Source: Survey Data (2017)

The results indicated that the largest Household size was more than 5 people; 175 people (33.9%) and the smallest size less than 3 people; 105 people (20.3%). Most of the households in the four informal settlements had a size of 3-5 people; 236 of 516; 45.7%. Illustrations from section 2.3 indicated that an average Household size of 5 people (Adams, 2018a; Dakyaga et al., 2018a).

4.2.3 Employment Type

As discussed in Empirical literature (see section 2.3), access to domestic water in its several dimensions is greatly affected by the household's income as it directly relates to the income. The household income determines the expenditure on water. Table 6 represents the descriptive results for the Household's Employment Type in the 4 settlements under study; Mathare Mashimoni, Kosovo, Mathare 4A & Mathare 4B.

Table 6: Employment Type

Employment Type	Frequency	Percent
Regular Employee	186	36.8
Casual Worker	313	61.9
Self Employed	7	1.4
Total	**506**	**100.0**

Source: Survey Data (2017)

The results showed that, in the four settlements the respondents or their spouses were mostly casual workers; 313 of 506; 61.9%. Regular employees were 186; 36.8% and Self- employed were 7 people; 1.4%. The results report similarities with findings from empirical literature (Adams, 2018a; Dakyaga et al., 2018b; Simiyu et al., 2018).

4.2.4 Water Sources

As discussed in the empirical literature, different water sources may influence the various aspects of domestic water access. Table 7 illustrates the descriptive results for the water sources in the 4 informal settlements.

Table 7: Water Sources

Water Sources	Frequency	Percent
Private connection to piped water	16	4.0
Compound tap	138	34.8
Water kiosk	238	60.1
Others	4	1.0
Total	**394**	**100.0**

Source: Survey Data (2017)

The results indicated that most of the respondents sourced their water from water kiosks; 238 of 394; 60.1%. The respondents also sourced their water from compound taps; 138 respondents, 34.8%. 16 respondents, 4.0% sourced water from private connections to water pipes and 4 respondents, 1.0% reported other sources of water besides the three listed. From empirical literature informal settlement dwellers mostly sourced domestic water from Water Kiosks and taps (Adams, 2018a; Angoua et al., 2018; Dakyaga et al., 2018b; Kamau & Njiru, 2018).

4.2.5 Land/Structure Tenure

As discussed earlier in Chapter 2 (see section 2.2 & 2.3), the tenure system has an effect on the investment in water infrastructure in informal settlements. Table 8 illustrates the descriptive results for land/structure tenure in all the informal settlements under study.

Table 8: Land/Structure Tenure

Land/Structure Tenure	Frequency	Percent
Own land and structure	25	4.9
Own the structure but not land	44	8.6
Rent Paying Tenants	434	85.1
Other	7	1.4
Total	**503**	**100.0**

Source: Survey Data (2017)

The results illustrated that most of the respondents in the four informal settlements are rent paying tenants (see table 8). 434 rent paying tenants were reported; 85.1%. 25 of the respondents owned both the land and the structures they stay in; (4.9%). 44 respondents owned the structure but not the land; 8.6%. 7, 1.4% of the respondents reported a different arrangement of tenure.

4.2.6 Environmental Conditions

As discussed in Chapter 2, the environmental conditions/location of settlements affect the establishment and sustenance of water infrastructure among other effects. Table 9 illustrates the descriptive results for the environmental conditions in the settlements under study. Flooding conditions were analysed and level of problem posed reported.

Table 9:Environmental Conditions

Flooding Conditions	Frequency	Percent
Not a problem	103	24.0
A problem	327	76.0
Total	**430**	**100.0**

Source: Survey Data (2017)

The results indicated that flooding in the informal settlements was a problem to 327 of 511 respondents; 76.0% under study and reported not a problem by 103, 24.0% respondents under study.

4.2.7 Structure Construction Materials

Discussions from Chapter 2 indicated that the unit materials influence domestic water access in the informal settlements. Table 10 illustrates the descriptive results for the unit materials for the walls in the 4 settlements under study.

Table 10: Structure Construction Materials

Structure Construction Material	Frequency	Percent
Stone/Brick/Block	113	22.9
Mud/Wood	41	8.3
Corrugated Iron sheet/Tin	295	59.7
Mud/Cement	45	9.1
Total	**494**	**100.0**

Source: Survey Data (2017)

According to the results (see table 10) most of the respondents dwelling unit walls were made of corrugated iron sheets/tin; 295 out of 494; 59.7%. 113; 22.9% respondents had stone/Brick/Block walls. Some unit's walls were made from mud/wood; 41 of 494; 8.3%. 45; 9.1% of the respondent's unit walls were made from mud/cement.

4.2.8 Access to Domestic Water

As illustrated in Chapter 2 and operationalized in section 3.7, Access to domestic water is the dependent variable. Access to domestic water in the study is defined by the quantity of domestic water that the respondents in the four informal settlements have had access to in the past year. Table 11 illustrates the descriptive results for the quantifications of water across the 4 study areas.

Table 11: Access to Domestic Water

Access to Domestic Water	Frequency	Percent
No Water Severally	231	45.5
Always Had Water	277	54.5
Total	**508**	**100.0**

Source: Survey Data (2017)

The results indicated that most of the respondents always had access to domestic water in the past year; 277 out of 520; 54.5%. 231 of the respondents ,45.5% had gone without clean water several times in the past year.

In summary, descriptive results indicated that, there were more female respondents than the male respondents as in most of the studies that were documented in section 2.3 (see chapter 2). The total number of female respondents was 325 (62.9%) while the male respondents were 192 (37.1%). The descriptive results for household sizes indicated that most households had a size of 3-5 people. The descriptive results for the employment type indicated that most of the respondents or their spouses were casual workers; 313,61.9% while 186, 36.8% were regular workers. The results for the land/structure tenure indicated that most of the respondents were rent paying tenants,434, 85.1% and did not own either the land or the structures that they stayed in. A small portion of the respondents owned both the land and the structures they were staying

in. They did not have proper documentations for the land owned however. The descriptive results for the environmental conditions focused on the riparian floods in the informal settlements.

Most of the respondents indicated that the riparian floods were a problem in their places of residence. The descriptive results for the material of house construction; walls, indicated that most of the respondent's walls were made from corrugated iron sheets/tin. Households water sources results indicated that most of the respondents collected their water from water kiosks in the settlement areas the others mostly fetched water from shared compound taps. On access to domestic water; most of the respondents always had access to domestic water in the past year, this was close to those that had no water severally in the past year.

In the preceding levels of analysis, the study did not include sex of the respondents; in the bivariate and regression analysis.

4.3 Bivariate Analysis Results

According to (Bryman, 2012) relationships in nominal variables is best shown using contingency tables, Chi-square and Cramer's V. The study therefore conducted a Chi-square analysis for all the independent variables. Chi-Square tests are used to determine whether access to water differs by a number of the independent variables (predictors). The Chi-Square results are summarised in the table below (see Table 12). The P- Values were interpreted at a 5% significance level.

Table 12: Bivariate Relationships between Access to Domestic Water and Predictors

Variables	**Chi-Square Value**	***P-Value***
Household Size	0.416	0.812
Employment Type	1.469	0.480
Water Source	8.664	0.034
Land/Structure Tenure	11.583	0.009
Environmental Condition	11.955	0.001
Structure Construction Material	11.866	0.008

Source: Survey Data (2017)

4.3.1 Household Size

Chi-Square Test results from Table 12, showed that the *p-value* of Household Size in relationship to the dependent variable (access to domestic water) through cross tabulations was 0.812. The *p-value* was > 0.05. This suggests that there were no differences in access to water across different Household size categories: Less than 3 people, 3-5 people and more than 5

people. Further, there was no significant association between access to domestic water and Household sizes. Access to Domestic water was therefore independent from Household sizes in the sample under study. It was not dependent on the type of employment.

4.3.2 Employment Type

The results (see table 12 above) showed that the *p-value* of Employment Type in relationship to access to domestic water was 0.480. It is > 0.05. This meant that, access to domestic water did not differ by the Types of Employment engaged in by the respondents in study sample; whether a respondent had a regular employment, casual work or self-employment. Further, there was no significant association between access to domestic water and Employment Type in the study sample. Access to domestic water was therefore independent from Employment Type. In other words, the results suggested that access to domestic water was not dependent on employment type in the study sample.

4.3.3 Water Source

The results from table 12 showed that the *p-value* of Water source, in relationship (through cross tabulations) to access to domestic water was 0.034. The *p-value* (0.034) was < 0.05. This suggests that access to domestic water differed across various sources of water (Water Kiosks, Private connection to Piped Water, Compound taps and other sources) in the study. Further, the result showed that there was a significant association between water sources and access to domestic water in the study. Conclusions drawn from the results suggested that access to domestic water was dependent on water sources.

4.3.4 Land/Structure Tenure

Chi-Square test results (see table 12) for Land/Structure Tenure in relationship to the dependent variable had a *p-value* of 0.009 which was < 0.05. This suggests that access to domestic water differed across various land/structure tenures (Own land and structure, own the structure but not the land, Rent Paying Tenants and other tenancy agreements) in the study. This means that there was a significant association between Land/Structure Tenure and access to domestic water in the study. Conclusions drawn from the results suggested that access to domestic water was dependent on Land/structure tenure.

4.3.5 Environmental Conditions

The Chi- square results for Environmental conditions in relationship to the dependent variable had a *p-value* of 0.001which was < 0.05 (see table 12). This means that access to domestic water differed across various environmental conditions; flooding was either a problem or not a

problem among the study sample. This suggests that there was a significant association between environmental conditions and access to domestic water in the study. Further, conclusions drawn from the results suggested that access to domestic water was dependent on environmental conditions in the study.

4.3.6 Structure Construction Materials

The results for Structure Construction Materials in relationship to the dependent variable (access to domestic water) had a *p-value* of 0.008 which was < 0.05. This suggests that access to domestic water differed across various structure(walls) construction materials (Stone/Brick/Block, corrugated iron sheets/Tin, Mud/Wood and Mud/Cement). This means that there was a significant association between Structure Construction Materials and access to domestic water among the population under study. Further, access to domestic water was dependent on the Structure Construction Materials.

In summary, in the Bivariate analyses, Chi-square tests were employed in combination of cross tabulations of each predictor/independent variable and the dependent variable to determine independence and association/relationship between them. In the results, four of the independent variables, had a significant association with the dependent variable. Access to domestic water in the areas of study differed across the four variables: Water Sources, Land/structure tenure, Environmental Conditions (Flooding) and Structure Construction material (Walls). The results showed that access to domestic water differed across land/structure tenure, environmental conditions and structure construction material. The results showed that access to domestic water did not differ across Household Size and Employment type. The results showed no significant association between the two independent variables with the dependent variable (access to domestic water) in the study.

