ASSESSMENT OF SANITATION CHALLENGES IN SLUM SETTLEMENT IN
OBUNGA, KISUMU CITY, KENYA

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT FOR THE
DEGREE OF BACHELOR OF ARTS IN URBAN AND REGIONAL PLANNING.

SCHOOL OF THE BUILT ENVIRONMENT
DEPARTMENT OF URBAN AND REGIONAL PLANNING

University of Nairobi.
Declaration
I, Odhiambo Kevin Ainea, declare that this Planning Research Project is my original work and has not been presented for examination in any other university.

Odhiambo Kevin Ainea

(Student)

Signature: ………………………………. Date……………………………

This Planning Research Project has been submitted for examination with my approval as the university supervisor.

Professor R.A. Obudho

(Supervisor)

Signature: ………………………………. Date: ………………………………..
Dedication
I want to thank the Almighty Jehovah for enabling me to successfully put together this piece of work until its completion.

I dedicate this piece of work to my family members, my loving parents and supportive brothers in giving me the support both morally and financially and their time taken in producing this research work.
Acknowledgement

I thank the Almighty Jehovah for giving the gift of life, good health and the ability to undertake this planning research project with a lot of determination. Secondly, I would like to pass my special thanks to my supervisor Professor R.A Obudho for his support and personal interest in helping me achieve the output that am able to produce in this research work.

I would also like to thank my intellectual classmates and their supportive nature to help where necessary to come up with the impressive piece of work. I would also like to pass my sincere gratitude to the Obunga community and the village elders and the able chief for their willingness to give information and offering security during the field work.

Finally I would like to thank the entire staff at the Department of Urban and Regional Planning, University of Nairobi for the resources and encouragement every step of the way to achieve my goals in completing my research project.
Abstract
Among the greatest challenges that governments in third world states will face is provision and maintenance of sanitation facilities for their ever growing city populations. In most of these countries, urbanization has caused the emergence of slums like Obunga, located in Kisumu Kenya. Obunga is home for approximately 3500 people with a population density of 97 people per ha. The purpose of this study is to examine the state of sanitation conditions and the existing sanitation infrastructure in Obunga, the scenario here basically reflects the situation in other urban slums in Kenya such as Mukuru Kwa Reuben, Kibera, and Nyalenda Manyata Arab in Kisumu etc. The study looks in depth into the level and impact including opportunities that can arise for the existing state of sanitation, and how it would be appropriate to provide sustainable sanitation for better living conditions.

This research was however conducted in Obunga (Kisumu) and a conclusive administration if 62 household questionnaires was concluded with majority responding positively. total of 43 questionnaires were administered fully with the rest having challenges of either the respondent abandoning the exercise or refusal to give vital information. The objective was to analyze the most feasible toilet technology to satisfy the sanitation needs of the community in a sustainable way by asking community members questions related to the causes and effects of poor sanitation facilities in their community, their willingness to improve their sanitation facilities and their general knowledge of the impact of practicing poor sanitation.

The study findings indicated that factors like overcrowding, lack of proper sanitation facilities, mismanagement and lack of toilet waste disposal were on the forefront of major causes of poor sanitation. Most people however understood the general aspects of sanitation, this is, what is good and poor/bad sanitation and the impacts of practicing poor sanitation, the community needs and expectations on sanitation facilities were identified. The study therefore recommends that measure be put in place to increase sanitation coverage Obunga through constructed community managed toilet facilities designed to meet the local community needs.
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<th>Description</th>
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<td>KeNHA</td>
<td>Kenya National Highways Authority</td>
</tr>
<tr>
<td>KIWASCO</td>
<td>Kisumu Water and Sanitation Company Ltd</td>
</tr>
<tr>
<td>KNBS</td>
<td>Kenya National Bureau of Statistics</td>
</tr>
<tr>
<td>LASDAP</td>
<td>Local Authority Service Delivery Action Plan</td>
</tr>
<tr>
<td>MoLHUD</td>
<td>Ministry of Lands, Housing and Urban Development</td>
</tr>
<tr>
<td>OPP</td>
<td>Orangi Pilot Project</td>
</tr>
<tr>
<td>OPP-RTI</td>
<td>Orangi Pilot Project Research and Training Institute</td>
</tr>
<tr>
<td>PDP</td>
<td>Part Development Plan</td>
</tr>
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CHAPTER 1: INTRODUCTION

The 20th century was a time of great change, and the greatest of those changes was in the numbers of people on the globe and where they lived. Between 1950 and 2010, humankind has endured its most rapid expansion, from 2.5 billion to 6.9 billion people. Sixty three per cent of this gain has been in urban areas, particularly in the urban areas of the developing regions, where the urban population has increased nearly seven times in only 60 years. Humanity is only about half way through this great transformation to urban living. Between the years 2010 and 2040, the global urban population will increase by more than 2 billion while rural populations will decline with almost 300 million people. The greatest impact will be felt in the developing regions and nowhere more so than throughout Southern and South-Eastern Asia and Sub-Saharan Africa. Between the years 2010 and 2025, many large cities in Asia and Africa will have increased their population by more than 50 per cent. (Bhatt, 2003)

The growth of informal settlements in Kenya dates back to the colonial period. Nairobi, founded as a station on the Mombasa-Uganda railway line in 1899, quickly became the focal point of the British colonial strategy in British East Africa and was declared the territory’s capital in 1907. During this period, British colonial rulers increasingly “saw East Africa as a hinterland for Nairobi” (Jackson & Rosberg, 1986: 203). Flourishing intraregional trading networks between Kenya, Tanzania and Uganda would drive Nairobi’s manufacturing industry, and at the same time, encourage rural-urban migration to the capital. A series of protective laws passed in 1915 banned non-whites from owning land both in the country’s’ hinterland’s rich agricultural areas and Nairobi. Crucially, this would push Africans into squatters’ settlements and render land ownership beyond the reach of the lower classes, who were predominantly African and South Asian.

Wherever humans gather, their waste also accumulates. Progress in sanitation and improved hygiene has greatly improved health, but many people still have no adequate means of disposing of their waste. This is a growing nuisance for heavily populated areas, carrying the risk of infectious disease, particularly to vulnerable groups such as the very young, the elderly and people suffering from diseases that lower their resistance. Poorly controlled waste also means daily exposure to an unpleasant environment. The build up of faecal contamination in rivers and other
waters is not just a human risk: other species are affected, threatening the ecological balance of the environment. The discharge of untreated wastewater and excreta into the environment affects human health by several routes. (WHO report, 2004)

According to world health organization (WHO), sanitation is a broad term used in the development of the needs of the society and actually a factor in the development of developed and developing countries. Sanitation as a whole covers quite a number of aspects such as;

- Safe collection, storage, treatment and disposal/re-use/recycling of human excreta (faeces and urine).
- Management/re-use/recycling of solid wastes (trash or rubbish).
- Drainage and disposal/re-use/recycling of household wastewater (often referred to as sullage or grey water).
- Drainage of storm water.
- Treatment and disposal/re-use/recycling of sewage effluents.
- Collection and management of industrial waste products.
- Management of hazardous wastes (including hospital wastes, and chemical/ radioactive and other dangerous substances).

In 2004, only 59% of the world population had access to any type of improved sanitation facility. In other words, 4 out of 10 people around the world have no access to improved sanitation. They are obliged to defecate in the open or use unsanitary facilities, with a serious risk of exposure to sanitation-related diseases. While sanitation coverage has increased from 49% in 1990, a huge effort needs to be made quickly to expand coverage to the MDG target level of 75%. Investing in sanitation infrastructure involves a long project cycle. (UNICEF report, 2004)

Sanitation problems are mostly manifested in slum areas according to the united nations settlement programme. The slum are characterized by their high population density leading to inadequate facilities, more so sanitation.

It has been estimated that one third of the urban population in developing countries today do not have access to adequate housing, and lack access to safe water and sanitation. These people live in overcrowded and un serviced slums, often situated on marginal and dangerous land. They lack access to public clean water, and have to pay a premium to private providers. Their waste not only
remains untreated, it surrounds them and their daily activities and affects their health, especially their children’s. (Cities Alliance, 1999)

In Kenya, slums are a major characteristic of urban area. Among the slums in Kenya, the major outstanding characteristic is the condition of their sanitation. Unattended latrines, burst sewerage pipes and lots of grey water.