In the next level of analysis; regression analysis, the study carried on with the analysis of the 4 predictors/independent variables that showed significant association with the dependent variable: Water sources, Land/Structure Tenure, Environmental Conditions and Structure Construction Materials. Household Size and Employment Type weren't included in the regression analysis since they had no significant association with access to domestic water in the study.

4.4 Regression Analysis Results

This section presents the results for the regression analysis. The study applied Binary Logistic Regression. The study deemed it the most suitable since the dependent variable was a binary

variable. The aim was to test the earlier defined hypothesis: *1.* The elements of Household Living Conditions have a positive and significant effect on access to domestic water. *2.* The higher the score of Household Living conditions, the higher the likelihood of access to domestic water. In the bivariate analysis results in previous section, access to domestic water differed across four independent variables, there was no significant difference across the remaining two. Binary logistic regression with only the significant predictors (independent variables) was carried out to test the two hypotheses.

4.4.1 Model Fitness

In the regression output results, the Model's significance under the Omnibus Tests of Model Coefficients was 0.000. The *p value* = 0.000 < 0.005. There is statistical significance that also indicated that predictors/independent variables had a significant influence on the access to domestic water. This was an indication that the model adopted by the study was a good fit, better than the null model with no predictors. It indicates a general good model fit. The results for the logit regression conducted is present in table 13 below.

Table 13: Regression Results for the Influence of Predictors on Access to Domestic Water

Variables	Coefficient	Std.Error	P-Value	Exp(Coefficient)
W_source			.079	
W_source(1)	20.830	23204.432	.999	1113117483.693
W_source(2)	21.890	23204.432	.999	3212359218.056
W_source(3)	21.168	23204.432	.999	1560406208.989
Landten			.860	
Landten(1)	-21.037	19481.494	.999	.000
Landten(2)	-20.329	19481.494	.999	.000
Landten(3)	-20.761	19481.494	.999	.000
Environ(1)	**-1.040**	**.281**	**.000**	**.353**
Materials			.118	
Materials(1)	-.549	.472	.245	.577
Materials(2)	-.433	.565	.444	.649
Materials(3)	**-.925**	**.426**	**.030**	**.397**
Constant	.483	30297.586	1.000	1.621
Nagelkerke, R-Squared = 0.151	Cox & Snell R-Squared = 0.113			

Source: Survey Data (2017)

The Nagelkerke R-Squared = 0.151 and Cox and Snell R Square = 0.113. The study found that the model explained 15.1% (0.151) of the variance in access to domestic water. Nagelkerke (R-Squared = 0.151) explains the variance in the dependent variable. It indicates that 15.1% of the variance in the outcome (dependent variable); access to domestic water can be explained

by the independent variables while the rest by other factors that are not part of the study model. To further understand the model's goodness of fit, the Hosmer and Lemeshow test were employed. In the Goodness of Fit result (Hosmer and Lemeshow); Pearson Chi-square= 6.907, df = 8 and the Sig = 0.330. The significance values are greater than 0.05 in both cases. This was a further indication that the model fits the data better than a null model. Table 13 represents the regression results for the influence of living conditions on access to domestic water (outcome) in the settlements under study.

In order to establish/demonstrate the influence of each of the predictors (independent variables) on the outcome; Access to Domestic Water, the regression coefficients and the significance levels were examined. The predictors (independent variables) were each categorized in the study from the onset of descriptive analysis. The same categories were used in this section. As illustrated in Table 13 above: Water Source (W_source) was in 4 categories, Land/Structure (Landten)Tenure 4 categories, Environmental Conditions (Environ) 2 categories and Structure Construction Material (Material) 4 categories. In the analysis the model treated each of the categories independently but they collectively makeup each of the predictors (independent variables).

The regression coefficients (see table 13 above) are interpreted as the predicted change in the log odds for every one-unit increase on the predictor; reflective change in the predicted log odds. The values can also be considered as indicators in the change of probability. A positive value coefficient indicates that with increasing scores on the predictor variables, it predicts an increased likelihood of access to domestic water (target group). On the other hand, a negative coefficient indicates that with an increase in values/scores of predictor variables, there is a decrease in the likelihood of individuals falling into the target group/access to domestic water. The P-Value indicates statistical significance (significance at 95% level), if P-Value > 0.05 = no statistical significance while if P-Value < 0.05 = statistical significance. Exp (coefficient) is the odds ratio. A value of 1 = indicates that there is no relationship between the predictors (independent variable) and the dependent variable. For a value greater than 1, indicates a positive relationship and also associated with a positive regression coefficient. If less than 1, the regression coefficient is negative (negative association).

In the next sections, the study interprets the results of each of the predictors/independent variables and their influence on access to domestic water in the study.

4.4.2 The Influence of Water Sources on Access to Domestic Water.

The regression coefficients for water sources in the model are all positive values (see table 13 above). This means that an increase in the score of Water source categories (Private connection to piped water, Compound Tap, Water Kiosks and other sources) in the model predicts an increase in the likelihood of access to domestic water in the informal settlements under study. Further, from the model, the respondents that sourced their water from other sources were more likely to have access to domestic water in the settlements as compared to those that sourced their water from Water kiosks, compound taps and private connections to piped water). The respondents that sourced water from private connections to piped water were less likely to have access to domestic water.

The *P-Values* were all > 0.05. This suggested that waters sources categories had no significant influence on access to water in the informal settlements under study. The odds ratio by relationship is > 1 and implies a positive association between the predictor (water source) and the dependent variable (access to domestic water). The study therefore, found no significant influence of water sources on access to domestic water in the informal settlements that were under study.

4.4.3 The Influence of Land/Structure Tenure on Access to Domestic Water.

The regression coefficient values from the model were all negative (see table 13 above). According to the model, an increase in the score of Land/structure tenure categories (Own land and structure, Own structure but not land, Rent paying tenants and other arrangements) predicts a decrease in the likelihood of individual's access to domestic water. This suggested that the respondents with other tenancy agreements were less likely to have access to domestic water in the informal settlements under study. Further, respondents that owned both the land and the dwelling structures were more likely to have access to domestic water compared to the other three categories (own structure but not land, Rent Paying tenants and other arrangements).

The *P-Values* in all the four categories were > 0.05. This means that all the categories of Land/structure tenure had no significant influence on access to domestic water in the settlements under study. The odds ratio values by relationship are < 1, indicating a negative association between the predictor and the dependent variable (access to domestic water). The study therefore found out that land/structure tenure had no significant influence on access to domestic water in the settlements under study.

4.4.4 The Influence of Environmental Conditions on Access to Domestic Water.

The Environmental Conditions predictor focused on flooding in the informal settlements. The value of the regression coefficients was a negative value (= -1.040, see table 13 above). This means that an increase in the score of Environmental condition categories as a predictor in the model, predicts a decrease in the likelihood of access to domestic water in informal settlements. Therefore, from the categorizations, those who responded that environmental condition was a problem, were less likely to have access to domestic water as compared to those who responded that environmental conditions were not a problem. To those that it wasn't a problem, they were more likely to have access to domestic water in their settlements.

The P-Value for environmental conditions was 0.000, it was < 0.05 (see table 14 above). This means that Environmental conditions had a significant influence on access to domestic water in the settlements under study. The odds ratio(exp(correlation)) 0.353 was < 1, indicating a negative association between the predictor and the dependent variable. The study therefore found out that, environmental condition as a predictor had a significant influence on access to domestic water in the informal settlements under study.

4.4.5 The Structure Construction Materials on Access to Domestic Water.

The predictor was specific to walls of the structure/dwelling units of individuals in the informal settlements. The regression coefficients in all the categories were negative (see table 13 above). Therefore, from the model, an increase in the score of structure material categories predicts a decrease in the likelihood of an individual's access to domestic water in the informal settlements while a decrease in the score predicts an increase in the likelihood of access to domestic water by the study sample. There were 4 categories in this case (stone/brick/block, Mud/Wood, Corrugated Iron sheets/Tin and Mud/Cement).

This means that, the respondents whose structure's walls were made from Mud/cement were less likely to have access to domestic water in the informal settlements under study as compared to structures made from corrugated iron sheets/tin, Mud/Wood and Stone/Brick/Block. Further, this means that respondents whose structures were made from Stone/Brick/Block were more likely to have access to domestic water in the settlements under study. The P-Value for the last category (Mud/Cement) was 0.030. It was < 0.05, this means that this category had a significant influence on access to domestic water in the informal settlements under model.

The values in the odds ratio (Exp(coefficient)) are < 1 by relationship. They therefore indicated a negative association between the predictor and the dependent variable (access to domestic

water). The study therefore found out that 1 category (Mud/Cement) in the Structure Construction Material had a significant influence on access to domestic water in the settlements under study.

Amongst all the predictors (independent variables), 2 had a significant influence on the dependent variable; access to domestic water in the informal settlements that were under study: The first one was Environmental Conditions. All the categories of environmental conditions (Flooding) had significant influence on access to domestic water. The Environmental conditions were categorized into two: Flooding was either a problem to a respondent or not a problem to them. The second predictor that had a significant influence on access to domestic water was unit/structure materials and out of the four (stone/brick/block, mud/wood, corrugated iron sheets/Tin and Mud/cement) categories one had statistical significance. The forth category, Mud/cement had a significant influence on access to domestic water. The study found out that the two predictors had significant influence on access to domestic water. The Regression Analysis results have a level of consistency with some of the bivariate analysis where through Chi-Square tests, access to domestic water differed across 4 independent variables that were then considered in the regression analysis, this section.

The results presented in this section, have indicated that different elements of household living conditions have different levels of influence on the access to domestic water, dependent variable. The results from the regression analysis; different elements of the household living conditions take different paths (both positive and negative) in the influence of access to domestic water. This was useful in rejecting the null hypothesis (H_o) the Null Hypothesis in this study states that access to domestic water does not differ across various independent variables (Household living conditions), that all categories have the same influence on access to domestic water in in the informal settlements. Based on the results the study rejects the null hypothesis. The alternative hypothesis that were tested in the process, were 2 (H_1= Elements of the household living conditions have a positive and significant influence on access to domestic water and H_2= The higher the score of (independent variables) Living conditions the better/more likely access to domestic water there is). The 2 hypothesis have been proven. Two 2 of the independent variables that had a positive association and a significant influence on access to domestic water.

The second hypothesis has also been partially proven right, in the regression results, the positive coefficient values indicates that an increase in the score of different living condition

elements predicts an increase in the likelihood of access to domestic water in the model. The study found out both positive and negative associations/relationships.

In the preceding section, the study presents the summary of findings, conclusions and recommendations to inform policy, practice and further engagement in research.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In the previous section, an analysis of the results from the study was presented. This chapter presents the summary, conclusions and the recommendations. Inclusive of the introduction, it is divided into 4 sections. 5.1 presents the introduction, 5.2 presents summary of the study, 5.3 presents the conclusions and 5.4 presents some the recommendations that are drawn wholly from the study.