My assessment of the sanitation condition will be carried out in Kisumu Obunga slums, which is a major densely populated area in Kisumu along the Kisumu-Kakamega road bypass. The area has a nucleated form of settlement with a high density of informal houses that can are not integrated with latrine or toilet services. The area has uncontrolled development which has also impacted negatively on the development of the area. The site has a slight sloping topography which has the advantage of the gravity in channeling the solid wastes to a more centralized area for effective collection.

**Definition of terms.**

**Sanitation:** Sanitation literally means measures necessary for improving and protecting health and well being of the people. Sanitation is any system that promotes proper disposal of human and animal wastes, proper use of toilet and avoiding open space defecation (WHO, 2003)

**Slum:**

Slum at its simplest, is ‘a heavily populated urban area characterized by substandard housing and squalor’. (Bhatt, 2003)

‘Slum’, at its simplest, is ‘a heavily populated urban area characterized by substandard housing and squalor’. This definition encapsulates the essential characteristics of slums: high densities and low standards of housing (structure and services), and ‘squalor’. (Hasan and Mohib, 2003)
1.2 Problem statement
Sanitation conditions have been a major concern from time in memorial. Dating back to the ancient civilization and settlements, majority of the health problems and hazards have been linked to the way human, solid waste and grey water have been disposed. (WHO)

According to Kenya population census 2009, Kisumu city has a population of 409,928 making it the 3rd largest urban area in Kenya, this as a result gives it the challenges of the uncontrolled development which as a result brings up the informal settlements leading to strain in available amenities including sanitation facilities and this becomes a planning issue that will need planning interventions.

Obunga area has specifically the problem of sanitation, inadequate supply of sanitation facilities i.e. toilets, improper maintenance of the available ones and poor drainage of waste water with no sewer lines. The accessibility of the solid waste disposal sites are also a major problem, this leads to another problem of collection and management. (KISIP report, 2015)

Environmental wise the situation has become a real issue especially to the riparian of river Kisat and also to the pollution of the river in terms of grey water and lack of sewer lines.

This has in turn been a major problem in the containing of outbreak of diseases which always come about as a result of the predisposing factors of the sanitation conditions.

The main goal is to effectively resolve the issue of human waste disposal among the other sanitary situations in a way that will be beneficial to both the public and the environment. The issue of the development of a habitable place which is up to standard and approved by the general standards of sanitation.
1.3 Objectives of the research.

- To find out the existing sanitation conditions in Obunga slums Kisumu
- To determine the causes of sanitation problems in the slum area
- To determine the impacts/effects of the sanitation conditions in Obunga slums
- To propose workable solutions that will mitigate the problem of sanitation in the area of study.

1.4 Research questions

- What is the condition of Obunga slums in terms of sanitation?
- What are the main causes of sanitation challenges in Obunga slums in Kisumu?
- What are the major causes of the sanitation problem in the area of study?
- How can the sanitation conditions be improved in Obunga slums.

1.5 justification for study.

According to medium term plan 2008-2012, Sanitation as a basic concern and vital issue has been discusses. Sanitation and waste management are closely related to human health. The challenges of addressing sanitation and waste management have been compounded by rising population, improvement in standard of living, and high rural urban migration which is responsible for the development of densely populated informal settlements in urban and per urban areas with poor sanitation facilities. Pollution and waste management is exacerbated by dumping of waste into rivers, streams and other water bodies coupled with inadequate strategies leading to serious health implications. As part of the development goals, eradication of the sanitation menace or managing it to a sustainable level as one of the fore most agenda.

Sanitation as a whole, including water availability has also been captured in the Kenya’s vision 2030, as a need to the development goals of the sector there has been a Close link to the
environment is the water and sanitation subsector. Access to clean water and sanitation is a fundamental human right and critical for human development. Providing access to safe and adequate water remains a key developmental challenge for governments, particularly in sub-Saharan Africa. This and the most affected area include mostly the slum areas which are mostly characterized by the sanitation problems.

1.6 Methodology

This part of the research is to bring up clearly the logical sequence and the way the study will be carried out in a systematic order. In this section will focuses on the research design, target population, data needs, type of data, data collection methods, sample and sampling procedures, data collection instruments, data collection procedures and data analysis procedures.

1.6.1 Introduction letter from university.

Due to the formality and representation of the professionalism of the work, The University of Nairobi gave an introduction letter to access and to formalize my access and meeting with relevant people who will help me study my work.

1.6.2 The specific objectives of the research includes;

Objective 1: To find out the existing sanitation conditions in Obunga slums Kisumu.

The aim of this is to find out the current existing sanitation situation in Obunga slums, the condition of the existing facilities distribution and even availability of the sanitation facilities.

This will be availed by the household questionnaires in Obunga. The household questionnaires will be directed to find out the way the people perceive the situation.

An observation checklist will also be used to get the info that assess the situation on the ground.

Objective 2: To determine the causes of sanitation problems in the slum area.

This objective leads to find and focus on what situations lead to the existing sanitation conditions of the area. What actually triggered it and what made the sanitation conditions as they are.

This will be addressed by the use of household questionnaire to find out the situation and perception of the householders.
The area chief will be a key informant in the finding out where the problem started and why its persisting.

Planning officer will also be a key informant in the section to address the way the situation has developed overtime.

**Objective 3: To determine the impacts/effects of the sanitation conditions in Obunga slums.**

The results of the existing conditions are to be determined here. What effects are there as a result of the sanitation conditions in Obunga slums?

The data needed will be able to gauge the impact of the sanitation conditions to the surrounding area and also the residence.

The physical planner will be a key informant and the public health officer in charge of the section of Obunga slums.

**Objective 4: To propose workable solutions that will mitigate the problem of sanitation in the area of study.**

This will be aimed at finding the solution of the sanitation condition and planning interventions to the existing problems.

This will be seeking to know the plans that are underway to improve the sanitation condition of the slum area.

An interview with the county physical planner will provide information on what is needed in the situation.

**1.6.3 Study area.**

The study will be conducted in the informal settlements in Kisumu (Obunga) which were purposely sampled because they have some of the poorest sanitation facilities in Kisumu.

**Data collection process**

Data collection is carried out as follows.
1.3.4 **Literature review and document reviews.**

This included a desk top research on the factors that led to the realisation of the problem statement and how it has manifested itself in the earlier stages and how they have been able to give the relevant and tangible evidence of the problem on the ground. This will include identification of the theories and the factors that contribute to the formation and growth of informal settlement. Planning and policy recommendations employed elsewhere to make up for the informal sanitation menace.

This will be to find out the local and international organizations that have had projects on the same on the area of study, that is Obunga slums. Their input in improving the sanitation conditions and their progress in the same.

**Scholarly Journals;** these were mainly found from internet and in libraries.

**Theses;** these are mainly other works from scholarly undergraduate, Masters and doctorate of philosophy (ph. D) graduate students.

1.3.5 **Reconnaissance**

A familiarization of the study area in order to obtain information that will be used in the field work.

This will included transect walks through the settlements and a household survey. This will be used to know the exact interest points and how the study will be carried out systematically. This will actually be a 1 day event that will also include the taking of photographs and use of visual interpretation and analysis of the area. The day will also be involved with the use of few residents to know briefly about the situation of the area and what has caused the sanitation problem. Observation check list can be done at this time.
1.3.6 Target population.
The population target for the field work is approximately 3500 people. This will include both the households and the persons who reside in the area.

1.3.7 Profiling
In the process of acquiring the best method of collecting data. Profiling of Obunga area into 3 sections/villages brought the idea of having an effective data collection exercise in a comprehensive way.

Obunga area has a population of about 3500 persons with about 875 households. House hold size is of an average of 4 persons. This makes a total of about 840 households. 20 questionnaires were administered with 30 in section A, 20 in section B and the last section in C had 10. This was based on the high population density and the sharing of similar problems in the area of study sections.

The sampling techniques will be simple random and progressive to avoid bias.

1.3.8 Data collection instruments.
The field work is designed to be data oriented from the resident population the local authority and the planning officer from the current county government. This exercise will be executed out by various methods such as interviews, Questionnaires, observations check lists and document reviews.

Interviews.
Key informant interviews will be a major information point. The study will include an organized meeting with the local planning officer and the local administrator which will be the local chief. A transect walk with an informal talk with a few community members to get to know the area better and to observe the condition of sanitation facilities.

Interviews will also be conducted with the key informants to get the situation from the administrative side. The survey sample will be selected through random route sampling techniques in proportion to the population of the study area.

Observation check list.
This will be used to check the available sanitation facilities and conditions of the sanitation facilities with respect to environmental assessment and impacts.

**Sanitation inventory.**

This will also be carried out to find out how many toilets are there and how many families is it serving, as well as any evidence of open defecation around the house and backyards. This will also form a study visit.