5.2 Summary

The main objective of the study, was to assess the influence of Household Living conditions on access to domestic water in the informal settlements of Nairobi. The Informal settlements included in the study were in Nairobi city. The study used secondary data that was collected in 2017. The study involved 11 informal settlements in Nairobi but this study selected 4 of them that were all located in Mathare Sub-County: Mathare Mashimoni, Kosovo, Mathare 4A and Mathare 4B. There was a total of 521 respondents from the 4 areas. The decision to include only 4 informal settlements in this study was randomly arrived at. This study was motivated by the scanty information available on the arguments that household living conditions could be a possible influence on access to domestic water in the informal settlements. This was derived from several empirical studies on access to water in the informal settlements that attributed inadequate access to domestic water to several factors. The study then decided to adopt the argument that living conditions could be a possible influence on access to domestic water in the informal settlements.

The empirical evidence analysed for this study, showed that access to domestic water in the informal settlements was majorly attributed to governance related issues like poor urban planning, corruption, stringent budgets and targeted exclusion among others, economic inequalities in cities, increased rates of urbanization and increasing population growth rates. A few of the literature attributed geographical location, tenure systems and general living conditions among others to access to water in the informal settlements. This literature was used to hypothesize the study. The study based its arguments on such literature and sought to understand the possible influence of household living conditions on access to domestic water in the informal settlements. Based on the set of data available and the theoretical framework adopted by the study, the elements of Household Living conditions sort after by the study were: Household size, Employment type, Land/dwelling unit tenure, environmental conditions and the materials used in the construction of the dwelling units/structures.

To achieve the study objectives, three levels of data analysis were conducted. Descriptive analysis, bivariate analysis and regression analysis. Descriptive analysis results showed that more than half of the respondents were female and that on average, the household sizes in the informal settlements were between 3-5 people. These results also revealed that most of the respondents or their spouses were casual workers. In terms of the Land/dwelling unit tenure, the descriptive analysis results showed that most of the respondents were renting the units they were living in and that only a handful of respondents owned the land and structure they lived in. According to the descriptive results, more than half the respondents sourced their water from water kiosks in their localities. The study showed that environmental conditions (riparian flooding) was a severe problem to most of the respondents and lastly the descriptive results showed that most of the dwelling units (walls) of the respondents were made from corrugated iron sheets and tin.

The bivariate analysis conducted through Chi-Square tests in combination with cross tabulations revealed that access to domestic water differed across water sources, environmental conditions (flooding), land/structure tenure, and the structure/unit material (specific to unit walls). The results also showed that access to domestic water did not differ by household size and employment type in the study sample.

The regression analysis for the influence of each of the components of Household living conditions on access to domestic water showed that Environmental Conditions (flooding), and Structure/unit material (Walls) had a significant influence on access to domestic water in the informal settlements under study. All the categories under Environmental conditions had significant influences on access to domestic water while only one category under the Structure/unit material had a significant influence on access to domestic water. From the analysis, the other predictors; Water sources and Land/structure tenure had no significant influence on access to domestic water in the study sample. Positive correlation coefficients in the analysis showed positive associations between the independent variables and the dependent variable for example; a positive coefficient of the water source showed that an increase in the score of water source predicted an increase in the likelihood of access to domestic water in the study sample.

On the other hand, a negative coefficient showed that, an increase in the score of Land/structure tenure in the model predicted a decrease in the likelihood of access to domestic water by the populations in the study sample. All the results were interpreted at a 5% confidence level.

The next section discusses the conclusions from the study. These are discussed as per the objectives of the study and the results presented in Chapter 4.

5.3 Conclusions

To achieve the overall objective; assess the influence living conditions on of access to domestic water in the informal settlements, the study sought to analyse some of the socio-economic characteristics of informal settlement dwellers in Nairobi City's selected informal settlement setups. The study associated the characteristics with access to domestic water in the settlements. The respondents for the study sample were mostly female (more than 50%) across all the 4 informal settlements under study. This was in agreement with (Adams, 2018a; Kovacic et al., 2019; Simiyu et al., 2018), in the studies reviewed most of the respondents were female in the different informal setups, this was highly associated with unemployment among the female gender and therefore being available for surveys often. In analysing the type of employment that the respondents and or their spouses engaged in, the study revealed that most the respondents were casual workers as in (Dakyaga et al., 2018b; Simiyu et al., 2018; Winter et al., 2019). High numbers of casual workers in informal settlements in literature has been linked to several factors: education levels and high rates of unemployment. In analysis of the household sizes, most of the households in the study sample mostly had a size of 3-5 people, on average the household size was 5 people coinciding with the empirical literature reviewed.

The study also sought to assess the living conditions in the informal settlements. In analysing the results for the living conditions in the informal settlements, the study showed that most of the respondents had a problem with the environmental conditions (flooding) in their places of residence, from literature this is a possibility since informal settlements are argued to be located in derelict land/flood plains among other lands geographically unsuitable for human occupation. In analysing the tenure systems for the structures/dwelling units and the land, the study revealed that most of the respondents were renting the units that they lived in and only a handful of them owned the structures and the land that they lived in. In the analysis of the structure materials, the study revealed that most of the respondent's dwelling units were made of corrugated iron sheets or tin. The materials were presented to affect the infrastructure/piping for water provision. Lastly, on water sourcing, a majority of the respondents in the study sample drew their water from water kiosks within their areas of residence.

Lastly, from the objectives the study sought to assess the influence of Household Living Conditions on access to domestic water within the study sample. The results showed that there

are elements of the household living conditions that had a significant influence on access to domestic water while others did not hold any significant influence on access to domestic water in the informal settlements. The elements that had significant influence on the access to domestic water were: Environmental conditions (flooding) and structure/dwelling unit materials. This means that environmental conditions in informal settlements influence the provision and access to domestic water. In empirical studies this; environmental conditions have been associated with hindering/destruction of water infrastructure. The others like: water sources and Land/structure tenure were showed to have no significant influence on access to domestic water in the informal settlements. This means that the sources of water in the formal settlements and their land/structure tenure had no significant influence on their access to domestic water in the study sample.

The next section that is the last section presents the recommendations for further research, policy and practice.

5.4 Recommendations

The study makes several recommendations, first, the flooding conditions in the informal settlements within the study sample should be addressed. The flooding conditions analysed as environmental conditions had a significant influence on access to domestic water in the informal settlements. According to the results all categories of environmental conditions (flooding) had an influence on access to water and a majority of the respondents reported that flooding was a problem in their areas of residence. The responsible authorities (Nairobi City County Government) should take up the necessary steps and adopt the necessary actions to ensure the upgrading of drainage systems in the informal settlements. The upgrade of drainage systems will reduce the flooding occurrences that in turn influence access to domestic water in the areas under study.

Secondly, the study recommends that the Government of Kenya should take up an active role in the upgrading of the amenities, housing and services that are available in the informal settlements. The general living conditions in informal settlements have been associated with housing structure (materials of the housing structures) and the infrastructure that they have access to, inclusive of water services. A general upgrade of the informal settlements will be expected to translate to a better access to services; provision and supply of water in the informal settlements of Nairobi City and other towns/cities in Kenya.

Lastly, the study recommends that a further study should be carried out and could focus on a comparison of the different elements of the living conditions, across the different informal settlements and analyse how their influence on access of domestic water differ across the categories in each and every informal settlement and then conduct a collective analysis on their overall influence on access to domestic water in the settlements unlike the approach in this study that collectively looked at the living conditions in 4 informal settlements as one and how the elements collectively influence access to domestic water in the informal settlements in the study sample. A comparison between different informal settlements would be an interesting approach since informal settlements differ from each other city to city, country to country and region to region.

REFERENCES

Adams, E. A. (2018a). Intra-urban inequalities in water access among households in Malawi's informal settlements: Toward pro-poor urban water policies in Africa. *Environmental Development*, *26*, 34–42. https://doi.org/10.1016/j.envdev.2018.03.004

Adams, E. A. (2018b). Thirsty slums in African cities: household water insecurity in urban informal settlements of Lilongwe, Malawi. *International Journal of Water Resources Development*, *34*(6), 869–887. https://doi.org/10.1080/07900627.2017.1322941

Angoua, E. L. E., Dongo, K., Templeton, M. R., Zinsstag, J., & Bonfoh, B. (2018). Barriers to access improved water and sanitation in poor peri-urban settlements of Abidjan, Côte d'Ivoire. *PLoS ONE*, *13*(8), 1–13. https://doi.org/10.1371/journal.pone.0202928

Araya, F., Faust, K. M., & Osman, K. (2019). Assessment of water infrastructure interaction in US informal settlements. *Proceedings, Annual Conference - Canadian Society for Civil Engineering*, *2019-June*(June).

Babbie, E. (2014). *The Practice of Social Research* (Fourteenth). Cengage Learning.

Blomkvist, P., Nilsson, D., Juma, B., & Sitoki, L. (2019). Bridging the critical interface: Ambidextrous innovation for water provision in Nairobi's informal settlements. *Technology in Society*, *60*. https://doi.org/10.1016/j.techsoc.2019.101221

Bryman, A. (2012). *Social Research Methods* (Forth Edit). Oxford University Press. http://repositorio.unan.edu.ni/2986/1/5624.pdf

Corburn, J., Vlahov, D., Mberu, B., Riley, L., Caiaffa, W. T., Rashid, S. F., Ko, A., Patel, S., Jukur, S., Martínez-Herrera, E., Jayasinghe, S., Agarwal, S., Nguendo-Yongsi, B., Weru, J., Ouma, S., Edmundo, K., Oni, T., & Ayad, H. (2020). Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements. *Journal of Urban Health*, *97*(3), 348–357. https://doi.org/10.1007/s11524-020-00438-6

Crow, B., & Obada, E. (2009). Scarce, costly and uncertain: water access in Kibera, Nairobi. *UC Santa Cruz: Center for Global, International and Regional Studies*, *January 2009*, 1–4.

Dagdeviren, H., & Simon A., R. (2009). Access To Water in the Slums of the Developing World. *Business*, *57*, 31.

Dakyaga, F., Kyessi, A. G., & Msami, J. M. (2018a). Households' Assessment of the Water Quality and Services of Multi-model Urban Water Supply System in the Informal Settlements of Dar es Salaam, Tanzania. *Journal of Civil Engineering and Architecture*, *12*(5). https://doi.org/10.17265/1934-7359/2018.05.005

Dakyaga, F., Kyessi, A. G., & Msami, J. M. (2018b). Water Access Today and Tomorrow: Domestic Water Sustainability under Informal Water Supply Markets in Dar es Salaam, Tanzania. *Journal of Sustainable Development*, *11*(6), 120. https://doi.org/10.5539/jsd.v11n6p120

Dorice, K., Kabeyene, K., Véronique, B., Nkamjou, S., Gaston, L., & Emmanuel, E. G. (2008). Water supply , sanitation and health risks in Yaounde , Cameroon. *Science And Technology*, *2*(11), 379–386.

Dovey, K. (2013). Informalising architecture: The challenge of informal settlements. *Architectural Design*, *83*(6), 82–89. https://doi.org/10.1002/ad.1679

Dovey, K. (2015). Sustainable Informal Settlements? *Procedia - Social and Behavioral Sciences*, *179*(November), 5–13. https://doi.org/10.1016/j.sbspro.2015.02.406

Garland, A., & Herzer, L. (2009). Water for the Urban Poor: Integrated Solutions. *SAIS Review of International Affairs*, *29*(1), 101–107. https://doi.org/10.1353/sais.0.0027

Gulyani, S., & Bassett, E. M. (2010). The living conditions diamond: An analytical and theoretical framework for understanding slums. *Environment and Planning A*, *42*(9), 2201–2219. https://doi.org/10.1068/a42520

Gulyani, S., Bassett, E. M., & Talukdar, D. (2012). Living conditions, rents, and their determinants in the slums of Nairobi and Dakar. *Land Economics*, *88*(2), 251–274. https://doi.org/10.3368/le.88.2.251

Gulyani, S., Talukdar, D., & Jack, D. (2010). Poverty, living conditions, and infrastructure access: a comparison of slums in Dakar, Johannesburg, and Nairobi. *World Bank Policy Research*, *July*, 59. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1650479

Kamau, N., & Njiru, H. (2018). Water, sanitation and hygiene situation in Kenya's urban slums. *Journal of Health Care for the Poor and Underserved*, *29*(1), 321–336. https://doi.org/10.1353/hpu.2018.0022

Kariuki Muigua. (2017). *Streamlining Water Governance in Kenya for Sustainable Development Kariuki Muigua*. http://kmco.co.ke/wp-content/uploads/2018/08/Streamlining-Water-Governance-in-Kenya-17TH-FEBRUARY-2017.pdf

KISIP. (2017). *Kenya Informal Settlements Improvement Program : Socio-Economic Report, Nairobi County*. (Issue September).

Kovacic, Z., Musango, J. K., Ambole, L. A., Buyana, K., Smit, S., Anditi, C., Mwau, B., Ogot, M., Lwasa, S., Brent, A. C., Nsangi, G., & Sseviiri, H. (2019). Interrogating differences: A comparative analysis of Africa's informal settlements. *World Development*, *122*, 614–627. https://doi.org/10.1016/j.worlddev.2019.06.026

Ogendi, G. M., & Ong'oa, I. M. (2009). Water Policy Accessibility and Water Ethics in Kenya. *Santa Clara Journal of International Law*, *1*(1), 177–196.

Onjala, J., Ndiritu, S. W., & Stage, J. (2014). Risk perception, choice of drinking water and water treatment: Evidence from Kenyan towns. *Journal of Water Sanitation and Hygiene for Development*, *4*(2), 268–280. https://doi.org/10.2166/washdev.2014.131

Ruíz, A. A. B. (2015). *The Right to Water*. *3*(2), 54–67. http://repositorio.unan.edu.ni/2986/1/5624.pdf

Schrecongost, A., Wong, K., Dutton, P., & Blackett, I. (2015). Delivering water and sanitation to Melanesian informal settlements: Preliminary findings of a review of WASH services in informal settlements of the Melanesian region. *Water: Journal of the Australian Water Association*, *42*(3), 40–43.

Shurie, M. M., Mwaniki, B., & Kameri-Mbote, P. (2017). *Project Country Report Water Permit Systems, Policy Reforms and Implications for Equity in Kenya*. *March*. file:///home/cowuor/Documents/PhD/phdliterature/Water-Permitting-Kenya-Country-Report-PI_IWMI-March-2017.pdf%0Ahttp://africa.iwmi.cgiar.org/wp-content/uploads/sites/2/2017/04/Water-Permitting-Kenya-Country-Report-PI_IWMI-March-2017.pdf

Simiyu, S., Cairncross, S., & Swilling, M. (2018). Understanding Living Conditions and Deprivation in Informal Settlements of Kisumu, Kenya. *Urban Forum*. https://doi.org/10.1007/s12132-018-9346-3

UNDP. (2016). *Sustainable Development Goals*.

WHO. (2011). The Human Right to Water and Sanitation Media brief. *UN-Water Decade Programme on Advocacy and Communication and Water Supply and Sanitation Collaborative Council*, *April 2011*, 1–8. http://www.un.org/waterforlifedecade/pdf/human_right_to_water_and_sanitation_media_brief.pdf

Winter, S. C., Dreibelbis, R., Dzombo, M. N., & Barchi, F. (2019). A mixed-methods study of women's sanitation utilization in informal settlements in Kenya. *PLoS ONE*, *14*(3), 1–20. https://doi.org/10.1371/journal.pone.0214114

WSUP. (2018). *A journey of institutional change*.

APPENDICES

Appendix 1: Survey Questionnaire

HOUSEHOLD QUESTIONNAIRE FOR THE KENYA INFORMAL SETTLEMENT IMPROVEMENT PROJECT (KISIP)
(FOMU YA KUHESABU KATIKA JAMII KWA MRADI WA KISIP)

RESERVE CODES: **NOT APPLICABLE** (NA): 97; DON'T **KNOW**: 98; REFUSED: 99

Six Modules:

Module 1:	Demographics and household composition/Takwimu za watu na familia
Module 2:	Household Employment, Income and Expenditure/Maswala ya kiuchumi
Module 3:	Education, Nutrition and Health/ Security of housing, land and tenure/Elimu, Afya
Module 4:	Crime and Violence/Maswala ya Usalama
Module 5:	Land, Tenure, and Housing Conditions
Module 6:	Infrastructure and Services/Maswala ya miundo msingi
Module 7:	Social Amenities, Issues, and Community Support
Module 8:	Contingent Valuation of KUP (WTP)

Name of city/settlement/cluster (Jina la Mji/Kijiji/eneo katika kijiji):
_____

Enumerator's name (Jina la mwenye kuhesabu):
_____

(Month, day, year Mwezi, siku, mwaka):_____

Structure number/Nambari ya Nyumba (use plot numbers – Land Reference (LR)- from survey maps/ Tumia nambari kutoka kwa ramani) **_____**

Name of respondent/Jina la mwenye kujibu
_____

Name of structure owner/Jina la mwenye nyumba_____

Name of land owner/Jina la mwenye kumiliki ardhi_____

Result codes/:

1. *Completed*
2. *No (competent) household member at home*
3. *Entire household absent for extended period*
4. *Postponed* _____
5. *Refused*

6. *House vacant or address not a house*
7. *House destroyed*
8. *House not found*
9. *Other (specify)*

Enumerator visits	**1**	**2**
Result		

Introduction

- Introduce yourself (name, where you live)
- Objective of the survey
- Length of interview – around 90 minutes
- Explain that participation is voluntary but will benefit the community

May we begin? Yes/No
ENUMERATOR, PLEASE MAKE SURE YOU ARE TALKING TO HOUSEHOLD HEAD, SPOUSE OF THE HEAD OR SOME OTHER INFORMED MEMBER OF THE HOUSEHOLD.THE RESPONDENT SHOULD BE AT LEAST 18 YEARS OR OLDER.

Module 1: Demographics and household composition

Q1.1. I would like to collect some information about your household members. Please remember that household members are those people who share this house and share the household's income and food. /Ningependa kukuuliza maswali kuhusu familia yako. Tafadhali elewa kwamba familia ni wale ambao wanaishi katika nyumba hii na wala na kushirika na familia hii.

Household member	a **What are the <u>names</u> of the household members? Please begin with yourself, then list the other members from oldest to youngest.**	b **Relation to household head** [Use Codes Below] 01: Head 02: Spouse of head (wife/husband) 03: Child of head (son/daughter) 04: Grandchild of head 05: Parent/parent-in-law of head 06: Son-/daughter-in-law of head 07: Other relative of head 08: Adopted/ foster/stepchild of head 09: House help unrelated to head 10: Other person unrelated to head	c **What is the sex of [NAME]?** Male.....01 Female..02	d **How old was [NAME] on his/her last birthday?** [RECORD IN COMPLETED YEARS]	**ASK ONLY IF MEMBER IS 5 OR OLDER** e **What is the school attendance status of [NAME]?** Currently attending.....01 (GO TO f) Left school..02 (GO TO f) Never went to school…. 03 (GO TO g) Graduated…. 04(GO TO f)	**ASK ONLY IF MEMBER IS 5 OR OLDER** f **What is the highest school grade completed by [NAME]?** PRIMARY 01: STD 1 02: STD 2 03: STD 3 04: STD 4 05: STD 5 06: STD 6 07: STD 7 08: STD 8 SECONDARY 09: FORM 1 10: FORM 2 11: FORM 3 12: FORM 4 13: FORM 5 14: FORM 6 UNIVERSITY 15: UNIV 1 YEAR 16: UNIV 2 YEARS 17: UNIV 3 YEARS 18: UNIV 4 YEARS 19: UNIV 5 YEARS 20: UNIV 6 YEARS

						OTHER 21: COLLEGE CERTIFICATE DIPLOMA 22: POST GRADUATE DIPLOMA 23: NONE; 99: OTHER
Member 1.) (respondent)						
Member 2.)						

Q1.1. continued

Household member	ASK ONLY IF MEMBER IS 5 OR OLDER/ULIZA TU KAMA MWENYE KUJIBU AKO ZAIDI YA UMRI WA MIAKA 5 AU ZAIDI g **What has been [Household Member's] main activity during the last 12 months? *Select one*/ Je (jina lake) amekuwa akifanya kazi wapi kwa miezi 12 iliyopita? *Chagua moja*** 01: Working for pay as a "regular" employee 02: Working for pay as "casual" employee 03: Own account worker/ self-employed 05: Helping without pay in household business 06: Apprentice 07: Not employed 09: Student 10: Retired/Pensioner 11: Earning income from investments or property 12: Sick/handicapped, unable to work 13: Looking for work 14: Not looking for work at this time 15: Other (specify below)	ASK ONLY IF MEMBER IS 5 OR OLDER/ ULIZA TU KAMA MWENYE KUJIBU AKO ZAIDI YA UMRI WA MIAKA 5 AU ZAIDI h **Ask if answer in g is 1-7/Uliza kama swali la g ni 1-7** **Is [Household Member's] main activity inside or outside the settlement?/(jina lake) kwa kawaida hufanya kazi ndani au nje ya kijiji?** Inside/Ndani…...01 Outside/Nje…02 Both/Kwote……03 Neither/Hakuna….04 Other [SPECIFY BELOW]/Nyingine {TAFADHALI ELEZA]…05	ASK ONLY IF MEMBER IS 5 OR OLDER/ ULIZA TU KAMA MWENYE KUJIBU AKO ZAIDI YA UMRI WA MIAKA 5 AU ZAIDI i **Ask if answer in g is 1-7 Uliza kama swali la g ni 1-7** **What was [Household Member's] main mode of travel [FOR ACTIVITY MENTIONED IN COL g]/Kwa kawaida, (jina lake) alitumia nini kwa usafiri?[Kwa ile kazi aliyotaga katika g]** 01: Walk/Tembea 02: Own Bicycle/Baisikeli yake 03: Own vehicle/Gari lake 04: Microbus/Matatu 05: Shared Taxi/Alipanda taxi na mwengine 06: Taxi (vehicle)/Taxi 07: Boda boda (Bicycle taxi) 08: Bus regular/Basi
Member 1.) (respondent)			

Member 2.)			