**Questionnaires.**

Administration of household questionnaires will be a major point of data need to find actually the take of the resident population on the sanitation facilities available. This will fill the situation on the ground.

**Key informant interviews.**

The key informants that will be targeted in the field work exercise will be.

- The physical planner Kisumu County
- The local area chief
- Public health officer
<table>
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<tr>
<th>Data need Objectives</th>
<th>Type of data</th>
<th>Source of data</th>
<th>Method of data collection</th>
<th>Analysis</th>
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<td>Operations and maintenance of the communal sanitation facilities, performance of sanitary facilities. Affordability of sanitary facilities. Availability of the sanitary facilities.</td>
<td>Field survey</td>
<td>Observation Interviews mapping</td>
<td>Spatial analysis</td>
<td>Photographs showing the sanitation conditions in Kosovo.</td>
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<td>Map showing sanitation infrastructure.</td>
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<tr>
<td>To determine the causes of sanitation problems in the slum area.</td>
<td>Access to the sanitation facilities Methods of disposing wastes both human and solid Type of drainage and efficiency</td>
<td>Field survey</td>
<td>Observation Interviews Questionnaires Taking photos</td>
<td></td>
<td>Pictorials showing waste disposal methods</td>
</tr>
<tr>
<td>To determine the challenges arising because of the existing sanitation conditions in Obunga slums.</td>
<td>Types of sanitation facilities available Management formulae Cost of maintenance and operation</td>
<td>Field survey</td>
<td>Interview with local authority(chief) Observations Questionnaires Taking photos</td>
<td></td>
<td>Photograph illustrating the effects of poor sanitation in Kosovo.</td>
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<td>To propose workable solutions that will mitigate the problem of sanitation in Obunga.</td>
<td>Guidelines to propose possible planning interventions for safer neighborhoods.</td>
<td>Secondary sources</td>
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<td>Review on planning techniques to improve poor sanitation.</td>
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*Source: Author (2016)*
CHAPTER 2: LITERATURE REVIEW.

2.1 Understanding Slums.

The term ‘slum’ is used in this report and in the MDGs in a general context to describe a wide range of low-income settlements and/or poor human living conditions. These inadequate housing conditions exemplify the variety of manifestations of poverty as defined in the Programme of Action of the World Summit for Social Development (convened in Copenhagen in March 1995).

“A slum is a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services. A slum is often not recognized and addressed by the public authorities as an integral or equal part of the city” (UN-HABITAT, 2002:21; 2003:10).

The first two criteria are physical and spatial, while the third is social and behavioral. This spread of associations is typical, not just for the definition of slums but also of our perceptions of them. Dwellings in such settlements vary from simple shacks to more permanent structures, and access to basic services and infrastructure tends to be limited or badly deteriorated. The definition of the term ‘slum’ includes the traditional meaning – that is, housing areas that were once respectable or even desirable, but which have since deteriorated as the original dwellers have moved to new and better areas of the cities. The condition of the old houses has then declined, and the units have been progressively subdivided and rented out to lower-income groups. Typical examples are the inner-city slums of many towns and cities in both the developed and the developing regions. Slums have, however, also come to include the vast informal settlements that are quickly becoming the most visible expression of urban poverty in developing regions cities, including squatter settlements and illegal subdivisions. The quality of dwellings in such settlements varies from the simplest shack to permanent structures, while access to water, electricity, sanitation and other basic services and infrastructure is usually limited. Such settlements are referred to by a wide range of names and include a variety of tenure arrangements.

Africa, though reported to be the least urbanized continent, is recognized as one where the rate of urbanization is highest. To house all these new city dwellers, informal settlements in the peri-urban areas continue to develop and expand.
It is not only housing that the urban population requires, clean drinking water and hygienic sanitary conditions are also essential. Providing water and sanitation in these peri-urban areas is however very difficult, for technical, financial, institutional and spatial reasons.

Lack of proper sanitation not only leads to undignified and unhealthy conditions. Stagnant water causes breeding pools for malaria, plus the streams entering and leaving the slum catchment, either as surface water or groundwater, form a significant pollutant load. This water is polluting drinking water and, due to extremely high phosphorus fluxes from the slum catchments, eutrophying surface water. Therefore, the main research question of this project is. How to improve sanitation in urban slums, with emphasis on reducing the output of nutrients leaving the slum? This was a research question of Bwaise III Parish, Kampala, Uganda when they wanted to put away the menace of sanitation problems.

2.2 Sanitation, a historic view.
Historically, the sanitation crisis in slum areas has largely been perceived as either an issue of developing appropriate technologies or, in recent years, as an issue of creating demand for sanitation services. Many cities continue to experience population growth that far exceeds the ability and resources of local authorities to extend coverage of infrastructure or provide adequate levels of sanitation services. As a result, there is considerable diversity in the levels of service provision within different parts of cities. These range from areas with high incomes and high water consumption, which are connected to sewerage systems, to pour flush toilets connected to cesspools or open drains, to no provision at all. Most middle and upper income groups live in urban areas. This ensures that average incomes and the proportion of people with services are higher in urban areas. However, this does not mean that the poorest of the urban population, most of them living in unplanned informal settlements, have better basic services than their poorer rural counterparts (Sustainable Sanitation in Cities, 2011).

In 2011, almost two thirds (64%) of the world, relied on improved sanitation facilities. Since 1990, almost 1.9 billion people have gained access to an improved sanitation facility. The greatest progress has been made in Eastern Asia, where sanitation coverage has increased from 27% in 1990 to 67% in 2011. This amounts to more than 626 million people gaining access to improved sanitation facilities over a 21-year period. However, current trends show sub-Saharan Africa and
Southern Asia still struggle with low sanitation coverage. In sub-Saharan Africa, 44 per cent of the population uses either shared or unimproved facilities, and an estimated 26 per cent practices open defecation while in Southern Asia, the proportion of the population using shared or unimproved facilities has declined to 18 per cent but open defecation remains the highest of any region (39 per cent). Sub-Saharan Africa presents some of the most critical challenges for improving sanitation, where population growth exceeds the increase in sanitation coverage. Between 2004 and 2010 the number of people practicing open defecation in urban areas rose by 3 million and the number serviced by unimproved sanitation systems rose from 145 to 183 million (WHO/UNICEF, 2012). The projected demographic trends compound these challenges.

Open defecation rates declined globally from 24% in 1990 to 15% in 2011. In absolute numbers, this signifies a drop of 244 million people to 1.04 billion in 2011. The decline in the population practicing open defecation has differed from region to region. Eastern Asia, South-eastern Asia and the Latin America and Caribbean regions have seen a steady decline since earliest measurements describing conditions in 1990. In Southern Asia, the population practicing open defecation peaked around 1995, after which it declined. Only in sub-Saharan Africa is the number of people defecating in the open still increasing. It is currently estimated that 1.1 billion people in the world lack access to improved water supplies and 2.6 billion people lack adequate sanitation (UNICEF et al. 2004). The global health burden associated with these conditions is staggering, with an estimated 4000–6000 children dying each day from diseases associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene (WSSCC 2004).
2.3 Impacts of poor sanitation.

Population, most of them living in unplanned informal settlements, have better basic services than their

Areas where groups of housing units have been constructed and the occupants have no legal claim to, or occupy illegally, unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing). UN (UNSTAT, 2005).

Detecting informal settlements might be one of the most challenging tasks within urban remote sensing. This phenomenon occurs mostly in developing countries. In order to carry out the urban planning and development tasks necessary to improve living conditions for the poorest worldwide, an adequate spatial data basis is needed (Mason, O. S. & Fraser, C. S., 1998).

Both definitions are obviously emphasizing the illegal character of informal settlements. In contrast, the definition of Mason, O. S. & Fraser, C., 1998 takes the environmental, socioeconomic and living conditions more into account. They describe informal settlements as: dense settlements comprising communities housed in self-constructed shelters under conditions of informal or traditional land tenure. They are a common feature of developing countries and are typically the product of an urgent need for shelter by the urban poor. As such they are characterised by a dense proliferation of small, makeshift shelters built from diverse materials (such as plastic, tin sheeting and wooden planks).

This has actually given the impression that the urban informant settlement has been a very important aspect of study but does give a problem in identification.

In Nairobi, the level of immigration has a very big impact on the way the population of the cities attract through the businesses and the bigger opportunity in life. Rural-urban migration occurs at varying rates in every country, this presents arguments in support of the proposition that rural-urban migration is an inevitable component of the development process, (Mc Catty 2004).
This has given the rise to the population because majority of the people either have low paying casual jobs or have no jobs at all. Most of the people in the city informal settlements also have attachment to the city as well as the middle and upper class. This comes about with the feeling of the rights to the city.