Q1.2. [ENUMERATOR: PLEASE FILL IN THE FOLLOWING TABLE AFTER COMPLETING TABLE 1.1 ON HOUSEHOLD MEMBERS ABOVE.]/[MWENYE KUJAZA FOMU: TAFADHALI JAZA MRABA BAADA YA KUJAZA LILILO HAPO MBELENI 1.1 KUHUSU WANAOKAA KWA NYUMBA]

	ADULTS/ WATU WAZIMA	**CHILDREN 5 -14 YEARS/WATOTO WA UMRI WA MIAKA 5 - 14**	**CHILDREN UNDER 5 YEARS/ WATOT WALIO CHINI YA MIAKA 5**
Based on the information I just collected, there are [*Number*] [*ADULTS/CHILDREN*] in your household. Is this correct?/Kulingana na habari niliyochukua hapo mbeleni, kuna (idadi ya) [WATU WAZIMA/WATOTO] katika familia yako. Hii ni sawa? **1** Yes/Ndio (*record number on right*) or **0** No/ La (*specify numbers on right*)			

Q1.3. How long has your household lived in this settlement? /Familia yako imeishi hapa kijijini kwa muda upi?

[ENUMERATOR: RECORD RESPONSE IN YEARS, MONTHS OR DAYS; DO NOT ASK SPECIFICALLY FOR MONTHS or DAYS/ MWENYE KUULIZA: JAZA JIBU KWA MIAKA, MIEZI AU SIKU; USIULIZE MUDA HASWA KWA SIKU AU MIEZI] _____years/miaka _____ months/miezi _____ days/siku

Q1.4. How long has your household been occupying this house?/Familia yako imeishi katika nyumba hii kwa muda upi?

[ENUMERATOR: RECORD RESPONSE IN YEARS, MONTHS OR DAYS; BUT DO NOT ASK SPECIFICALLY FOR MONTHS or DAYS/ MWENYE KUULIZA: JAZA JIBU KWA MIAKA, MIEZI AU SIKU; USIULIZE MUDA HASWA KWA SIKU AU MIEZI] _____years/miaka _____ months/miezi _____ days/siku

Q1.5. Where did the household live before coming to this settlement? / Familia yako ilikuwa ikiishi wapi kabla ya kuhamia katika kijiji hiki?[IF HOUSEHOLD DID NOT LIVE IN ANOTHER SETTLEMENT PREVIOUSLY, USE CODE **97 (NA)**/KAMA FAMILIA HAIJAISHI NJE YA KIJIJI HAPO MBELENI, ANDIKA 97]

1. Informal or slum settlement in the city/Katika mtaa wa vibanda katika mji huu
2. Regular/formal settlement in the city/Katika eneo la makkazi rasmi
3. Other city or town in Kenya/Katika mji mwingine nchini Kenya
4. Rural area in Kenya/Mashambani nchini Kenya
5. Other country /Nchi nyingine
6. Peri-urban/Kando kando ya mjini

Module 2: Employment, Income and Expenditure Profile

We will now ask you some questions on the income and expenses of all members of your household (not *only* your individual expenses and income, unless they are the *only* ones.)/ Nitakuuliza sasa maswali kuhusu hali ya mapato katika familia yako(si mapato yako peke yako, ila kama ndio mapato pekee ya familia)

Q2.1. What was your total household expenditure last month-NOT including rent?/ Mwezi uliopita, familia ilitumia pesa ngapi- usipojumulisha na kodi?_____Ksh

Q2.2. How much do you spend daily on food for the household?/ Familia hutumia pesa ngapi kwa chakula kwa siku? _____Ksh

Q2.3. In the **last month** (30 days), how much did your household spend on the following items?/Kwa siku **mwezi uliopita** (siku 30) zilizopita, familia yako imetumia pesa ngapi kwa vitu vifuatavyo?

[OTHER ITEMS SUCH AS SPENDING ON WATER ARE ASKED LATER. /MATUMIZI KWA VITU VINGINE KAMA MAJI VITAULIZWA BAADAYE]

Item/Kitu	Ksh
Fuel for driving/Mafuta ya gari	
Fuel for other uses/Mafuta ya matumizi mengine	
Clothing and footwear /Nguo na viatu	
Household supplies (cleaning, etc) and personal care (soap, toothpaste, etc.)	
Domestic services—cleaning help, childcare, etc…	
Transportation/Usafiri	
Recreation – e.g. movies, eating out, tobacco, alcohol, parties	
Mobile phone/Simu ya mkononi	
Internet services/Wavuti	
Sending money to relatives or friends not usually living with you /Kutuma pesa kwa familia na rafiki wasioishi na wewe	

Q2.4. How much did your household spend in the past **year** on the following items? /Kwa **mwaka** uliopita, familia yako ilitumia pesa ngapi kwa vitu vifuatavyo?

Item/Kitu	Ksh
Car insurance/Bima ya gari	

Item/Kitu	Ksh
Education expenses such as fees, books, and uniforms but not transport	
Income tax– please estimate if necessary	
Property rates – please estimate if necessary	
Home furnishings and maintenance	
Vehicle maintenance and repair	

Q2.5. What was the **total household cash income in Ksh last month**? Please do not include cash assistance you receive from family or friends who live outside the household - I will ask about this later. / Kwa mwezi uliopita, mapato yote ya familia ilikuwa pesa ngapi kwa jumla? Tafadhali usijumulishe na fedha ambazo familia hupata kutoka kwa jamaa au marafiki wanaoishi mbali nao-itauliza maswali haya baadaye.

[ENUMERATOR: SHOW RESPONDENT THE CARD WITH INCOMES ON IT AND ASK HIM/HER TO SELECT THE NUMBER FOR THE INTERVAL THAT IS CORRECT FOR HIS/HER HOUSEHOLD. /MWENYE KUJAZA FOMU: ONESHA UNAYEMJAZIA FOMU KADI YENYE MAPATO KISHA UMUULIZE ILE NAMBARI AMABAYO INAONESHAMAPATO SAHIHI YA FAMILIA YAKE]

1. Less than/ Chini ya 3,000
2. 3,001-6,000
3. 6,001-9,000
4. 9,001-13,000
5. 13,001-18,000
6. 18,001-22,500
7. 22,501-30,000
8. 30,001-37,500
9. 37,501-45,000
10. 45,001-60,000
11. 60,001-75,000
12. Above 75,000

Q2.6. Where does your household keep its savings/Familia yako huweka wapi akiba?

1. At home/Nyumbani
2. Bank/Benki
3. Other (specify)/Nyingine(eleza)_____
4. NA

Q2.7a. Does any member of this household currently have a loan(s)/Kana mtu yeyote katika familia hii aliye na mkopo(mikopo)?

1. Yes /Ndio 2. No/La (**GO TO/Enda Swali Q2.8)**

Q2.7b. Where did the household member(s) obtain this loan(s)/Alipata mkopo wapi [CIRCLE ALL THAT APPLY/CHAGUA MAJIBU YOTE AMBAYO NI SAWA]?

1. Bank/Benki
2. NGO or savings & credit group/coop.
3. Relative or friend/Jamaa au rafiki
4. Informal lender
5. Other, specify _____

Q 2.7c What was the loan in Q2.7a intended to be used for? /Mkopo huo ulikuwa wa kufanya kazi gani?

1. Business/Biashara
2. Education/Masomo
3. Hospital Bill
4. House

Q2.8. In the past 12 months, did anyone in your household RECEIVE cash support from family or friends who do not usually live with you? /Kwa miezi 12 iliyopita, familia yako ilipata usaidizi wa kifedha kutoka kwa jamaa au marafiki wasioishi katika nyumba hii?

1. Yes/Ndio 2. No /La

Q2.9a. Please describe your household's MAIN business (i.e. the one that generates the highest revenue?)/Tafadhali eleza ile biashara MUHIMU ya familia [**GO TO MODULE 3 IF NOT APPLICABLE/RUKA HADI SEHEMU YA 3 KAMA FAMILIA HAINA BIASHARA**]

Description as reported by respondent/Jibu liloelezwa na mwenye kujibu maswali

ENUMERATOR: PLEASE CODE ONLY AFTER HAVING WRITTEN DOWN THE DESCRIPTION; CHECK CATEGORY WITH THE RESPONDENT. MARK ALL THAT APPLY.

Making goods (Manufacturing)	Manufacturing of clothes or shoes	1
	Manufacturing of baked food (Baker)	2
	Manufacturing of coffee, sugar, oil, dry fruits and other processed foods(exclude restaurants, street food-sellers,)	3
	Manufacturing of handicrafts	4
	Manufacturing of furniture	5
	Manufacturing of metal products	6
	Manufacturing of household items	7
	Manufacturing of tools and instruments	8
	Other manufacturing (not included above)	9
Selling goods or services (services)	Selling food or groceries (street food sellers, restaurants)	10
	Selling of clothes or household items	11
	Selling of business/computer/phone services	12
	Selling of other goods (not included above)	13
	Transport Services (renting out or operating matatus, hand carts for cargo, taxis, boda-boda/bicycle taxi, trucks, buses etc)	14
	Cleaning and washing services	15
	Hairdressers and barber shops	16
	Professional Services (including internet)	17
	Other services (not included above)	18

ENUMERATOR PLEASE INFORM THE RESPONDENT THAT, FROM THIS POINT ON IN THIS MODULE, ALL QUESTIONS REFER ONLY TO THE MAIN BUSINESS

Q2.9b. For how long has this **MAIN** business been in operation?/Biashara hii imeendelezwa kwa miaka ngapi? [ENUMERATOR: DO NOT ASK FOR MONTHS, BUT RECORD IT IF THE INFORMATION IS OFFERED BY THE RESPONDENT/MWENYE KUJAZA FOMU: USIULIZE MIEZI LAKINI HABARI HII IKITOLEWA NA UNAYEMJAZIA FOMU REKODI.]

_____years/miaka and _____months/miezi

Q2.10. Which household member spends the most time and effort to keep the MAIN business running?
[ENUMERATOR use household list to "select" name, relationship to household head and the gender (a, b, c in HH table in Q1A)]

Relationship to HH head_____, sex_____(Male/Female)
Q2.11. Is this MAIN business seasonal, in that your household operates it only during certain months in a given year?