The right to the city is far more than the individual liberty to access urban resources, it is a right to change ourselves by changing the city. It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization. The freedom to make and remake our cities and ourselves is, I want to argue, one of the most precious yet most neglected of our human rights (David Harvey and Peter Marcuse).

This actually shows the way people have been made to feel that the more privileged persons in the urban areas are the well off and that they have an advantage of the city more than the poor slum dwellers. This is actually a way to state that the city is actually a place to have anyone as the manpower and the economics of the city are driven by both the low income and the high profile customers.

60 to 80% of Kenya’s urban population live in slums characterized by lack of access to water and sanitation and adequate housing. Kibera is one of the largest slum settlement in Africa occupying approximately 256 ha of land and situated about 7Km to the south of Nairobi city centre. Kibera initially grew as a village housing the Nubian soldiers of the demobilized army of British East Africa at the end of the Second World War, in 1947. It has expanded over the years and is currently composed of 12 villages. UN-HABITAT piloted a community managed sanitation service provision model to support the efforts towards attainment of MDG targets within the urban poor settlements. The pilot phase established in one village of Kibera - “Soweto East” within the framework of Kenya Slum Upgrading Programme (KENSUP report).
2.4 Human settlement
Location theory

According to this theory, each settlement of a particular order acts as a central place for certain goods and services. There should be a regular pattern and distribution of settlement within an area. The size of each hexagon depends on the order of the central place, village, town and city. Factors considered in this theory were transport was equally possible in all directions. (Christaller, 1903)

Human settlement and habitation in the urban area has been a very important aspect of an urban areas growth. This has been as a result of many aspects of the development goals and human labour that is readily available for development. The strategic placement of the urban areas and development of the larger aspect of the urban area as developed by Walter has led to the understanding of major aspects of the development of an urban area.

Considering the development of an urban area, the concentric circles of the central place theory has also led to a proper understanding of the what an urban centre can develop in a more organized way. The way we utilize the city is as very different as the way one can analyse. This can be both the economic analysis, the accessibility analysis and also the compatibility analysis with the surrounding land uses.

As with the relation with the informal settlements which are always characterized the urbaneness of the developing area and the relation at which the urban formal settlement and the urban informal settlement brings a symbiotic arrangement that would be a reason to come up with the interaction that will be conducive to both the urban formal dwellers and the informal dwellers.

The central place theory has quite a lot of relevance in today’s planning field and development of settlement areas.

The central place theory enables planners to plan for equitable distribution of resources and makes sure that the society has even accessibility to the resources appropriate location of commercial land use and Industrial land use. Every person has the right to a clean and healthy environment
Sanitation as one of the major concerns of urban areas, has been a major challenge. One of the major problems is the issue of housing density which as a regard has been a major distractor in the urban development as far as sanitation is concerned.

Sub-standard sanitary situations and high crime rates are only a few of attributes which go aside with the phenomenon informal settlement. Due to their informal character, reliable and accurate data about informal settlements and their inhabitants is rarely available. On the other side there is a strong need to transform informal into formal settlements and to gain more control about the actual spatial development of informal settlements. Consequently, reliable procedures for detecting and monitoring the spatial behaviour of informal settlements are required in order to react at an early stage to changing housing situations. Thus, obtaining spatial information about informal settlement areas which is up to date is vital for any actions of enhancement in terms of urban or regional planning.
2.5 Case study

2.5.1 CASE STUDY OF ORANGI PILOT PROJECT IN KARACHI, PAKISTAN.
The Orangi Pilot Project (OPP) in Karachi Pakistan has been identified as one of the most successful interventions in the provision of sanitation in slums. The objectives of the project were to understand the problems of Orangi and their causes and through action research develop solutions that people can manage finance and build. Thereafter it was to provide people with technical guidance and managerial support to implement the solutions in the process overcome constraints that governments face in upgrading informal settlements. The project was an initiative of Orangi Pilot Project Research and Training Institute (OPP-RTI). The project was a community-owned, community-managed infrastructure upgrading program with the intention of improving sanitation for the residence of Orangi whose main form of sewage disposal was bucket latrines or soak pits and open sewers (World Bank, 2001).

The project was started in 1980 and has directly and indirectly assisted about one million people in Orangi (Karachi) to improve their sanitation. The project was developed through research into household resources and aspirations in Orangi. It has utilized minimal external support in order to assist households to achieve their objectives for local development. The Project has also been able to incorporate the people of Orangi and the surrounding area in the provision of a number of additional services which include housing, health and education facilities.

Infrastructure provision by OPP-RTI has been made possible by adopting a low-cost sanitation programme that enables low-income households to construct and maintain modern toilets with their own funds and under their own management. The programme relies heavily on capacity building among the slum dwellers where it upgrades the skills of local masons by introducing proper construction techniques and through educating house-owners on planning, orientation and low-cost technology.

The success of the project demonstrates the strength of alternative models of development which depend on the scale of people’s initiative and activity. The project has strengthened the position of women in the communities by encouraging participation in community affairs. These goes to show that if local residents and communities in slums join hands with little expectation that the government will respond or come to their aid then sanitation provision in slums can be an attainable goal.
2.5.2 CASE OF TIRUCHIRAPALLI, TAMIL NADU, INDIA

Before the Tiruchirapalli City Corporation (TCC) approached Water Aid to help build communal latrines in several slums, existing latrines built by the TCC were not maintained and consequently not in use. The involvement of Water Aid assured that the project had a major community participation component and developed into “a 3-year integrated sanitation promotion programme for 100 slums” (Calaguas and Roaf). For those slums where Water Aid managed projects, the organization collaborated with three local NGOs. The role of women in these projects was crucial as they were the first to get mobilized and form self-help groups (SHGs), which eventually federated into a network. Emphasis was placed on meeting the needs of the community and this led to the construction of child-friendly toilets. Those slums managed by TCC were less successful and soon exchange visits were organized to learn from the SHG approach and extend it to the remaining slums. Now SHGs are managing the public toilet facilities across the targeted slums. The remaining challenge is to get men to use the facilities after they become used to defecating in the open (Ganapathy 2003).

This case shows that the involvement of the local community is crucial to the success and sustainability of sanitation projects for the urban poor. The programme has changed the governance of the city in that the SHG network has been invited to get involved in future developments of the city. However, it also needs to be mentioned that the project took part in regularized settlements and SHGs have only now started to engage with communities of unregularised communities (Calaguas and Roaf 2001).

2.5 Sanitation system and urban areas.

How does plot size constrain the use of on-plot sanitation? Critics of pit latrines often claim they are unsuitable for small plots in urban areas. In Jamaica, regulations prohibit pit latrine construction in areas where the density is higher than ten houses per acre (23 houses per hectare); in Indonesia, regulations state that areas with over 250 persons per hectare shall be classified as
densely populated and shall not use on-plot excreta disposal (Alaerts et al., 1991). A manual prepared for Habitat states that the pit latrine system (except VIPs) is ‘unsuitable for use in even low-density urban developments’ (Roberts, 1987). The smallest plot size recommended for twin pit pour-flush latrines in India is 26m² (Riberio, 1985). None of the criteria used appear to be based on reasoned argument or on evidence of performance.

Operational problems associated with on plot sanitation include odour and insect nuisance and groundwater pollution. Odour and insect nuisance Complaints about pit latrines most frequently mention odours and insect nuisance, yet there are few specific references to overcoming these nuisances in urban areas. Flies are a serious problem because they spread disease through feeding and breeding on faeces. Some types of mosquitoes (the Culex variety) breed in polluted water such as in wet latrines and may carry the disease filariasis. Controlling smells, flies and mosquitoes is, therefore, a high priority for reducing household and environmental health hazards. In general, research findings suggest that the problem is not extensive; very few users perceive odour and insect nuisance to be a common problem with their latrine.

Odour and insect nuisance

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2.10 Legal context

2.10.1 Constitution of Kenya 2010
According to the constitution of Kenya 2010 chapter four (bill of rights) states that Every person has the right to a clean and healthy environment, which includes the right to accessible and adequate housing, and to reasonable standards of sanitation and the rights to clean and safe water in adequate quantities.

Informal settlements behave very dynamical over space and time and the number of people living in such housing areas is growing worldwide. The reasons for this dynamical behaviour are manifold and are not matter of this article. Nevertheless, informal settlements represent a status quo of housing and living conditions which is from a humanitarian point of view in the most cases below acceptable levels.