1. Yes/Ndio 2. No/La

Q2.12. For your MAIN business, what is the primary location where the work is mainly done? (If the main business is manufacturing—for example, furniture making—where are the goods mainly made or manufactured? If it is selling or trading—for example, selling household goods—at what location are the goods mainly sold?)

[ENUMERATOR: MARK THE ANSWER THAT BEST APPLIES.]
1. The home/household
2. Another location that I own or rent
3. At the client's location (home, office, factory, etc)
4. This business has no fixed location (i.e. street vendors or services without fixed location)

Q2.13. How many household members including yourself have worked in your MAIN business during the past month? *Please include both full-time and part-time workers.*
_____number of household members

Q2.14. During the past month how many people did the MAIN business employ as paid workers who are not members of this household? *Please include both full-time and part-time workers*. (NOTE: MUST BE LESS THAN THE RESPONSE IN Q??) _____number of non-household members

Q2.15. What was the total revenue of this business in the past month? /Mapato yote kutoka kwa biashara kwa mwezi uliopita ni ngapi? _____ Ksh

Q2.16.Over the past year, have you paid any of the following fees or taxes to the government (for example to Kenya Revenue Authority or to the local authority)? ENUMERATOR: MARK ALL STATED AS PAID

1. Daily market fee (to the local authority)
2. Single Business Permit fee (to the local authority)
3. Value Added Tax (VAT to Kenya Revenue Authority)
4. None

Q2.17. Which of the following elements are obstacles faced by this business? For each element, please tell me whether it is a large obstacle, a small obstacle, or not an obstacle at all.

Feature	**Large obstacle**	**Small obstacle**	**Not an obstacle at all**
Access to finance or loans			
Access to affordable space to conduct business			
Limited access to land			
Lack of access to or problems with public electricity supply			
Lack of access to or problems with public water supply			
Lack of access to good transportation services			
Government rules, processes and attitude towards business			
Corruption in government			
Corruption in private firms, e.g., payments to secure contracts with them			

Module 3: Health and Nutrition

Q3.1 What are the major health issues affecting the residents of this settlement?

1. Cholera
2. Diarrhoea
3. Tuberculosis
4. Malaria
5. Typhoid
6. Respiratory problems
7. Other, (specify)

Q3.2 Have any of your children (under the age of 10) had diarrhoea in the last month?

1. Yes 2. No 3. Don't know

Q3.3. Can you please estimate the total amount your household spent in the past month on medical treatment? _____ Ksh

Module 4: Crime and Violence

Q. 4.1 Crime and Security status

		Yes	No
A	*Do you feel safe inside the house*		
B	*Do you feel safe leaving the house alone*		
C	*Do you feel safe leaving the kids alone in the house*		
D	*Has the house had been robbed in the last 12 months*		
E	*Has a family member or you have been robbed in the last 12 months*		
F	*Has a neighbor been robbed in the last 12 months*		

Module 5: Security of housing, land and tenure

Land tenure

Q5.1. Do you own this land and structure, rent it, or is there a different arrangement? /Je, wewe ni mwenye kumiliki shamba na nyumba hii, mpangaji wa nyumba ama kuna mpagilio tofauti?

1. Own both land and structure/ Mwenye shamba na nyumba **GO TO/Enda swali Q5.2**

2. Own the land but not the structure/Mwenye shamba lakini nyumba si yangu
3. Own the structure but not the land/Mwenye nyumba lakini shamba si yangu **GO TO/Enda swali Q5.3**
4. Own neither the structure or the land; am just occupying this site/Nina ishi tu, mimi si mwenye shamba wala nyumba
5. Rent paying tenant/Mpangaji anayelipa kodi
6. Occupant not paying rent/Naishi lakini silipi kodi **GO TO/Enda swali Q5.13**

Q5.1a

	Ksh
How much rent do you pay your landlord for the housing unit/structure per month?/Kodi yako ya nyumba ni pesa ngapi kwa mwezi?	
	Codes
Is water for cooking, bathing, etc. included in the rent?/Je kodi hii pia huwa imejumulishwa na malipo ya maji? 1=yes/ndio, 2=no/la	
Is electricity included in the rent?/Stima huwa imejumulishwa kwa kodi? 1=yes/ndio, 2=no/la	

Q5.1b. Does your landlord live on this plot/building?/Je mwenye kumiliki nyumba au shamba anaishi kwa hii ploti

1. Yes/Ndio **GO TO/Enda swali Q5.1d** 2. No/La

Q5.1c. Does your landlord live in this settlement?/Je mmiliki wa shamba au nyumba anaishi katika kijiji hiki?

1. Yes /Ndio 2. No/La

Q5.1d. In the last year, has the rent changed ?

1. Increased **GO TO Q5.3** 2**.** Reduced **GO TO Q5.3** 3. Neither **GO TO Q5.3**

Q5.2. What type of document do you have for the land?/Una cheti cha aina ipi ya umiliki wa shamba?

1. None/Hakuna
2. Temporary occupation license/Cheti cha kukaa kwa muda
3. Certificate of title (long-term lease from City council/Government)/Cheti cha umiliki(Kutoka kwa serikali au munispaa)
4. Letter from the chief (provincial administration)/Barua kutoka kwa Chifu(utawala wa mikoa)
5. Freehold title
6. Share certificate
7. Other, specify/Nyingine, eleza _____

Q5.3. Do you rent out any rooms in your house to people who are not members of your household? /Je umekodisha vyumba vingine katika nyumba yako kwa watu ambao si jamma ya familia yako

1. Yes/Ndio 2. No/La **GO TO/Enda swali Q5.4**

Q5.3a. How many rooms do you rent out?Umekodisha vyumba vingapi _____ rooms/idadi ya vyumba

Q5.4. **For land owners/landlords / Kwa wenye kumilika mashamba au nyumba** - Do you feel you have secure tenure to your land? By "secure" I mean that no one could just come and force you to leave without an official legal process in which you would participate./ Je unahisi kama una usalama wa umiliki wa shamba lako? Hapa nazumgumzia usalama kumaanisha kwamba hakuna yeyote anaweza kukutoa kwa shamba lako bila kupitia njia za kisheria ambazo hata wewe utaweza shiriki.

1. Yes /Ndio 2. No/La

Q5.5. **For structure owners/landlords/Kwa wenye nyumba** - Do you feel you have secure tenure for your unit, structure, or house? By "secure" I mean that no one could just come and force you to leave without an official legal process in which you would participate./ Je unahisi kama una usalama wa umiliki wa nyumba yako? Hapa nazumgumzia usalama kumaanisha kwamba hakuna yeyote anaweza kukutoa kwa nyumba yako bila kupitia njia za kisheria ambazo hata wewe utaweza shiriki.

1.Yes/Ndio 2. No/La

Q.5.6. **For owners/Kwa wenye kumiliki** - How did you acquire the funds to purchase the structure and/or land? / Uliweza kupataje fedha za kununua nyumba na/au shamba?

1. Loan/Mkopo
2. Family Support/Usaidizi kutoka kwa jamii
3. Savings/Akiba
4. Inheritance/Urithi
5. Other/Nyingine

Q5.7a. Have you ever been evicted from your land, structure, house or unit in [name of city]?/Umewahi kuhamishwa kwa lazima kutoka kwa shamba lako, nyumba yako au chumba katika [jina la mji]?

1. Yes /Ndio 2. NoLa **GO TO MODULE/Enda sehemu ya 3**

Q5.7b. When was the most recent eviction?/Kuhamishwa kwa mara ya mwisho ilikuwa lini? _____ (year/mwaka)

Q5.7c. By whom were you evicted?/Nani aliyekuhamisha?

1. [Name of city]/Government/[Jina la baraza la jiji]/Serikali
2. Company or individual that holds the head title to the land/Shirika au mwenye cheti cha umiliki wa shamba
3. Landlord/Mwenye shamba
4. Other, specify/Nyingine, eleza _____

Q. 5.8 Satisfaction with your current housing status – using scores from 1-10, how would rate the following?

		Less satisfied			*Somewhat Satisfied*				*Satisfied*		
A	*Floor Quality*										
B	*Wall Quality*										
C	*Roof Quality*										
D	*Flood Water when it rains*										
E	*Whole House*										
F	*Quality of Life*										

Module 6: Physical Infrastructure and services

WATER MODULE

Q6.1.Do you have a private piped water connection inside your house?/Je, uko na maji ya mfereji nyumbani kwako?

1. Yes/Ndio….. **Go TO/Enda swali Q 6.3** 2. No/La

Q 6.2a.Do you have a piped water connection in your compound?/Je, uko na maji ya mfereji katika boma lako?

1. Yes /Ndio 2. No/La ... **GO TO/ENDA SWALI Q 6.4**

Q6.2b.(If yes to compound) Is your compound connection the main source of water for other households besides your own?/(Kama iko kwa boma) Je, mfereji wa maji katika boma pia inatumiwa na familia jirani na si yako pekee?

1. Yes /Ndio 2. No/La ...

Q6.3. (For those **with** in-house OR compound connections, i.e. **if Q6.1=1 or Q6.2a=1**) who is your water service provider, that is, the agency or company that is responsible for the water supply?

1. The public (government/council) water company called [Insert name in each town]
2. A private water company [please ask name and fill it here_____]
3. It is a system (well, borehole, etc) that is owned by my household
4. It is a community/settlement/self-help system (including shared boreholes)
5. Don't know
6. Other (specify) _____

ENUMERATOR: GO TO Q6.6

Q6.4. (For those **without** in-house OR compound connections, i.e. **if Q6.1=2 AND Q6.2a=2**) Are there houses or businesses within 50 meters of your home that have a piped water connection in the compound or house?

1. Yes 2. No

Q 6.5.(For those **without** in-house OR compound connections, i.e. **if Q6.1=2 AND Q6.2=2**) What are the two main reasons that you do not have a water connection in the house or compound?

1. Do not want a connection, because other water sources are available
2. We are renters and this house does not have one (or the landlord will not get one)
3. The water company has a waiting list for connections
4. Cannot afford to pay for a new connection
5. Cannot afford to pay monthly bills for water
6. Water service is not available
7. Other 1, specify _____
8. Other 2, specify _____

Most important reason _____ (record No. from list above

2nd most important reason _____ (record No. from list above)

Q6.6. Please help us fill this table about your water supply in the last year. I want to ask you about water for drinking, cooking, washing, and cleaning.
[ENUMERATOR: FILL IN COLUMNS BY MARKING ALL THAT APPLY.]