2.10.2 Kenya vision 2030
Kenya Vision 2030 is the current national development blueprint for period 2008 to 2030 and was developed following on the successful implementation of the Economic Recovery Strategy for Wealth and employment Creation which saw the country’s economy back on the path to rapid growth since 2002. GDP growth rose from 0.6% to 7% in 2007, but dropped to between 1.7% and 1.8% in 2008 and 2009 respectively. The objective of the vision 2030 is to transform Kenya into a middle income country with a consistent annual growth of 10% by the year 2030”. The 2030 goal for urban areas is to achieve “a well-housed population living in an environmentally-secure urban environment.” This will be achieved by bringing basic infrastructure and services—roads, street lights, water and sanitation facilities, storm water drains, footpaths, and others—to informal settlements. By strengthening tenure security in informal settlements, the KISIP will also foster private investment in housing and in businesses. The government’s Medium-Term Plan 2008–
2013, which presents the first five-year program to implement the Vision 2030, also specifies improving urban informal settlements as a priority. One of its flagship projects is installation of physical and social infrastructure in slums in 20 urban areas to make them formal settlements, permit construction of permanent houses, and attract private investment. The proposed KISIP will directly contribute to this goal.

- some of the objectives of kenya vision 2030 are:
  - To transform Kenya into an industrializing middle-income country providing high quality of life to all citizens by 2030
  - Create a cohesive, equitable and just society.
  - Achieve an average economic growth rate of 10% per annum and sustaining the same until 2030.
  - Aims to realize an issue-based, people-centred, result-oriented and accountable democratic system.

The Kenya Vision 2030 is based on three key pillars; Economic, Social and Political. This document was prepared to take over from the Economic Recovery Strategy (ERS). as much as the vision 2030 was a major breakthrough, it also had some limitations.

The document in itself has the proper lay out of how the country can achieve the desired state in the 2030 year.

2.10.3 Sessional Paper No. 3 of 2009 on National Land Policy

The National Land Policy was formulated with the aim of securing rights over land and provide for sustainable growth, investment and reduction of poverty in line with Government overall development objectives. The policy will offer a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide:

- All citizens with opportunity to access and beneficially occupy and use land;
- Economically viable, socially equitable and environmentally sustainable allocation and use of land;
- Efficient, effective and economical operation of land markets;
- Efficient and effective utilisation of land and land-based resources; and
- Efficient and transparent land dispute resolution mechanisms.

2.10.4 Sessional Paper No. 3 on National Housing Policy for Kenya
The overall goal of the Housing Policy is to facilitate the provision of adequate shelter and a healthy living environment at an affordable cost to all socio-economic groups in Kenya in order to foster sustainable human settlements. This will minimize the number of citizens living in shelters that are below the habitable living conditions. It will also curtail the mushrooming of slums and informal settlements especially in the major towns.

2.10.5 Sessional Paper No. 6 of 1999 on Environment and Development
Following the first National Environment Action Plan (NEAP) in 1996, Sessional Paper No. 6 on environment and development was developed in 1999 to harmonize environmental and developmental goals to achieve sustainable development. It contained comprehensive strategies and appropriate guidelines for the government to act.

The key objectives of the Policy include: -

- To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,
- To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require a “sustainable development” approach. These issues relate to waste management and human
settlement. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or non-waste technologies, increased public awareness and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities.
CHAPTER 3: STUDY AREA BACKGROUND.

3.1 Information of study area.
Obunga is located in Obunga sub-location Obunga ward approximately 3km north of the central business district of Kisumu.

Map 1: Locational context of Obunga slums, Kisumu, Kenya.
Map 2: Showing Obunga area in the context of Kisumu city.

(Source Google earth)
(Source KISIP conceptual design report).

Obunga neighbors Nyawita which is also a slum and next to it is the Kenya breweries Kisumu Company which provides some casual jobs to the locals in Obunga.
3.2 Population and settlement structure of Obunga.

The settlement pattern in Obunga area is one that is given the characteristics of the slum. The settlement is clustered and populated in the confines of the area.

The following presents the available population numbers in Obunga settlement. The estimates are provided by the Ministry of Lands and Housing and propose a total population of 3,500 inhabitants. The national average household size of 4 inhabitants per household is then applied to determine the total household number (875). The MoLHUD settlement surface area estimate of 36 ha has been revised by the consultant to 46ha. (ministry of lands and housing urban development )

During the socioeconomic works, the average household size of the sample size was calculated. This resulted in a household size of 4.7 per/household, which is higher than the national average. (KISIP project). These figures are used in order to define Obunga demographics as shown in the socioeconomic report.

Table 2: Population estimates of Obunga settlement

<table>
<thead>
<tr>
<th>Number of households(est)</th>
<th>Household size(est)</th>
<th>Population estimates</th>
<th>Population density</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoLHUD estimates.</td>
<td>875</td>
<td>4</td>
<td>3500</td>
</tr>
</tbody>
</table>

Source KISIP Report Kisumu.

3.3 Infrastructure

3.3.1 Road network and access

The settlement is accessed from Kisumu City by either the Breweries – Junction road or the tarmacked Kakamega – Kisumu highway. The settlement’s main access road is a murram road that runs from Breweries to Junction to link with Kakamega road. The alternative main access road comes in from Kanyakwar through to Kudho Primary.

The internal settlement roads run mostly perpendicular to the main access roads providing a network that connects the whole settlement. All these roads are murram surfaced. The network of
roads follows the PDP, though encroachment on the road platform is observed with the extension of household boundaries onto the road corridor.

Figure 1: Roads leading to Obunga settlement.

(Source author)

3.3.2 Drainage Network

The Obunga settlement does not have any obvious outfall nearby. No information exists concerning an existing drainage network in Kisumu City as well as the Obunga settlement.

Regarding the internal settlement drainage, the overall topography of the settlement makes drainage a challenge as the settlement is relatively flat. The network of drainage structures provided mainly follow the road corridors as indicated in the PDPs.
Figure 2: Children playing with water from a burst pipe.

(Source author)
3.3.3 Water Supply

The main source of drinking water for households is piped water either private or shared or from a water kiosk. The majority get their water from the kiosks. The flow of this water is not very reliable.

**Figure 3: Water kiosk**

3.4 Solid Waste Management

The area is mostly seen with waste pits and a few waste disposal bins. The majority of the people in the area are using mostly the open air dump sites to dump most of their wastes. Socio-economic surveys indicate that 86% households reported that they either dumped solid waste in the settlement or burnt it. A negligible number of household paid for garbage collection.(KISIP report)

3.5 Sewerage Network

The sewerage network does not serve Obunga settlement. The socio-economic report findings indicated that the residents of Obunga use various types of toilets ranging from pit latrines to
individual flush toilets with a shared pit latrine being the large majority 87%. These are evacuated through either the same pits or septic tanks. (county government of Kisumu social economic survey).

Table 3: Sanitation inventory in Obunga (KISIP project) in %

<table>
<thead>
<tr>
<th>Have piped water, in house or shared tap in compound (%)</th>
<th>44.8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilet facilities</td>
<td>Individual toilet – pit or flush 8.1%</td>
</tr>
<tr>
<td>Excreta disposal system</td>
<td>Formal connection to public sewer 4.1%</td>
</tr>
<tr>
<td>Drainage</td>
<td>Storm water drainage along the main access road 57.3%</td>
</tr>
<tr>
<td>Garbage disposal system</td>
<td>Dump in the settlement 41.1%</td>
</tr>
</tbody>
</table>

(Source KISIP project)
3.6 ADMINISTRATIVE SETTING IN KISUMU.

3.6.1 County Government of Kisumu (CGK).

The Mandate, Role and Function, which County Governments have and execute are as specified and vested in them, by the CK 2010 and the various Acts of Parliament that effect and facilitate the implementation of the relevant provisions in the Constitution. The mandate of the CGK is defined under the CK 2010. This mandate describes the roles and the framework of which the Council provides the services for: Education, Primary health, Social Services & Housing, Engineering, among others. In line with this mandate, the functions of the Council are outlined in various sections of CK 2010. The following Departments as well as their specific responsibilities are relevant to our project:

- Finance and economic planning sector:
- Physical planning, Roads and Public Works: this department deals in City Planning and infrastructure
- Water, energy, and natural resources: the department deals with, water and Sanitation policy, Electricity and gas reticulation.
- Environment: dealing with solid waste removal and dumping

With regards to the specific infrastructure components relevant to the KISIP project, the CGK is responsible for the following key infrastructure components:

- Road networks within the settlements
- Drainage network
- Solid waste management
- Street lighting and flood lighting
- Public spaces (e.g. parks)
- Footpaths and bike paths
Chart 1: County government organogram. Reference to Kisumu.

3.7 Economics of the area? Everyday life of the area.
Developments in the area in terms of infrastructure mainly the bypass has brought commercial enterprises along the road. Shops and kiosk are a major business activity of the area. The area has also the juakali industry which is mostly metal work and wood work for commercial purposes to the neighboring market and residential areas.

Figure 4: A business stall in Obunga.
3.8 Kisumu Environment

This section provides a general overview to Kisumu City from an environmental perspective, as relevant to the overall design needs. The preliminary Environmental and Social impact checklist is presented in Annex to the report.

3.8.1 Physical Environment

Kisumu City lies at about 340 km East of Nairobi. The town lies at an average altitude of 1131 meters above sea level. It is mainly accessed by road through any of the following networks: Three main highways lead to the town of Kisumu; the Kericho-Kisumu, the Kakamega-Kisumu and the Busia-Kisumu highways. The City is at the shores of Lake Victoria – the largest fresh water lake in Africa.

3.8.2 Climate of Kisumu.

The position of the Town near a large water body strongly affects the climatic conditions of the Town. The below Figure 1 shows rainfall and temperature averages between 1990-2009 for Kisumu. On average, total annual precipitations are of approximately 1223 mm, relatively evenly distributed throughout the year, though with higher precipitations during the winter months between April and September. (KISIP Report).
CHAPTER 4: RESEARCH FINDINGS

4.0 Introduction
In this chapter the provision of the analysis and interpretation of data collected from the area of study during the research period using different methods in the study. Data was collected through various research instruments which included questionnaires targeting a number of the households in Obunga area, observation check list and interview conducted with the key informants and through document analysis. The questionnaires were however the main focus. Other information was obtained from secondary sources i.e. books, journals and UN Habitat’s data and reports on the slum upgrading projects including KISIP. Further information was obtained from internet based articles and reports mostly on sanitation in slums. The quantitative data was analyzed using descriptive statistics and was presented in the form of tables, percentages, graphs and charts. Qualitative data that was gathered during the research period was analyzed and the results of the data analysis provided the information that formed the basis for discussion, conclusion, and interpretation of the findings and recommendations of the study.

4.1 Field work process.
Most of the field work was carried out in the better part of the day when everyone was readily available so as to find maximum participation as advised by the chief of the area. The despondence was very good with about 75% if the turnout able to come up for information delivery. Most of the respondents were female at about 70% while males were 30%.
Chart 2: Respondents gender in percentage.

(Source Field survey)

Graph 1: Showing the age bracket of the majority who stay in Obunga slum

Source: Field survey (2016)

4.2 Environmental sanitation evaluation and infrastructure

4.2.1 Slope orientation

The slope of the area of study is a fairly sloppy ground which is oriented to the river kisat side and it will be a good resource to come up with drainage facilities that will include sewer lines and other
storm water drainages. This will of Course need to be given a proper analysis to come up with the way the slope dictates.

River kisat

This is also an area of interest which is greatly polluted by the residents. The population blame the vice to carelessness and the lack of damp sites and poor waste management techniques by the authority and by land owners. This has greatly been the effect of the pollution process in the river.

4.2.2 Damp sites.
Most of the communal damp sites are not properly maintained and carelessly used by the residents. The sensitization level is not enough to encourage the people to do the work in the way the people will appreciate the environment. This is a setback that was noted also by the KISIP project offices who were doing their study to come up with slum improvement.

**Figure 5: Dump site in Obunga.**

Source: Field survey (2016)
Collection of the wastes deposited in the dumpsite was the most common practice seen by the residents. A small percentage could actually see nothing being done at all by the local authorities.

4.2.3 Toilets

Types and condition of the toilets found in the Obunga area are the latrines and a few flash toilets used by individual households.

Figure 6: Toilets in Obunga slums.

Source: field survey (2016).
Most of the toilets are maintained and cleaned by mostly the land lord. Even though they are always in very poor condition. According to the field research the people are given.

**Chart 3: showing who takes care of the toilet facilities in Obunga.**

![WHO MAINTAINS THE TOILET FACILITIES.](chart3)

Source: Author(2016)

### 4.3 Infrastructure.

#### 4.3.1 Access road

The Obunga area is one of the slums in Kenya that is having access well to both the interior and also to reach it. The Kakamega bypass which was completed has given a major uplift of the area and has made the access of the site very possible.
The access road to the slum is also a fairly motor able and can be accessed by motorists. It’s the roads that actually forms the boundary of Obunga and nyawita area, this road links the Kakamega road and the bypass to airport.

Source: Field survey (2016).
4.3.2 Drainages

Figure 8: showing condition of drainage channels in Obunga slums.

Source: field survey (2016).

4.4 Effects of poor sanitation in the area.

Most of the poor sanitation in Obunga area is characterized by the careless waste disposal, unmanaged latrines, open drains of grey water and sewage and finally contaminated drinking water. This has been a concern to most of the residents of the area and most of them are highly affected by the situation in terms of the health of the area.

Most of the households mentioned the most common disease in the area is diarrhea. Malaria and typhoid also contribute to the disease prevalence inventory of the area.
Graph 3: Showing common diseases in Obunga slum.

Source: author (2016)

The issues of disposal of human wastes unnecessarily for people who do not have the facilities nearby has also contributed to the disease outbreaks of both typhoid and diarrhea.

4.4.1 Preference of people

Most of the residents prefer the garbage collection to be done by the city council and collected to a controlled damping site. Then the garbage to be burnt to help manage the waste in the area. This as shown in the chart below.
Graph 4: showing preference of people in who to clean the environment.

Source: Author (2016)

4.4.2 Sanitation options methods of disposal.
Most of the residents in the area suggested that the disposal methods should be self-initiative and a centralized place should be provided for easy collection and management. At least 10 houses should be provided with a well-maintained toilet and bathroom which will be connected to a sewer line to avoid unnecessary contamination of piped water and pollution of the area with grey water.
4.4.3 Household waste disposal.

The household wastes is left for personal initiative to take care of. This is as proposed by most of the households.

Graph 5: Showing people preferring to use household waste bins and contractors more than a dumpsite

![Graph showing people's preference]

Source: Author (2016)

4.4.4 Willingness to clean the environment.

Majority of the households agreed that the cleanliness of the environment is also the responsibility of the council in collaboration with the residents. This should be done with the help of the collaboration of both the parties involved.

4.5 Objective findings

4.5.1 Objective 1: To find out the existing sanitation conditions in Obunga slums Kisumu.

Regarding the internal settlement drainage, the overall topography of the settlement makes drainage a challenge as the settlement is relatively flat. The network of drainage structures
provided mainly follow the road corridors, this makes creates the problem of the grey water stagnation leading to health problems. Water contaminated with the burst pipes making the hygienic conditions of the area undesirable. Damping of wastes is viewed as a personal issues hence the dumpsite is at the disposal of the household. This clearly shows how the people of the area are having their waste not taken care of well and hence the issues needs a proper planning to achieve a desired goal.

4.5.2 Objective 2: To determine the causes of sanitation problems in the slum area.
The analysis indicates that 86% of households reported that they either dumped solid waste in the settlement or burnt it and 88% of the population use outside shared and mostly unmaintained latrines. This means that most of the people are not just concerned about their environmental surroundings but are also neglecting in the self-responsibility of cleaning their own environment and the need to keep their surroundings clean. Ignorance and carelessness play a major role in this.

4.5.3 Objective 3: To determine the impacts/effects of the sanitation conditions in Obunga slums.
Obunga area is reported to be very prone to diseases including malaria, typhoid and recently high risks of cholera. Majority of the people in the area fear and are aware of the dangers that they are in but they are not given proper ways to deal with the menace.
4.6 Conclusion.

Obunga area in itself has a lot of challenges that are drawn by mostly the negative attitude of the residents about the way the environment is being taken care of. Most of the individual interviewed were suggesting that the cleaning and maintenance of a habitable environment will only be effective when the local government now the county shows interest and provides the necessary steps that can be accepted by the residence themselves. Most of them prefer to be involved in some of the decision making processes instead of being left in the dark with the phrase that “we are helping you.”