Which sources?	**a** Over the past year, which sources of water did your household typically use **(Select all that apply)**	**b.1** Which was your primary source for drinking over the past year? (**CHOOSE ONLY ONE** OF THE SOURCES USED)	**b.2** Which was your primary source for cooking over the past year? (**CHOOSE ONLY 1** OF SOURCES USED)	**b.3** Which was your primary source for washing (bathing, laundry, etc) over the past year? (**CHOOSE ONLY ONE** OF THE SOURCES USED)	**b.4** Which was your primary source for cleaning (the house, utensils etc.) over the past year? (**CHOOSE ONLY ONE** OF THE SOURCES USED)	**c** Overall, for all water uses combined, which was your household's most important source and which was 2nd most important over the past year? Primary source...1 Next most important source…….2	**d** What is the amount you pay (per unit) for water from this source? **CODES** 1.Jerry can (10 litres) 2. Jerry can (20 litres) 3.bucket 4.liter 5.pay for a day's needs 6. pay for a month's needs (piped)	**e** What is the total amount that you spend on water from this source (please specify whether it is per day, per week, or per month)? KSh on average **CODES (PERIOD)** 1=per day 2= per week 3= per month 4= specify period (every 3 days etc) Pay nothing …….0 Don't know 98	
1) Private connection to piped water in house or compound									
2)Bottled (mineral)									
3) Compound tap (shared									

4) Water kiosk							Ksh ____ per code ___	Ksh _____per code (period)_____	
5a) Water tanker							Ksh ____ per code ___	Ksh _____per code (period)_____	
5b) Other water vendors (specify)							Ksh ____ per code____	Ksh _____per code (period)_____	
6) Neighbors							Ksh ____ per code ____	Ksh _____per code	
7a) Borehole or well –private, owned by your household	If yes, ask lined or unlined?								
7 b) Borehole or well – shared (with a group of households or settlement)	If yes, ask lined or unlined?								
7 c) other natural sources outside house or compound (lake, river, spring)									
8) Other, specify _____									

Q6.7. Who collects water most of the time from the primary drinking water source?/Nani kwa mara mingi huchota maji kutoka mahali pa kuchota maji ya kunywa?

1. Head of household
2. Spouse
3. Child
4. Other relative
5. House help
6. Other (specify)
7. NA

Q6.8. For EACH TRIP, normally what is the average time (in minutes) spent travelling to and from the water source, waiting in line and filling containers? _____minutes

Q6.9. Normally, how many times per week does this member collect water from this source? _____ number of times/week

Q5.10. I will ask you a couple of questions about the reliability of your primary drinking water source.

Source (from Q6.6) (write down primary drinking water source)	**How many hours per day is water available from this source on average?**		**How many days a week is water available from this source on average?**	
	Overall	**In dry season**	**Overall**	**In dry season**
1 _____				

[ENUMERATOR: ASK EITHER Q6.11 or Q6.12 BASED ON THE MAIN WATER SOURCE OF THE HOUSEHOLD – **DO NOT ASK BOTH QUESTIONS**.]

Q6.11. (For households whose main water source is <u>not</u> a house connection) Over the last <u>one week (7 days)</u>, what was the total amount that you spent on water from **ALL** sources? _____per day (in Ksh) **go to Q6.13**

Q6.12. (For households whose main water source is a house connection) How much do you pay on average <u>per month</u> for water from **ALL** sources? Please exclude any amounts that are included in the rent.

[ENUMERATOR: PROMPT THE RESPONDENT TO CHECK THE WATER BILLS IF AVAILABLE] _____per month (in KSh)

Q6.13. How would you characterize the quality of water from your primary source for drinking water [restate name of source from Q6.6]?

1. Poor 2. Fair 3. Good

Q6.14. Do you treat the water you use for drinking? /

1. Yes 2. No **GO TOQ6.16**

Q6.15. In what ways does your household treat water for drinking? [MARK ALL THAT APPLY]

1. Boiling/Kuchemsha
2. Adding bleach/chlorine
3. Using a water filter
4. Standing and settling

3. Sieving through a cloth/Kuchunga ukitumia kitambaa 6. Other (specify)/Nyingine (eleza)_____

SANITATION

Now I would like to ask you some questions about sanitation in your household.

Q6.16. Do you or members of your household sometimes pay a facility or a neighbor to take a bath? /Je, familia yako kwa wakati mwingine hulipa jirani au mahali pa biashara kutumia bafu?

1. Yes/Ndio 2. No/La **[GO TO/ENDA SWALI Q6.19]**

Q6.17. How often does someone from your household pay for a bath facility? /Kwa kawaida, bafu hilipiwa lini?

1. Daily/Kila siku
2. More than once a week (but less than daily)/Zaidi ya mara moja kwa wiki (lakini si kila siku)
3. Once every 2 weeks/Mara moja kila wiki mbili
4. Less often than every 2 weeks/Chini ya mara moja kwa kila wiki mbili

Q6.18. How much do you/they pay for the bath per use?/ Je wewe/au familia yako hulipa pesa ngapi kutumia bafu? _____ Ksh

Excreta Disposal

Q6.19. What types of toilet does this household **usually** use? ***Select Top 2***

1. No facility/flying toilets **[GO TO Q6.29]**
2. Individual ordinary Pit Latrine
3. Individual VIP Latrine
4. Flush Toilet/WC
5. Public/shared Latrine
6. Paid shared facility
7. Other,specify _____

Q6.20. How long does it take you to walk from your house to the toilet (if toilet facility is not in house)? _____minutes to walk

[ENUMERATOR: CODE 7777 IF TOILET IS IN THE HOUSE OR COMPOUND]

Q6.21. How many households and people share the toilet, including your household and household members? _____households _____people

[ENUMERATOR: CODE 97 if HOUSEHOLD DOES NOT SHARE]

Q6.22. Who is responsible for repairing the toilet?

1. Landlord
2. My household
3. A group of households
4. A private operator
5. A NGO
6. Other (specify) _____

Q.6.21b: Who is responsible for cleaning the toilet?

1. Landlord
2. My household
3. A group of households
4. A private operator
5. A NGO
6. Other (specify) _____

Q6.23. (For those who use a paid facility – option 6 in Q6.19) How much do you pay for using the toilet facility? [ENUMERATOR: ONLY TAKE ONE ANSWER]

1.Ksh per use _____ Ksh
2.Ksh per month per person _____ Ksh
3.Ksh per month per family _____ Ksh

Q6.24. Which type of disposal system is your toilet connected to (i.e. where does the excreta/ sewage go)?

1. Formal connection to Public sewer **[GO TO Q6.29]**
2. Pit latrine
3. Informal connection to Public sewer **[GO TO Q6.29]**
4. Septic tank/or soak pit **[GO TO Q6.27]**
5. Other, Specify **[GO TO 6.29]** _____specify (e.g. to water drain, to river etc.)

Q6.25. What do you do when the pit is full?

1. Usually have it emptied
2. Dig a new pit **[GO TO Q6.29]**
3. Let it overflow [**GO TO Q6.29]**
4. Other**,** specify _____

Q6.26. Which methods are used for emptying?

1. City Council/Local Authority exhauster services
2. Council managed manual methods
3. Manual methods (not Council)
4. Private exhauster services.
5. Other, specify _____

[GO TO Q6.29]

Q6.27. How is the septic tank or soak pit emptied?

1. By truck
2. Manually
3. Tank distributes waste into the ground **[GO TO Q6.29]**
4. By overflow
5. Has never been full
6. Other, specify_____ _____

Q6.28. How often is the septic tank/soak pit emptied? [Fill in one answer]

Not yet emptied _____ *or* Every ____ year(s) *or* Every _____month(s)

Q6.29. How do you dispose of used kitchen or bath water, also called “grey water”?

1. Pour it into the drain
2. Pour it onto the road or pavement
3. Pour it into a pit latrine
4. Other, specify

_____

Solid Waste

Q6.30. What is the most commonly used mode of disposing garbage from this household?

1	Dumping in the settlement **GO TO 6.34**	5	City collection system
2	Dumping in your own compound **GO TO Q6.34**	6	System run by CBO (community based organization)
3	Burying in your compound **GO TO Q6.34**	7	Organized private collection system
4	Burning **GO TO Q6.34**	8	Other (specify)

_____

Q6.31. Do you pay for garbage collection?

1. Yes 2. No [**GO TO Q6.34]**

Q6.32. How much do you pay for garbage collection <u>per month</u>?

[ENUMERATOR: ENTER 0 IF THIS IS INCLUDED IN THE RENT]

_____(in KSh) per month

Q5.33. How many <u>times per month</u> is your garbage collected?

1. Weekly
2. Every 2 weeks
3. Once a month
4. There is no regular pattern
5. Other (specify) _____

Electricity

Q6.34. Is your housing unit connected to electricity? / Je, nyumba yako ina stima?

1. Yes/Ndio 2. No/La [**GO TO/ENDA SWALI Q6.39]**

Q6.35 On average, how many hours per day do you get electricity? /Kwa siku, wewe hupata stima kwa muda upi? _____hours/day/masaa/siku

Q6.36. In a typical week, how often do you face power outages or power cuts? /Kwa kawaida kwa wiki, stima hupotea mara ngapi?

1. Rarely
2. Once a week
3. 2-3 times per week
4. more than 3 times a week

Q6.37. How or to whom do you pay? /Je, wewe hulipa nani kutumia stima?

1	Pay to utility company	**4**	Included in rent
2	Buy prepaid card	**5**	Pay person who takes electricity from the government power line
3	Pay to landlord (separate from rent)	**6**	Other: specify_____

Q6.38. How much do you pay on average for electricity per month?

[ENUMERATOR: IF RESPONSE TO Q6.37 = 1, PROMPT THE RESPONDENT TO CHECK THE ELECTRIC BILLS FOR THE PAST 3 MONTHS] _____(Ksh average/month)

Q6.39. (For those **without** electrical connections) Are there any electrical connections to buildings within 50 meters of your house?

1. Yes 2. No

Q6.40. (For those **without** electrical connections) What is the main reason that you do not have an electric connection in the house?

[ENUMERATOR: **DO NOT READ** THE RESPONSE OPTIONS TO THE RESPONDENT]

1. We are renters and this house does not have one (or the landlord will not get one)/Sisi ni wapangaji na nyumba hii haina (ama mwenye nyumba hajatuletea)
2. The electric company has a waiting list for connections/Kampuni ya kusambaza stima ina majina ya wanaosubiri kupata stima
3. Cannot afford to pay for a new connection/Sina uwezo wa kulipia pesa za kuwekewa stima
4. Cannot afford to pay monthly bills for electricity/Sina uwezo kulipia matumizi mwisho wa mwezi
5. Power line is too far/Nyaya za stima ziko mbali sana na kijiji
6. Other , specify/Nyingine,eleza

_____

Other Issues

Q6.41. What is your primary fuel for cooking? /Je, unatumia nini kupika?

1. Electricity/Stima
2. Paraffin/Kerosene/Mafuta taa
3. Gas
4. Firewood/Kuni
5. Charcoal/Makaa
6. Solar
7. Do not cook/Sipiki
8. Other, specify

_____

Q6.42. What is the approximate cost of fuel for cooking per month or per day?
[ENUMERATOR: IF INCLUDED IN THE RENT OR ELECTRICITY, ENTER **0** HERE AND **98** IF 'DON'T KNOW'.] _____Ksh per month, *OR*
_____ Ksh per day

Q6.43. What is your household's primary source of lighting?