Considering sanitation conditions the development of the existing facilities would be a boost to the health and also appeal of the surrounding. This was mainly addressed to the land lords and the relevant officials in the area. This as a result makes the area and the entire population a very promising in terms of ideology to assist in implementing some developments in the area.
CHAPTER 5: PLANNING IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction
This section includes the possible and workable conclusions that will be helpful in Obunga area. The main aim is to help it become more sustainable in terms of sanitation conditions. With reference to the other chapters that have been covered like chapter 2, 3 and 4, this chapter will look at how these conditions can be directed to an improved state. Obunga area is highly capable of growing and becoming a sanitation satisfactory area both environmental wise and health wise.

5.2 Solid Waste Management.
The solid waste projects which included the recommended relocation of the dumpsite and the proper responsibility of the environment by the residents as discussed by the county planner. The general approval of the residents is actually the proposed development concerning the solid waste an agreement. Temporary bins will be allocated to the specific site which will be able to come up with the formulae of collecting and managing the wastes. This will be monitored and executed the people appointed by the chief and monitored by the city council of Kisumu.

5.2.1 What is preferred?
Privatize to enhance collection and dumping system within the settlement was the most preferred way of handling the solid waste. This will enhance the management of the provision of solid waste management infrastructure.

5.2.2. Means of achieving this:
Coordination with the community and the county government in order to propose a solid waste management structure that is sustainable to handle the wastes in the area.
Coordination with county government and with local community to define infrastructure requirements for solid waste management in Order to ensure that community waste is managed on a City-wide level.
5.2.3 Design issues.
Review of a specific requirements for intermediate disposal sites, including potential location for sites taking into account their impact on surrounding households as well as their accessibility.

- Design of size of intermediate disposal sites based upon estimates to overall solid waste volumes.
- Overall cost estimation of installations
- Review of the needs of the community in equipment, tools.

Provision of the necessary instruments to come up with the development of the management of the wastes.

5.3 Water Supply and Sanitation.

5.3.1 What is preferred?
Provide a sewerage network. Meet demand of water supply, provision of a sewerage network and review the feasibility of facilitating household connections.
Separating the piped water channel and sewerage system channel to avoid contamination.
Provision of sessions of water treatment and management with the community organization as the chief of the area and also county government health officers.

5.3.2 Means of achieving this.
Coordination with Kisumu water and sanitation company (KIWASCO) and lake Victoria south water service board (LVSWSB) for planning, design and O&M issues, feasibility of connecting the proposed sewer network to the existing city supply and treatment infrastructure.

5.3.3 Design issues
- Determination of support to KIWASCO to increase supply of treated water to water points
- Cost estimate as per the incomes level of the area.
- Calculation of specific sewerage volumes and dimensioning of sewerage infrastructure.
- Review O&M
5.4 Storm water drainage

5.4.1 What is preferred?
Provision of a settlement level drainage network following the road network. This will enable the channel to provide the easy way to provide the channels to direct the run offs to the required drains and to give the desired.

5.4.2 Means of achieving this.
Coordination with county government of Kisumu and communities for definition of the drainage network as well as overall requirements for project implementation and O&M requirements.

5.4.3 Design.
Confirmation of the drainage infrastructure alignment and outflow point
- Calculation of specific drainage volumes and dimensioning of drainage infrastructure
- Definition of potential options to the infrastructure, based upon the above elements
- Cost estimation

5.4 Emerging issues.
- Responsibility of cleaning the environment which can be done in collaboration with both the residents and the county via a specific private of county programme.
- Ways of disposing off the wastes to define a better way of disposing off the solid waste and their management.
- Type of toilet facility mostly used and management issues to be a priority.
- Common Diseases and disease prevention measures due to being susceptible to the wanting environmental conditions and contamination of water.
- Accessibility to clean drinking water.
Table 4: Summary of the emerging issues and causes.

<table>
<thead>
<tr>
<th>Causes</th>
<th>Main issue</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of improved sanitation facilities</td>
<td>Inadequate waste collection systems.</td>
<td>Creating unhygienic conditions thereby instigating diseases.</td>
</tr>
<tr>
<td>Mismanagement and lack of proper toilet waste disposal management</td>
<td>Improper maintenance of existing facilities</td>
<td>Results in creating a serious health problem.</td>
</tr>
<tr>
<td>Improper waste disposal in the settlement</td>
<td>Dumping waste on both solid and liquid into the nearest open furrow.</td>
<td>Led to the blockage of drains and proliferation of mosquitoes creates unhygienic living conditions in the settlement.</td>
</tr>
<tr>
<td>Contamination of clean drinking water with overflowed latrines</td>
<td>Channeling water pipes in the same transect as the latrines and drains.</td>
<td>Latrine-pits flood and the refuse mixes with the clean water leading to contaminated.</td>
</tr>
</tbody>
</table>

Source: Author (2016)

5.5 Alternative approaches.

5.5.1 Scenario 1

This will include the improvement of the existing situation and in a cost effective way. First the existing structures in Obunga to be realigned to assume a specific line or transect to be designated for drainage and sewer lines construction. The introduction of a sewer system will link the toilets and channel the wastes to a sanitation centre where the waste can be treated and disposed off or used to make biogas.

This will be very economical in the development of new toilets in the same direction to avoid the haphazard constructions by the tenants and also the land owners. This will enable the flow of wastes either grey water and sewage in a defined and a manageable flow in case any issues of blockage arises. It will go hand in hand with the gradient of the land to reduce pumping cost and take advantage of the gravity.

Then at the collection point we can have the main solid waste collection point which will be linked to the other satellite collection points in the area. This will lead to the easy collection of the solid waste of the area in a very efficient and even cheaper way. County environment office in coordination with the city management will be responsible of management of the solid waste.
assembly point for either burning or prospect for usage of other form of economic activity like production of biogas.

**Advantages**

Workable in the short run because it will involve minimal destruction of property and slight changes of daily routine of proper sanitation awareness

Easily acceptable by the local tenants because of ease in congestion with solid waste sites.

**Disadvantages.**

The ideas will be slow to be enacted because of challenges in the funding.

5.5.2 Scenario 2

Constrict new toilets which are of better standard that is both safe in terms of cleanliness and access. This will require the intervention of the county to develop a mechanism to build permanent latrines and adequate ones to reduce the average of people using a latrine to about 5 or lower and this will bring a sense of responsibility to the users. The toilets will be assigned to specific households and they will be responsible for the maintenance of the toilet and also the landlord will be accountable. This will mean that in the rent paid by the tenants he should put a share for the maintenance of the toilets.

Secondly the drainages and the water pipes should be separated so that the waters do not contaminate.

The open waste disposal pits should be managed by the radius of use, this will be done by regularly burning of the wastes disposed there.

**Advantage.**

There will be adequate toilet facility which will mean that the carelessness will be reduced.

**Disadvantages**

Cost of constructing new toilets and diverting the existing water pipes and drainages
5.6 Conclusion

Slums will be with us and what we can try to do about it is to manage it to be a more livable environment, most of the people being interviewed would actually say and relate to that. Most of the residents of Obunga said that slum formation is one of the greatest challenges for this generation and the generations to come. Slums are mushrooming and policy makers seem not to be willing and able to serve their inhabitants. The fact that the MDGs have somehow ‘forgotten’ to include specifically and explicitly in their targets the issue of communal sanitation for slums is a sad illustration of such. Fortunately many non-governmental actors and community based organizations have stepped into the void left by the official governments, and have taken admirable initiatives to serve the slum dwellers by providing them with enhanced sanitation options.

The existing sanitation systems in Obunga are not to standard and just past the basic level of human sustainability. Personally I cannot deny that the state of affairs in the Obunga is not really to the edge of the definition of bad but it really needs improvement to be able to sustain itself in matters of sanitation.

Most of the people who stay in Obunga either own that land or either stay there as just tenants, this has given them the individuals who own the land the Secure land tenure which is described as the rights of individuals or groups in relation to land. For any development the land owners are actually the ones to be consulted and settle any disputes before any development is undertaken.

Community members have good knowledge of what proper sanitation involves, which can be seen in their stated results on expectations of sanitation facilities and the impacts of poor sanitation in their community. In fact most of the residents are very optimistic in participating in the sanitation pro activities but they get drawn back by the government procedure which always sideline them to owning their area with their personal interest. This most of the time has delivered had caused wars and differences in the communities in the area and also among themselves due to divided interests as most of the people who stay on Obunga slums are mainly from the Luo community.

Finally Obunga is not that badly off in terms of access and provision of basic necessities and room for improvement with the matters that not only concern about environment and sanitation but also the development security and more so economic sustainability.
SELECT REFERENCES.


Appendix 1: Key informant questionnaire area chief.

Key informant questionnaire area chief.