1. Electricity
2. Kerosene (Pressure lamp, lantern, tin lamp)
3. Firewood
4. Gas
5. Solar panels
6. Paraffin, candles
7. Other (specify)

_____

Internal Roads

Q6.44a. Is the <u>main road</u> to your house paved, gravel or tarmacked?/<u>Barabara kuu</u> ya kuelekea nyumbani kwako ina lami?

1. Not paved/ earth road
2. Paved (brick or stone)
3. Gravel/Murram
4. Tarmacked
5. Other (specify)

_____

Q6.44b. During the last dry season, was this <u>main road</u> in good or poor condition?

1. Good/Nzuri 2. Poor/Mbaya

Q6.45. Is this main road usable in the rainy season?

1. Yes, most of the time or all of the time
2. Yes, some of the time
3. Rarely or never

Drains

Q6.46. Is there a drain outside your house for rainwater?

1. Yes 2. No

Q6.47. In the most recently ended rainy season was your house ever flooded?

1. No **go to Q6.49**
2. Yes, once
3. Yes, 2-3 times
4. Yes, more than 3 times

Q6.48. How deep was the water in your unit during the worst flooding? _____ cm

Street lighting

Q6.49. Do you have street lights or lamp posts on your street?

1. Yes 2. **GO TO Q6.51**

Q6.50. Do the street lights in your street work?

1. Yes, most of the time or all of the time
2. Some of the time
3. Rarely or never

Infrastructure Priorities

Q6.51 Please rank your top 2 priorities for infrastructure improvements in your settlement? the following:

	Infrastructure	**Priority Rank 1 and 2**
Q6.51a	Electricity	
Q6.51b	Garbage disposal system	
Q6.51c	Storm water drainage	
Q6.51d	Water supply	
Q6.51e	Sewerage	
Q6.51f	Street lighting	
Q6.51g	Roads	
Q6.51h	Open spaces/playgrounds	
Q6.51i	Other (specify)_____	

Module 7: Social Amenities profile

Settlement Conditions/Hali ya kijiji

I would like to ask you a few questions about this settlement./Ningependa kukuliza maswali kadhaa kuhusu kijiji hiki

Q7.1. First I want to ask about how well situated the settlement is regarding several kinds of services. Tell me whether the following services are available within a 20 minute walk of your settlement. If the service is available, please also tell me whether you have used the service within the past 3 months./ Kwanza ningependa kukuuliza maswali kuhusu hali ya huduma. Nieleze kama huduma zifuatazo ziko umbali wa dakika 20 kutoka katika kijiji hiki. Kama huduma inapatikana, pia nieleze kama umewahi kukitumia kwa muda wa miezi tatu iliyopita

Facility/ Service/ Kituo/ Huduma	Yes/Ndio (in settlement or within a 20 minute walk/inapatikana kijijini ama umbali wa dakika ishirini)	No/La	Do not know/Sijui	(If yes, in column one,) has your household used this facility or service in past 3 months? Kama ulijibu ndio hapo mbeleni) kuna yeyote kutoka kwa familia yako aliteweza kutumia kituo ama huduma hii kwa miezi mitatu iliyopita? Yes/No /Ndio/La
Nursery schools/Shule ya chekechea				
Primary schools/Shule ya msingi				
High schools/Shule ya sekondari				
Health clinic/Kliniki				
Hospital/Hospitali				
Food shop or kiosk/Duka la vyakula au kioski				
Shop(s) for other goods/Duka la bidhaa nyingine				
Parks/Maeneo wazi ya kuumzika				
Transportation service (bus/matatu) into city centre/Huduma ya usafiri hadi mjini				

Q7.2. Now I want to ask about some environmental conditions that might exist in your settlement. *I am asking about conditions in the area around your house, i.e., the settlement.* I will read you the conditions and you will tell me whether the condition is a *severe problem*, a *mild problem*, or *not a problem at all./*Ningependa kukuuliza maswali ya kuhusu mazingira ya kijiji. *Maswali haya yatakuwa*

kuhusu maenoe yanayo zingira nyumba yako. Nitakusomea mambo kadhaa ambayo utanielezea kama ni *tatizo kubwa* au *si kubwa*, ama *si tatizo kamwe.*

ENUMERATOR READ OPTIONS TO THE RESPONDENT. ENTER AN **"X"** FOR ANSWER THAT BEST APPLIES/MMWENYE KUJAZA FOMU: TAFADHALI SOMEA MWENYE UNAMHOJI MAJIBU HALAFU KATIKA JIBU LIFAALO WEKA ALAMA YA "**X**"

Condition/Hali	Severe problem /Tatizo kubwa	Mild problem/Tatizo lisilo kubwa	Not a problem at all/Sio tatizo hata	Do not know/Sijui
The area floods when there are heavy rains				
We are located on a hillside that is subject to mud slides				
Located near a garbage dump (formal or informal)				
Located near a sewerage plant				
Close to a polluting factory (air, water, noise)				

Module 8: Willingness to Pay for SUP

Description of the SUP in the KISIP project:

As you may know, providing adequate housing and services to residents of rapidly growing cities remains a significant challenge to local and national governments worldwide. Nowhere is the challenge more daunting than in the cities of the global south, where the growth of unserviced and informal settlements outpaces citywide growth.

The government is planning to support settlement upgrading, sanitation facilities (ablution blocks) and water supply for the residents of this slum.

With special considerations on location choice, this infrastructure will have positive impacts on the health of the residents, and on local environment. The new project will also improve the drainage and expand the solid waste collection and disposal service to cover the slum.

The improvements in the infrastructures might however cost you additional rental value on your dwelling unit!

Elicitation for Willingness to Pay (WTP)

Closed-ended question

Q.8.1. Now, I want you to assume that the improved priority infrastructures (REFER TO Q6.51) would entitle a typical household like yours to improved quality of life. This would cost your household rental charge shillings per month:

	N1	N2	N3	N4	N5	N6	N7	N8
	50	100	200	400	600	800	1000	1200

What do you think your household would do? *(Enumerator: Read choices 1 and 2, not the third)*

(1) Pay the higher monthly charge and continue in the housing estate
(2) Find a house elsewhere
(3) Don't know

Q.8.2. How sure are you of your decision?

(1) Totally sure
(2) Somewhat sure
(3) Equally sure or unsure
(4) Somewhat unsure
(5) Totally unsure

(Enumerator: For those who chose to stay pay for higher monthly rent (1), GO TO QUESTION 3; for those who chose to find a house elsewhere (2), GO TO QUESTION 4)

Q.8.3. Could you explain to me your main reasons for staying in the improved house? *(Enumerator: Allow them to answer on their own. If no answer, then prompt with the following)*

(1) I really want/need the improved infrastructures.
(2) The increased monthly rent is not too high.
(3) I am worried about the risks of the improved infrastructures.
(4) I like the idea of having improved infrastructures.
(5) Other (please specify): _____
(6) Don't know/not sure

Q.8.4. Could you explain to me your main reasons for leaving the infrastructures?

(1) I do not really want/need the improved infrastructures
(2) The increased rent bill is too high; I cannot afford it
(3) I am not worried about the risks of the existing infrastructures
(4) I do not want the government involved in infrastructures improvement project
(5) Other (please specify): _____
(6) Don't know/not sure

Q.8.5. If you leave the housing project, where do you think your household would find alternative housing?

(1) Private house elsewhere
(2) Neighboring estates
(3) Other (please specify): _____
(4) Don't know/not sure

Open-ended question

Q.8.6. "WHAT IS THE MAXIMUM MONTHLY AMOUNT THAT YOU WOULD BE WILLING TO PAY IN ORDER TO ENJOY THE INFRASTRUCTURES IMPROVEMENT?"

Kenya Shillings: ……

(END OF THE SURVEY)

Module 8: Willingness to Pay for SUP
Interviewer observations
[ENUMERATOR: THE FOLLOWING SHOULD BE FILLED IN AFTER THE INTERVIEW]

Q9.1. Interviewer observation: Please assess how the condition of this house compares to others in the settlement

1. Worse than average
2. Average
3. Better than average

Q9.2. What materials have been used for construction of the house?

Type of material	a External walls	b Roof	c Floor
	Stone……..……1 Brick/block……..…..2 Mud/wood…….....3 Mud/cement……..….4 Wood only…….....5 Corrugated iron sheet....6 Tin…….....7 Other……..….8	Corrugated iron.....1 Clay tiles…….....2 Concrete……...3 Asbestos sheet…....4 Makuti (thatch)…...5 Grass…….....6 Tin……..…..…….7 Other……...….8	Earth/clay…….....1 Tiled floor…….....2 Cement……..……3 Wood……..….....4 Other……..……5

Q9.3. Mark the answer that best describes the type of structure.

1. Single family house, row house or house in a compound occupied only by this household
2. A house shared with others
3. Single story structure or compound of individual rooms and shared facilities
4. Room in a house, with the house shared with others
5. Shack occupied by only the household
6. House or room in multi-story structure with bathroom for the household's private use
7. House or room in multi-story structure with bathroom outside the unit shared with other households
8. Other: (specify) _____

Q9.4. How would you rate the overall quality of the interview in terms of willingness to answer correctly?

1. Poor
2. Fair
3. Good

Signature, Enumerator .....

Signature, Supervisor (field work).....

Conclude interview

Appendix 2: A sample for Socio-Economic Survey in Nairobi County

A Sample for Socio-Economic Household Survey in Nairobi County

1	2	3	4	5	6	7	8	9	10	11	12
		Estimated Popn	**n**	**Average Household size**	**Households**	**Adjustments for non-response**	**Area Ha**	**Acres**	**clusters/enumeration areas**	**Households per cluster**	**Households per cluster2**
Nairobi	Kinyago Kanuku	20000	**377**	3	126	188	1.7	4	4	47	**48**
	Kahawa Soweto	15000	**375**	3	125	187	0.8	2	4	47	**48**
	Kosovo	25000	**378**	3	126	189	4.3	9	6	32	**32**
	Gitathuru	1000	**278**	3	93	139	0.8	2	4	35	**36**
	Njiku	1300	**297**	3	99	148	1	2	4	37	**40**
	Embakasi Village	3000	**341**	3	114	170	1.2	3	4	43	**44**
	Ghetto	1000	**278**	3	93	139	0.8	2	4	35	**36**
	Kambi Moto	1241	**294**	3	98	147	0.4	1	4	37	**40**
	Mathare 4A	12000	**372**	3	124	186	1.4	3	4	47	**48**
	Mathare 4B	12000	**372**	3	124	186	4	9	6	31	**32**
	Mathare Mashimoni	4000	**351**	3	117	175	2.8	6	4	44	**44**
	Total				**1237**	**1856**					

***Source**:*
Survey Data (2017)