INTRODUCTION/CONSENT

Good Morning/Afternoon.

I'm Kevin Ainea Odhiambo, a student at The University of Nairobi undertaking a Bachelors’ Undergraduate Degree in Urban and Regional Planning.

Currently I'm carrying out my Planning Research study on assessment of sanitation challenges in Obunga slums Kisumu.

The information obtained from this interview will be handled confidentially. The results of this survey will be used to write B.A Planning Research Project and the recommendations can be shared with stakeholders including the neighboring societies, government, NGOs, and CBOs in implementing better sanitation solutions that would be of benefit to the residents of Obunga.

<table>
<thead>
<tr>
<th>RESPONDENT’S DETAILS</th>
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<tbody>
<tr>
<td>1. Name:</td>
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<tr>
<td>2. Phone No.:</td>
</tr>
<tr>
<td>3. Gender:</td>
</tr>
<tr>
<td>1. Male</td>
</tr>
<tr>
<td>2. Female</td>
</tr>
<tr>
<td>4. Age in Years:</td>
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</tbody>
</table>

1. For how long have you been the chief of this area?
2. In terms of sanitation, what is the major menace and how bad is it?
3. What has your office done to address this situation?
   If any what are the temporary measures you have taken to address the issue of sanitation?
4. As a representative of the government, do you think it’s doing enough towards solid waste management in your area? 1. Yes 2. No
If No, What do you recommend to be done by the government to improve the situation of solid waste management in this area?

5. Is the local government supportive in your efforts to sort out sanitation challenges in Obunga? Yes or no

6. If yes, what has the local government done to improve the sanitation conditions in Obunga? How reliable/effective is it?

7. Do you have a locally arranged cleaning days with your residents?
   Yes 2. No

8. If yes how regularly is it done? and how effective is it?

9. Are there any community organization that is mandated to take care of the sanitation in the area?

10. What do you think should be done to improve the sanitation conditions of Obunga?

11. Did the national youth service NYS helped to improve the sanitation conditions in Obunga slums
12. Are there any administrative sanctions levied to the solid waste contributors in this area? 1. Yes 2. No

13. If Yes, Mention the sanctions.

14. 1. ........................................................................................................................................

15. 2........................................................................................................................................

16. 3........................................................................................................................................

17. Are there any on-going solid waste management programs/projects in this area either by government or NGOs? 1. Yes 2. No

18. If Yes, What are they doing to alleviate the problem of solid waste illegal disposal in this area?

19. Are there any officials from NCC, NEMA who usually monitor the situation of solid wastes alongside the river? 1. Yes 2. No

20. How often is the monitory done?

21. Has there been any research work carried out by the government in this area in regard to solid waste management before?
22. Have there been any implementations from any of the research activities?

23. Do you have any questions for me?

Thanks you for your Corporation.
Appendix 2: Key informant questionnaire county planning officer

Key informant questionnaire county planning officer.

INTRODUCTION/CONSENT

Good Morning/Afternoon.

I'm Kevin Ainea Odhiambo, a student at The University of Nairobi undertaking a Bachelors’ Undergraduate Degree in Urban and Regional Planning.

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The information obtained from this interview will be handled confidentially. The results of this survey will be used to write B.A Planning Research Project and the recommendations can be shared with stakeholders including the neighboring societies, government, NGOs, and CBOs in implementing better sanitation solutions that would be of benefit to the residents of Obunga.

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<tr>
<td>3. Male</td>
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<tr>
<td>4. Female</td>
</tr>
<tr>
<td>6. Age in Years:</td>
</tr>
<tr>
<td>2. Phone No.:</td>
</tr>
</tbody>
</table>

1. What is the condition of Obunga in terms of waste disposal and management?

2. Is there anything currently being done to address the human waste management and solid waste management in Obunga slums?

3. What is the county doing in terms of solid waste management in Obunga?

   If yes what is the outcome of the
4. Is there any collaboration with any institution to improve the solid waste management in Obunga slum?

5. According to the current plan, if any what is the immediate plan that is underway in improving the sanitation situation in Obunga slum?

6. What is the future plan of Obunga in terms of sanitation?

7. Have you ever tried any improvement of the Obunga slum especially the sanitation sector?

8. Are Obunga residents able to access clean tap water? yes no

   If not, What are the measures taken to avail the clean water?
INTRODUCTION/CONSENT

Good Morning/Afternoon.

I'm Kevin Ainea Odhiambo, a student at the University of Nairobi undertaking a Bachelors’ Undergraduate Degree in Urban and Regional Planning.

Currently I’m carrying out my B.A Planning Research study on THE ASSESSMENT OF SANITATION CONDITIONS IN OBUNGA AREA.

The information obtained from this interview will be handled confidentially. The results of this survey will be used to write B.A Planning Research Project and the recommendations can be shared with stakeholders including the government, NGOs, and CBOs in implementing viable general sanitation strategies and policies that would bring the sanitation conditions of the area to a desirable condition in all areas including Environmental, Health and Socio-Economic Sustainability.

Section A: BIO DATA

<table>
<thead>
<tr>
<th>RESPONDENT’S DETAILS</th>
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</thead>
<tbody>
<tr>
<td>1. Name</td>
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<tr>
<td>3. Gender</td>
<td>1. Male</td>
</tr>
<tr>
<td>4. Age in Years</td>
<td></td>
</tr>
<tr>
<td>6. Employment</td>
<td>1. Employed</td>
</tr>
<tr>
<td>7. for how long have you lived in Obunga?</td>
<td></td>
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<tr>
<td>----------------------------------------</td>
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</tbody>
</table>

**Section B: Responsibility towards sanitation.**

<table>
<thead>
<tr>
<th>1. Whose responsibility is it to clean the surroundings/environment?</th>
<th>1. The Individual Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Kisumu City Council(KCC)</td>
</tr>
<tr>
<td></td>
<td>3. Both</td>
</tr>
<tr>
<td></td>
<td>4. Community Based Organizations (CBOs)</td>
</tr>
<tr>
<td></td>
<td>5. Non-Governmental Organizations (NGOs)</td>
</tr>
<tr>
<td></td>
<td>6. Everyone Using the Environment</td>
</tr>
</tbody>
</table>

| 2. Are you satisfied with the way wastes are managed in this area? | 1. Yes | 2. No |

<table>
<thead>
<tr>
<th>3. How do you dispose of your refuse?</th>
<th>1. The use of council facilities and services</th>
<th>2. Use of Private waste control contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5. Others. Specify</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 4. How reliable/effective is it?                                        | 1. Good  
2. Reasonable  
3. Not effective                                                         |
| 5. What has the local government done to improve the sanitation conditions in Obunga? | 1. Regular garbage collection  
2. Provision of waste bins  
3. Community cleaning sessions  
4. Other: specify                                                             |
| 6. Do you think it is appropriate for individuals to clean their own disposable surroundings? | 1. Yes  
2. No                                                                 |
| 7. Which kind of toilet facility do you use                              | 3. Pit Latrines  
4. Water closets (W.C)  
5. Portable toilets  
6. Other specify.                                                             |
| 8. How many households use an outside toilet facility?                   | Specify?                                                                |
| 9. How are the toilet facilities maintained?                             | 1. By council  
2. By residents  
3. Land lord  
4. Not maintained                                                             |
| 10. Have you ever heard/seen any organisation sensitizing the area residents about proper waste disposal? | 1. Yes  
2. No                                                                 |
| 11. Do you think a private waste bin is necessary for a proper solid waste management? | 1. Yes  
2. No                                                                 |
| 12. How so?                                                              |                                                                        |
| 13. How far is your nearest toilet facility in meters                    | 1. Less than 50m  
2. 50m < 100m  
3. specify                                                                  |
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| What is the distance from your house to the nearest waste disposal.     | 1. O to 50 m  
2. 50 to 100 m  
3. specify                                         |
| 14. Are you aware of any plans that are underway to address the sanitation issue in Obunga? | 1. Yes  
2. No                                      |
| 15. If yes, which one?                                                |                                                                       |
| 16. What are the common diseases among your household members?         | 1. Common Cold  
2. Malaria  
3. Typhoid  
4. Cholera  
5. Diarrhoea  
6. Skin diseases  
7. Other                                 |
| 17. Do have access to clean drinking water                             | Yea  
No                                         |
| 18. If yes is the tap water reliable?                                  | Yes  
No                                         |
| Section C : suggestions                                                |                                                                       |
| 19. What would you like to be done to improve the sanitation condition of the area? |                                                                       |
| 20. Any other issue of concern that is affecting sanitation conditions in the area? |                                                                       |